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Section One

INERT MATTER

Consequentialism and Commercial Space Exploration

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The authors investigated the relevance of consequentialism in commercial space exploration as well as in the actively developing space market. The authors conclude that space expansion and colonization of space objects will lead to a revision of the foundational consequentialism provisions. Consequentialism, formed during the history of terrestrial civilization, loses its effectiveness under conditions of space commercialization. The basics of planetary thinking are different from those of cosmic thinking. Therefore, considering the meaning of the terms “cosmic expansion” and “colonization of the cosmos” through the existing theory of consequentialism faces serious contradictions. There is a range of problems that are not explored in modern philosophy and ethics due to the lack of an empirical basis for philosophical analysis.

Keywords: consequentialism, commercial space exploration, space commercialization, “New Space” ecosystem, space market, moral rightness

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Introduction

In the last decade, Commercial Space Exploration has been actively proceeding from the field of theoretical research to practice. The introduction of NASA's Commercial Orbital Transportation Services (COTS) program has become a new milestone in the relationships between public funding of space programs and the opportunities of private investments into space exploration. Clelia Iacomino's book is one of the latest large-scale studies of the evolving role of private actors in space exploration (Iacomino, 2019). Iacomino offered a comprehensive overview of current space exploration in terms of geopolitical and commercial aspects.

New advances in space exploration raise the urgency of problems that have not previously been explored or are inadequately explored by science. One of these problems is the ethics of space exploration commercialization.

In the present article, the authors will consider the relevance of the maxim "the end justifies the means" in space exploration. This maxim as well as the Ovid phrase "The result justifies the deed" correspond to the class of normative ethical theories combined by the term "consequentialism." The term was first used by Gertrude Anscombe, a British analytic philosopher in 1958.

Commercial Space Exploration: present state and prospects for development

More than 60 years have passed since the launch of the first artificial Earth satellite. Sputnik-1, made in the USSR, was launched into orbit on October 4, 1957. For more than 50 years, the space flights and space exploration have been regarded as programs that can only be financed by highly developed nations. For this reason, achievements in space exploration directly depended on the economic development of the state. For example, after the collapse of the USSR, its cosmic potential was distributed in unequal proportions among the Russian Federation, Ukraine and Kazakhstan. Each of the three states has different ways of financing space exploration. In Ukraine and Kazakhstan, government funding for space programs has virtually ceased. As a consequence, these states have lost their leadership in space exploration. In the Russian Federation, public funding for the space industry is still ongoing. It has fallen far short of funding for state space programs in the US, China, the European Union, India and Japan. We take into account not only the share of public funding, but also the effectiveness of space programs, as well as their impact on the development of the scientific potential of the state. However, the very fact of financing allows the Russian Federation to remain among the states that are united by the term "space power".

At present, governments and heads of the state institutions specializing in space exploration are developing programs that stimulate the involvement of commercial actors in public programs. The European Space Policy Institute and the Italian Space Agency conducted a study on potential contributions of commercial actors to space exploration. The general objective of the study was to understand potential ways to foster successful contributions of commercial actors to achieve European strategic space exploration objectives. The authors of

the study concluded that despite the efforts made by the states, the profitability of the space industry is not obvious to private investors. The space industry is still not regarded by private investors and investment funds as an attractive asset in terms of profitability.

To increase the attractiveness of the space services market, Clelia Iacomino and Silvia Ciccarelli suggested the following steps (Iacomino & Ciccarelli, 2018):

1. Creation of solid partnerships: the public sector should not have a strong control of the partnerships. States should look for investor partners who are ready to develop their research programs including commercial space exploration.
2. Establishment of tax and investments incentives: to improve the business case of entrepreneurs and support the start of a new industry, the space agencies are encouraging new businesses to invest in creating new markets in space exploration, providing tax breaks.
3. Creation of a portfolio with multiple partners: a diverse portfolio of partners and investing in diverse solutions, should create competition which drives “performance up and costs down”.

The experience of the USA showed that leadership in space exploration, which is maintained solely through public funding, could be erroneous. Since 1984, the share of public funding has gradually decreased in space telecommunications, commercial space transportation, remote sensing, etc., while the share of participation of non-state enterprises has increased rapidly. A legal and regulatory framework has been modified to stimulate space commercialization. The stages of space law development are discussed in the research of Valentyn Halunko (Halunko, 2019), Larysa Soroka (Soroka & Kurkova, 2019), etc. Larysa Soroka and Kseniia Kurkova explored the specifics of the legal regulation of the use and development of artificial intelligence for the space area (Soroka & Kurkova, 2019).

As a result of changing the legal framework and attracting private investors to the space market, the US did not lose its leadership in space exploration, but rather secured it. Private investment along with government funding have significantly reduced the risk of business projects in the space industry. The quality and effectiveness of space exploration programs have increased.

In 2018, Springer published an eloquent book *The Rise of Private Actors in the Space Sector*. Alessandra Vernile, the author of the book, explores a broad set of topics that reveal the role of private actors in space exploration (Vernile, 2018). The book covers the following topics: “Innovative Public Procurement and Support Schemes,” “New Target Markets for Private Actors,” etc. In the “Selected Success Stories,” Vernile provides examples of successful private actors in space exploration (Vernile, 2018).

The current level of competition, which has developed on the space market, allows us to state the following fact. Private space companies have been able to compete with entire states in launching spacecraft, transporting cargo to orbital stations, and exploring space objects. The issue of mining on space objects, the creation of space settlements and the intensive development of the space tourism market are on the agenda.

In the 21st century, the creation of non-governmental commercial organizations specializing in the field of commercial space exploration, is regarded as an ordinary activity. They are established as parts of the universities around projects funded by private investors. For example, Astropreneurship & Space Industry Club based on the MIT community (Astropreneurship, 2019).

Large-scale research in the field of commercial space exploration, as well as the practical results achieved, led to the formation of a new paradigm called “New Space” ecosystem. The articles of Deganit Paikowsky’s (Paikowsky, 2017), Clelia Iacomino (Iacomino & Ciccarelli, 2018) et al. reveal its key meanings and the opportunities it offers in the space sector. The “New Space” ecosystem is a new vision for commercial space exploration. It is the formation of a cosmic worldview, in which the near space with all the wealth of its resources and capabilities, becomes a part of the global economy and the sustainable development of the society.

The “New Space” ecosystem offers the following ways for commercial space exploration (Iacomino & Ciccarelli, 2018):

1. Innovative public procurement and support schemes, which significantly expand the role of commercial actors in space exploration.
2. Attracting new entrants in the space sector. First of all, these are companies working in the domain of Information and communications technology, artificial intelligence, etc. that are expanding their research in space markets. They offer innovative business models and new solutions to space commercialization.
3. Innovative industrial approaches based on new processes, methods, and industrial organization for the development and production of space systems or launchers.
4. Disruptive market solutions, which significantly reduce commercial space exploration prices, increase labor productivity, provide new types of services, etc.
5. Substantial private investment from different sources and involving different funding mechanisms. For instance, these are private fortunes, venture capital firms, business angels, private equity companies, or banks, etc.
6. Involvement of an increasing number of space-faring nations investing in the acquisition of turnkey space capabilities or even in the development of a domestic space industrial base. This expands the space markets and makes it more competitive.

The analysis of the research and advances in commercial space exploration allows us to draw the following conclusions:

1. In fact, the space market has already been created. It is currently undergoing continuous development that will integrate the resources and capabilities of the near space into the global economy over the next decade.
2. A new paradigm, denoted by the term “New Space” ecosystem, is at the heart of the created space market. The “New Space” ecosystem is a step towards the formation of cosmic thinking, in which outer space, with its resources and capabilities, is considered as a sphere of human activities.
3. Space market regulates space law, which is constantly evolving. The space law develops within the bounds of international law. In essence, the space market is integrated into the international legal field and is governed by its laws.
4. Space commercialization updates ethics issues. The link between law and ethics remains relevant in the space market. The study “The Revival of the Notion of Arete in Contemporary Philosophy” proves the continuity of the founding provisions of ancient and modern civilizations (Bazaluk, 2019). In fact, the continuity of cultural history, on the basis of which planetary thinking is formed, becomes apparent. The inclusion of the near space in the activities of terrestrial civilization must be accompanied not only by changes in the regulatory and legal framework, but also by a rethinking of the laws of ethics.

Consider moral challenges of commercial space exploration.

Moral challenges of commercial space exploration

Jai Galliot conducted comprehensive and unifying analysis concerning the rise of private space exploration, with a view toward developing policy that may influence real-world decision making (Galliot, 2015). He investigated the plethora of questions demanding serious attention — privatisation and commercialisation, the impact on the environment, health futures, risk assessment, responsibility and governance.

From our point of view, there are several key moral challenges in commercial space exploration.

The foremost moral challenge, which at first transformed space exploration into a closed club of superstates, is due to the fact that space technologies and space exploration have always had a dual purpose since their inception. On the one hand, they expanded the presence of man throughout the universe and made it possible for man to use the resources of outer space for the civilization development. On the other hand, space programs have been considered as a part of the national security strategy. They were used for military purposes: to defend and attack the enemy.

The “New Space” ecosystem reduces the relevance of this moral challenge. The evolving space market, which integrates into global international and economic relations, offers new solutions to this moral challenge for its participants. On the one hand, the space market provides its participants with a number of benefits that greatly expand the scope of their activities and, accordingly, opportunities. The “New Space” ecosystem is an opportunity for private actors and less-developed states to become involved in new high technologies and their use for commercial space exploration. This is an opportunity to join the emerging cosmic thinking. The cumulative potential of new entrants to the space market forces us to reconsider the existing ethical standards applied in contemporary international relations. The continuous increase in the number of space market participants reduces frontier tensions and decreases the ability to use space technologies for military purposes. On the other hand, if the benefits received by space market participants are not governed by strict ethical standards, they can lead to a distortion of the balance between the loci of civilization. On the contrary, it will increase the frontier power and, accordingly, increase the likelihood of regional wars (Bazaluk & Svyrydenko, 2017). Commercial space exploration is always a new discovery, the results of which cannot be predicted by planetary thinking. For example, the discovery of new types of matter, energy and information in the process of space exploration can lead to monopolization of the market and even to the superiority of a space corporation over any other that is limited to activities on a planetary scale.

When analyzing the “New Space” ecosystem, Deganit Paikowsky comes to the following conclusion. For a long time, space exploration has been driven mainly by three reasons: national security and military considerations; economic growth, prosperity, development, and benefit to society; and / or the aspiration to sustain and upgrade international status (Paikowsky, 2017). The “New Space” ecosystem paradigm is based solely on the desire to profit. Considering space as an investment project and as an opportunity “to profit” is the second key moral challenge. How ethical is it to make money from space exploration? For a long time, space exploration has been considered as a purely supreme value. Outer space and overcoming planetary scales have been seen as a challenge to terrestrial civilization. Space walks have been transformed from a dream into a goal. Ultimately, this goal led to the integration of the potential of civilization, the mobilization of political, economic and scientific resources of states that were previously at odds with one another.

However, the era of space exploration poetry has passed. The exploration of space and its resources has become a daily occurrence that requires completely different approaches. The editors of *The Ethics of Space Exploration* have attempted to determine a robust and theoretically informed approach to the ethical dimension of discussions on space and society (The Ethics, 2016). The book presents research on normative ethics, ethical issues in Solar System exploration, etc. The book contributes significantly to the understanding of issues of value, which repeatedly emerges in interdisciplinary discussions on space and society.

The second moral challenge makes us ponder over the consequences of space commercialization. In fact, space exploration changes from the supreme value, that unites the potential of terrestrial civilization, into a new qualitative state — the space market. Will commercial space exploration not lead to the split of civilization? What is a new supreme value that is able to unite civilization in the face of competition with commercial space exploration?

Consider the relevance of a particular class of normative ethical theories in commercial space exploration. How ethical is the maxim “the end justifies the means” in commercial space exploration? We believe that the answer to this question will be a definite contribution to the comprehension of a new supreme value capable of unifying terrestrial civilization in terms of commercial space exploration.

Best or right is whatever makes the world best in the future

Consequentialism about the moral rightness of acts states the following. “Whether an act is morally right depends only on the consequences of that act or of something related to that act, such as the motive behind the act or a general rule requiring acts of the same kind.” Or otherwise, “What is best or right is whatever makes the world best in the future, because we cannot change the past, so worrying about the past is no more useful than crying over spilled milk” (Sinnott-Armstrong, 2019).

Consider two examples.

Elon Musk in his article “Making Humans a Multi-Planetary Species” expressed his vision of the future of humanity. According to Musk, human civilization should “become a space-bearing civilization and a multi-planetary species” (Musk, 2017). Russian astronaut and explorer Sergey Krichevsky views terrestrial civilization as cosmic humanity. He argues that the evolution of human civilization will lead to the creation of cosmic humanity (Krichevsky, 2017). Oleg Bazaluk states that the appearance of humanity is a natural phenomenon, which is conditioned by the philosophy of the Cosmos (Bazaluk & Kharchenko, 2018). Thus, human expansion of space is regarded not only as an obvious phenomenon, but also as a natural process of human evolution. Colonization of space objects is expected to become a common practice in the short term. We are currently observing the formation of a sequence of actions that, at the first stage, will lead to the colonization of Mars. The first colony on Mars is expected to be built by 2030 (Musk, 2017).

Consider to what extent the cosmic expansion and colonization of space objects are consistent with the moral rightness of acts. Consequentialism about the moral rightness of acts has been established and operates on a planetary scale. “Best or right is whatever makes the world best in the future” implies, above all, human activities on Earth as a space object. The thesis “makes the world best” is an exclusively human vision of the world, limited by its current level of development. In addition, we do not have a unified and well-established basis for planetary worldview in the scale of terrestrial civilization. It is pluralistic. Earth-scale consequentialism is effective because Earth as a cosmic object is the medium of birth and

development of human civilization. Human has the right to regard the environment of their birth and existence as “Homo Nooeconomicus” as a Human Image for the Noospheric Epoch” (Smirnov & Odintsova, 2019). However, how ethical is the expansion of consequentialism theory to spaces that are not the birthplace and formation of human civilization? Does consequentialism apply to space objects that do not have a history of human presence?

Musk, Krichevsky, Bazaluk, and many other researchers regard space expansion as a natural process for the evolution of human civilization. However, is this not equivalent to acknowledging that aggression is an ontological characteristic of humans? After all, expansion is primarily aggression. On the scale of Earth, expansion is associated primarily with the terms “war”, “violence”, “coercion”, “restriction of rights and freedoms”, etc. What will change when we consider the ethics of “space expansion”?

We have every right to compare commercial space exploration with the discovery and development of America by Christopher Columbus and the Europeans. The consequences of colonization of America for its indigenous peoples are well known. The exploration of Mars that Elon Musk is so eager for is tantamount to “conquering America” by terrestrial civilization. Currently, the fact of the presence of complex biological organisms on Mars is not reliably established. However, scientists are inclined to believe that Mars has the simplest biological organisms. In 2018, Princeton University Press published the book *Life on Mars: What to Know before We Go* by David A. Weintraub. David A. Weintraub is Professor of Astronomy at Vanderbilt University. His research essentially precedes the maxim “The end justifies the means.” An ethical problem arises: how far is humanity willing to go to satisfy their desire to colonize Mars? If biological life is indeed to be found on Mars, then colonization of Mars will, at best, lead to its transformation and, at worst, to death. There are a sufficient number of examples like this in world history.

It is possible to extend the consideration of the problem of “Mars exploration”. For example, we can assume the existence of civilizations that are beyond earthly civilization in terms of development. Such a conclusion follows, for example, from the new paradigm of the Universe proposed by Bernardo Kastrup (Kastrup, 2018). Suppose these highly developed civilizations would be the observers of the “colonization” of Mars by modern man. What conclusions can they come to when observing the devastating effects of Mars colonization by man? How will the ethics of a human colonizer correspond to the ethics of the behavior of highly developed space civilizations?

Space expansion formulates a problem that has not previously been faced by humans. Suppose, in 2030, the first colony will be really built on Mars. Will consequentialism remain relevant to it? The first colonizers will face at least the following problems:

1. Moral rightness and wrongness of actions is determined by the history of human development on Earth. To what extent can the history of human development on Earth and the consequences of consequentialism, formed on its basis, be projected on the ethics of Mars colonizers?
2. What can the colonizers of Mars mean by the phrase “makes the world best in the future”? Primarily, the first colonizers of Mars will be aware of the degree of risk of their presence on a new planet and the inability to return to Earth. Will this not cause the extension of consequentialism? Secondly, few of the colonizers of Mars will consider their future on Mars. For most of them, the experience of colonization will be a bright but short-lived event of their lives. Again, will this initial setting not change the foundations of consequentialism? Finally, thirdly, man will colonize a planet that lacks complex biological organisms. The present planetary thinking does

not imply the ethics of the attitude towards the simplest ones. Something, which man cannot visually perceive, is mostly beyond their thinking. This means that, in essence, the colonization of Mars does not imply the ethics of attitude toward the indigenous Martian life. A priori, man will act on Mars as an aggressor.

3. How can you understand the phrase “makes the world best” when you live in a colony surrounded by life-threatening space? What does “the world” mean? Is it the colony or the surface of Mars? How ethical is the assumption that an alien from another planet — a colonizer — can make Mars better? At its best, they can make their stay on Mars better. However, this “better” for Martian evolution will be comparable to the “better” for the indigenous people of America after its colonization by Europeans.

Consider the second example. Commercial Space Exploration is not only the development of the space tourism and space travel market. This is, first and foremost, the use of mineral resources that are part of the structure of space objects. When we consider the use of mineral resources on a planetary scale, we are guided by consequentialism. The moral rightness and wrongness of actions is determined by the stereotypes existing on the Earth’s scale about what “makes the world the best in the future” (O’Connor, 2016). Current ethics laws strike a balance between utilitarian views on the use of planet resources and awareness of the effects of environmental disasters on human life. Moreover, this equilibrium is not stable. It is constantly regulated under the influence of continuous rethinking of the connections between the tangible, living and rational matter, which results in the human understanding of the philosophy of the Cosmos (Bazaluk & Kharchenko, 2018). The basis of this understanding is formed by the experience of human activities on a planetary scale.

Commercial space exploration updates the problem of transferring the ethics of extraction and use of mineral resources in Earth conditions to other space objects. The question is how effective is consequentialism in organizing the extraction of mineral resources on Mars? If consequentialism on Earth establishes specific boundaries that limit human intervention in the ecosystem of the planet, are there such boundaries on Mars? Is there a need to create such boundaries on a planet that lacks reasonable matter?

Extraction of minerals on space objects of various forms actualizes another problem. The fact of the absence or presence of biological life at this site is significant, but not determining. Man is far from understanding the cosmic processes. Suppose cosmic expansion opens up the possibility for man to extract mineral resources on the planet, which is guaranteed to have no biological evolution. It is basically impossible there. However, the extraction of mineral resources is always an interference with the geological evolution of a space object. Human intervention in its geological evolution raises a problem of danger for the space object. Moreover, it is followed by another problem. If human intervention in the geological evolution of a space object leads to its collapse, how much will the destruction of the cosmic object affect the cosmic processes? Man does not know the answer to the question: how much can geological evolution change the evolution of the Universe?

The examples we considered, allow us to formulate the ultimate question of our study. How applicable are the maxim “The end justifies the means” and consequentialism itself in commercial space exploration?

Overall, the present study will at least result in the revision of consequentialism in commercial space exploration. The history of culture, that laid the foundations for it, limits its influence solely to the scale of Earth. This means that under conditions of space expansion, consequentialism loses its cogency and cannot be used as an effective theory. Space expansion

and colonization of space objects present completely new history of terrestrial civilization that may lay entirely new groundwork for the moral rightness of acts.

Conclusions

The main conclusion that can be drawn from the present findings is that we approached another important question. Does a person get more rights and freedom in commercial space exploration? This question is not accidental, because in the course of the study we found that the basis of consequentialism in space exploration is not as convincing and obvious as in the conditions of terrestrial civilization. Consequentialism in space expansion and colonization of space objects will at least be reconsidered. Commercial space exploration is a new page in the world history. It will lead to a change of planetary thinking into cosmic, or to a division of thinking into planetary and cosmic ones.

The performed analysis provided evidence for the fact that the effectiveness of using consequentialism in commercial space exploration is not obvious. The experience of planetary evolution, which laid the foundation for modern consequentialism, essentially rendered useless in space exploration. In the course of commercial space exploration, it is necessary, at least, to gain experience and provide answers for the following questions:

1. What is meant by the term “the world” in cosmic thinking?
2. What is the meaning of the phrase “makes the world best in the future” for the colonizers of space objects?
3. How relevant is the pursuit of commercial space exploration and space expansion to the moral rightness and/or wrongness of acts.

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Between Physics and Metaphysics — on Determinism, Arrow of Time and Causality

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Contemporary physics, with two Einstein's theories (called "relativity" what can be interpreted erroneously) and with Heisenberg's principle of indeterminacy (better: "lack of epistemic determinism") are frequently interpreted as a removal of the causality from physics. We argue that this is wrong. There are no indications in physics, either classical or quantum, that physical laws are indeterministic, on the ontological level. On the other hand, both classical and quantum physics are, practically, indeterministic on the epistemic level: there are no means for us to predict the detailed future of the world. Additionally, essentially all physical principles, including the arrow of time and the conservation of energy could be, hypothetically, violated (with some exceptions in the world of heavier quarks, and probably, the cosmological arrow of time). However, in contrast to Hume's skepticism, we have no experimental evidence that the causality can be removed or even "hung on" in any case. The text contains some didactical-like issues, as well.

Keywords: Quantum mechanics, determinism, causality, classical physics

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Introduction

The question to which extent we determine our lives and how it is decided by some external fate waving our live thread, is probably as old as the human reflection. In addition, it is still vivid: in modern cosmology these are parallel universes of Max Tegmark¹, which we cannot contact with but our twins perform there parallel actions with ours.

From times of Aristotle, physics is called as a starting subject in philosophical discussion: the teleological cause appeared in his *Physics*. The reason for the epistemological importance

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¹ Tegmark is well known for the cover of Scientific American (May 2003) on parallel universes, but he brought several important contribution to cosmology, like anthropic constraints for neutrino's mass (Tegmark, 2005).

of physics in the contemporary philosophy is that it brought two spectacular mental revolutions: quantum physics and Einstein's relativity. Both of them are still far from being understood. Robert Crease, in a book published by Institute of Physics, writes: "Quantum mechanics is indeed difficult to interpret" (Crease, 2017). Another title, in American Journal of Physics says: "Do we really understand quantum mechanics?" (Laöle, 2001).

One of the "victims" of quantum revolution is the strict determinism (Giammarchi, 2015). Statements on the unpredictability of event, on their relativity, on the chaos in physical (and biological) systems or on self-ordering are frequently cited in many contexts. From times of Heisenberg "the future is no longer contained in the past" says British physicist (and theologian), John Polkinghorne (1989).

Both revolutions of modern physics are commonly considered as *ontological*, suggesting that the micro-world is chaotic-like and the macro-world is relative. However, as we discuss here, this is incorrect: both revolutions are *epistemic*, i.e. limiting our possibilities of knowledge on the universe.

This paper is born in the same way as our works in experimental physics (Karwasz et al., 2004; Karwasz, 2005): from careful observations of the real world. However, differently from measurements, in order to reveal dependences going outside simple physical objects, a longer experience is needed. We discuss the subject of determinism, in view both of classical and quantum physics, but we go beyond physics, to what Aristotle would call metaphysics.

The paper is organized as follows. First, we ask if the modern physics, Heisenberg's and Einstein's theories in particular, create any space for *ontological indeterminism*. Then, for the classical physics, we ask if physics really assures any *epistemic determinism*. Concluding this part, we ask if there is any evidence of non-causal actions in particular via so-called Einstein-Rosen-Podolsky (EPR) "paradox".

The second argument discussed is the time arrow, as inverting the time is a common temptation against the principle of causality. The symmetry (or asymmetry) of the time arrow is linked to principles of conservation in physics and is related to cosmology (López, 2018).

We conclude that the *ontological determinism* holds firmly in physics, but the *epistemic indeterminism*, for several reasons, is a limiting feature both in classical and in quantum physics.

2. Determinism

The mathematical structure of the Nature, as discovered by Ptolemy, Copernico, Galileo and Newton, prompted the conviction that an "exact" description can be applied not only to the present state of the universe, but extrapolated into the future. Therefore, the physical world would be fully deterministic. Albert Einstein first, just at the dawn of the 20th century, still within the classical physics and Werner Heisenberg soon later, within the quantum mechanics, expressed doubts on the possibility of the exact *description* (i.e. on the epistemic ability); a simplified conclusion is sometimes drawn that the physical world is *not* deterministic, also ontologically.

2.1. Classical Mechanics

Physics puts well founded laws on the material world. Galileo defined the paradigm of contemporary physics — repetitive, simple experimental procedures that can be generalized and that predict new phenomena via a theoretical reasoning. Nowadays, Galileo's definition has been extended: the cosmology is the best example of a non-repetitive experiment.

The first great success of this paradigm was *Philosophiæ Naturalis Principia Mathematica*. Newton applying his own mathematical methodology explained the free fall described by Galileo. By reasoning on the motion of Moon around Earth, he generalized the concept of gravity and applied it to whole Solar system, including comets and satellites of Jupiter. These achievements brought to physics a splendour of the science that allows not only reproduce but also *predict* phenomena, with a great (perfect?) precision.

Soon, a temptation came to physicists that if we knew the initial conditions we would be able to determine the eternity of the universe: “En effet, si l’état présent de l’univers était entièrement semblable à l’état antérieur qui l’a produit, il ferait naître à son tour un état pareil; la succession de ces états serait donc alors éternelle” (Laplace, 1840). In fact, already in 1801 Gauss managed to calculate the expected position of the first planetoid, Ceres (discovered few months earlier casually by an Italian priest, Secchi), and in 1845 Adams and Le Verrier predicted the existence of Neptun from small deviations observed in the motion of Uranus. The world seemed to be a perfect clock.

These successes triggered an idea, that the motion of the whole universe is fully deterministic. Already before there was a similar conviction on the immense possibilities of physics, in the words of Archimedes: “give me a point for the support and I will move Earth”. Obviously, to move Earth, the support should be enough massive and a cantilever sufficiently long and stiff. Hence, this statement was, practically (i.e. ontologically), meaningless.

Similarly, the convincement of Laplace is meaningless. Even if equations of motion in the classical mechanics are exact (i.e. the mathematics that *we* invented and/or discovered fits perfectly the universe) their solving, especially in case of many bodies, presents serious problems. Pluto, till recently the ninth planet, was discovered by pure observations: it is much smaller than Neptune and his orbit is inclined to the ecliptics, so theoretical calculations failed in predicting its existence. Even if objects in the belt of asteroids are constantly monitored, a huge number of them present a serious risk of an unexpected impact on Earth. Henri Poincaré showed that even for three interacting bodies we *cannot* perform “exact” calculations; computer-based, approximate, “perturbative” methods must be used.

Here we come to the real problem with Laplace’s optimism: in order to *know* the initial conditions (3D vectors of the position and 3D vectors of velocities) of all objects in the universe, we would need to *register* them. Nevertheless, there is not enough atoms in the whole universe to do this. Therefore, even if from the ontological point of view the fate of the universe could be *fully deterministic*, it is not available and/or is not useful to *our* knowledge.

A half of century ago the term “classical chaos” was invented. It was discovered theoretically that some system, described by equations more complicated than linear ones (i.e. more complex than Newton’s laws) behave in an unpredicted way. However, this is only an illusionary chaos: simply, the initial conditions influence the final state much more than in linear systems. In principle, if we knew these conditions with *enough* accuracy, we could predict the behaviour of the system. Nevertheless, this is impossible even in the simple case of six-wall dices, not saying about the thermodynamics of weather forecasts. Again, what is *ontologically* deterministic is not such *epistemically*.

Finally, still within the classical physics, but extended by Einstein beyond the Newton’s equations, the gravity is not so simply as we teach in schools. Even if the equation of the general relativity can be represented mathematically in a beautiful, concise form

$$\mathbf{G} = (8\pi G/c^4) \mathbf{T}$$

(without the so-called cosmological term, with $\mathbf{G}$ being a tensor of the space-time curvature, $\mathbf{T}$ the tensor of mass-energy, G — gravitational constant and c — the light velocity), in practice these are ten, coupled, differential-integral equations. Quoting Michał Heller, Polish priest and cosmologist, the above equation contains some 10,000 terms, out of which we know now five or six: the laws of Newton (the second law of dynamics and the Newtonian gravity), the gravitational time dilatation (Pound-Rebka experiment), the space-frame dragging (Lense-Thirring's effect), geodetic precession (de Sitter's effect). The three latter are extremely small, but measurable (and applied as small corrections in Global Positioning System). It will take us a few centuries to find explicitly next terms in Einstein's equation.

Therefore, our limits on predicting the future of universe on the ground of the classical physics are purely *epistemic*: few equations can be solved exactly, i.e. analytically, for other approximate methods must be used, we cannot gain all the information needed, and even if gained — there is no way to store and process this information.

Resuming the classical mechanics: *nothing* indicates that the physical world would *not* be fully deterministic. Newton's and Einstein's equations are mathematically exact, so the future is exactly determined. However, we do not know how to solve these equations analytically and we do not know all starting parameters, so from epistemic point of view the classical world is practically indeterministic.

2.2 *Quantum mechanics*

Quantum mechanics, apparently, changed the certainty of the classical world. Heisenberg's principle states that some pairs of measurements, like the position and the velocity, or like the energy and the time are *non-commutating*, i.e. cannot be measured *both* with an arbitrarily chosen precision. We still lack an exact mathematical limit, see (Erhart et al. 2012; Fujikawa et al., 2013), but it is usually quoted, that the indetermination in measurements of the position Δx times the indetermination in measurement of the momentum Δp (which is the velocity times the mass of the particle) is higher than Planck's constant h divided 2π :

$$(\Delta x \Delta p) > h/2\pi$$

Reasons that brought Werner Heisenberg to this principle are not clearly explained, even at the university level. Himself, he recalls attempts in February 1927 to describe the trajectory of an electron in a fog chamber. Triggered by discussions with Einstein on the observable world, he realized that it is not an intact trajectory, which is observed, but a series of points, where the electron collided with gas particles. And *we* assume, that the electron travelled between these points (with a certain velocity). Therefore, observations of the position and the velocity of the electron are exclusively complementary.

The *material* reason for the principle of indeterminacy is that in order to measure the position of an electron a probe-particle must be sent to collide with it. A quantum of light, i.e. the photon is a good probe projectile. In order to determine electron's position with a high accuracy, a photon with a short length should be sent. However, on the basis of the wave-matter dualism, the shorter is the wavelength of the photon, the higher is its momentum. Shorter is the wavelength of the photon, a higher recoil momentum is transferred to the electron, i.e. a higher is the change in electron's velocity. One arrives in this way to the $\Delta x \Delta p$ dependence.

An *ontological* interpretation of Heisenberg's principle would say: "In the moment of the measurement, the system jumps into one state of the many probable states, without any apparent

reason to jump into one or another possible state” (Silva, 2013). Heisenberg, in particular in discussion with Einstein, sustained that the quantum mechanics removed the determinism from physics: we cannot predict the path of an electron. However, in our interpretation, Heisenberg’s principle is not a kind of a philosophical rule governing the universe: it is a precise, experimental limit posed on *our* knowledge of the micro-world. The position and the velocity of an electron are always “exact”: these are *we* (i.e. physicists) who cannot (using other material particles) measure both the position and the velocity. The indeterminism resulting from Heisenberg’s principle is not ontological but *epistemic*, i.e. concerning the very nature of the knowledge not the electron itself.

A similar conclusion regards the so-called matter-wave dualism. Particles of the micro-world behave in some conditions like material points and in other conditions — like waves of matter. What is the reason? Why sometimes particles appear as material points and sometimes like diffused waves? An analogue question is: how does a coin look like? It depends on the side of the coin. The same with dualism: a specific nature appears in a given, projected experiment. When an electron strikes a scintillation pixel on a TV screen it behaves like a particle, if it goes through a thin sample of silicon in an electron microscopy — it behaves like a wave. Again, the dualism is nothing mysterious — physicists know equations and know how to handle experimentally electron beams (Karwasz, 2005).

Two interesting aspects are related to the dualism. The first one is analogous to Young’s experiment with the interference when a beam of light is sent via two narrow slits. On the screen, we get not shadows of the slits but a series of black and white fringes. The same pattern can be obtained with electrons, even if we send them one by one. In a common sense, it seems that a successive electron “knows” that the previous one chose a slit *A* so the next electron “decides” to go through a slit *B*. Again, the final pattern on the screen is strictly governed by equations of quantum mechanics but we *cannot predict* the path of any successive electron. Better, we could monitor the path of electrons, say, illuminating them by light before slits. Then the interference pattern *disappears*: electrons do not show their wave character. Electrons are the same, but the epistemologies are different.

The second important experiment related to the dualism is the quantum cryptography. The origin of the quantum cryptography is to be traced back to so-called paradox of Einstein-Rosen-Podolsky. Laws of conservation (of momentum, energy and angular momentum) hold both in classical and in quantum physics. When an atom emits light, it is one of its electrons that falls from a higher to a lower orbit. The electron, when orbiting, possesses the angular momentum. During the transition its momentum changes: the difference in the angular momentum is carried by the photon emitted.

Einstein, Podolsky and Rosen asked in 1935 what happened if a couple of photons with opposite angular momenta were emitted from an atom (we call such photon to be entangled). According to quantum mechanics, the momenta of these photons are not determined until a measurement is performed. The result of the measurement on one of the photons can give a result up or down. At this point, the angular momentum of the other photon is immediately determined, independently from the distance. This would violate the locality (i.e. the specific relativity, as the “knowledge” on the other photon propagates quicker than light.)

EPR phenomena were verified experimentally and they become the basis of the successful applications of quantum cryptography (Horodecki et al., 2004). Simplifying, two partners exchange information using entangled photons. Before, they exchange the cryptographic key (via a normal correspondence). Then the information is sent as a chain of entangled photons. Differently from the traditional cryptography, any attempt to decipher the information without the key makes the whole message disappear. Quoting one of the founders of

quantum cryptography, Paweł Horodecki, we know how to produce photons, how to make the computer encode the information into photons, how to transmit them and how to decipher the information, but we do not know *why* the whole process works. Our ability of using the mathematical apparatus exceeds our possibility of *understanding* phenomena.

Quantum mechanics caused serious discussions on the determinism. Some, quite influential authors, physicists and philosophers (Barrow, 1999: 356) introduced a concept of “empty time” in which the non-material world would appear. We do not agree much on such “lacunas” — there is no need to steer “by hand” single electrons in the diffraction experiment: the Schrödinger equation predicts the *final* result.

Resuming, physicists still struggle in hope to “understand” quantum mechanics: they would like to “know” the trajectory of an electron instead of “expecting” the trajectory to be somewhere, see (Laloë, 2001). Quantum mechanics is the first serious case that we do not *understand* the nature, even if we can *operate* it. So, nothing excludes that quantum mechanics could be (ontologically) fully deterministic. The serious point is that this determinism is intrinsically not accessible to us. Seems that metaphysics overrides physics (Marganeu, 1941).

2.3 *Special relativity*

The time and the space were already the main subject of Aristotle’s *Physics*. For him the space was determined by objects existing in it: a free space was the distance between bodies. The modern understanding of the space (and time) came with Galileo, who noticed that the description of the motion depends on the chosen system of reference: inside a ship moving with a constant velocity all objects seem to be in rest. A next step was the space system of reference as introduced by Descartes in the form of three perpendicular axes. These axes go also to negative values. In the space, the objects can move in three directions, with both positive and negative arrows. For the time axis the dependences in negative directions are graphically signed but, obviously, are physically not accessible (any more), as they correspond to the past.

With Immanuel Kant the space and time became abstract categories, in which the whole real world is immersed: the space and the time exist also without the (material) world. Such pure space and time vanished with works by Einstein. The special relativity removed the absolute time and space. With the general relativity, an empty space disappeared: the universe contains matter and the matter defines both the time and the space. Einstein’s general relativity seems to bring back the notion of space and time to Aristotle (Karwasz, 2016).

The restricted theory of relativity is usually said that all observers have their own systems of reference (i.e. the space and time) and events that are contemporary in one system can happen in different moments in another system of reference. These statements are correct, but differences in time do not change the *causality principle*.

This Einstein’s has important consequences. The first is that the velocity of light is the highest possible with which the information can be transmitted. This puts intrinsic limits on our knowledge of the world: we cannot know cosmological limits of the universe, as already stated by Copernicus (*De Revolutionibus*, Liber I, 6a) “Why then do we still hesitate to grant it the motion appropriate by nature to its form rather than attribute a movement to the entire universe, whose limit is unknown and *unknowable*?”²

² Cur ergo haesitamus adhuc, mobilitatem illi formae suae a natura congruentem concedere, magis quam quod totus labatur mundus, cuius finis ignoratur, sciri quae nequit, neque fateamur ipsius cotidiana evolutionis in caelo apparentiam esse, et in terra veritatem?

The second consequence of the special relativity is more optimistic: looking very far into the space we look also deeply into the past, back almost to the beginning of the universe. Unfortunately, looking into “before” the Big Bang lacks the information carriers: the third detection of the gravitational wave (Abbott et al., 2017) proved that they travel with light velocity.

Einstein’s theory does not make events ontologically “relative” what could be understood as indeterminism. This is exactly opposite: it puts a precise order in actions and results: the space-time distance between them is always governed by the velocity of light, c . No event can happen before a signal of light brings the information from the cause, to trigger the effect. Space-time distance is described now by four coordinates — three perpendicular space axis, x, y, z and the time distance ($c\Delta t$), using the same units.

$$(\Delta s)^2 = (c\Delta t)^2 - [(\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2]$$

The space-time distance is positive for any pair of events linked by the causality relation (i.e. a sufficient time is elapsed between the events, depending on the relative space distance).

The space-time interval of two events is independent from the fact of movement. “With the sign of $(\Delta s)^2$, nature is telling us about the causal relation between the two events” (Tipler, 2008). Minkowski described the time-space as a particular cone of events that can be connected by the causality relation. In Minkowski’s space, every observer has his own cone, with the origin in his “now-and-here” but all cones have identical features: the time is individual for different observers, as already stated by Aristotle in *Physics*.

The restricted relativity brings some “paradoxes”: moving objects seem shorter and the time in moving reference systems goes slower. The first experimental evidence of the relativistic stretching of time is the elongation of the lifetime of instable particles, muons coming from the cosmic radiation and travelling almost at the velocity of light: they reach Earth surface thanks to the relativistic dilatation of their time-frame (Rossi, 1941). In contrary, a fast moving stick fitting (hypothetically) into a barn (Tipler & Lellevyn, 2009) remains still a *Gedanken experiment*, solely.

We note formally that nothing is said in the special relativity on the sign of the time t (positive or negative); the only requirement for the causality is the positive value of the space-time interval $(\Delta s)^2$.

2.4 General relativity

Einstein’s restricted relativity was born from considerations on the motion with a constant velocity. A question on the *accelerated* motion brought the result that the acceleration and the gravity are to some extent identical. This is the core of the general relativity.

A really unexpected issue, in the very first instance for Einstein himself, was that Universe could not be stable: it must expand in continuation in order not to collapse under the omni-present forces of gravity. More, there must be a mysterious force powering this expansion (Pearlmutter, 2003): the dark energy, together with dark mass exceeds the whole matter perceptible to us by a factor of 20. We observe only 5% of the existing matter and still we have no clear idea what dark mass and dark energy could be. For a moment, scientists speculate, moving within already used ideas, like hidden dimensions, or new type of elementary particles, “axions”, giving explicitly the time arrow (Wilczek, 2016). For a moment, proposed solution remain still only vague hypothesis.

Therefore, through the equation of the general relativity, the very universe is the prove of its beginning in time: the expanding universe is *the cosmological time arrow* (López, 2018). However, nothing, mathematically speaking, would forbid the universe collapse (and the cosmological arrow of time go backwards). Einstein's relativity, especially that general, brought back the space and time to the Aristotle's matter: this is the omnipresent *matter*, which defines the space and time. No vacuum exists in any place of the universe.

A limit of the light velocity on any transfer of matter and/or information surprised even Einstein. In 1935, he and Nathan Rosen worked on unifying the electromagnetism with general relativity theory (Einstein & Rosen, 1935). They elaborated the idea of a double funnel, connecting separate sheets of space-time, thus allowing to "cheat" the light velocity limit. These, purely hypothetic structures were called "space-time worms". The problem is that either such structures are unstable or any material object (the light included) gets captured inside. Space time-worms are now judged as a wrong step done by a genius (Lindley, 2005).

The ideas on travelling faster than light via folding the space-time come back in other forms. A Mexican physicist, Miguel Alcubierre (1994) speculated about another kind of energy, negative one, which would be needed for such travels. Moreover, a travel to the nearest star would consume such negative energy equivalent to the mass of Jupiter. In other words, to travel through the universe we would gradually make it annihilate. A really costly solution...

So the whole physics — classical, quantum, relativistic — puts a precise order on events: all are governed by strict mathematical rules. There are no cracks in the ordered happening of actions and results. In other words, all physics points towards the determinism and, as a consequence, to the *causality principle*. This determinism is governed by the precise order of the time line, going from the past to the future. And the time and space are, following Aristotle and Einstein, intrinsically related to the material world. Therefore, before discussing philosophical issues of the causality principle, we come back to the question of the negative time arrow.

3. The principle of causality

The existence of the causal relations has been questions by Hume some three centuries ago. As remembered recently by John Polkinhorne (1989), in spite of a continuous debate, "The fact is that our actual knowledge of the causal structure of the physical world is still patchy and incomplete." Inverting the time (or travelling freely in time) would allow (it is believed so) to change the future. Therefore, it would violate the determinism.

3.1 Time arrow

One of favourite ways of science fiction authors to change the present (and in this way to intervene in the causality chain) is to travel in time, or invert the time flow. Changing now an event that happened in the past will, it seems, change the present and the future.

In the whole classical physics, including Maxwell laws of electromagnetism, the time and space are mathematical objects, like the numerical axis in mathematics, i.e. continuous and extending from minus infinity to plus infinity. If we watch a film of two colliding balls and this film goes in the backward direction, nobody can notice the difference: instead of going from right to left, the balls go in the opposite direction but all laws of mechanics act perfectly.

Also in the electrodynamics, the time is perfectly symmetric. Maxwell' laws allow to use $(-t)$ instead of $(+t)$ — this changes only the sign of the voltage created. One of the best teachers ever and Nobel prize winner, Richard Feynman in his famous "Lectures", when speaking

about electromagnetic waves, stated clearly “Now let us assume that the sign of the time axis is plus”. Solving Maxwell’s equations with the sign plus we get “retarded potentials”, i.e. an electromagnetic wave travelling in space (in any direction) and into the future. Nothing, in principle, would forbid to use “anticipated” potentials and make an electromagnetic wave (i.e. a message) travel back in time.

A global time arrow appears in the expanding universe, but this arrow is purely *experimental*. It appears also in thermodynamics, i.e. phenomena of heat exchange. It is trivial that when mixing a glass of hot water with a glass of cold water we get tepid water. And it is not possible any more to separate hot molecules from cold ones — in fact they exchanged their kinetic energies and on average they are tepid. However, this is only the *mean* energy — there are always some molecules, which are somewhat hotter and other, somewhat cooler: we do not *know* which.

James Maxwell invented a microscopic “demon” — who could separate back the warm molecules from cold ones. A demon opens a gate when a warmer molecule approaches it. By closing and opening the gate in appropriate moments, the liquid (or gas) can be separated into two different temperatures. This would invert the thermodynamic time arrow. However, there is one problem.

In order to open and close the gate the demon has to acquire and process the information. However, the information is physical. “It is stored in physical system like books and memory sticks, transmitted by physical means — for instance via electrical or optical signals — and processed in physical devices. Therefore, it must obey the laws of physics, in particular laws of thermodynamics” (Lutz & Ciliberto, 2015). This law says that processing information consumes the energy: the gain of energy from a possible work of the demon is never higher than the energy he consumes to process the information.

Therefore, in thermodynamics, one could reverse the arrow of time, but this would consume the energy. Again, we need the energy if we want to *force* the laws of physics. And, knowing that we cannot create energy either mass from null, such an inverting of time, on a global scale, is outside our *material* possibility.

Another evidence for the time arrow are unstable elementary particles. Schrödinger’s equation did not include the relativity. In 1931, Paul Dirac proposed a relativistic equation to describe the dynamics of the electron. This equation is still valid if the electrical charge of the electron (that is negative) gets changed into positive. Soon, such positive electrons (positrons) were discovered in the cosmic radiation. They are complementary to electrons — the same mass, spin, magnetic momentum and the opposite electric charge, point-like and stable in vacuum; when meeting electrons they annihilate in nanoseconds (Karwasz et al., 2004).

A question was raised if the world with the inverted electrical charges (positive electrons and negative protons) is the same as our world. In 1957 an experiment on a radioactive decay of cobalt showed that changing the electrical sign changes also the orientation of the rotation of elementary particles: say, electrons rotate (around their own axis) left and positrons — right.

In 1917, a German mathematician, Emmy Noether, stated that the symmetry of the space (up-down, left-right) corresponds to the conservation of momentum (i.e. of the velocity as a vector, considering also its direction). Further, the conservation of energy is assured by the symmetry of the time axis and the conservation of the angular momentum by the symmetry of rotations — clockwise, anticlockwise. Now, with the broken symmetry of rotation physicists challenged the nature to check if a combined symmetry — charge C + rotations (= parity, P) is conserved. Studies of the decay of another “exotic” particle, kaons, showed in 1964 that

neither the *CP* symmetry is conserved. Only in 2000 a series of experiments, see (Geer et al., 2000) showed that the combined symmetry — *CPT is conserved* within experimental uncertainties. This means that for kaons the time is *asymmetric*.

Experiments on quarks of the third generation (heavier and several orders of magnitude less stable than kaons) showed that for the very exotic particles that, physicists suppose, existed only in the first instances after the Big Bang) the time is even more asymmetric. In detail, for quarks of the second generation (called *strange*, component of kaons) a reference number for breaking the symmetry of time is 0.002, for *bottom* quarks (much heavier, of the third generation) such a reference number is as much as 0.1 (Barlow, 2014).

If the very early universe (in first 10^{-12} s) consisted of heavy quarks — the time arrow was *decisively asymmetric*. Normal quarks (i.e. nowadays quarks, *up* and *down*, that the whole matted is now made of) do not show any measurable time asymmetry.

In conclusion, even if breaking of the time symmetry is possible (not forbidden), decisively the whole universe is subject to the positive time arrow (i.e. aging). Note however that inverting the time arrow does not say anything on the causality principle. Moreover, the question of sending messages back in time (from future to the present) needs some additional considerations.

3.2 Messages from the future

The mathematical symmetry of the space would suggest a mathematical symmetry of the time. But the *physical* (i.e. filled with material particles) time-space *could be* non fully symmetric, as indicated by the time asymmetry for heavier quarks. Physical theories hardly *explain* why.

Our hypothesis is that propagation of signals back in time is possible but highly dampened. A physical analogy is a mirror. Why does a mirror (i.e. the glass covered on the back side by silver) reflect the light? Because silver reflects light? This is not a sufficient explanation. Silver reflects the light because propagation of the light *inside* silver is strongly damped. The light enters only the surface layers; it is quickly attenuated and therefore sent back³.

So signals from the future are possible? Even if, they are highly damped: they propagate from the *near* future, and are more intense if the importance of the message is higher. But they are also noisy — so confused that one could *not prevent* the predicted events to happen. Messages from the future may be possible, but they must resemble watching TV (that we cannot influence). So seeing the future does not brake the chain of actions happening in the present: the principle of (ontological) determinism is not violated.

3.3 Causality

The main mental disorder that can emerge from a superficial understanding of Heisenberg's principle is that the quantum mechanics introduced *casual* (contingent) events: the path of a single electron is not governed by any rule — it is completely random. This is not the case: the path of every electron is such that the *final* picture are the interference fringes. The “behaviour” of a single electron is governed by Schrödinger's equation that defines the *probability* of a given path. The sum of these probabilities, via applying the rules of statistics, gives *always* what is predicted by equations of quantum mechanics.

From the very beginning of quantum mechanics (Bohm, 1980; Schroer, 2011), numerous trials to find out some *hidden variables* that determine one-to-one the path are under way;

³ Mathematically, a propagation of light is described by a sine wave, that is the sum of $\exp[\pm i(kx - \omega t)]$. The attenuation of the light is described by $\exp[\pm (kx - \omega t)]$. The difference is in the imaginary unit i , which results from a sign minus in the equation of propagation.

nowadays these trials fail to gain any wider scientific acceptance. We need not hidden variables: the position of every electron is well determined in any moment (we could even illuminate it, but then the interference picture disappears) and only that *we* cannot know it.

But the concept of the causality is more stringent than the determinism. The determinism means that two events touch each other in Minkowski's space. The search for the causality is more abstract than the determinism — the causality means that events form some longer chains. These chains can be ramified: not only events directly “touching” one another in Minkowski's space are related, but also those which seem to be independent. This is the main difficult in proving the causality.

In analyzing the chain of events two types of reasoning should be distinguished: 1) an event will have an effect; 2) if we observe an effect, for sure there was a cause. We show this distinction on a picture below.



Known action → ?expected result 2) ? Probable reason → Observed state

David Hume stressed that we observe only separated facts and that deducing on their connection via a cause-effect relation is only our supposition. As far as Heisenberg doubted in determinism, Albert Einstein (1994) questioned even the causality, in particular that proposed by Kant:

Hume noticed clearly that some concepts, for example the causality, cannot be deduced with logical methods from experimental data. Kant, being strongly convinced that some concepts are indispensable, and exactly those which proved such in practice, has interpreted them as indispensable premises of any speculation, and has distinguished from the concept of the experimental origin. Instead, I am convinced that such a distinction is erroneous... All concepts, also those the most close to the experience, are from the logical point of view conventions freely chosen, like in fact in the case of the concept of the causality from which has the origin this type of problems.

The EPR paradox can be considered as an argument against quantum mechanics (that predict entanglement) and/or against the causality and/or against the locality of events. If the second, entangled photon (in a remote lab) inverts its spin when the first one (in the local lab) is detected, so either there is some non-local field governing the whole space, or the two photons exchanged “information” with the velocity exceeding the speed of light.

The EPR experiment translated to an experimental procedure by so-called Bell inequalities is under exhausting series of checks starting from seventies of last century. The aim of these experiments is to *impede* photons exchange “information”, for ex. via supplying cables of the computers. Till now all experiments confirm EPR. Alan Aspec (2015), the founder of this branch of experiments says that in view of EPR we should renounce the local realism.

Does EPR violate the causality? Can we influence events in the remote lab? No! As I got the explanation from an Italian pioneer of such “tele-transportation”, Francesco De Martini (Boschi et al, 1998), we have information on the state of the photon in the remote lab but

this is completely *useless*. In order to use this information, i.e. to perform an *action* in the remote lab, we need *to send* this information to the remote lab. And this can be done only in a *classical* way (i.e. within the special relativity) — by telephone, with the c velocity. The causality principle survives the EPR test. The causality survives also the hypothesis of Einstein's (1935) space-worms: no material particles, including photons, could travel via such worms, even if they (i.e. worms) had existed (Fuller & Wheeler. 1962).

However, criticism of Hume comes from all over modern science: the *conviction* on the causality principle is the basis and motivation of any research. "I cannot literally observe the causal relation between a mosquito on my arm and the itch that follows its departure. But my causal inference is based on strong background knowledge", writes Patricia Churchland (2016) in "How Biology Influences Philosophy".

"Proving" the causality is a difficult or more precisely, an impossible task. In other subjects it is enough to show the existence of an example, say of unicorn, to know that they exist. Normally, it is more difficult to show the non-existence of unicorns, as the whole globe should be browsed. In the case of the causality, one should find an event that occurred *without* a cause. The question is always the same — there was *no* cause at all or simply we are not *able* to identify this cause.

Repeating, the modern physics, from times of the EPR paradox, has removed from principles of science the *local reality*: "entangled" events can happen simultaneously at any distance. But this violation of locality is only apparent: no (material) information can be exchanged with the velocity higher than c . It is hard to understand the mathematical details of the EPR phenomena (or better *quantum entanglement*) but there are no doubts that the term *locality* needs a modified meaning. Leonard Susskind writes (Suskind & Friedman, 2014):

Some people think so. Einstein railed against the "spooky action at a distance" (*spukhafte Fernwirkung*) that he claimed was implied by quantum mechanics. And John Bell became almost a cult figure by proving that quantum mechanics is nonlocal. On the other hand, most theoretical physicists, particularly those who study quantum field theory, which is riddled with entanglement, would claim the opposite: quantum mechanics done correctly ensures locality. The problem, of course, is that the two groups mean different things by locality. Let's begin with the quantum field theorist's understanding of the term. From this point of view, locality has only one meaning: it is impossible to send a signal faster than the speed of light.

Therefore, in spite of all different trials, starting from space-time worm-holes, and including the EPR paradox, modern physics did *not* remove the *principle of causality* from the nature. The objection of Hume against the principle of causality is that it cannot be proved on the basis of experimental evidence. It cannot be deduced from first principles, either.

However, in mathematics we have a third (not experimental, not deductive) way of proving laws: the mathematical *induction* procedure. It consists in: i) showing the first event, for $n=1$, ii) *assuming* that the event happened for a given n -case, iii) proving that n will cause $n+1$ be valid. There is no need to prove the whole chain of relations for $n = 2, 3$, etc.

The physical world is for sure more complex than simple mathematical relations for natural numbers. So the existence of the mathematical induction is not a *proof* for the causality principle, but only a hint: i) events happen, ii) a successive event is always caused by the preceding one, iii) so on the basis of the mathematical induction we *believe* in the whole chain. Obviously, like with predicting the future, the above reasoning is not a proof of causality, but only a possibility.

Conclusions

Quantum mechanics and Einstein's relativities induced philosophers to consider the world as *ontologically* indeterministic, while still insisting on the *locality* of physical laws. Although it is not written directly in the equations of physics, a rising opinion is that the world could be *non-local*. However, nothing indicates that the law of *causality* does not hold in the physical world.

We discussed in particular that:

1. Inverting an arrow of time in the classical, relativistic and quantum physics is not forbidden. It seems, from experiments on elementary (i. e. sub-atomic) particles which are short-lived and exotic, that inverting the time is very limited (i.e. strongly improbable). This would be the second, after the general relativity (López, 2018), argument for one-direction time arrow in physics.
- 1) Space-time tunnels, originally conceived by Einstein have no minimal experimental proof, and alternative hypothesis on them indicate that huge amount of energy would be consumed to create space-time worms or folding.
- 2) On the basis of 1) it is not forbidden in physics that the information travels from the future to the past, i.e. predicting the future. The utility of such predictions to change the future is completely null: the messages are so obscure that there is no way to decipher them before the predicted event occurred. Therefore, changing the future in such a way would violate the principle of causality.
- 3) There is absolutely no experimental neither theoretical evidence that events can happen without causes: the *causality law in physics* can be superior to any other, comprised the principle of conservation of energy. However, we cannot prove it. So, *the causality principle* moves from the domain of physics to metaphysics.

The overlap of these two sciences is a never-ending story.

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The Contemporary Cosmological Models: in Search of the Ways of Systematization

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Modern cosmological models differ in their methodology, tools of argumentation and outlook on the content of the problematic field of study, the apparatus of logical and conceptual justification and the specifics of verification of the results and conclusions. Such pluralism of the epistemological approaches of modern cosmology requires not only ordering but also proper analysis. The article is devoted to the attempt to systematize the main methodological approaches of modern cosmology, and includes the analysis of world-view, philosophical, theological and natural-scientific models of description of modern cosmological projects. The results of the study are important in view of the increase of informative facts on a certain topic in the context of civilization development, rapid processes of the development of the Universe and the development of relevant technologies, as well as the lack of comprehensive interpretation and evaluation of intermediate results and prospects for further theoretical exploration and development.

Keywords: cosmology, cosmological model, methodology of cosmological theories, systematization, human development

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Introduction

Cosmology as a scientific knowledge of the Universe has a long history of its formation and appears relevant at present. At the same time, the desire to encompass and understand the Universe in its totality is both the virtue and the problematization of scientific search within cosmology. That is why the discourse of cosmological research uses the concepts that are difficult to experimentally prove or refute, and which need philosophical reflection in their implementation. In particular, Konstantin S. Khroutski emphasizes the need for the development of a holistic field of philosophical knowledge — philosophical cosmology, and provides the following definition: “Taking up this position, we formulate the following definition: Philosophical Cosmology is the section of philosophy dealing with the comprehension and cognition of the common universal Process of the Earth’s life

evolution (CEPEL) and, within it, exploiting the wellbeing of Homo sapiens *cosmicus* — the determining unit of this evolutionary Process” (Khroutski, 2001: 208). In his view, in today’s society there is a steady demand for such research and knowledge. Being grounded on the traditions of Russian cosmism and the theory of active evolution, he conceptualizes the subject, object, and method of this discipline, its problematic field, and basic theoretical models. The main strategy of this knowledge is named by the author as “comprehensive synthesis”, which is demanded by the ideology of “Cosmology Enlightenment”.

Complex dialectics of natural scientific and philosophical knowledge in modern cosmological studies is reflected in a purely pragmatic plane. For example, John E. Renesch argues for the importance of world-view transformation in understanding business leadership through the lens of cosmological knowledge, awareness of the complex processes of Human-Universe interaction (Renesch, 1998). The technological age is being replaced with establishment of an era of consciousness, for which the paradigm shifts, complexity and integrity of thinking are not problematic.

Indeed, natural or cosmological activities must be at the heart of social and civilizational advance and development. That is, planetary thinking as a consequence of globalization processes and acceleration of technical impact on the environment requires qualitatively new management, which would be focused on the conservation of the planet’s resources and the peaceful exploration of space. It is clear that this movement in theoretical terms should be based on understanding the current trends in the field of cosmology, and precisely the ordering of ideas about modern cosmological models, which our research is aimed at. At the same time, we are aware that there are interesting practical studies in cosmological discourse, such as space law research (Drozd, 2019; Rybachok, 2018), international politics (Svyrydenko & Yatsenko, 2018), etc., but they are not fundamental and their systematization is not within the scope of this article. Articles in these and other fields seek to address specific problems associated with the processes of space research and exploration, however, cannot be considered cosmological without being relevant to the subject of this field of modern science.

We do not neglect the fact that a number of national and international organizations are trying to integrate cosmological research into their activities. One such example is the activity of the International Society of Philosophy and Cosmology, which has consolidated the research efforts of international experts in philosophy and cosmology from 25 countries for fifteen years (Svyrydenko & Khomenko, 2019).

Cosmological Issues in the Theological Projection

Traditionally, cosmological issues were formed in mythological and religious concepts. Questions about the structure and evolution of the Universe, the understanding of space and time, the place and role of consciousness and spirit in the ontology system have consistently been the main content of religious doctrines and myth-making. Modern cosmological studies are also often focused on finding and discovering the potential of religion, Christian in particular, for the basic laws of the Universe. Honorary Professor of Astronomy and History of Science at Harvard University and Honorary Senior Astronomer of the Smithsonian Astrophysical Observatory Owen Gingerich analyzes the transformation of Christian cosmology and theology into modern cosmological studies and proves that Kepler’s cosmology is based on metaphorical three-metamorphic symbols, which is not contrary to the Aristotle’s geocentric model of the Universe (Gingerich, 2011).

Professor of Mathematics and Astrophysics Rodney D. Holder updates the cosmological issues that are important in terms of theology: the beginning of the Universe and the essence of the fine-tuning of the Universe for life. According to the author, classical science is not able to answer the fundamental question about the cause of the emergence of the Universe: “It seems to me that modern cosmology poses two fundamental issues that take us beyond the science into the realm of metaphysics and, I shall argue, theology. The first relates to the question of the beginning and to the traditional cosmological argument for the existence of God, in one form or another. The second relates to the so-called fine tuning — the way in which the universe, and the laws of nature describing its structure and evolution, seem to be set up in a very special way in order for intelligent life to evolve at some stage in its history” (Holder, 2016: 234). The author considers the presence of the Absolute to be the most expedient explanation of the Universe: “In addition, design by God is a simple explanation, and much more economical than the multiverse. One is not invoking a whole multitude of complex entities with which one can have no possible interaction, but one intelligent being — like ourselves in some ways, but so much greater: a being of unlimited power and knowledge (omnipotent and omniscient in classical terms), and perfectly good” (Holder, 2016: 253). Accordingly, the concept of the Absolute remains a powerful argument in explaining the diversity of the world and its systematic functioning.

Patrick J. Connolly resuscitates the philosophical interest in the work of Susan Newcome, “Evidence of the Christian Religion,” where the author reconstructs the innovative argument about the existence of God: “Specifically, Newcome encourages a richer understanding of causal chains in nature and what is required for their existence. By focusing on the ways in which causal processes rely on external support, Newcome hopes to show that the universe cannot be explained without appeal to a transcendent God working to sustain observed phenomena” (Connolly, 2019: 17). The main essence of this argument is to appeal to Newtonian natural philosophy, which assumes the presence of entropy in the Universe. Accordingly, causal relationships in nature cannot exist autonomously, so they require an external, in relation to the Universe, leader. The authors call this external motive and stabilizing power as God.

This opinion is shared by Wesley J Wildman. He analyzes the relationship between physical and philosophical cosmology, which is to limit the speculative capabilities of philosophical analytics: “In the theistic version of this supernatural cosmology, one omnipotent deity with determinate features is the ultimate reality who creates everything and interacts with the world according to divine purposes. The natural world may or may not reflect the deity’s determinate character, just as the potter’s clay may be forged into shapes that both express and fail to express the potter’s personality. However, the deity is nonetheless responsible for the created world in some ultimate sense. This gives supernatural theism considerable flexibility of interpretation in relation to the metaphysical implications of physical cosmology” (Wildman, 2008: 199). The author notes that these restrictions are not categorical, but have a significant effect on the content of philosophical concepts of cosmology. He distinguishes three different classes of philosophical cosmology: supernatural, procedural, and cosmology of the basis of existence. They all contain original research methodology and design different cosmology models that sometimes share common predications (Wildman, 2008).

Joseph Milne pertinently claims that the obtaining of medieval Christian cosmology, along with Christian mysticism, have a significant influence on modern materialistic cosmology (Milne, 2011). Therefore, the author focuses on the discrepancy between the “inner” aspect of mystical experience and the “outer” conception of nature and the Universe. Accordingly,

the attempts to reconcile medieval mysticism with modern scientific cosmological concepts are doomed. The author insists on the criticality of judgments in space exploration and the need to abandon stereotypical and unfounded assumptions.

Demarcation methodology in modern cosmology

In the methodological complex of modern cosmology, the physical, mathematical and philosophical apparatus of the research closely interact. At the same time, the priority of one of them in modern cosmological research is extremely difficult to be specified unequivocally. John E. Renesch regards cosmology as a field of contradiction, and the range of its assessment varies from the fundamental refusal of cosmology in scientific status (its recognition as ‘pure fantasy’) to the belief in the undeniable value of such research: “Cosmology is a field riddled with controversy. With regard to cosmology itself, there are several different schools of thought. Some think that there is basically no such thing as scientific cosmology, and that cosmology is just a pseudoscience. Alternatively, as the French physicist Brillouin put it, cosmology is ‘pure fantasy’. A second school says that the value of cosmology is undeniable. Astronomical observations and measurements have already encountered large-scale problems, and these problems have an objective existence; they are not fabricated. This school holds, however, that because at present observational results are still scant, we should therefore emphasize the accumulation of observations and the organization of data and speculate less about theories or models of the universe. Some observational astronomers hold this view. Then there are still other people who believe that we want not only to emphasize observational facts, but also to make a serious effort to analyze the underlying mechanisms. We should look not only at the universe of the present, but also explore cosmic evolution, developing our cosmology based on the mutual interplay of theory and observation” (Renesch, 1988: 55). Emphasizing the importance of observations in the study and considering their impossibility, the question arises as to the criterion of truth and the possibility of predicting the further unfolding of space evolution.

Thomas Lepeltier, who criticizes Edward Milne’s cosmological concept, mentions this very problem. The author considers it to be general and non-observational: “Milne was without doubt a brilliant astrophysicist, and his cosmological model, at the time it was invented, was recognized as original and sophisticated. Having fallen into oblivion since, its rehabilitation by Gale and co. is welcome. However, as the quotations above show, these authors describe Milne as the victorious champion of the hypothetico-deductive method and of rationalism in physics” (Lepeltier, 2006: 473). The great resonance, caused by this work, did not subsequently have a significant impact on cosmological studies, so the author concludes that Milne’s rationalism did not change the general methodology of modern cosmological research.

The necessity and impossibility of empirical studies in cosmology are actualized by Martin Rees, who relies on the opinion of cosmologists about the empirical status of cosmological science. The prerequisite for this possibility is a high level of overall symmetry and uniformity. Comparing the methodology of cosmology and biology, the author concludes with the complexity of the problem field, both at macro-level and micro-level, and the level of organic life (Rees, 1999).

Therefore, the problematic field of modern cosmology is a complex of mystical-religious, metaphysical-philosophical, and natural-scientific methods of research and analytics. Judging from these views, Helge Kragh draws attention to the difference between cosmology and other fields of science. The juxtaposition of the standard and speculative models of the

Universe, the emergence of the idea of the multiplicity of universes (the Multiverse) and the anthropic principle broadens the problematic field of cosmological research. The author tries to discretionarily systematize the theories available in cosmological discourse as follows: "There are several ways in which to classify multiverse theories, but none that has won general recognition. Nor is there, for that matter, consensus as to what constitutes or defines a multiverse. According to Laura Mersini-Houghton it is completely theory dependent, namely 'the ensemble of all possible universes predicted by the underlying theory'. A simple classification has been proposed by George Gale, who distinguishes between (1) spatial multiverse models, (2) temporal multiverse models, and (3) models with universes of other dimensions. The second class comprises cyclic models, new versions of which have recently attracted considerable attention. In some of these models the current and previous cycles are physically unconnected in the sense that no information from the previous universe passes over to the successor universe; in other models the new universe has some memory of its predecessor" (Kragh, 2009: 539). Based on the above, it can be argued that in the current research situation of cosmological discourse, epistemological discussions on the methodology of exploration and substantiation of knowledge about space are of particular importance.

Accordingly, the idea of certain unitarity of research practices and beliefs within established scientific fields will be illusory. For example, Yuriy Baryshev conceptualizes the main content of the problems of modern cosmological studies, among which the most important ones are the expansion of space, the comparison of the rate of decline of distant galaxies with the speed of light, the problem of gravity and cosmological constants. However, there is no clear answer to any of these questions, but only a field of heated debate and competing hypotheses (Baryshev, 2000).

The problem of time and space is the main one in modern cosmology. Logically, the existence of time beyond space is impossible. However, cosmological theories project the ideas about the space of possible orders that contain primal temporal dynamics, or quantum-cosmological models, exploring the function of the waves of the Universe and claiming its timeless nature. Therefore, time is proclaimed to be the effect of perception of the macrocosm. In addition, different modes of temporality are possible in the complex hierarchy of reality, so the only time for all astrophysical objects is not only difficult to imagine but also unnecessary. Equally important to modern cosmology is the notion of the Multiverse, a complex model of interaction and the mutual existence of the n-number of Universes. Changing the status of this object from a hypothetical to a real can be enabled by studying the astrophysical phenomenon called a 'mole hole', which, according to researchers, not only combine different Universes, but also allows the circulation of matter and information throughout a complex structure of being. Consequently, if the beliefs about the model and patterns of being in the Universe do not prevail, they definitely extend the boundaries of our vision.

The subjectivity of ideas is shaped by culture and tradition. Therefore, these are questions of morale and morality, which, according to the purpose of our study, can have a corresponding impact on the nature and content of cosmological theories. Ed Luker looks at the problem of moral imperative from a cosmological perspective. Analyzing works of art and their historical context, the author proves the problematic justification of moral imperative in the conditions of technological progress: "It is not just our attentive capacities that are held by the dominating force of this meniscus but also the landscape we were previously asked to attend to. In contrast to the emphasis on nature and place in *The White Stones*, one might consider this poem to enact a 'metabolic rift' between man and nature, understood poetically. The 'metabolic rift' is a concept developed by Marx in *Capital* vol. III. It identifies that nature

becomes an object entirely appropriated and reigned to the needs of capital by human labour” (Luker, 2016: 15). This is literature that is regarded as a valuable asset in understanding, interpreting, and furthering cosmological research.

The researchers from James Douglas Orton and Kari A. O’Grady perform a qualitative meta-analysis of the concept of ‘cosmology episode’. The authors consider literature to be the first finding, in which the episodes of cosmology are mentioned at the individual, team, organizational, social and national level. The second finding is that cosmological episodes have a procedural character of stability. The third one is typologizing literature into catastrophic, contextual, ancillary and metaphorical episodes. The authors summarize: “Contextualized cosmology episodes impact people within a specific high-risk industry context — in contrast to catastrophic cosmology episodes with their impact on entire nations, and disastrous cosmology episodes with their impact on specific geographic regions” (Orton & O’Grady, 2016: 14).

Therefore, as modern cosmologists point out, there is no longer a demarcation line between physics and metaphysics in the twentieth century. Physical-mathematical models of the reality of modern cosmology significantly change the perception of order and causality. Yet, ordering is defined not only as the geometric time that took place in the classic model of the Universe. Geometric time means marking objects of reality into a certain established system of mutual coherence. Non-classical models produce a different notion of order, in which the factor of systematization is not a spatial-temporal localization, but an expedient conceptual content.

Pluralism of modern cosmological models

Therefore, the content of modern cosmological queries is to find out the possible answers to the following questions:

1. About the nature of reality (reality as an object of observation and / or speculative object of philosophical reflection).
2. About the nature of cognition (interaction of theoretical and experimental research methodology).
3. About the nature of human activity (the question of the anthropic principle: reality is static or plastic under the presence of consciousness).

Modern cosmological studies offer different models of answers to these fundamental queries. Oleg Bazaluk and Iliana Vladlenova provide the following definition: “Cosmological models are physical-mathematical models that seek to describe the development of the Universe as a whole. The use of modelling in cosmology is due to the complexity of processes and phenomena occurring in the Universe, as well as the increase in the pace of mathematization and the expansion of its scope. Thus, the cosmological model is a substitute object of the original object, which provides the study of some qualities of the original and gives information about its most important qualities” (Bazaluk & Vladlenova, 2013: 51). The most traditional, according to the authors, is a mechanistic model of the Universe, namely “Newton’s cosmological model is based on the achievements of classical mechanics of the 17th-18th centuries and is, therefore, of a purely mechanistic nature, reflecting the way of explaining the motion and interaction of the objects of study based on mechanical regularities. The Newtonian model of the Universe contained three basic tenets: stationarity, the invariability of the Universe in time; homogeneity and isotropy; lack of privileged directions; Euclidean space” (Bazaluk & Vladlenova, 2013: 62). This model reflects the

basic principles of classical metaphysics and the corresponding categorical apparatus of the research.

Modern cosmological models also often imply determination, causality, time and space in other worldviews. Robert L. Oldershaw proposes a cosmological model called ‘self-similar hierarchical cosmology’, according to which nature is regarded as organized into a transfinite hierarchical structure of self-similar systems: “Local hierarchical organizations are defined as those that are a function of spatial or temporal considerations, whereas global hierarchical organization is independent of location and time. Our current cosmological paradigm, based on the various types of ‘Big Bang’ models that involve an initial cosmological singularity, treats nature’s hierarchical organization as being independent of spatial considerations, as expressed in the Cosmological Principle, but very much a function of time. The hierarchical organization of nature is interpreted within this paradigm as having resulted from a sequence of ‘condensations’ of matter occurring after the ‘Big Bang’. According to this paradigm the universe begins and ends without hierarchical organization; multi-levelledness is a function of time and therefore the ‘Big Bang’ paradigm does not involve global hierarchical organization. The self-similar hierarchical paradigm, on the other hand, views nature’s hierarchical organization as being neither a function of spatial considerations nor a function of time, hence the Hierarchical Principle which asserts that nature’s hierarchy is global” (Oldershaw, 1985: 248). The author understands self-similarity as a discrete rather than a continuous form of conformal invariance. He explains this position by the presence of large intervals between analogue systems on a spatial-temporal scale. It is noted that the identified analogue systems from galactic, stellar and atomic scales will have formally similar morphologies kinematics and dynamics. The author offers the criteria for empirical justification of this model and the mathematical apparatus. The idea of the formation and perspective of the self-similar hierarchical paradigm of the Universe research is developed.

The justification of the anthropic principle, the implementation of which contains a powerful epistemological potential, is important in modern cosmological models. Thus, Milan M. Čirković (Čirković, 2004) notes that after classical criticism in modern research, the place of the anthropic principle in distinguishing cosmological models should be revised: “The simplest way to divide all cosmologies is into two broad classes: those postulating the eternal universe and those which postulate some origin of the Universe, or at least the part of it that cosmologists are currently inhabiting. Eternal universes (and here by eternal I mean those with no beginning or end, or even only those with no beginning) are the only ones that could pretend to adopt some sort of stationarity, a condition which is of singular importance in many branches of physics (among other issues because the law of energy conservation is closely connected with a translational symmetry of time), and which is certainly seen as greatly simplifying the solution of specific problems everywhere” (Čirković, 2004: 567). The author argues that the anthropic principle is important for further cosmological studies, especially in current inflation models such as the theory of chaotic Linde inflation. In his view, the cognitive value of the anthropic principle is expedient in solving the end-to-end problems of third-party rational observers and in the context of temporal infinity.

Ian G. Moss explores the theoretical implications of the discovery of the Higgs boson, which reveals the possible pluralism of cosmological scenarios and produces the potential to emerge from standard models of particle physics and cosmology (Moss, 2015). A cosmological model of a different kind is offered by Anna Popova, who studies the cosmological solutions of the spatial dimensions of galaxies with respect to their age and chemical composition. In addition, the author proposes her own procedure and classification for determining the

dimension and other parameters of our Universe: “With these formulations of WAP in mind, it is clear why the Davies’ argument against the Ellis *et al.* cosmological model can be called *anthropic* at all; it takes into account the restrictions to be imposed on cosmological models following the existence of a specialized subclass of intelligent observers, namely the ‘technological communities’” (Popova, 1995: 570).

When following the integrative methodology of cosmological research, we find obvious prerequisites for dialectical opposition, which is transformed into an extensive network of negative dialectics. Modern physics offers, together with the classic mechanical model of the Universe, quantum (Max Planck) and relativistic (Albert Einstein), which fundamentally change the concept of the nature of space and time and patterns of interaction. One version of such non-classical concepts is ‘pancake theory’ by Iakov Zeldovich, one of the most influential researchers in cosmology of the century. This theory analyzes the problem of symmetry and gravity and designs the configurations of space objects: “The growth of fluctuations in both adiabatic and isothermal models are described, and nicely detailed through the use of graphs to make it easier to understand how the form of the fluctuations changes between epochs. A big emphasis is placed on the role of the inflationary universe, on the possibility of a neutrino dominated universe, and the importance of pancake structures for the bubbly structure seen in our universe” (Zeldovich, 1976: 136).

The Big Bang theory, or the theory of the genesis of the Universe of singularity, has gained wide recognition. Modern researchers have criticized the definition of singularity as infinity, and have suggested replacing these quantities with a Planck, that is, a quantum description. Proponents of the Big Bang theory, in order to correlate theoretical and experimental data, work out the so-called ‘inflation model’, which assumes the existence of the ‘pre-singular’ state of matter.

A complex hierarchical model of reality is offered by the holographic model of the Universe, according to which reality is a multilayered formation of sub-physical forms of matter, which are various in quality. Similar in content is the fractal model of the Universe, according to which the diversity of reality focuses on a particular configuration of particles, which is repeated in different modifications at different levels of being. Another interpretation of reality is offered by the so-called information models of the world. According to these concepts, the basis of the Universe is not matter, but information, and its movement and transmission. Matter in such a theory plays a supporting role, such as technical equipment. Although these models are more often an object of criticism of modern cosmologists, we cannot avoid them trying to show the breadth of interpretation of cosmological issues.

Conclusions

As a result of an attempt to propose the author’s approaches to the systematization of cosmological models, the following conclusions were reached:

1. Modern cosmology is a science with a long history of research and uncertain status.
2. The range of its estimates varies from the definition of cosmology as a promising and accurate science of physical-mathematical character to its philosophical and theological expediency.
3. The debatable status of cosmology as a science is reflected in its methodology, which demonstrates the realization of the principle of demarcation between natural and philosophical knowledge.
4. The philosophical and theological component of cosmological research not only outlines the worldview paradigm of interpretation and study of the Universe, but also

provides the necessary justification for explaining the scale of the outer space, which far outweighs the possibilities of human subjectivity.

Scientific cosmological models create new projections of orientation and interpretation of space and time, specifics of dynamic processes of the Universe and formation of strategies of human activity explication according to ontological shifts and universals.

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Unmanned Spacecrafts and Space Drones as the Challenges for Space Law

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In the article, the authors considered the challenges for space law, which are created by the intensive development of production technologies of unmanned spacecrafts and space drones, as well as their use in the space industry. The authors clarified the term “space object”, which is used in the Space Law. This helped reveal the difference between the terms “unmanned spacecrafts” and “space drones”, which are synonymous in the Air Law. The authors investigated the basics of the space law and proved that in the existing formulations, the space law is not able to regulate the modern space exploration. Based on the study, the authors proposed: (1) to consolidate the influence of public organizations created in the space industry and specializing in the space exploration in the space law; (2) to change approaches to space law; space law should be considered as an effective regulator capable of ensuring the sustainable development of the mankind;. (3) under the space law, to create a holistic concept for using all types of space object on the Low Earth Orbit.

Keywords: space object, unmanned spacecrafts, space law, space drones, U-space, air law, Low Earth Orbit

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Introduction

Mikko Huttunen discloses the issues related to integration of civil unmanned aircraft systems (drones) into airspace in the article “The U-Space Concept”. These are problems relating primarily to safety, traffic management, privacy, and law enforcement. To solve them

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the European regulatory bodies have come up with a new concept: U-space. Huttunen proves in his study that U-space is not merely a legal but also a technological concept, and it is as much a public as it is a private effort (Huttunen, 2019).

The Air Law is governed by various laws and regulations (Khomiachenko, 2018), two of which are the determining documents:

1. The Convention on International Civil Aviation. It was first adopted in 1944. The sixth, latest edition was published in 2006. As of March 2019, the Chicago Convention had 193 state parties
2. Standards and Recommended Practices (SARPs) developed by the International Civil Aviation Organization (ICAO) (Standards, 2019). Unlike the Chicago Convention, SARPs have no legal force. They are published by ICAO in the form of Annexes to Chicago Convention and are advisory in nature.

International non-governmental associations play the important role in organizing and coordinating the air transport industry. They are the driving force that stimulates the continuous excellence of defining laws and regulations of the Air Law. For example, the International Air Transport Association (IATA). The IATA was established in 1945 and currently represents “the prime vehicle for inter-airline cooperation in promoting safe, reliable, secure and economical air services — for the benefit of the world’s consumers” (International, 2019). Today it has some 290 members from 120 nations in every part of the globe.

The existing organizational structure and legal support of the airspace up to the last decade made it possible to provide reliable and secure air service. The advent of unmanned aircraft systems (or drones) and their intensive development have created three major problems for the Air Law (Huttunen, 2019):

1. The price of drones varies from cheap to expensive. These devices can be toys that are used by teenagers and adults without any training, and they can be commercial systems that are managed by specialists.
2. Due to their small size and low retail price, many drones are not equipped like a transponder, which provides their safety among other aircraft. In addition, drones usually operate at low altitude, which is classified as uncontrolled. At this altitude, there is a great risk of collisions between drones and people, structures, and other aircraft. This risk makes drones potentially dangerous to privacy and security.
3. According to the definition, drones do not have a pilot on the board. Therefore, drones face difficulties with the VFR / IFR distinction, and their capability to follow established avoidance procedures is also limited.

There are some attempts to solve the problem in the aviation industry in different ways. For example, the creation and implementation in practice the U-Space concept. The creation of the concept of “U-space” was first proposed at the European 2016 High Level Conference on Drones. In the legal field, U-space was legalized last year. This is above all, Notice of Proposed Amendment 2017-05 (A) (Notice, 2017) and Notice of Proposed Amendment 2017-05 (B) (Notice, 2017), as well as in Opinion No 01/2018 (Opinion, 2018) and other regulations (Huttunen, 2019). A full review of the U-Space concept, as well as the features of its implementation in practice are outlined by Mikko Huttunen (Huttunen, 2019).

Integration of civil unmanned aircraft systems into the airspace goes through the first stages only. On its way, there are many problems, both scientific and technical, and those associated with changes in international and national laws. Mikko Huttunen concludes that

“the design of the legal framework is inappropriate for drones in numerous ways” (Huttunen, 2019: 87). The concept of U-Space at present represents only fragments that as a whole do not work in any state yet. The full implementation of the U-Space concept is expected by 2027.

In this article, we will expand the perception of the intensive development of unmanned aircraft systems to the space industry. We explore the challenges for space law that are created by the intense development of unmanned spacecrafts and space drones.

Modern technologies of development of unmanned spacecrafts and space drones

Currently, space exploration is carried out in three main directions. These are the earth-based observations, airborne and orbital telescopes, probes and fly-by spacecraft, orbiters, Landers, rovers, and sample return. As Chris Barrett wrote back in 2000, “We now know of 66 moons in our own Solar System, one with an atmosphere, 16 with water ice or oceans, and 5 with both. In addition, we now know of 20 extra-solar planets” (Barrett, 2000).

New knowledge about the Universe, discover new resources that amaze with their inexhaustibility and power. The search for knowledge and inexhaustible sources of energy makes the mankind expand its sphere of activity. The first settlements on the Moon and Mars are planned already in the 2030s. They open up new prospects for the involvement of space resources in human-organized cycles of matter, energy, and information. For example, a study by Evgeny Slyuta proves the reality of gas production on the Moon and its use by humans (Slyuta, 2017).

In the aircraft industry, the terms “unmanned aircraft systems” and “drones” are often used synonymously. Regulatory documents of the Air Law evidence of this (Notice, 2017; Opinion, 2018). The space industry terminology has not been so well-established and defined. The reason is the lack of perfection of space law. Let us consider the classification of the products of the space industry, with the help of which humanity masters the near space. The reason is the lack of improvement of the space law. Let us consider the classification of the products of the space industry, with the help of which the humanity explores the near space.

In the space law, the term “space object” is used. “Convention on Registration of Objects Launched into Outer Space” gives the following definition: the term “space object” includes component parts of a space object as well as its launch vehicle and parts thereof (Convention, 1974). The Registration Convention was adopted in 1974 and entered into the force in 1976. Since then, no clarifications have been made. Victoria Rybachok in her study “The Term *Space Object* and its Legal Status” pointed out the legal conflicts caused by the discrepancy between the meanings of the term “space object” and modern realities. Rybachok made strong arguments for the need to clarify the term “space object” in the space law (Rybachok, 2018).

Let us specify the term “space object”.

On the website of the United Nations Office for Outer Space Affairs we find such a record: “To date over 88% of all satellites, probes, landers, crewed spacecraft and space station flight elements launched into Earth orbit or beyond have been registered with the Secretary-General” (United Nations, 2019). In the space law, the classification “space object” is not specified. We will take as a basis the classification given at the official website of the key authority, which is the legal authority of the international space law.

The information on website of the United Nations Office for Outer Space Affairs allows us to clarify the term “space object”. These are satellites, probes, landers, crewed spacecraft and space station flight elements launched into Earth orbit or beyond.

In the space industry, the established classification concerns only man crewed spacecraft. Although, we emphasize, this classification is not enshrined in the space law. Man crewed spacecraft includes space capsules, spaceplanes, and space stations, on board of which the full human life is provided. Consequently, the remaining categories such as “satellites, probes, landers, and spacecraft” we should refer to “unmanned spacecrafts”.

Uncrewed spacecrafts — are spaceships without people on board, used for robotic spaceflight. Uncrewed spacecrafts have different levels of autonomy from human participation. They may be remote controlled, remote guided or even autonomous, meaning they have a pre-programmed list of operations, which they will execute unless otherwise instructed. The official website of NASA provides a classification of Uncrewed spacecrafts. It is not unified and mandatory for space agencies of other states. Although, for example, the Department of Space of Indian Space Research Organization uses roughly the same classification of uncrewed spacecrafts (List of Spacecrafts, 2019). NASA identifies eight broad classes of robotic spacecraft according to the missions the spacecraft are intended to perform (Spacecraft Classification, 2003):

1. Flyby spacecraft.
2. Orbiter spacecraft.
3. Atmospheric spacecraft.
4. Lander spacecraft.
5. Rover spacecraft.
6. Penetrator spacecraft.
7. Observatory spacecraft.
8. Communications spacecraft

We should note that the existing uncrewed spacecrafts classification does not use the term “space drones”. A possible reason is that in 2003, the type of “space drones” was not so common and in demand in the space industry.

Mostafa Hassanalian and the co-authors explore the emergence and evolution of space drones in the space industry. Mostafa Hassanalian is considered to be one of the key experts in the field of *space drones research*. In the studies of Mostafa Hassanalian and his co-authors, we meet the classification of space drones for the first time (Hassanalian et al., 2018; Hassanalian et al., 2018a). In the classification of space drones, Hassanalian is based on the research by Chris Barrett, who singled out in the emerging “new types of planetary exploration vehicles — aerobots and hydrobots” (Barrett, 2000). Hassanalian et al. gave the extended classification of aerobots and hydrobots. “Aerobots include robotic atmospheric vehicles, such as drones, lighter-than-atmosphere vehicles, and suborbital ballistic hoppers which are applied for exploration of planetary atmospheres. Hydrobots include gravity-melt lander vehicles, submersible hydrodynamic robotic vehicles, and submersible probes which are applied for planetary ocean exploration” (Hassanalian et al., 2018a).

Hassanalian et al proposed a technique, which distinguishes two main types of drones including fixed and rotary wings that have been considered for planetary exploration. Although, as the authors admit, “nowadays there are more configurations for planetary exploration, such as balloons, airships, gliders, fixed wings, helicopters, cyclocopters, VTOLs, tilt-rotors, rotary wings, and flapping wings” (Hassanalian et al., 2018a). Such a variety of configurations of space drones is not accidental. Mostafa Hassanalian believes space drones are more efficient than the orbitals and rovers. Drones can perform research that, for technical reasons, other classes of robotic spacecraft cannot do. Researches with

drones will greatly expand the knowledge of a planetary science. Therefore, the development of space drones in the space industry is more promising.

Thus, we can draw the following intermediate conclusions of our study:

1. The terminology used in the space law does not correspond to the current level development of technologies in the space industry. This leads to the legal conflicts. In particular, the term “space object”, which is used in the space law, does not allow to classify the space technology and consider its use in the legal field, as it is done in the air law.
2. We have clarified the classification of the term “space object” and concluded that in the space law, the terms “unmanned spacecrafts” and “space drones” are not synonymous. Currently, the United Nations Office for Outer Space Affairs, as the legal body of the international space law, has not approved the standards to classify uncrewed spacecrafts. In NASA’s classification of robotic spaceflights, the term “space drones” is not used.
3. Space drones are the most efficient and promising types of unmanned spacecrafts. The type of “space drones” is considered as a priority in the study of planets and other space objects. However, in the space law, this type of space technology is not mentioned anywhere.

In order to understand the reason for the conservatism of the space law and offer the own clarifications in the space law related to the use of space drones, we must consider the basics of the current space law.

The modern basics of the space law

Let us consider the basics of the modern space law. The treaties commonly referred to as the “five United Nations treaties on outer space” are (United Nations, 2002):

1. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (General Assembly resolution 2222 (XXI), annex) — adopted on 19 December 1966, opened for signature on 27 January 1967, entered into force on 10 October 1967.
2. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (resolution 2345 (XXII), annex) — adopted on 19 December 1967, opened for signature on 22 April 1968, entered into force on 3 December 1968.
3. Convention on International Liability for Damage Caused by Space Objects (resolution 2777 (XXVI), annex) — adopted on 29 November 1971, opened for signature on 29 March 1972, entered into force on 1 September 1972.
4. Convention on Registration of Objects Launched into Outer Space (resolution 3235 (XXIX), annex) — adopted on 12 November 1974, opened for signature on 14 January 1975, entered into force on 15 September 1976.
5. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (resolution 34/68, annex) — adopted on 5 December 1979, opened for signature on 18 December 1979, entered into force on 11 July 1984.

Along with five General Assembly resolutions, the Declaration of Legal Principles forms the basis of the international law (United Nations, 2002).

It is obvious, the basis of the space law is formed by the laws and principles that were adopted at the beginning of the era of human space exploration. In contrast to the air law, the foundations of the space law are not reviewed. It reduces the effectiveness of the space law in some degree. In fact, space exploration is carried out outside the law.

In this regard, the study by Valentyn Halunko deserves attention. Halunko's considered the current trends in the development of space law. Trade regulation factors in outer space, as well as the legal aspects of the militarization of outer space and space debris have been clarified. The tasks of the space law, considered by Halunko, such as: standardization of legal space terms, approval of private space law, stimulation of private capital involvement in space programs, development of the theory of the right to use space bodies, regulation of the rights and legitimate interests of space tourists, development of sanctions agreed by the world community for violation of space law, subjects and procedures for their application deserve special attention (Halunko, 2019).

Larysa Soroka and Kseniia Kurkova investigated the specifics of the legal regulation of the use and development of artificial intelligence for the space area. The authors have proved the need of adoption of a legal instrument under the auspices of the United Nations, which would cover the creation of a law enforcement international agency monitoring artificial intelligence the observation of basic human rights in space technologies (Soroka & Kurkova, 2019).

The study of the foundations of the space law, as well as the contemporary researches in the space law, leads us to the following conclusions:

1. The fundamentals of the space law do not correspond to the modern challenges of the space industry. If the fundamentals of the air law are periodically reviewed and improved, taking into account new advances in aviation science and technology, the fundamentals of the space law have never changed since they were adopted.
2. The space industry is rapidly developing. Projects of development of the Moon and Mars are coming to the final stage of implementation. Along with the government projects, private investors and companies take an active part in space exploration. The foundations of the space law do not take into account the peculiarities of the new reality.
3. If we compare the features of the development of the air law and the space law, then the absence of a consistent policy of development of the space law is noteworthy. In our view, the United Nations Office for Outer Space Affairs is failing in its responsibilities. The reason, perhaps, is not so much in it, as in the absence of authoritative and powerful in the degree of influence of non-governmental organizations, such as the International Civil Aviation Organization (ICAO), International Air Transport Association (IATA) and others. In the space industry, the non-governmental international organizations have not yet achieved the degree of influence that they have had in the aviation industry. It is for this reason that the United Nations Office for Outer Space Affairs takes a passive position and does not perform its key *statutory* functions.
4. *The modern space law does not regulate space exploration.* In fact, many human actions in space go beyond the existing space law. Case in point, using space drones. This term is not used in the space law, although in the prospects of space exploration this type of unmanned spacecrafts is the key one.

Conclusions

In conclusion of our study, we will return to the U-Space Concept and its legal regulation of the air law. Mikko Huttunen's research reveals to us not only the relevance of the U-Space, but also the difficulties of its implementation in practice. The main difficulty lies in changing the international law and national legislations (Huttunen, 2019). This is a complex and time-consuming process that occurs under the influence of new technologies embodied in the everyday life of a person. However, this process ensures the order and safety of airspace use.

Modern cosmological models affirm man in the role of cosmic force (Bazaluk, 2015; Kastrup, 2018). Intensive development of the space industry makes space exploration plans real. With our research, we want to draw attention to the difficulties associated with any changes in space law. Bearing in mind that outer space is a *res communis* area (i.e. outside the jurisdiction of any State), the consideration of the concept of 'exploration and use' under the guidance of the sustainable development principle requires a special approach. This issue was first raised in a study by Orsola Greco (Greco, 2019). The concept of 'exploration and use', in which Greco examines the threats posed by small satellites to the sustainability of the Low Earth Orbit environment, is similar in content to the threats that the U-Space Concept is trying to prevent. However, in terms of complexity of implementation and consequences, these threats are incomparably more complex.

All human activity in outer space should be determined and regulated by the space law. Without exception, all the leading states of the world realize their ambitions in space. Therefore, the lack of the term "space drones" in the space law, which can be technologically used for both space exploration and military purposes, poses threats to security on the Earth. The use of space drones needs strict regulation. As practice shows, the creation of unmanned spacecrafts in most cases involves dual use: for peaceful and military purposes. The space law is the only and key regulator that defines and protects the interests of all mankind. For this reason, we offer:

1. The space industry needs powerful non-governmental international associations capable of exerting pressure on the United Nations Office for Outer Space Affairs and national space agencies. It is necessary to strengthen the influence and secure in the space law the determining role of public organizations created in the space industry and specializing in the space exploration. These organizations should become the necessary driving force for the development of space law.
2. It is necessary to change the approaches to the space law. The space law should be considered as an effective regulator capable of ensuring the sustainable development of mankind. Its effectiveness should be significantly higher and take into account all the changes that occur in the space industry as a result of the introduction of new technologies.

Within the framework of the space law, it is necessary to create a holistic concept of using all types of space objects on the Low Earth Orbit. It will ensure the legal regulation of the use of outer space by the states and private corporations.

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Section Two

LIVING MATTER

Discovery of the Cold World on the Earth and in the Universe: from Ancient Natural Philosophy to Cryosophy¹

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Discovering today diversity of extraterrestrial cryogenic objects, as well as the large range of scales and rates of cryogenic processes, undermines the conventional views of cold in the classical terms. The classical approach of natural sciences that study different cryogenic objects and processes separately is giving way to the apprehension of the cold world as a self-evolving complex system, with a great variability of its constituents in the scale of the Universe. In this respect, we discuss the methods and conceptual basis of the terrestrial and extraterrestrial cryology in terms of a new science called cryosophy. Cryosophy studies the role of cold in the origin and evolution of life and heat-mass interactions in the world. It addresses the key features and principles of the evolution of the cryosphere and uses both classical (for simple physical and chemical systems) and synergetic (for complex and living systems) approaches, as well as information logistic methods that generate knowledge about knowledge. Studies of cold date back to the ages of ancient Greek natural philosophy, which flourished between the 7th and 4th centuries BC. Unlike Greek natural philosophy, which pretended to be a universal

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syncretic science, cryosophy is a kind of integrator, which attracts different fields of knowledge related to the cold world and builds a framework for its ontology. The properties of ice can be summarized in a model of a multi-function system with six main components plotted in the scales of space (ice as a physical system and a natural material), energy (ice as a physicochemical system and a phase state), and time (ice as a system of information and control). The concept of cryodiversity covers multiple biotic and abiotic complex systems, such as cryophilic bacteria that live in permafrost, atmospheric precipitation, gas hydrates, etc. Cryodiversity also refers to cryogenic effects in the extraterrestrial space, which have been increasingly more widely investigated since the middle of 20th century. The evolution and properties of the cryosphere in different planets or other celestial bodies make part of the basic knowledge indispensable for the future exploration of the Universe.

Keywords: natural philosophy, cryosophy, cosmology, cold, cryodiversity, interdisciplinary researches, post-nonclassical science

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Introduction

The science of geocryology that deals with objects, phenomena, and processes in the Earth's cryosphere originated about one hundred years ago. In its concepts and methods, it stemmed from geology and geography, while the object of studies was restricted to the lithosphere. However, the scope of subjects and methods of geocryology has expanded largely for its short history. In the 2000s, the lines of research encompassed the environment-forming role of permafrost; cryogenic effects in the atmosphere; physical and chemical properties of ice and snow; cryobiological issues; role of cold in the evolution of biota and humans, etc.; the cryosphere became considered as a separate Earth's sphere. Revolutionary changes in the idea of the cold world became possible due to advances in the space exploration, including observations and experiments, remote sensing, and progress in astronomy and astrophysics. The gained knowledge provides a new perspective of diverse cryogenic objects and processes in the Universe, which have no analogs on the Earth.

However, it becomes clear that the apprehension of the cold world remains limited and problematic, despite the improved instrumental facilities and the avalanche-like increase in the amount of collected data. The reason is primarily that the discovered diversity of extraterrestrial cryogenic objects, as well as the large range of scales and rates of cryogenic processes, undermines the conventional views of cold in the classical terms. The classical approach of natural sciences that study different cryogenic objects and processes separately is giving way to the apprehension of the cold world as a self-evolving complex system, with a great variability of its constituents in the scale of the Universe. This understanding of the cryosphere agrees with the principles of postnonclassical science, which aims at creating a holistic view of the world (Stepin, 2006). However, as fairly noted Oleg Bazaluk и Larysa Kharchenko, "The undervaluing of philosophy and philosophical knowledge has led to the fact that modern research in cosmology, biology and neuroscience is completely unrelated and does not enrich each other through explorations" (Bazaluk & Kharchenko, 2018: 10). This situation is typical for different fields of knowledge. Therefore, the most important methodological problem of the modern science is development of the philosophical

approaches playing a role of the integrating basis for cross-disciplinary researches (Epstein, 2016; Rovelli, 2018). In 2019 was issued the article “Why science needs philosophy” (Laplane et al., 2019). Its authors on the example of three advanced scientific research where cooperation is recognized as mutually useful, show that the contribution of philosophy can take at least four forms:

- a) Specification of scientific concepts;
- b) Critical assessment of the scientific assumptions or methods;
- c) Creating of concepts and the checked and predicted theories which help to lay new ways for empirical researches;
- d) Development of dialogue between various sciences, as well as between science and society.

The philosophical analysis allocates important semantic and conceptual problems in different fields of science. Philosophy helps to get rid of the problem or outdated assumptions, concepts, helping to stimulate scientific changes. In this respect, we discuss the methods and conceptual basis of the terrestrial and extraterrestrial cryology in terms of a new science called cryosophy (Melnikov & Gennadinik, 2011). Cryosophy studies the role of cold in the origin and evolution of life and heat-mass interactions in the world. It addresses the key features and principles of the evolution of the cryosphere and uses both classical (for simple physical and chemical systems) and synergetic (for complex and living systems) approaches, as well as information logistic methods that generate knowledge about knowledge.

Although geocryology as a particular natural science is only 100 years old, the philosophical views of cold are at least 2500 years old. To expand the perspective of the cold world, it is crucial to learn the whole history of its apprehension by the global science.

Cold: evolution of scientific views from natural philosophy to geocryology

Studies of cold date back to the ages of ancient Greek natural philosophy, which flourished between the 7th and 4th centuries BC. It was then a single science not yet divided into philosophy and natural sciences, leaving aside the more detailed later division (Rozhanskiy, 1979). Natural philosophy studied the world as a whole; the Greek thinkers tried to pick essential principles (elements) of the nature in their versatility and interactions and made their conclusions from direct observations of the natural phenomena. In that worldview system, nature was treated as *Cosmos*, an entity rather than an environment as it has been since the Modern ages. Each individual physical being in cosmos was thought to have its specific place and destination, while the cosmos as a whole was the absolute perfect (Akhutin, 1988). Correspondingly, many Greek thinkers considered cold as a universal element that controls the physical features of cosmos.

In the early history of Greek nature philosophy, cold seemed interesting as an element in the system of dichotomy. For Parmenides, warm and cold were elements like fire and earth (Aristotle, 1981). Anaximander viewed the world as a scene of interacting essential opposites extracted from the infinite (*apeiron*) which was the source of all things. The cold tends to overwhelm the warm, the dry overwhelms the wet and vice versa, while the *apeiron* maintains the overall balance and prevents the opposites from winning one over another (Kessidi, 1982). Heraclitus developed Anaximander's theory and was the first to formulate the idea of *Logos* as a universal rhythm, measure, and order. As fundamentals of dialectics, Heraclitus understood transformation as replacement of one element by another: what is cold becomes

warm and what is warm becomes cold; what is wet becomes dry and what is dry becomes wet (Kessidi, 1982). Heraclitus viewed the opposites as a consistent system making up a single whole, in which all things and phenomena could change and transform into their opposites (Kessidi, 1982: 53).

A key question at that evolution stage of science was whether cold is a physical matter or a universal property of any matter. According to Anaximenes, a Milesian philosopher, cold and warm were transient states of matter rather than specific substances. As he affirmed, anything, which undergoes contraction and condensation of matter, is cold, while anything that suffers rarefaction and distention is hot (Lebedev, 1989). Anaximenes treated air as an element of any matter, which can acquire various physical states associated with its condensation or rarefaction and thus provides the diversity of things in the surrounding world (Rozhanskiy, 1979); he imagined these changes as rhythmical respiration of Cosmos (Kessidi, 1982).

Plutarch's *On the Principles of Cold* was among earliest special treatises on the cold world. The philosopher inquires whether there exists an active principle or substance of cold (as fire is of heat) or is coldness rather a negation of warmth, as darkness is of light and rest of motion (Rozhanskiy, 1979). Plutarch insists that cold is not mere negation or privation of heat, but is rather a positive substance or force that can make change to matter like heat. Furthermore, rest in frozen things is not mere inaction but rather stability, which is due to the consolidating and compressing capacity of cold (Rozhanskiy, 1979).

The great merit of Greek philosophers was that they were the first to seek explanations for the framework role of cold in the physics of the Earth and the cosmos. Anaxagoras tried to understand how an ordered world of cosmos emerged out of the formless primordial matter; as he thought, the dense, the moist, the dark and the cold, and all the heaviest things collected in the centre and consolidated, and thus gave birth to the Earth (Rozhanskiy, 1979).

Plato and Democritus who laid the foundations of the theory of atomism tried to explain the effect of hot and cold by the action of tiny invisible particles: *atoms* (Rozhanskiy, 1979). Plato distinguished two varieties of water: "liquid" water and "fusible" water; the former refers to all fluids and the latter to solids that can melt and flow under the action of fire.

The contribution of Aristotle's physiophilosophical views into the theory of cold was the greatest. He considered cold and heat as elements producing the properties of matter by making it dense or solid (Aristotle, 1981). In his views, the opposites of cold/hot and dry/wet, combined in different ways, formed the four elements of fire, air, water, and earth (Fig. 1); cold was part of two latter elements: cold+wet=water; cold+dry=earth (Aristotle, 1981). Developing the ideas of Anaximenes and Heraclitus, Aristotle postulated the existence of a single matter common for the opposites of hot and cold (Aristotle, 1981). He was among the first thinkers to focus on the issues of cold and its role in atmospheric phenomena like hoar, dew, snow, and hail (Aristotle, 1981).

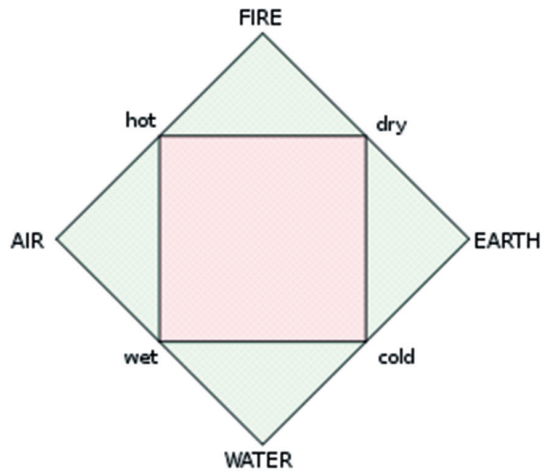


Fig. 1. Aristotle's elements and their properties

Summing up the contribution of Greek philosophers into the knowledge of cold, it is pertinent to note that the problems they formulated were actually a breakthrough for the science of that time and remain essential nowadays. The issues they covered were:

- a) cold as one of opposites in the system of natural elements (Parmenides, Heraclitus, Anaximander, Anaximenes, Aristotle, etc.);
- b) material carriers of cold (Plutarch, Empedocles, etc.);
- c) cold as a universal property of matter (Anaximenes, Aristotle, etc.);
- d) effect of cold on state change in natural objects (Aristotle, Plato, Democritus, etc.);
- e) cold as framework in the structure of the Earth (including its atmosphere) and the Cosmos (Anaxagoras, Anaximenes, Aristotle, etc.).

Of course, the ancient knowledge was insufficient to find realistic solutions and many speculative hypotheses on the nature and features of cold did not hold up. However, the very formulation of problems had a great scientific value and became precursor to the basic objectives of cryosophy thousands of years before it originated.

After the period of classical antiquity, the development of the theory of cold and its properties remained suspended for centuries, because the syncretic ancient natural philosophy dispersed into several sciences in the Hellenistic times, the natural sciences decayed in the Middle ages, etc. The interest to cold as an agent in various natural phenomena and processes rekindled during the Renaissance. The 18th century was another milestone, with Isaac Newton's law of cooling and *Scala Graduum Caloris. Calorum Descriptiones & Signa* (Scale of the Degrees of Heat. Description and Signs of Heat) that came out in 1701, where he suggested a scale of 12 degrees between the melting point of ice and body temperature. Guillaume Amontons presented his air thermometer in 1703 setting absolute zero at the point where air loses elasticity (-239.5°C). In 1750, Michael Lomonosov published his work *On the Causes of Hot and Cold* where he proved that the temperature, or the heating degree of bodies, was a measure of motion of small physical particles (Lomonosov, 1951); hence, the state when the particles stop moving corresponded to the greatest degree of cold. Johann Heinrich Lambert, a German scientist, updated the absolute zero value to -270°C in 1779. In those and other studies of that time, the apprehension of cold as affecting the structure

and properties of matter advanced actually in terms of the basic problems put forward by the Greek philosophers.

On the other hand, positivistic thinking that set in the methodology of science in the 19th century implicitly precluded turning back to ancient philosophical approaches to the nature of cold. The positivists rightfully criticized the physiophilosophical attitudes, which often imposed speculative ideas of natural objects and processes but were wrong to extrapolate that criticism onto philosophy as a whole and to negate its basic principles and ideas as off-cast “metaphysics” (Stepin, 2006). At the same time, as noted by Olga Stoliarova (Stoliarova, 2018), the principle of empiricism jointly with criticism pushed the metaphysics into the marginal background, isolated it from the empirical thinking and left in an unstable and equivocal position. That was the setting in which the observations of Haurace de Saussure, Alexander Humboldt, Alexander Middendoff, Karl Baer, Peter Kropotkin, and others created prerequisites for glaciology, a new science of ice and glaciers that appeared in the latest 18th century, as well as for geocryology, a science of permafrost that formed in the 20th century. In their early history, both glaciology and geocryology were mostly descriptive sciences based on field observations concerning the extent and physical properties of permafrost, ice, and snow.

New perspectives of the cold world in postnonclassical science

The scope of objects and lines of research about the cold world has extended markedly at the turn of the 21st century. Many studies of cryogenic effects have been closely related to the classical subjects of geology and geography, as well as to various problems of physics, chemistry, cosmology, climatology, ecology, pedology, biology, medical sciences, etc., which led to changes in the axiological comprehension of cold. Now it became clear that cold is a yet underestimated resource rather than something hostile (Melnikov & Fedorov, 2018; Fedorov, 2019). A few years ago, the term *cryodiversity* (Melnikov & Gennadinik 2018) was coined to help understanding the diversity of objects and phenomena associated with cold and phase change of H₂O, as well as forms and properties of ice as a focus of theoretical research. The properties of ice can be summarized in a model of a multi-function system (Fig. 2) with six main components plotted in the scales of space (ice as a physical system and a natural material), energy (ice as a physicochemical system and a phase state), and time (ice as a system of information and control) (Melnikov & Gennadinik, 2011).

The concept of cryodiversity covers multiple biotic and abiotic complex systems, such as cryophilic bacteria that live in permafrost, atmospheric precipitation, gas hydrates, etc.

Cryodiversity also refers to cryogenic effects in the extraterrestrial space, which have been increasingly more widely investigated since the middle of 20 century. The evolution and properties of the cryosphere in different planets or other celestial bodies make part of the basic knowledge indispensable for the future exploration of the Universe. In this respect, the concept of *cryogenic type planets* has been used in rapidly progressing planetary cryology, a recent natural science that deals with the principles of existence, formation, space-time evolution, structure, and properties of both terrestrial and extraterrestrial frozen rocks containing H₂O, CO₂, CH₄, and some other substances in liquid, solid, and gaseous states, as well as cryogenic phenomena and processes.

Frozen rocks (permafrost) belong to the cryosphere which makes up a sphere of some planets in the Solar System and their satellites, comets, and asteroids, where water, methane, ammonia, and carbon dioxide in different phase states can coexist. Planetary cryology

studies frozen rocks, including accumulations of snow and ice consisting of H_2O (various modifications), CO_2 , CH_4 , etc., above and below the ground surface (Komarov & Isaev, 2010). Cryogenic phenomena and processes on different planets are extremely diverse depending on their physicochemical features, core state, orbits, gravitation, density of atmosphere, etc.

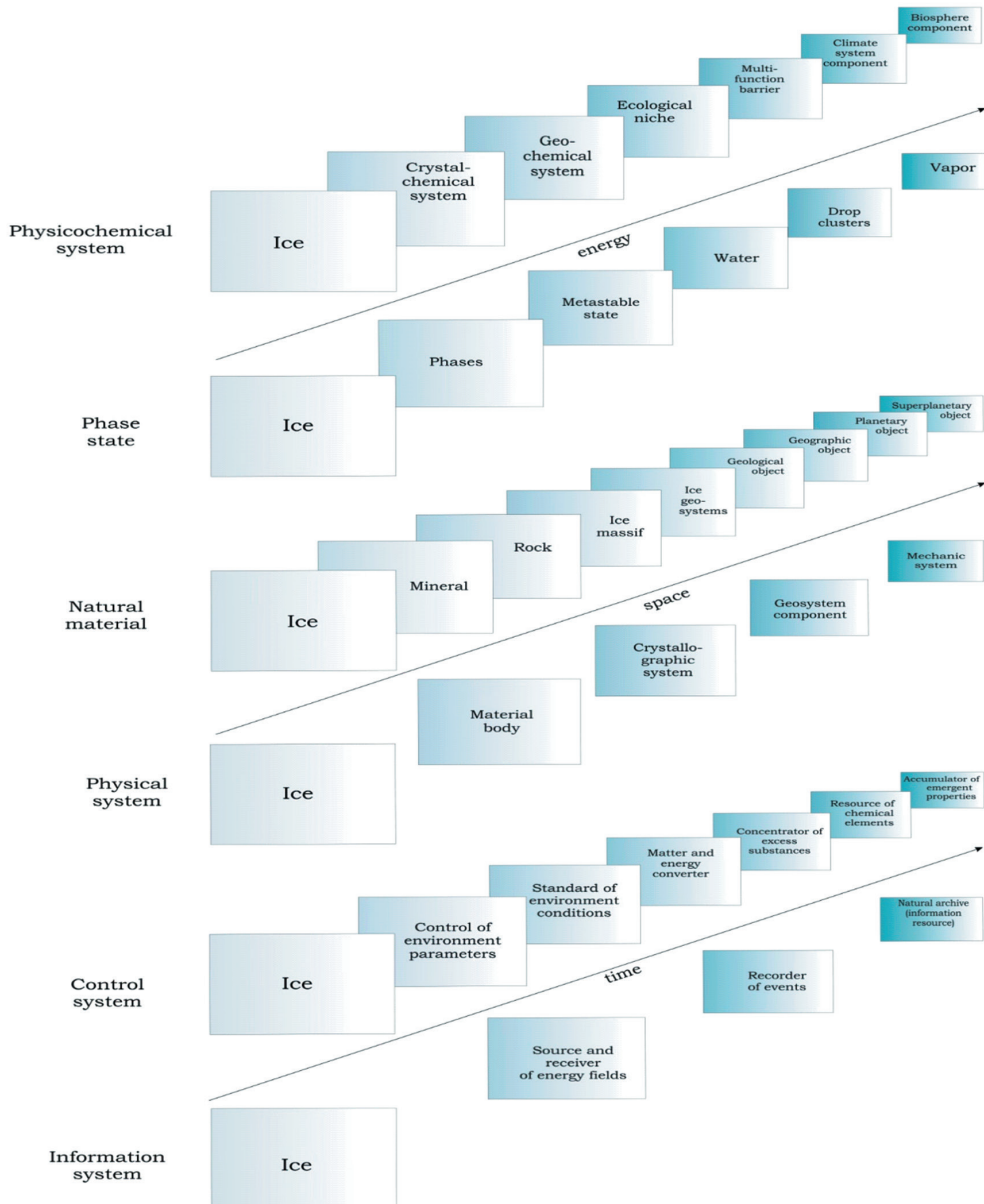


Fig. 2. Ice as a multifunction system (author of the scheme — Victor Gennadinik).

Many such effects would be hard to imagine from the viewpoint of the terrestrial conditions. According to one of versions of the researchers, water on the surface of Gliese 436b (Fig. 3), an extrasolar planet discovered in 2004 in the constellation of Leo, can remain solid at a temperature of $\sim 300^{\circ}\text{C}$. The reason is that water converts to ice under extremely high pressure produced by gravity. That is why it was called the *planet of burning ice* (Shiga, 2007; The Planet of Burning Ice). On the other hand, interstellar ice composed of water, methanol, and ammonia at temperatures between -120°C and -210°C can exist in a honey-like viscous state under UV irradiation (Tachibana et al., 2017).

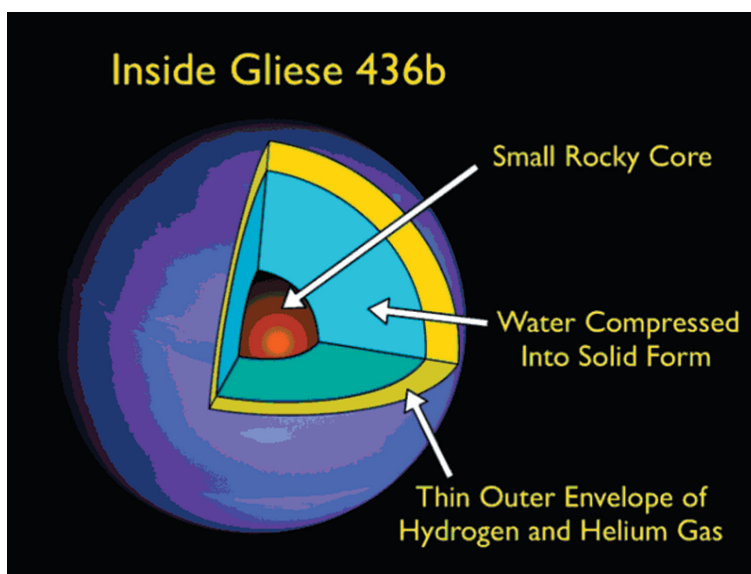


Fig. 3. Internal structure of Gliese 436b. Borrowed from <https://astronaut.com>

Prior to these discoveries, H_2O ice in space bodies was found out to exist in various crystalline modifications, which differ markedly in their thermodynamics: ice I is common to Earth and Mars while ice varieties II to VIII exist at high pressures above 10^2 MPa (Komarov & Isaev, 2010). The domains of ice varieties III, V, VI, and VII border that of liquid whereas the domains of II and III border the solid state region of other varieties.

H_2O ice is common to the Earth as well as to Mars and icy moons of Jupiter (Europe, Ganymede and Callisto) and Saturn (Mimas, Enceladus, Tethys, Dione, Rhea, Titan, and Iapetus). The H_2O ice may coexist with other ice types: CO_2 ice on the polar caps of Mars; NH_3 ice on some moons of Saturn (Titan and Enceladus) and Neptune (Triton), and CH_4 ice also on Neptune and Triton (Komarov & Isaev, 2010).

In some cases, climate change on the Earth can produce cryogenic effects which were previously thought to be possible on other planets only. This is, for instance, formation of gas explosion craters in the Yamal Peninsula, a phenomenon similar to cryovolcanism reported from some celestial bodies (Kizyakov et al., 2017, 2018).

As shown by studies of extraterrestrial cryodiversity, the concept of *cold* is actually relative when applied to physical processes on the scale of the Universe (e.g., the ice varieties that form at $>0^{\circ}\text{C}$). This concept is also used metaphorically to describe some types of matter in the space, which may have positive temperatures, such as *cold dark matter* or *CMB cold*

spot. It is also used in this sense in the cosmogonic theory of Otto Schmidt (Schmidt, 1962) claiming that the Earth and other planets of the Solar System formed out of cold solid bodies of the gas-dust cloud around the Sun.

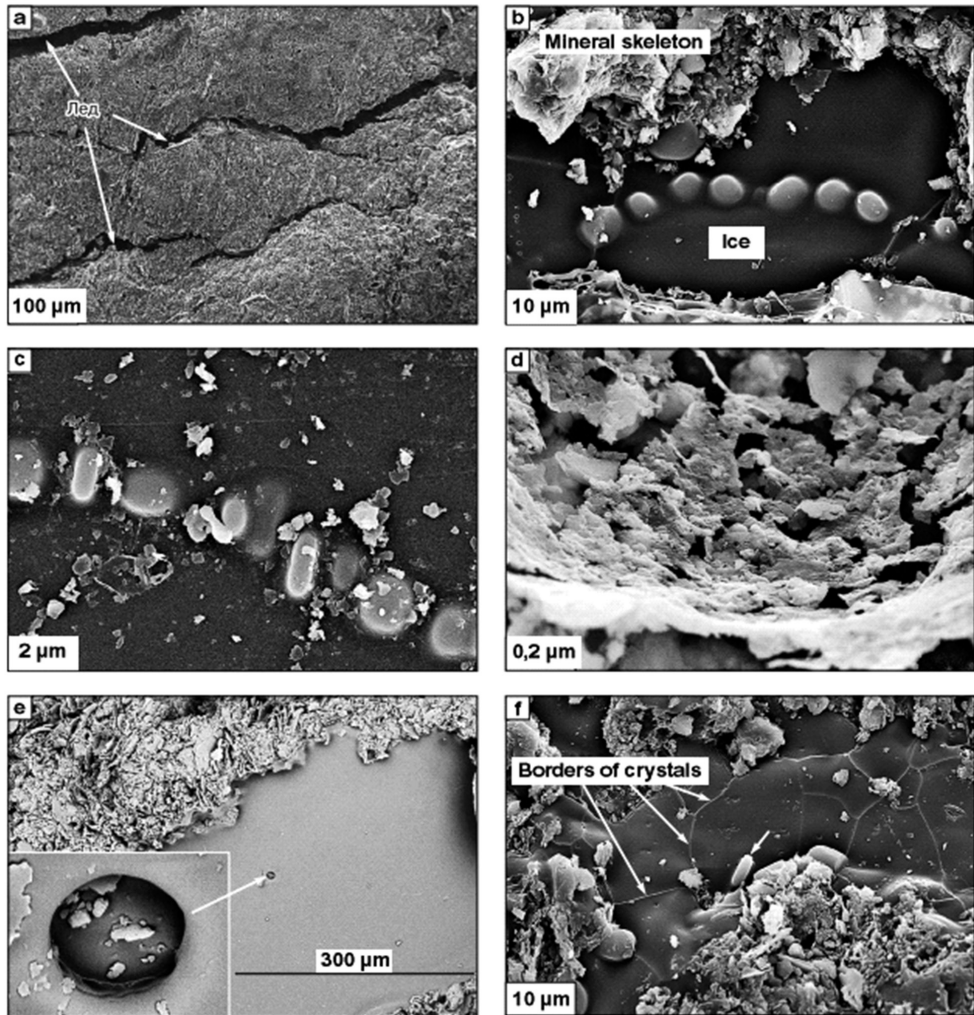


Fig. 4. Ice and microorganisms in frozen ground: (a) layers of segregated ice in clay silt; (b, c) cells of different shapes in ice layers; (d) mineral coat over a microbial cell; (e) cells of *Bacillus cereus* in an ice layer in kaolin (inset at magn $\times 30$); (f) cells of *Bacillus* sp. in an ice lens.

Cryodiversity shows up also in a large range of rates of cryogenic processes: a snowflake can form in the troposphere for fractions of a second; it falls on the ground from the height of 3000 m in 30 minutes; if it falls on the Antarctic ice sheet, it will reach its base in 500,000 years. People commonly can perceive the relatively short processes commensurate with a human lifespan and rarely think about geological-scale changes. Meanwhile, cold can maintain very long life in organisms unusual for our perception of biological time. For instance, biological processes are very slow in paleobacteria that remain viable in permafrost for many thousands

of years (Fig. 4) (Brouchkov et al 2016, 2017; Margesin et al 2016). Ice can slow down biotic processes due to its properties: low dielectric permittivity and magnetic susceptibility which reduce electromagnetic fields; high stiffness which resists mechanic impacts; low permeability which decelerates mass transport; high heat capacity and anomalous specific heat of melting which damp temperature variations. Thereby, the interaction between an object and its environment in the cryosphere is basically restricted to weak gravity effects and very slow diffusion. For this reason, the cryosphere of other bodies in the Universe may be a candidate for a medium favorable for the dawn of extraterrestrial life.

When studying cryodiversity in terms of cryosophy, it is important to take into account all elements in the system of cold; otherwise, missing even a single element will lead to misinterpretation of the system's state. The Earth's cryosphere is a second-order system in the supersystem of the Universe-scale cryosphere; in its turn, it has its subsystems, such as different $<0\text{ }^{\circ}\text{C}$ atmospheric layers with their specific features, cryogenic components on the ground surface, permafrost, and gas hydrates. Thus, cryosophy is a methodological paradigm creating a holistic perspective of the cryosphere in the context of interdisciplinary postnonclassical science. This is a trend toward a general scientific world view based on the principles of universal evolutionism which brings together the ideas of systemic and evolutionary approaches to the study of complex self-evolving systems (Stepin 2006: 331; Bazaluk, 2015; Ursul & Ursul 2017).

According to the views of Vyacheslav Stepin (Stepin, 2006), complex self-evolving systems are arranged hierarchically and can generate new hierarchic levels. Note that the philosophical system of Aristotle likewise presents the world as a hierarchic system with dynamically interacting elements of different levels. In this respect, there is overlap between the objectives of Greek natural philosophy and the modern postnonclassical science. The ancient thinkers had a syncretic view of the world and put forward basic problems of scientific knowledge, but they could not find the solutions with the limited methodological and instrumental facilities of that time. Meanwhile, the science at the postnonclassical stage has acquired new features as prerequisite for the creation of an advanced worldview. The idea of such holistic approach remained for a long time a remote ideal until real opportunities appeared in the 1970s to bring together the views of the living and nonliving nature and the society based on general scientific principles. These principles take into account the specificity of each field of science and, at the same time; act as invariants in the diversity of various ontologies (Stepin, 2006). In this context, cryosophy is an attempt of joining the three existential complexity levels, with a focus on cryogenic phenomena.

Conclusions

Philosophical apprehension of cold dates back to the ages of Ancient Greece. Aristotle, Plutarch, Heraclitus, Plato, Democritus, Anaximenes, Anaxagorus, and Anaximander were the first to formulate the basic problems concerning the cold matter, its properties and role in the world. It was yet impossible to find the solutions in terms of the metaphysical worldview of that time. Paradoxically, it took more than two thousand years to approach the understanding of the problems put forward by the natural philosophy of the classical antiquity. It became feasible due to new facilities for space-borne studies of cryodiversity; a new axiological paradigm of cold with its environment-forming and resource values; interdisciplinary integration of natural, humanitarian, mathematical, and engineering sciences that study various objects and processes associated with cold; viewing the cryosphere as a complex system.

The scientific problems formulated by Greek thinkers are developed in cryosophy. The role of cold in the system of opposites is often considered in the modern science in terms of dialectics. For instance, the phase transition of ice from solid to liquid and back illustrates the principle of transition from quantity into quality. Aristotle, Plutarch and other philosophers tried to understand the role of cold in the formation of the elements at the base of natural objects, while cryosophy studies transformations and interactions of hydrogen and oxygen, which are primary and secondary elements, with their hydrogen bonds being the base of both inorganic and organic matter. The very evolution of the Universe, since the matter emerged from the elementary particles of protons, neutrons, and electrons at the big bang, has been associated with hydrogen that formed first (together with helium) upon cooling (Melnikov & Gennadinik, 2012). The systemic value of cold in the physical structure of the Earth and the extraterrestrial space, which interested Anaxagoras and other thinkers of Ancient Greece, is the principal subject of cryosophical research on cryogenic systems in the terrestrial and extraterrestrial evolution. The investigation into the effect of cold on the structure and state of natural objects initiated by Aristotle, Plato, and Democritus still brings about new discoveries.

However, unlike Greek natural philosophy, which pretended to be a universal syncretic science, cryosophy is a kind of integrator, which attracts different fields of knowledge related to the cold world and builds a framework for its ontology. The integrating and framework role of cryosophy is consistent with the global trends in philosophy of science evolving from a “real science” to its epistemological comprehension through generalizing models and evolution principles (Lebedev & Kos'kov, 2014). This self-comprehension of the science began at its nonclassical stage and has been progressively more important in the postnonclassical history of its epistemology and philosophy. In the case of cryosophy, it has been the first attempt to formulate a system of cognitive views of terrestrial and extraterrestrial cryogenic objects, phenomena, and processes integrated into the emerging holistic scientific worldview.

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Section Three

INTELLIGENT MATTER

Nonlinear Cosmogony of “Black Mirror”: Darkness as a Symbol of a Distorted Chronotope in the Futuristic Netflix Series

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The article is devoted to the study of the symbolic significance of light and darkness in the life of modern humanity. In order to analyze this problem, the author turned to “Black Mirror”, a science-fiction anthology released by Netflix company. This popular series creates pessimistic and dystopian picture of life in a high-tech civilisation. The future in the serial appears as a multidimensional matrix, the elements of which form intricate correlations with the nowadays world. One of the most commonly echoed themes in the episodes of “Black Mirror” is the human being in the world, whose functioning is determined by a nonlinear space with conditions of artificial lighting, when the natural change of day and night matters no more. Darkness and light appear here as symbols that have different, sometimes polar meanings. In search of their identity and a bright future, human constantly returns to the Plato’s cave, but instead of the shadows of divine light on the stonewalls, he sees only flickering pixels. From this perspective, “Black Mirror” is a hopeless attempt to return to the original cosmogonic harmony of light and darkness. Unfortunately, this is the labyrinth without exit, since there is no way one can find the true essence of being in the distorted chronotope of social networks and virtual reality.

Keywords: futurology, darkness, light pollution, chronotope, “Black Mirror”

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Introduction

The science-fiction anthology “Black Mirror”, the first season the company “Netflix” released in 2011, has the status of one of the highest rated and the most perspective projects. It is not a coincidence, because the picture, created in the serial, is full of themes that the modern humanity is concerned. “Black Mirror” provokes a discussion of a large number of topical issues: ecology of consciousness, artificial intelligence, digital simulation of personal relationships, total tracking and control over the citizens’ privacy, technological intrusion in socio-political life, etc. According to the words of C. Huber, “the depictions of state control and technology within episodes of “Black Mirror” are not just mere spectacles of entertainment, but are rooted in reality” (Huber, 2017: 42).

At the same time, “Black Mirror” provides a possibility to discuss the problem of light and darkness in a high-tech world, which has lost its orientation on the natural rhythm of day and night. The symbolism of light and darkness in the series far exceeds the traditional cultural interpretations of this binom. It touches not only ethical, aesthetic and axiological aspects, but also the general ontological essence of light and darkness, connected with general changes in the time-space perception in modern culture.

The concept of the series is defined by the metaphor encoded in the name, which is directly constructed on the opposition of light and darkness. In the literal sense, “Black Mirror” means the surface of the gadget, which brings people to a completely different dimension of being. According to Charlie Brooker, the creator of the TV series in question, “The “black mirror”... you’ll find on every wall, on every desk, in the palm of every hand: the cold, shiny screen of a TV, a monitor, a smartphone” (Brooker, 2011).

In the cultural and historical sense, the mirror symbolizes the portal to the paranormal world of alternative reality, the habitation of non-human entities — gods, spirits and ancestors. In traditional cultures, the difference between physical and metaphysical worlds was clear. Modern high-tech digital mirrors simulate numerous unreal worlds, creating a distorted image of factual life. Therefore, there are new demons of humanity — simulations, which prevent society from seeing an objective reflection of reality. A man of a digital era does not want to seek the reflection of his true Self in philosophical reflections, ethical and aesthetic thinking, spiritual experiences. The digital mirror designs a brilliant multi-colored image in which one can see many options of oneself, none of which will be genuine. Thus, “Black Mirror” becomes a symbol of the high-tech world, in which a real person is lost.

“The future is bright” (1-2 seasons)

The dystopian story “Fifteen Million Merits” (S01E02, directed by Euros Lyn) tells about the world in which people have to generate electricity using bicycle dynamo machines. Workers live in the building, which is completely isolated from daylight. Each worker receives a certain amount of “merits” and usually spends its on artificially synthesized food or to get rid of annoying advertising. The system has a full control over the day and night mode, even the eyes can be closed only with special permission. In this way, the tranquility of the night and natural darkness of closed eyes is inaccessible to a small person. We see a picture of a total penetration of artificial light in human life, which has become a reality of modern megacities.

Because of the readiness to sacrifice themselves (to give their merits and then their life), the main character comes to a new level of being, where light and darkness are genuine. He reaches the privileged layer of society, so he can afford fresh fruit juice and a penthouse with

huge windows and view to the forest. This story determines one of the central messages of the anthology "Black Mirror": the darkness associates with artificial imitations of real life, which arises as a result of the remoteness of the modern man from nature.

Formally, scientific and technological progress pursues the target at improving people's lives. In fact, in parallel with the development of technology, doubts are raised about the truthfulness of the phrase: "Knowledge is light and ignorance is darkness". Dramatic story "The Entire History of You" (S01E03, directed by Brian Welsh) clearly denies this old maxim. In alternative reality, everyone has an implanted chip that records everything that a person does, sees or hears. This device also allows playing one's private memories of relatives either directly before your eyes or on the screen. Liam, the protagonist, begins to be jealous of his wife. At the end, analyzing the available videos, he finds out that he is a betrayed man who brings up the unrelated child. Deeply shocked, Liam removes his chip with memories. The screen sharply blacks and the viewer think: is the knowledge of the past really so important to a person? Would not it be better to stay in the darkness of ignorance? Why the knowledge, which has always been associated with the light, can transform a life into the black hell?

Thus, the main idea of the series becomes invariant of the philosophical mirror of Jacques Lacan: here my knowledge of Me is realized not only through the feelings and memories of loved ones, but also through a virtual twin acting in the role of the Other (Lacan, 2006: 75-81). However, the pseudo-personality that looks like a mirror from social networks is not real. This is the main idea of the movie "Be Right Back" (S2E1, directed by Owen Harris). The young widow Martha attempts to get rid of loneliness: she replaces her suddenly deceased husband with an artificial copy — first in a digital format, later in the form of a biotechnical semblance. In this plot, the modernized myth about returning of the deceased can be traced: due to premature death, the anxious spirit continues to disturb his wife. However, human death is an inevitable and logical end: the deceased cannot be turned back neither with the help of magic, nor by using of high technologies. Human is not a simple sum of replicas, statuses in social networks, images in photos and videos, behavioral reactions and algorithms. That is something larger, and the mystery of human nature remains inaccessible.

The moments of social decay of the heroes "Black Mirror" are associated with the time of natural darkness. In the political satire "The Waldo Moment" (S2E3, directed by Bryn Higgins) actor-comedian Jamie, who refused to participate in the local elections in the image of the animated character Waldo, eventually lives as a homeless under the bridge. The final scene of the episode — the loser Jamie is looking at a huge monitor, watching as the glory of Waldo walks around the world. The morale is obvious: the digital mirror in no way reflects the personality, distorting not only creating as a projection of the human soul, but also the entire system of social relations, including the politics.

Transformation of the sense of the opposition of light and darkness in the serial also changes the symbolism of the shadow. Here, this phenomenon does not mean a natural lack of lighting, but becomes a symbol of all sorts of shortcomings of the human nature. The horrible story "White Bear" (S2E2, directed by Carl Tibbetts) is a philosophical essay on the ethics of punishment for a crime. Victoria Skeleyn, the main character of the immersive spectacle, wakes up every morning with erased memories, undergoes persecution, chase and danger. And every evening she understands that all this is just a staging, created to punish her for the murder of a child. Every night, Victoria becomes the central figure of a disgraceful ceremony, similar to the torch walk arranged by the medieval inquisition before the process of witch burning. Historically ritualistic fire (candles, torches, and bonfire) symbolized the sacrificial purification and repentance: though during the ceremony in this series we observe

only the devilish twinkle of iPhones instead of the true peculiar fire. The night loses its significance of sacral time; it is only a moment that erases the boundaries between moral and immoral. Consequently, in the digital era, brutal snuff-video, where the victim is humiliated and tortured, comes in place of just punishment. The night shadows acquire archetypal significance in the context of Jung's theory: society consciously denies the darkness of its immorality, because the court must begin with the discovery of everyone's hidden depths. Thus, the episode "White Bear" highlights the violent nature of public punishment and "the dark prison tourism" encouraged by the state (Huber, 2017: 40).

Thus, lighting technology changes the archaic perception of hell as a darkness, as an eternal night, which is illuminated only by the fiery glow of lava, torches, braziers and other tools for sinner's excruciation. The invention of electricity "presented" to humanity a new type of torture: the dazzling artificial light in the prison cell or psychiatric clinic's chamber, which is even more striking for the prisoner's mind than the dark space of a dungeon. This is the image of hell from the special Christmas episode of 2014 "White Christmas" (directed by Carl Tibbetts). The protagonist is forced to suffer in a personal jail filled with brilliant snow-white glow for having committed a crime. His mental twin is forever locked in a Christmas gift with a fractal structure. Inside the general form, there is an infinitely split pattern that repeats the captive in his infernal living space, limited by the room of the polar station.

So, even if the original tagline of the first and second seasons of "Black Mirror" proclaims: "The future is bright", the creators of the series give a rather gloomy picture of tomorrow. The brightness of the future is just the illusions of digital simulations that conceal the set of dark, immoral, distorting light images of utopian futurology.

"Welcome to the darkness" (3-4 seasons)

While fans of "Black Mirror" are convinced that the brightness of the future has many dark sides, third season is released with the slogan "Welcome to the darkness". Although such an invitation has a negative semantic of unknown, mysterious and potentially dangerous, life without artificial light is habitual for a natural person. The ancient people did not use the lights at night and perfectly orientated in the obscurity. The dark surface with numerous visual objects has its long-standing prototype — the starry sky. Our ancestors directed their eyes to cosmic darkness every night, considering it as a kind of sacred picture. However, now a monitor becomes the contemporary sacral fetish — a very dubious analogue of the celestial screen.

For Lacie Pound, the personage of the story "Nosedive" (S3E1, directed by Joe Wright), the invitation to the dark becomes fatal. The girl lives in a world, where people appreciate each other using special gadgets. The level of life (work, housing, personal relationships) entirely depends on social rating. At first, the viewer sees a sugary picture of the finest future, and "this effect reinforced by the pastel aesthetics of the images" (Cirucci & Vacker, 2018: 206). Due to a number of circumstances, Lacie loses good grades and befalls at the bottom of society. However, the social decline and at the same time the return to the true nature of the main heroine falls on the dark time, when the savage desire to be sincere awakens. Her absolute liberation from the conventions and hypocrisy, imposed by society, occurs in conditions of artificial lighting of the prison cell. It is there that Lacie gets an absolute pleasure from expressing her true feelings — angry and unlimited sarcasm.

The "black mirror" of the novelty technologies is able to draw on the surface the hidden shades of the human soul, all those dark depths, which psychoanalytic psychology cannot reach. This is reflected in the episode "Playtest" (S3E2, directed by Dan Trachtenberg).

Cooper, the hero of history, agrees to collaborate with the company maker of the virtual games. Specialists implant in his head a gadget capable of simulating realistic images and sounds in his mind. When this device diagnoses anything that frightens Cooper, he creates a creepy mansion in the spirit of Edgar Poe and popular video games. In gothic darkness, the protagonist faces the worst fears of life — nightmares from his childhood, unpleasant images of the past. However, this is only the superficial layer of hidden darkness in Cooper's mind. A truly murderous infusion is his fear of Alzheimer's disease, which led to the death of his father. Thus, the viewer is aware of one more idea: high technologies, that can actualize the darkest and deepest layers of the subconscious, are destructive to the human psyche.

A natural night has always been associated with a mystery, with the ability to hide something intimate, personal, not intended for the public. Technologies of post-industrial society distort the norms of respect for private life. This is the theme of the episode "Shut Up and Dance" (S3E3, directed by James Watkins). The protagonist, teenager Kenny, along with other losers, are victims of unknown hackers: they use a virus to take over the laptop's camera, which captures intimate moments of the user's life. Through the intimidation, Kenny is forced to go on illicit doings. At the end, within self-defense, he committed murder. Despite the fact that objects of blackmail carry out all the rigid and absurd tasks, unknown hackers publish compromising information about the protagonists. The climax of the trolling takes place in the dark time: Kenny and other victims get a message with the "trolls face" and realize that their life is destroyed forever.

According to the ideals of transhumanism, the goal of which is the infinite continuation of human lifetime in the metaphysical digital world, one can enjoy the vivid completeness of existence even after the death of the physical body. In the utopian story "San Junipero" (S3E4, directed by Owen Harris), virtual reality models a resort town, where old and sick people can download their consciousness. A digital imitation of existence allows everyone to turn off the experience of pain and feel young. Externally, a happy Eden is depicted in a specific coloring — here dominates darkness with sparkles of pink and blue neon (a hint of bisexual relations of the main heroines). A city with artificial lighting, which does not sleep at night, becomes an amusement park for superhuman life, a twisted model of a beautiful paradise garden.

Cybertechnologies can absolutely control the dark, irrational depths of the human psyche. This is proved by the anti-utopian world of a story entitled "Men Against Fire" (S3E5, directed by Jacob Verbuggen). In the post-apocalyptic future, according to a eugenics program for the purification of humankind, scientists have developed a technology for the use of neural implants MASS. The purpose of the system is to dehumanize the enemy, which allows the soldiers to kill more efficiently. Inculcation takes place in two phases — at night, when the system suggests erotic images of "normal" people, and in the day, when people with minimal genetic defects appear in the minds of the soldiers as vile "roaches". The darkness on the screen as the dominant visual effect equals the two groups of images created by the MASS system. A young attractive woman in a semi-illuminated boudoir and people-outcasts hiding in dark-skinned homes or dugouts are all products of virtual consciousness. Thus, the suggestion of a management system of consciousness only distorts the vision of reality and removes a person from its true nature.

The creators of the series also urge to reflect on the problem of collective responsibility in media communities. Social networks from the innocent communication environment are increasingly turning into a dangerous tool allowing to influence the society. They become tools for spreading propaganda and misinformation, coordinating criminal gangs, total

tracking and interference with privacy. Episode “Hated in the Nation” (S3E6, directed by James Hawes) tells us about the danger of slacking collective emotions on the Internet. According to the plot, the using of the hashtag #DeathTo leads to the death of persons, which has been convicted of the community. An Autonomous Drone Insect (ADI), designed to replace extinct bees, is looking for victims of trolling and destroy their brain, entering the head through the earing canal. At the end, bright posts and dark hatred of users should lead to the deaths of hundreds of thousands of people. Only the operational work of special services allows avoiding tragedy.

Scientific and technological progress allowed not only to consider space through special devices, but also to visualize numerous fantastic worlds. At the same time, the inhabitants of the metropolises do not see the real stars due to the global pollution of the environment. In this case, digital technology creates a paradoxical illusion of the proximity of humankind to outer space, although people are just as far from traveling through the universe as their distant ancestors are. Ethical maxims of a modern person remain sometimes at savage level. So contemptible is the inward world of the protagonist cosmopolitan “USS Callister” (S4E1, directed by Toby Haynes). Robert Daley is a talented programmer and co-author of a popular online game; he suffers from lack of respect from his colleagues. As he became an alien in real life, Robert expresses himself in the virtual world. He creates a game simulation of the spacecraft from the series *Star Trek*. Team members are clone colleagues, simulated with DNA. In a dark cosmic world, he plays the role of the captain of a space boat, to whom all must worship.

Night and day, darkness and light, good and evil are inevitable parts of human life. When technology distorts the natural balance, it provokes negative consequences. Mary, the main heroine of the drama “Arkangel” (S4E2, directed by Jodie Foster), loses her little daughter Sarah in a crowded place. So that this incident does not happen again, Mary agrees to take part in the special Children Protection Program. An embedded chip and a special “paternal tablet” allow her to know her daughter’s location, her vital signs and visual impressions. Technology “Arkangel” protects the child from the dark sides of human life — violence, pornography, horror. All dangerous objects are blocked, turning into grey spots. However, the isolation from negative sides of being is, in fact, a brutal restriction of children’s freedom, which has catastrophic consequences. Teenager Sarah, who finds out about the intervention of her mother in private life, begins to beat her in the onset of rage. The gray filter on her eyes prevents her from seeing damages she is causes.

Darkness is a convenient background for checking sincerity, because sex and immorality in the modern world are associated with intense lighting, with bright simulations of reality in the Internet network. The utopian System of searching for couples compatibility algorithms prompts its subjects to rebel against experiments over them. This idea lies at the base of the story called “Hang the DJ” (S4E4, directed by Tim Van Patten). The main characters of the episode, Amy and Frank, use the Dating System, which forces them to experience many models of marital relationships. At the end, a couple gets tired of it: lovers run into the dark, the world breaks down to the pixel, and the heroes find out that they have become the actors of 1000 simulations. The darkness in this episode becomes a symbol of natural sincerity, the time of knowing the truth, and the night loses direct connotations with immorality: in this virtual space, sex without love is associated with illumination of different intensity and color. Therefore, the denial of the virtual brightness of the digital world, reproduced by the System, leads to the adoption of the only correct solution of sincerity.

Black-and-white episode “Metalhead” (S4E5, directed by David Slade) tells a depressing story in the horror style. The plot of the episode is very simple: the dogs-robots attack people.

The director David Slade says that the story is very "pared down, bleak and post-apocalyptic". The graphical picture of the world is an imitation of digital mechanism's view. "The world has been starved of color — there's not much hope left in the world — so to have the world be drained of color felt right, — Jones says. — And also, for a lot of it you are seeing the robot's POV, and it has digital, it is kind of grainy. The idea that we paint the whole world through the robot's eyes appealed to us and made sense and we embraced it wholeheartedly" (Turchiano, 2017).

The episode "Black Museum" (S4E6, directed by Colm McCarthy) is an anthology of three stories. Each is devoted to technologies that allow exploring the human consciousness and transferring it to inanimate objects. The proprietor of the Black museum, Rolo Haynes, conducts an excursion and tells the visitor Nish the various horrors associated with exhibits: about a psycho-doctor, who was pleased with a pain of patients; about a toy monkey with the consciousness of a real woman; about an unlawfully convicted man, who suffers in the digital eternity.

The Black Museum is a collection of all the dark vices of the human soul. This story contains links to each of the previous episodes of the series: a comic called "Fifteen Million Awards"; torture video by Victoria Skeleyn from the "White Bear", an artificial bee from the episode "The Enemy of the People", the paternal tablet from the episode "Arkangel", etc. The darkness of "Black Museum" acquires tactile characteristics: it is a stuffy hot space, a viscous substance, which, incidentally to the biblical image of the ninth Egyptian treasury (Ex. 10: 21-29), slows down movements, causes asphyxia and eventually death. In the final of the episode, sadist Haynes dies of poisoning and Nish places his mind in the chamber of eternal torture.

"Bandersnatch" is an interactive film directed by David Slade (released in 2018). The nonlinear script of this episode is based on the principles of art and challenges the concept of free will. The life of the protagonist of the programmer, Stephen Butler, appears as a wandering in a dark labyrinth, whose structure raises and branches storylines. The viewer turns into a co-author of the series and active management of the fate of heroes changes the usual time-space guides. The interactive principle of constructing an episode makes it possible to transform the artistic reality into one's own instead of passive contemplation. Although there are five main variants of the endings, this is a story without a good final, because its nodus at the symbolic level is the product of darkness: an upright fateful action in the life of the protagonist Stefan (his father takes a toy rabbit that accidentally leads to the tragic death of his mother) occurs at night.

In this cinema world, life is full of options, as in a computer game. However, the choice of the line of developments is made not by the acting personages, but by spectators: for a few time they are happy to test the functions of the gods. In support of the theory of absolute determinism of human life, the hero of "Bandersnatch", leading programmer Colin Ritman, tells Butler about a secret government intelligence program, alternative time lines and various options for fate. In order to demonstrate this theory, Ritman invites Stefan to jump from the balcony (the viewer has to choose which of them will jump). If Ritman jumps, he misses from the further history. If Stephen jumps, the game ends without him. In this episode, there is a very significant moment: when Colin tells about total control over mind and absurdity of life choices, he looks in the dark window of his reflection. It is as illusory as the nighttime metropolis, which shines by the lights behind the mirrored surface of the window.

Conclusion

“Black Mirror” has a compound dramaturgy with a nonlinear chronotope, cosmological fantasies, utopian and anti-utopian pictures of the future. The future in the serial appears as a multidimensional matrix, whose the elements form intricate correlations with the nowadays world. The author of the idea, Charles Brooker and directors of episodes, created a variational picture of an open composition designed to embody original ideas and unexpected storyline twists. This fantastic world, like the mirror labyrinth with fractal structures, reflects a variety of forms of human existence: from its material aspects to important spiritual problems. In this series, futuristic forecasts are made by using the structural principles of computer hypertext: the representation of alternative virtual reality, the choice of viewers or characters in the course of occasions, the presence of numerous points of intersection of different plot lines, etc. Thus, the viewer, who looks into the prediction of tomorrow through the black mirror of his monitor, becomes the creator and participant of the future.

“Black mirror” reflects a bright future, which has many dark sides. Darkness appears here as a symbol that has different, sometimes polar meanings. On one hand, the image of darkness has negative connotations: it is associated with depression and despair. It appears as evil and hidden vices of the human soul; it is a cold that envelops a non-viable space, and at the same time a stifling, hot environment; it is a viscid material that not only disorients, but also slows down the movement. A dark night can provoke and stimulate the release of human savagery, be a time of horrors and dangers. On the other hand, we see the traditional historical and cultural understanding of darkness in the series: night is a time of sleep, a union with nature, a return to the pre-civilization condition of a person. From this point of view, darkness is a symbol of primary freedom, unpredictability, creativity, sincerity. Night is a time of rest, enlightenment, intuitive decisions. The night is associated with astral journeys of the soul, prominent dreams, communion with spirits, gods and ancestors; the night dream is mythologized as a model of death and as a parallel life, which soul lives far from the body.

The creators of the series emphasize that people are increasingly distancing themselves from the natural perception of darkness and night. The 20th and 21st centuries generate the phenomenon of night civilization — a culture of artificial lighting that avoids darkness. The urban environment contributes to the desacralization of the night: it ceases to be the time of sleep and dreams, the moment of communication with the higher forces. Excessive illumination is a symbol of human presence, an unnatural, non-animal rhythm of being. Hazardous from an environmental point of view, global environmental pollution is the result of wastefulness of energy and unconcerned attitude of humans to wildlife: the illumination of the night sky leads to a change in the conditions to which all forms of organic life are adapted. Human turns into a night creature; everything goes away from its natural biorhythms, which is really a heavy stress factor.

Therefore, in conditions of urban light pollution, even darkness becomes an artificially acquired object. Modern artistic forms mimic the darkness both on physical and symbolic level. The following institutions are becoming more and more popular: the museums of darkness, where exhibits need to be touched, restaurants where food is served in absolute dark, reserve areas of the starry sky — zones where artificial lighting is prohibited. Consequently, we can state the following trend: humanity is tired of complicated technologies and seeks simplicity and naturalness.

This idea is reflected in “Black Mirror”. The authors of serial, using a complicated symbolism of light and darkness, discuss one of the main contradictions of the modernity: although the physical conditions of bodily existence have not changed, human consciousness

in their reflections is more and more wandering at the crossroads between natural being and its digital imitation. In search of his identity, human constantly returns to the cave of Plato, but he sees only flickering pixels instead of the shadows of divine light on the stonewalls. From these positions, “Black Mirror” is a hopeless attempt to return to the original cosmogonic harmony of light and darkness; this is a portal without an exit, since the distorted chronotope of social networks and virtual reality does not reflect the true essence of being.

Thus, the futurological stories of “Black Mirror” encourage fans of science fiction to understand the main ethical, ecological, socio-political and aesthetic problems of the present. The creators of the anthology continue to shoot new episodes, and viewers wonder about many things. Whether the rapid growth of the global population will lead to a lack of energy and nutritional resources? Is knowledge a real light for a humanity? Should we further develop biotechnology, fight for the immortality of the body and the individual consciousness? Is it safe to create artificial intelligence? Why the using of the achievements of science and technology alienates humans off nature? Unfortunately, these issues are not rhetorical, and for the sake of a bright future, they need to be resolved immediately.

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Collapse of the Ontological Gradient

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Because an unmeasured quantum system consists of information — neither tangible existence nor its complete absence — no property can be assigned a definite value, only a range of likely values should it be measured. The instantaneous transition from information to matter establishes a gradient between being and not-being. A quantum system enters a determinate state in a particular moment (being) until this moment is past (not-being), at which point the system resumes its default state as an evolving superposition of potential values of properties, neither strictly being nor not-being. Like a “self-organized” chemical system that derives energy from breaking down environmental gradients, a quantum system derives information from breaking down the ontological gradient. An organism is a body in the context of energy and a mind in the context of information.

Keywords: Mind-body problem, Measurement problem, Complementarity, Implicate order, Memory, Nonequilibrium thermodynamics

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Introduction

Ever since Descartes characterized matter and mind in terms of extensive and cogitative substances, philosophers and scientists have struggled to resolve the mind-body problem. How do fundamentally different “substances” collaborate in the seamless workings of the brain? Surely, there is ultimately one substance only. Yet the materialist reduction of mind to brain makes no more sense than the idealist reduction of brain to mind. As Bergson pointed out (Bergson, 1911: 10-11), the brain cannot be at once a center of physical activity and a seat of representations of physical activity. A material object is bound by the principle of identity: $A = A$. Representational thought, on the other hand, entails $A = B$ or C or D , etc., depending on what object A is said to represent, such as a building or a car or a desk. To reduce mind to brain — to claim that the mind in reality is only the brain at work — is to suspend the principle of identity in the case of neurotransmission. Yet the brain, unless it has a *magical property* of intentionality or “aboutness,” remains a material object like any other — albeit a highly complex material object — and therefore cannot contain any mental properties even where its activities clearly correlate with them.

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The failure to resolve the mind-body problem allowed it to fester and mutate and metastasize until it was the central dilemma of physics: the quantum-mechanical measurement problem. According to the measurement postulate — a way of interpreting the famously “strange” rules of quantum mechanics — to transform the indefinite values of the properties of an isolated microphysical system into definite values requires a measurement, which means an interaction, a *happening*. In essence, what is postulated is time-passage. In order for us to have the sensation of tangible objects, atoms must be endowed with definite properties, not evolving sets of possibilities in superposition, as in the domain of Schrödinger’s wave mechanics.

The problem with the measurement postulate, which was proposed by Dirac and developed by von Neumann (Whitaker, 2006: 195), is that classical measurement *uncovers* values rather than creating them. By contrast, instead of just telling us what the electron is, quantum measurement calls forth from a cloud of indeterminacy a suitable set of results, though it could just as easily call forth different results so long as they fall within parameters set by a mathematical procedure known as the wave function. Why does an event, including the event of a measurement, endow with definitude a quantum system otherwise characterized by the systematic development — given the forces acting on it — of various possible configurations?

Since quantum mechanics is fundamental and classical mechanics only approximate, we might ask why there is a classical world at all. Where is the divide or “cut” between the inherently indeterminate system under investigation and the ostensibly classical device by which we observe it? A measuring device is composed of atoms, all of which are described by wave functions, so why not assign a wave function to the measuring device as a whole? Though the rules of quantum mechanics typically manifest only in the very small, in theory they ought to apply at all scales. What prevents “infection” of the measuring apparatus with the indefiniteness — the superposition of many values for each property — that characterizes the quantum system prior to measurement? To put it another way, what *magical property* enables the measuring device to force a classical outcome for the system under investigation?

“Measuring devices,” writes Peter J. Lewis, “are just hunks of matter, obeying the same physical laws as any other hunk of matter” (Lewis, 2016: 50). The same could be said of the brain.

A quantum measuring device might include a microscope through which an observer views a mark left by an atom on a photographic plate. Nothing fundamental divides the atom from that mark or, for that matter, from the microscope or the observer’s eye or the optic nerve that leads to the occipital lobe of the observer’s cerebrum. As far as von Neumann could see, the only cut was between the brain and consciousness (Whitaker, 2006: 173, 198). The quantum dilemma is the mind-body problem transposed onto physics.

According to Bergson (1911: 293-95), Descartes’ mistake was to contrast thought with the spatial property of extension. Bergson approached the issue in terms of time. Starting with the act of perception, which is neither purely material like sensation nor purely mental like thought, as we move in the direction of sensation and matter we ultimately arrive at a sequence of discrete moments, each identical to the previous except for the rearrangement of atoms in space. By contrast, as we move in the direction of thought we find memory, the preservation of the past as a function of indivisible duration. In one direction time is pulverized into durationless instants, each of which instantaneously converts from present to past, a sort of parade into oblivion. In the other direction time is a single movement with nothing demarcating past from present.

Memory is the inescapable outcome of time as flux. As a material object the brain can no more represent the past, i.e. that which is no longer there, than that which *is*. Only in the

context of continuous time — in particular the ongoing presence we call consciousness — is there representation. Matter, on the other hand, is limited to mere presentation.

Seeking a framework within which research could be conducted even without a clear description of the underlying reality of the quantum system, Bohr developed the principle of complementarity in conjunction with Heisenberg's discovery of the uncertainty principle, that is, the impossibility of obtaining precise values of position and momentum in the same measurement (Whitaker, 2006: 176). Though long regarded as inherently perplexing, in the proper temporal context complementarity is a model of simplicity. Implicit in a definite position is a distinct moment. Thus, a particle — say, a photon — has a precise position at a particular time. Momentum, on the other hand, is not limited to any given moment but carries over from before. Where position is a snapshot — a single instant in a sequence of instants — momentum is the current that runs through them, converting snapshots into cinema. Like momentum and position, energy and instantaneous time are also conjugate variables. As Whitehead observed, a vibratory system has no existence as such at less than a certain duration (Capek, 1971: 318). Since the value of energy is by necessity uncertain at an instant, to arrive at a precise energy level can only mean a degree of uncertainty in the timing.

Einstein came into the 1927 Solvay Conference with the intention of proving that position and momentum (and time and energy) can be determined in the same measurement. He was soon compelled to concede the point to Bohr (Whitaker, 2006: 205-09). However, Bohr could offer no fundamental explanation for why Einstein's seemingly sensible approach was faulty. Bergson might have pointed out that time cannot be revealed as both continuous flow and a sequence of discrete moments *at the same time*. Either time is flux or the moments abstracted from it. As it depends on context, we can look at it either way. The genius of complementarity is the recognition that the contradiction is in our perspective, not the actuality.

The Instantiation Postulate

Quantum mechanics combines two approaches to the study of microphysical systems. Whereas the fundamental dynamics are expressed in the Schrödinger equation — the solution of which for any given set of boundary conditions is the wave function — a measurement generates a definite value for the measured property. That the Schrödinger equation is linear means each superposition of values of a given property encoded in the wave function can be succeeded only by another superposition of values. To get from wave mechanics to the classical mechanics of large-scale sensorial existence, we need a nonlinear dynamic which, like a limb projected from a tree trunk, would allow for a departure from superposition into a single definite value of each property of the system under investigation. In the absence of any law or equation for such an outcome, the result of a measurement of, say, the spin of an electron ought to be a superposition of the measuring device indicating “spin up” and “spin down.” Since we know the actual measurement generates one result *or* the other rather than both, we naturally conclude that quantum theory is wrong or at least missing something (Albert, 2015: 161).

Einstein began his commentary at Solvay with the claim that quantum theory is incomplete. How can an electron be in a superposition of indeterminate states while on its way to a photographic plate only to reveal definite values of properties when it reaches the plate? Surely it possessed those values during the entire journey and not just at the moment of arrival (Whitaker, 2006: 203-04). The Bergsonian response would be that the interruption of the electron's movement at the screen constitutes the extraction, from continuous time, of a distinct moment in the context of which the electron bears a definite value of position.

Though Bohr believed classical objects such as measuring devices are exempt from the sway of the wave function, he could not explain why this should be the case. Even Schrödinger, despite having formulated the equation that governs the wave function, could not accept its ramifications. If an atom has a 50% probability of decaying in a given timeframe, and the life of a cat depends on that atom *not* decaying, then clearly the wave function applies to the cat as much as the atom. Yet a cat cannot exist in a superposition of dead and alive (Whitaker, 2006: 237).

The fog clears when the problem is reconfigured in a temporal framework. Unlike its constituents, all of which can exist in either a superposition of potential states in continuous time or a determinate state in a distinct moment, a macroscopic object exists as such only on the basis of underlying determinate particles. Indeterminate particles and atoms do not add up to tangible objects. The time of a measuring device or a cat is a succession of distinct moments or space-time “snapshots” rather than the ongoing presence expressed by the smoothly propagating wave function.

We need not accept Wigner’s dictum, also adopted by von Neumann, that the consciousness of the observer collapses the wave function, transforming superpositions into distinct values (Whitaker, 2006: 201). Nor do we need Girardi, Rimini and Weber’s addition of a term to the Schrödinger equation in order to render, through artifice, nonlinear propagation of the wave function (Whitaker, 2006: 328). Nor do we need Bohm’s attempt to eliminate wave function collapse altogether simply by invoking, from the get-go, particles with definite positions jostled about by quantum waves or, for that matter, Everett’s claim that every possible outcome expressed in the wave function does in fact take place but that the observer sees only one version, mistaking it for “reality” (Zeh, 2010: 132).

Instead of seeking an answer outside Bohr’s principle of complementarity, we need only deepen it. Bohr intended his principle to apply exclusively to the results of measurements, whether expressed as position or instant on the one hand or momentum or energy on the other. The first set of options entails “space-time coordination” while the second set enables a “claim of causality.” We can either make an observation so as to place the quantum system in space and time *or* we can explain how the current state of the system causally relates to what preceded it. A deeper understanding, however, means recognizing measurement and the wave function as complementary perspectives onto the system, much as “particle” and “wave” are complementary descriptions of the results of measurements (Folse, 1985: 113-14).

This form of complementarity, in turn, expresses the twofold nature of time. In addition to wave propagation in continuous presence, we have instantiation on the basis of local interaction. To measure an electron is to cause it to interact with its large-scale environment, forcing it from the domain of continuous presence to that of momentary presence. In the context of a distinct moment it exhibits a precise value for the measured property. If we measure it again immediately afterward, the property will retain this value. Thus the instant is not, strictly speaking, instantaneous but carries a miniscule duration before passing into history, at which time the electron reverts to a superposition of values in accord with the wave function. The measurement postulate turns out to have been a placeholder for the instantiation postulate.

Instantiation is the *physical process* whereby indeterminate values resolve into determinate values. Measurement allows for well-defined values because instantiation is implicit in large-scale processes, including measurement, since the constituents of large-scale objects are always interacting. The Schrödinger equation allows only for continued propagation of the wave function — making no provision for its collapse — because it represents only continuous

time and leaves out the discontinuity of instantiation and the concomitant departure from the linear progress of the wave function.

The instantiation postulate clarifies the well known double slit experiment. If an electron is fired at a screen, and along the way the electron must negotiate a barrier with two narrow openings, so long as the electron remains undetected it remains in its default state — as determined by its wave function — and acts like a classical wave that passes through both slits. Granted, when it reaches the screen, it leaves a single mark in a seemingly random location. Over time, however, as more electrons are fired through the slits, the pattern that emerges on the screen is that of classical wave interference (Lewis, 2016: 5). By contrast, if detectors are placed at the slits, each electron loses its wave aspect, and the resulting pattern on the screen is a simple aggregate of marks beyond each slit. By interacting with the electron, the large-scale detector translates it from continuous time to a distinct moment consistent with a definite location.

An electron is a particle with determinate properties in the context of moment-to-moment time and an evolving superposition of potential values of properties in the context of continuous time. At no time are its properties both definite and indefinite. We have only a pair of temporally imposed complementary perspectives onto the quantum system.

Memory as a Function of Temporal Complementarity

The robustness of the principle of complementarity is revealed in the circuitous journey of David Bohm, who sought to get beyond Bohr's framework and directly express the reality of microphysical existence but wound up embracing the complementary notions of implicate and explicate order.

By proposing that an unmeasured quantum system includes particles with definite though hidden positions, Bohm reproduced all the predictions of orthodox quantum theory despite eliminating the special role of measurement and the need for wave function collapse (Lewis, 2016: 56). However, he also identified a deeper problem unaddressed in either orthodox theory or any of the alternative interpretations, including his own: continued reliance on the Cartesian grid, a coordinate system that describes an extended local order. While curvature can be introduced into the grid to accommodate general relativity, no amount of tweaking can make it suitable for quantum theory. This is due to the nonlocality inherent to “indivisible quantum processes that link different systems in an unanalysable way” (Bohm & Hiley, 1993: 352). This problem was typically evaded, according to Bohm and Hiley (Bohm & Hiley, 1993: 350), with the claim that quantum theory is based not on the physical world but on a mathematical world comprised of Hilbert space, an abstract space of potentially infinite dimensions, each one corresponding to a potential value of a property of a quantum system (Ney & Albert, 2013: 6).

Insisting that physics describe the actual world, not a mathematical construct, Bohm devised the concept of implicate order so as to bring the mathematical and the physical into coherence (Bohm & Hiley, 1993: 351). He illustrated his concept with the hologram. Whereas an ordinary photograph contains a one-to-one correspondence to a negative image on film and thus adheres to the Cartesian coordinate system, a hologram is a set of marks seemingly unrelated to the three dimensional picture projected from it. This is because the picture is distributed throughout the hologram, any portion of which can reproduce the picture in its entirety. Rather than simply project a pre-existent image for viewing, the holographic process explicates or “unfolds” a picture from information enfolded in the hologram (Bohm & Hiley, 1993: 353-54).

In addition to the spatial metaphor provided by the hologram, Bohm offered a temporal metaphor involving ink droplets processed through glycerin (Bohm & Hiley, 1993: 358). The basic set-up is a cylindrical core that can be rotated within an outer cylinder. Between the cylinders is high viscosity glycerin. If we place an ink droplet onto the glycerin and then rotate the inner cylinder, the glycerin and the ink droplet swirl around it, causing the ink to disappear into the glycerin. If we then rotate the inner cylinder in the opposite direction, the ink droplet reconstitutes before our eyes. Thus the ink droplet, when no longer visible, is *implicate* or enfolded into the glycerin and becomes *explicate* again when the cylinder is rotated back.

Bohm also noted that ink droplets can be added to glycerin sequentially, each one enfolded into the glycerin before the next droplet is added. Once the last of the sequence is enfolded, the droplets reappear one at a time when the rotation is reversed. By rotating the cylinder at high speed, we see what appears to be a single steady dot. We can even make the dot move by enfolding droplets at sequentially different positions in the glycerin before rotating the cylinder in reverse at high speed. An electron, like the apparently enduring dot, takes on the appearance of an enduring particle on the basis of the rapidly repeating unfolding of implicate information. Bohm replaced the continuous trajectory of a determinate particle with a rapid succession of waves converging, at each instant, on a given point (Bohm & Hiley, 1993: 359, 374).

To summarize, in response to the Einsteinian imperative to restore certainty to the microphysical, Bohm postulated a particle with a precise position even before measurement. However, he could not stop himself from taking the next step. Motivated by the need for “a notion of order for all our concepts, both mathematical and physical” (Bohm & Hiley, 1993: 351), he proposed that the microphysical is the overlap of implicate and explicate orders, perhaps not realizing these orders are complementary in the exactly the sense that the wave function and the measuring device provide complementary views into a quantum system. Whether we call it implicate order or wave function, information periodically explicates or projects into determinate structure, i.e. matter.

Yet something of great value came out of Bohm’s journey from point A to point A: the basis of memory in nature. As opposed to the artifice of storing data *about* the past, nature’s memory is the continuation of past into present, that is, implicate endurance in the face of successive explications (Bohm & Hiley, 1993: 382-83). By resetting with each measurement and evolving from this revised starting-point, the wave function abstracts whatever has explicated, in effect saving in outline form each tangible moment for future reference. Bohm’s contribution was not so much to provide an alternative to Bohr as to demonstrate how memory can arise from the combination of wave mechanics and the quantum transition.

The wave function acknowledges neither future nor past. Indifferent to the direction of time, it describes the subtraction of superposed values in reverse time as readily as their addition in forward time. This is why, in the double slit experiment, the choice of whether or not to detect, say, a photon can be delayed until after it has passed the slits (Jacques et al, 2007: 966-968). Because the photon in its default state occupies continuous presence, it has no history distinct from its present. Thus, its passage through the slits is still present when the decision is later made to detect which slit it went through. The photon can be retraced to its arrival at the slits because its entire path remains present. By contrast, once a mark appears on a screen, it cannot later be made to disappear. Only indefinite presence, as revealed in the continuous wave function, is time-reversible.

According to Feynman’s path integral method, nicknamed “sum over histories” by his mentor, Wheeler, every possible particle interaction in the double slit experiment exists in

superposition (Halpern, 2017: 75, 82). The wave interference pattern on the screen is the summation of the possible histories of the particles. We might say the histories maintained in the ongoing presence of the wave-mechanical state ultimately wash ashore on a distinct moment. Ironically, Wheeler denied a fundamental reality to time on the grounds that “before” and “after” fail at the Planck length (Halpern, 2017: 199). What he overlooked is that the smallest distance in nature (10^{-35} cm) corresponds to Planck time (10^{-43} seconds), an interval too brief to crystallize into a classical moment, leaving only the *fundamental* time of an ongoing present without beginning or end.

Since memory requires a “before” distinct from the present, the time-reversibility of wave propagation cannot by itself constitute memory. Nor is there natural memory in strictly tangible existence, only the artificial memory of stored data. True memory requires not only the unfolding of information into a determinate state — the instantiation that distinguishes momentary presence from the past — but the enfolding of that determinate state back into the ongoing informational order. The accumulation of increasingly complex information over time in the implicate order allows for the *evolution* of increasingly complex systems in the explicate order of classical existence.

Evolution as a Function of Memory and Instability

Though the uncertainty principle could just as well be called the ambiguity principle since the quantum system itself — not our understanding of it — contains the “uncertainty,” Heisenberg’s terminology is useful insofar as it points up a similarity between wave mechanics and thought. Like thought, which represents aspects of the world, wave propagation represents possible states of a quantum system. To think is to consider alternative interpretations of a given circumstance and alternative options regarding action. The collapse of the wave function into a definite state is no different in principle from the collapse of thought into behavior. Given that the calculation of possible outcomes innate to mental activity is also at the core of all material activity, we ought to consider if this resemblance is a homology as opposed to mere analogy, much as Darwin wondered if hands and hooves are homologous.

The failure of 20th century theorists to take up the potential for quantum mechanics as the basis of a naturalized mentality might be due to Wigner and von Neumann’s spurious claim that consciousness collapses the wave function, occluding the parallel between measurement selecting from possible states of a quantum system and consciousness selecting from possible responses to a given situation.

Could mentality be an evolved form of wave propagation? If so, what is the mechanism by which the wave function transformed from the guiding principle of atomic behavior to that of neural behavior? The answer, if there is one, might be found at the boundary of order and chaos in the unstable system. Instability reveals two properties, holism and memory, which provide a bridge from the quantum to the conscious.

An undisturbed quantum system is not a collection of determinate particles but the wave propagation of potential values of properties of the entire system. In contrast to a machine, where the parts merely *comprise* the whole, the parts of a quantum system *express* the whole. The whole is fundamental and the parts subsidiary.

As Schrödinger observed, implicit in quantum theory is that electrons become nonlocally “entangled” due to a history of interaction (Ney & Albert, 2013: 17). Electrons that previously interacted are entangled in the sense that the values of their properties are correlated regardless of their distance. Thus, nonlocality implies not only holism but memory. The history of interaction between electrons remains present to them so long as they remain undisturbed

by the larger-scale environment (such as a measuring device). Whereas artificial memory is strictly local, like finding the right data in a hard drive or the right passage in a book, natural memory is nonlocal. Once enfolded into implicate order, the past has no location. It can be accessed from anywhere.

Natural memory provides a means by which the regularities of matter might have emerged from the lawless chaos of the initial universe. Since our current understanding of physical law is based on current properties of matter and strengths of forces, how can it account for their appearance in the first place? Instead of timeless laws giving order to matter, the random explications of the very early universe would have set in motion tendencies such that subsequent explications would likely play out the same way. In this way electrons emerged as carriers of charge along with a tiny amount of mass while neutrons emerged as carriers of far greater mass but no charge. Whereas photons always fall into the same state as nearby photons, electrons are excluded from the same state of nearby electrons. Current physical law cannot explain the basis of these and many other curious properties of matter. Perhaps they resulted not from timeless law but habit. A habit once ingrained is easily mistaken for a law.

Prior to nucleosynthesis the cosmos was open to countless possibilities (Unger & Smolin, 2015: 171). Once a stable set of particles and their respective properties were in place, however, cosmic evolution could proceed according to the deterministic and time-reversible principles of classical mechanics. Different combinations of various types of particles make for different types of atoms, which combine in predictable ways to make molecules and so on. Under the benign rule of mechanism, time is reduced from active presence to passive parameter, a sort of yardstick to keep track of the inevitable unfolding of pre-determined forms.

However, the Newtonian dream is interrupted with the reintroduction of indeterminism in the form of unstable systems, as described in the science of nonequilibrium thermodynamics. Over time, a gas is likely to arrive at equilibrium as concentrations of pressure and temperature smooth out. This is known as entropy. Far from equilibrium, however, gases or liquids are likely to encounter instability, which can trigger synchronized behavior. When water is sufficiently hotter than its environment, for instance, it spontaneously forms into convection cells that rapidly convey heat into the surrounding air. In one of the Belousov-Zhabotinski reactions, billions of molecules simultaneously turn blue, then red, then blue again. Many more coordinated reactions like this demonstrate that matter takes on new properties far from equilibrium (Prigogine, 1997: 67).

Though a quantum system is ordinarily under the rule of the wave function, measuring a property of the system forces it into a distinct moment, collapsing the deterministic wave function and leaving the system momentarily in a semi-random state. Likewise, when a nonequilibrium system hits a phase transition known as a bifurcation point, it either fails altogether or evolves into greater complexity. Even when all the relevant variables are known, the behavior of the system at a bifurcation point cannot be predicted. Like an explicating quantum system, the bifurcating chemical system is undetermined (Prigogine, 1997: 68).

Because a thermodynamic system irreversibly pursues equilibrium rather than following deterministic time-reversible laws, unlike in the case of a mechanical system its current state cannot be traced back to former states. Though systems that resist equilibrium with their environments are also beyond the reach of deterministic law, their behavior reveals a nonmechanistic “cyclical” recall (Schneider & Sagan, 2005: 73). For instance, a system of Taylor vortices, which forms in a fluid between a pair of cylinders when the rotation of the inner cylinder reaches a certain speed, abruptly changes its number of vortices as the

rate of rotation further increases, and these quantum-like jumps cannot be predicted without knowledge of the system's history (Schneider & Sagan, 2005: 129).

Whereas ordinary thermodynamic systems follow the entropic path of least resistance to the most probable state, nonequilibrium systems break down environmental sources of energy in order to generate increasingly *improbable* structures (Schneider & Sagan, 2005: 143). Possessed of both recall and goal-directed activity, complex systems that self-organize on the basis of gradient-reduction operate holistically.

The behavior of self-organized systems in no way follows from either the determinism of classical dynamics or the probabilism of statistical thermodynamics. Instead, something like the wave function is reinstated at the macroscopic level in the form of a wavelike distribution of possible trajectories (Prigogine, 1980: 249). Though the classical assumption would be that these wave packets merely represent ignorance of the actual state of individual particles, given Bohr's realization that ambiguity is objectively part of the quantum system under study (Jammer, 1974: 69), the same might be true in the case of self-organized systems. It seems the fuzziness inherent to both the wave function and the mind also resides in the chemical system that stubbornly resists equilibrium with its environment.

If the self-organized chemical system expresses an evolved form of wave propagation, so too does its living descendent. Every organism, down to the simplest bacterium, harnesses energy to maintain itself out of equilibrium with its environment. Yet we say an object is alive not because it is bounded and internally coherent — or even that it actively imports useful energy while dissipating entropy into its surroundings — but simply because it reproduces. In reality, the key factor that makes an organism alive is not its self-replicating DNA but its status as a self-referential whole (Schneider & Sagan, 2005: 104). According to Mae-Wan Ho, the “structure of living organisms arises as the consequence of energy flow and is strongly reminiscent of the nonequilibrium phase transitions that can take place in physiochemical systems.” Metabolism begins in complex chemical systems and evolves into the basis of biological systems (Schneider & Sagan, 2005: 111, 236).

Just as life precedes genes, intelligence precedes brains. “Slime mold,” as Schneider and Sagan point out, “has been shown to figure out and remember maze routes to get at food, and to split itself into two and rejoin along the shortest paths in mazes provided with two food sources” (Schneider & Sagan, 2005: 155). As this physiological variant of superposition demonstrates, what really counts is not the accoutrements of higher biological systems but that, like the quantum system in its default state, the parts *serve* the whole rather than merely comprising it.

Self-organized systems extract energy from the environment by breaking down gradients in pressure or temperature. (Schneider & Sagan, 2005: 85). Convection cells are powered by the energy unleashed from breaking down the temperature gradient between heated water and the surrounding air. Taylor vortices form spontaneously from a pressure gradient caused by rotation rate. Photosynthesis exploits the gradient between sunlight and the cool terrestrial environment. Whether chemical or biological, the pursuit of self-interest in the extraction of energy through gradient-reduction demonstrates self-existence and therefore at least the germ of mentality.

Whatever is influenced by its past, including its remote past, feeds into and in turn is nourished by implicate order. Like the first particles to emerge from primordial chaos, chains of chemical reactions spontaneously appearing in the early Earth enfolded into the background order and informed subsequent explications such that similar reaction chains became more likely. Without direction provided by implicate order, the emergence of life is exceedingly unlikely.

Whereas an ordinary causal mechanism operates in the moment-to-moment time of explicate order, natural memory is the continued influence of past explications by way of ongoing implicate order. Memory is a function of the wholeness of past and present. Given our habit of thinking spatially, holism is typically regarded in terms of a system of objects across space. In this sense holism is the spatialization of memory, the application of the whole to a single moment across space. Whether temporal or spatial, holism is ultimately rooted in the indivisibility of ongoing presence, that is, in Bergson's duration.

"Every organism arises out of itself," wrote Schelling. "Every organic product carries the reason for its existence inside itself, for it is cause and effect of itself" (Gare, 2011: 52). How can a thing cause itself except in a continuous present? In the domain of distinct moments, effect must *follow* cause. The self-organized system — and the living system that evolves from it — expresses time as ongoing presence and not just successive moments.

In contrast to a distinct moment, which is present only relative to the moments preceding it, fundamentally time is presence without relation to anything external to it, that is, according to itself. Operating in absolute presence, wave propagation is at the root of self-existence and ultimately consciousness.

Hameroff and Penrose suggest that "consciousness occurs due to quantum vibrations in brain microtubules" and that each "objective reduction" of the wave function corresponds to a moment of consciousness (Hameroff, 2014: 126, 132). Yet the wave function directs not just individual particles but whole systems. An evolved form of wave propagation would coordinate the activities of an entire brain, not just particles embedded in brain cells. As atoms materialize wave-mechanical information, neural systems materialize higher-order information. This is not to deny the significance of microtubules in conscious states. However, consciousness itself cannot be contained in microtubules any more than an atom materially contains its wave function.

Whether a wave function explicating into matter or the evolved form of wave propagation we know as consciousness explicating into a pattern of neurotransmission, that which is ongoing and potential manifests in a determinate state in the context of a distinct moment. To be conscious is to sail on a sea of ambiguity in a continuous present informed by living history in pursuit of self-propagation. We are wave made flesh.

Something from Nothing

As Wheeler liked to ask in his later years, "How come existence?" (Halpern, 2017: 19). In other words, why *is* there as opposed to *is not* there?

The question implies that existence and nonexistence are mutually exclusive. To get beyond the conundrum we must recognize that these concepts are inseparable. While it would seem that by placing "not" in front of being we thereby negate it, in fact we merely contextualize it. Not-being is implicit in being. To have being without not-being is like having a planet without the space it occupies. Space or void is not a thing in itself but simply the background that makes the foreground possible.

From a temporal standpoint, being is a distinct present moment, and not-being is the same moment when it has passed. The gradient between them depends on discontinuous time. In continuous presence there is no such gradient, as the wave function gradually interweaves them in the form of a superposition of *potential* values. Only when the wave function collapses is there a distinction or gradient between being and not-being. The momentary present is the triumph of being. Its passage is the triumph of not-being. The most fundamental cycle of nature can be conceived as the collapse and restoration of the wave function or,

alternatively, the emergence and collapse of the ontological gradient. Whereas collapse of the wave function yields matter, collapse of the ontological gradient yields information. In the context of the evolved or biological form of wave propagation, information is known as mind.

Though Dirac regarded a positron as a negative energy electron, Feynman conceived it as a temporally reversed electron (Muller, 2016: 242). Because ongoing presence does not admit of past or future, the undisturbed quantum system is indifferent to the arrow of time. Whether the wave function charts increasing or decreasing superposition of values depends on whether we take the electron's or the positron's point of view. As entropy demonstrates, only with successive instantiations does time take on a particular direction.

For the electron, the wave function gradually mixes being and not-being until the instantaneous collapse of superposition and restoration of the ontological gradient. For the positron, the wave function gradually sorts out being and not-being until the sudden collapse of the ontological gradient and the restoration of fully developed superposition. Like the convergence of sound waves with perfectly opposed amplitudes, the two processes cancel each other out. Something turns out to be nothing.

In addition, nothing turns out to be something. Directionality of time is revealed by not only entropy but also memory, by the accumulation of forms abstracted from successive explications. Simply by breaking the symmetry in favor of the electron's temporal arrow over the positron's, nature extracts something from nothing.

Like the wave function, pure thought admits of no preferred direction of time. Ideas seem to exist outside of time, and we can follow a train of thought in either direction, from $2 + 2 = 4$ to $4 - 2 = 2$. However, every time we act — every time the personal wave function collapses into definite action — we too extract something from nothing.

According to Bohm (Bohm, 1996: 113), even mass, the basis of our sense of material substance, decomposes upon examination into a pair of reciprocal qualities, inertia and gravitation, which turn out to be, in light of general relativity, the resistance to and generation of acceleration. What is left when they cancel each other out?

From the point of view of the explicate — the domain of definite properties — information seems to be nothing. For the implicate, the tangible existence resulting from explication is but a fleeting appearance. For each the other is nothing. Only in their union is there *something*.

Just as each new explication instantiates flowing presence, so too did the “big bang.” Far from initiating time, cosmic ignition merely instantiated it. The meaning of the wave function is that the “nothing” at the heart of matter is not static but temporal, that is, *animate*. Life is no accident but cosmically embedded.

According to the well known anthropic principle, without precisely the right values of numerous constants of nature such as the mass of the electron, the strength of the binding force of the atom, the relative strengths of electromagnetism and gravity, etc., we would not be here to witness the world. Because the fundamental parameters were set very early in cosmic development, we must surmise that the universe, like a healthy newborn, came into existence in the one right way and not in any of the myriad wrong ways. Perhaps in both cases the knowledge of the right way to enter existence resulted from the many previous explications of similar systems. If so, not just this or that species of atom or mammal but also the universe as a whole is a product of memory and evolution. How many universes had to come and go before this one got it right?

Conclusion

The rapid succession of explications of the wave function provides the basis for all sensorial experience (Bohm & Hiley, 1993: 382). What we think is happening now is precisely what has been removed from the absolute present, set aside in a momentary present. The classical world is on a delay.

On the basis of observations of the human nervous system, Benjamin Libet discovered that human awareness is on a half second delay (Libet, 2004: 72). What we think is happening now in fact happened half a second ago. Given that classical existence is already on explicate delay, Libet's delay turns out to be old news. What difference does it make whether our sense of "now" is once or twice removed from ongoing presence, i.e. true now? Since the "stuff" of consciousness is not the brain's moment-to-moment existence but the continuous presence of mind, consciousness need not be bound to the extremely rapid recurrence of explicate matter. Our on-off cycle is not that of classical objects but that of waking and sleeping. So long as we remain awake, we are continuous in time. Though our sense of what constitutes the momentary present is mistaken, this mistaken sense is *itself* absolutely present. Precisely because presence is ongoing, a delayed sensation can always be re-presented in consciousness.

An electron is information in the context of ongoing presence and a determinate particle in the context of a distinct moment. Consciousness is mind in the ongoing present and neurotransmission in the momentary present. By pursuing a deeper understanding of complementarity instead of seeking to supplant it in favor of alternative interpretations of quantum mechanics, we find resolution of not only the quantum measurement problem but also the dualistic impasse that originally gave rise to it.

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The Art of Understanding and the Testing Cosmological Models

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In the proposed study, the author explored the modern meanings of the term “art of understanding”. The conducted research allowed: a) to explain the relevance of creating a “universal language”; b) to explore the art of understanding as an ontological orientation towards understanding the Other. It has been proven that understanding the Other is an innate quality inherent in man; c) to prove that understanding the Other as an innate quality needs to be developed. Education and educational technologies are a society-created environment in which “understanding of the Other” passes into a new qualitative state of “the art of understanding of the otherness of the Other”; d) prove that the “art of understanding” can be used as an indicator of the correspondence of cosmological models with criterion of falsifiability. The proposed study extends the existing boundaries of the use of art of understanding and opens up the additional possibility of testing cosmological models. As an example, the author tested the model “Evolving Matter”.

Keywords: art of understanding, universal language, interpretation, testing cosmological models, criterion of falsifiability, otherness, the Other, model “Evolving Matter”

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Introduction

Modern conceptions of the cosmos expand the understanding of the nature and use of language. In our previous study “Hermeneutics as the Methodology of Interpretation of Languages and Texts of Extraterrestrial Intelligence” we answered two questions: “Is it appropriate to use hermeneutics to interpret the SETI signal?” and “Does hermeneutics have any ability to interpret the SETI signal?” (Dubinina & Tsybulco, 2019). In the proposed study, we consider the modern meanings of the term “art of understanding”. It will allow us:

1. to explain the relevance of creating a “universal language”. We use the methodology of the philosophy of language to prove the natural connection between the art of understanding and the continuous attempts of man to create the universal language that we observe in world history.

2. We will determine the origins of the meaning of the term “art of understanding”. We will consider the art of understanding as an ontological orientation toward understanding the Other. We will prove that understanding the Other is an innate quality inherent in man.
3. We will prove that understanding the Other as an innate quality needs to be developed. Society must create certain conditions so that it transfers to a new qualitative state “the art of understanding of the otherness of the Other”. These conditions are education and educational technology.
4. Thinking over the transition from the state of “understanding the Other” to “the art of understanding of the otherness of the Other”, as the ontological orientation of individual and collective self-realization, opens up new possibilities for using the meanings of the term “art of understanding”. We will prove that the “art of understanding” can be used as an indicator of the correspondence of cosmological models with criterion of falsifiability.

In general, our study expands the existing boundaries of the use of art of understanding and opens up the additional possibility of testing cosmological models.

The art of understanding in modern practices

In modern scientific literature, the term “art of understanding” is used widely. The art of understanding takes the key place in psychiatry and psychology. For example, Shawn Shea examines the art of understanding in a variety of professional disciplines from psychiatry to clinical psychology, social work, and counseling. For Shea, the potential of the art of understanding is concentrated in psychiatric interviewing (Shea, 2016). An important place is taken by the art of understanding in couple and family psychology. Researches by Sviytlana Storozhuk (Storozhuk & Goyan, 2017), Iryna Fatkhutdinova (Fatkhutdinova, 2015) and others reveal the important role of the art of understanding in the relationship between a man and a woman, between parents and children. In “Handbook of Family Therapy”, the editors of the book Thomas L. Sexton and Jay Lebow collected key studies in psychiatry and psychology that reveal, among other things, the contemporary understanding of the art of understanding in of couple and family relationships. The central theme of the handbook is “the integration of theory, clinical wisdom, and practical and meaningful research produce the best understanding of couple and family relationships, and the best treatment options” (Handbook, 2015).

The term “the art of understanding” is a key term in the art history. For example, Irina Costache considers “the art of understanding art” as new and meaningful ways of developing personal ideas and opinions about art and how to express them with confidence. According to Costache, the art of understanding is the only possible way to create and understand the Art World (Costache, 2012). For Hugh Moss “the art of understanding art” is “a theory that places art right at the centre of the evolution of human consciousness, as a key driver of the process”. This is an opportunity to “the art of any culture at any time” (Moss, 2016). Denys Svyrydenko and Wiktor MoŹgin investigate “the art of understanding art” more broadly. For them, this is understanding of culture, in particular, understanding the contemporary Ukrainian culture. It means “to create a common language code that will be accepted and understood by members of the whole society” (Svyrydenko & MoŹgin, 2019).

The art of understanding takes an important place in the social empathy, where it is seen as “the art of understanding others”. For example, Elizabeth Segal considers the art of

understanding others as a prerequisite for individual and collective security. It is not only to represent oneself in the place of another person, but also to take into account the social, economic, and political circumstances in which the “other” was formed (Segal, 2018). “The art of understanding others” defines the individual civic position and social policy of society. This is especially acute seen in the study of Ulrica Hörberg (Hörberg, 2018). Hörberg considers the art of understanding in forensic psychiatric care. At forensic psychiatric clinics, the staff have an initial negative attitude towards patients who have a severe mental disorder, for having committed a crime, and for being cared for against their will in an institutional environment with a high level of security. In this case, the art of understanding turns from a method into a caring supporting the carers to be open and sensitive in encounters with patients, for example, in doing risk assessments (Hörberg, 2018).

The art of understanding is considered also:

- a) as a way of bringing science and art closer together;
- b) as the only possible way of interdisciplinary research that ensures the quality of communication between scientists working in different fields of scientific knowledge;
- c) as a way of intercultural communication, excluding aggression and rejection of “foreign” culture, characterized by its values and ideals.

A brief review of the use of the term “the art of understanding” in modern practices is sufficient to reveal its basic meaning. This meaning is defined by the truth-conditional theories. We mean Frege’s intuition that we know the meaning of a word when we know the role it plays in a sentence and we know the meaning of a sentence when we know the conditions under which it would be true (Wolf, 2006). Following Frege’s intuition in the term “the art of understanding” the words “understanding” and “the art” reveal and mutually enrich a single meaning. They establish a specific ontological orientation, as well as a way of individual and collective self-realization. The “art of understanding” is an equivalent to “bring peace” to people, “live in peace” with people and even “unite for peace”. The “art of understanding” is *philanthropy* on a planetary scale. This is the basis of any communication in which the message of “peacefulness” is clearly traced.

Consideration of the art of understanding in such senses explains the relevance of the problem of “universal language”. The message of peacefulness and the desire for unity and peace should be understandable for a person of any culture. It is a bridge between ourselves and the Other that allows the otherness of the Other to be seen as “the intertwining of selfhood and otherness within our bodily experience” (Waldenfels, 2007). Bernhard Waldenfels showed how otherness penetrates the spatial structures of our lifeworld and how hospitality shapes our being in the world. However, “hospitality” must be formed. Otherwise, otherness causes rejection up to aggression. Therefore, the study of the art of understanding and universal language are ways of forming “hospitality”. It is a vital necessity that ensures the natural development of civilization.

Let us consider the peculiarities of the formation and development of universal language in the history of culture.

Prospects for the creation of a “universal language”

By a “universal language”, we traditionally understand the language that is spoken and understood by all or most of the world’s population. In the myths and legends that have survived to this day, it is stated that at the beginning of history, mankind spoke only one

language. The separation and confusion of languages occurred as a punishment from God. The contemporary ideas on universal languages originate in researches by Francis Bacon, Gottfried Leibniz, etc.

The idea of monogenesis is considered in historical linguistics as a key and reasoned one. It explains the origin of the existing diversity of spoken human languages from a single (“universal”) ancient great-language several thousand years ago. Currently, this idea has acquired an applied character. The possibility of creating an international auxiliary language, which provides close communication between groups that speak the main languages, is assumed.

Don Ringe’s book is one of the latest contemporary studies that explains the nature of human language and the sources of language changes, which are examined in historical linguistics. Ringe argues that the greatest success of traditional historical linguistics is the creation of comparative reconstruction, which explains the reasons for the emergence of language diversity, as well as the possibilities of new methods of comparing languages. Ringe argues that the greatest success of traditional historical linguistics is the creation of comparative reconstruction, which explains the reasons for the emergence of a variety of languages, as well as the possibility of new methods of comparing languages (Ringe, 2013).

Some researchers put into the term “universal language” meanings very close to the term “art of understanding”. For example, Leigh Booth considers “compassionate behaviors” as “universal language” (Booth, 2016). This approach to understanding the “universal language” is not much different from the meanings that are concentrated in the phrase “the art of understanding others” (Segal, 2018; Balinchenko, 2019).

We consider the traditional point of view, which is presented in the book by Don Ringe, more true and reasoned. The creation of a universal language is a derivative task that must be solved in accordance with the idea of monogenesis. This is a necessity dictated by the message of “peace”, concentrated in the art of understanding. Creating a universal language is a means of achieving the art of understanding.

Based on an analysis of research in the philosophy of language and historical linguistics, we can distinguish two main approaches in creating a universal language.

The first approach considers the universal language as the world language. The world language is formed historically and depends on three key characteristics: a) the number of native speakers; b) geographical distribution; c) use in international organizations and diplomatic relations. At the different periods of the world history, the world language was Ancient Greek, Latin, Classical Chinese, Persian, and other languages. Currently, English is the dominant language of international business and global communication. The main reason for using English as the world language is: a) the historical influence of the former British Empire that had established the use of English in regions around the world such as North America, Africa, Australia, and New Zealand; b) modern geopolitical influence of the USA and Great Britain. Both English-speaking states have a dominant influence on all spheres of activity of modern civilization: politics, economics, education, science, healthcare, etc. To date, over 1.1 billion use English as their first and second language of communication.

In United Nations, six languages are currently considered to be official and working languages. These are Arabic, Chinese, English, French, Russian, and Spanish. Official languages are the languages in which all official United Nations documents are provided. Working languages are used for internal communication between United Nations employees (Official Languages, 2019).

The second approach considers the universal language as the constructed language.

Constructed languages may also be referred to as artificial, planned, fictional or invented languages. Creation of the constructed language began at the end of the 19th century. At the beginning of the 20th century, the creation of the constructed language from the single attempts was transformed into the constructed language movement. Among the numerous constructed languages, the most popular and widespread are such languages as Latino sine flexione (1903), Ido (1907), Interlingue (1922), and Interlingua (1951).

A distinctive feature of constructed languages is that phonology, grammar, and vocabulary are created consciously by man. They are not formed historically within the boundaries of one culture, but are created as lightweight language constructs for intercultural communication, for availability of Web-based technologies, for experimentation in cognitive science, and for language games. Constructed languages are mostly distinguished by easy memorability, similarity with the basic constructions of world languages, accessible pronunciation, and some more features. For example, Interlingua is understood by hundreds of millions of people who speak Romance languages. Although the language itself is actively spoken by only a few hundred people.

The International Auxiliary Language Association (IALA) had a great influence on the creation of constructed languages. The IALA was created in the early 1920s and its projects at different periods of time were financed by the Carnegie Corporation, the Ford Foundation, and the Rockefeller Foundation. In the first decade of its creation, the International Auxiliary Language Association tackled three tasks: finding other organizations around the world with similar goals; building a library of books about languages and interlinguistics; and comparing extant IALs, including Esperanto, Esperanto II, Ido, Peano's Interlingua (Latino sine flexione), Novial, and Interlingue (Occidental). Since 1936, the members of the Association have started to develop their own language. They called it "Interlingua", which means "between languages". Currently, Interlingua along with Esperanto and Ido is considered the most common constructed language.

Thus, the idea of creating a universal language is purposefully embodied in everyday life. These are not experiments to investigate the possibilities of language that linguists conduct. It is an urgent need that forms the basis for understanding the otherness of the Other. The continuous desire to create a universal language reveals the organic need to learn the art of understanding.

The art of understanding of the Other as an ontological orientation

Mari Ruti in her book "Between Levinas and Lacan: Self, Other, Ethics" tried to establish the places where phenomenology of Levinas and the psychoanalytic theory of Lacan converge (Ruti, 2015). Emmanuel Levinas and Jacques Lacan are two key researchers whose work has helped form the modern vision of "understanding the Other" as an innate quality.

Emmanuel Levinas focused his creative efforts on developing a first philosophy. As a result of an ongoing critical dialogue with Hegel, Husserl and Heidegger, Levinas created a meta-ethics. Levinas's philosophy is a description and interpretation of the event of encountering another person. This meeting develops at the level of foresight, as a spontaneous act of responsibility for others. Levinas designated this act by the term "sensibility". "Sensibility" is an innate human quality. It makes a person socially dependent. Human nature turns to the Other and to understanding the otherness.

Therefore, a phenomenology of intersubjective responsibility, developed by Levinas, is aimed at interpretatively reconstructing a level of experience precursive to both reflective

activity and practical interests. It is an appeal to ontology of man for the purpose of discovering or even *releasing* his “sensibility”.

According to Lacan the Other refers to two additional types of otherness corresponding to the registers of the Symbolic and the Real. The Symbolic big Other is something that makes the opposing culture holistic and inclusive. This is its policy, economy, social and cultural values, education. This is a holistic perception of the otherness, which often helps abstract from particular manifestations or from the Real. The Real is love, psychosis, activity, i.e. everything in which the Other manifests itself and declares its otherness. For Lacan, “understanding the Other” is the basis of psychoanalysts. This is the key to understanding the self, which does not become the self outside the understanding of the Other. For Lacan, “understanding the Other” is the basis of psychoanalysts. This is the key to understanding the selfness, which does not become the selfness outside the understanding of the Other.

Based on the phenomenology of Levinas and the psychoanalytic theory of Lacan, we will formulate the following conclusions that are important for our study:

1. Understanding the Other, or, even deeper — understanding the otherness of the Other — is, in most cases, an innate quality of a person. This is what is inherent in man by nature and what ensures the *desire* of people to unite themselves in micro and macro-social groups.
2. In itself, understanding the otherness of the Other is an active action that has a clearly defined ontological orientation. It is not just talking about understanding the otherness of the Other. *Man wants to understand the Other. Man seeks* to “bring peace” to people and to “unite in the name of peace”. This confirms the clear ontological orientation of human self-realization.
3. Like any innate quality, understanding the Other needs to be developed. It needs to teach the younger generations, using the modern possibilities of educational technologies. For understanding the Other to become an art and become the art of understanding, society needs to make an effort. It is necessary to create appropriate conditions in which the innate quality of understanding the Other reaches its highest flowering — it becomes the art of understanding of the otherness of the Other.
4. The innate understanding of the Other and the socially formed art of understanding are two very different qualitative states of understanding. Only by reaching the last quality or *the art of understanding*, the modern civilization is able to transform itself into a cosmic civilization. В этом случае, мы можем рассматривать the art of understanding как индикатор the criterion of falsifiability. Cosmological models, where the transition from understanding the Other to the art of understanding of the Other are taken into account, are true. Cosmological models, in which this transition is not provided, are false. They contradict the ontological orientation of human self-realization.

We come to understanding of the importance and necessity of qualitative transformation of the state of understanding the Other into the state of “the art of understanding of the otherness of the Other”. This is equivalent to transforming the ontological orientation into a specific way of life. The transition between the two qualitative states of “understanding the Other” is possible only in a special environment created by society. This environment is called “education”. We consider education as a special environment in which “understanding of the Other” goes into the state of “the art of understanding of the otherness of the Other”. The

key features of this environment are revealed in many studies. From our point of view, they are the most fully revealed in activities of the Association for Educational Communications and Technology (AECT). The AECT is a professional association of instructional designers, educators and professionals who provide leadership and advise policy makers in order to sustain a continuous effort to enrich teaching and learning (Association, 2019). The AECT was created in 1923 and since that time, it has become a world leader in promoting scholarship and best practices in the creation, use, and management of technologies for effective teaching and learning. AECT members work in colleges and universities, in the Armed Forces and industry, in museums, libraries, and hospitals, and in the many places where educational change is underway (Association, 2019). Such coverage of the fields of activity allows the AECT, on the one hand, to introduce new educational technologies around the world, on the other hand, to improve educational technologies and achieve their maximum effectiveness.

We believe that the capabilities of the Association for Educational Communications and Technology essentially determine the qualitative transition from the state of “understanding the Other” to “the art of understanding the otherness of the Other”. This is a clear example of a special environment created by society, in which any innate quality, including “understanding the Other” (or in Levinas’ terminology “sensitivity”) is revealed. It turns from an ontological orientation, i.e. potency, into a real way of life, i.e. into a quality inherent in individual and collective self-realization.

Testing the model “Evolving Matter”

Thus, the main conclusion of our study is the following. “Understanding the Other” is an innate human quality, which under the influence of educational technologies reaches the highest perfection — the state of “the art of understanding of the otherness of the Other”. We can use this established fact to determine whether cosmological models meet the criterion of falsifiability. Cosmological models meet the criterion of truth only if they provide for the integration of humanity into a single civilization, or the integration of terrestrial civilization with extraterrestrial civilizations. Cosmological models are false if they assume the death of the earth civilization from wars and conflicts, or claim that any communication of the earth civilization with extraterrestrial civilizations is impossible or dangerous. The criterion of truth in testing cosmological models is the ontological orientation of the “Intelligent Matter” (in Oleg Bazaluk’s terminology) towards peacefulness.

Let us test the model “Evolving Matter” as an example (Bazaluk, 2015; Bazaluk, 2016). In this model, humanity is considered as a structure of Intelligent Matter, which arose naturally in a certain part of the Universe. The rational matter of the Earth is at the first stages of its development, therefore it cannot be considered yet as a full-fledged cosmic civilization. The model assumes the emergence of a certain number of foci in the Universe, in which the Intelligent Matter is at different stages of its development. The model “Evolving Matter” provides for the integration of Intelligent Matter from different “centers”, as a result of which the Universe reaches a new qualitative level of development. The use of the fact of ontological orientation of neuroevolution on “understanding the Other” as an indicator of criterion of falsifiability asserts this model as a true one. The model corresponds to the criterion of falsifiability, as it provides for the integration of humanity into a space civilization with the prospect of integration with other “Intelligent Matter systems” (in Bazaluk’s terminology).

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Analyzing Cross-Cultural Studies of Arguing in the Globalized World

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Cosmology is often viewed as the study of the physical universe. However, it does not mean that the issues of philosophy of cosmology relate only to research fields of physics, astronomy, astrophysics, and mathematics. It should be noted that cosmology explores the physical situation in the large context of human existence.

In global times, new issues arise in the field of philosophical cosmology. How is the human mind changing with the improvement of human knowledge about the universe? What knowledge and skills should have a person of the future? Is it possible to create a universal human community, members of which will explore space, fly and live beyond the Earth? Can people of various cultures communicate with each other within this community?

For the answers, scholars should conduct theoretical as well as empirical research. In this context, I have turned to current cross-cultural studies of communication, in which researchers explore how people from various cultural perspectives establish a dialogue in global times and what challenges they face. In the paper, I focus on the international project of comparing arguing in various countries across the globe. In my mind, its findings are important for two reasons: a substantial and a methodological one. I pay particular attention to the latter.

Keywords: philosophy of cosmology, globalized world, person of the future, cross-cultural studies, face to face arguing, empirical research

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Introduction

The term cosmology is often viewed as the study of the physical universe. However, it does not mean that the issues of philosophy of cosmology relate only to research fields of physics, astronomy, astrophysics, and mathematics. In this regard, it should be noted that one of the key features of cosmology is to explore “the physical situation that is the context in the large for human existence: the universe has such a nature that our life is possible. This means that although it is a physical science, it is of particular importance in terms of its

implications for human life” (Smeenk & Ellis, 2017). It is no coincidence that most religions and cultures include some cosmology treatments due to explain the universe as totally and its conceptual foundations. In global times, the new issues arise in the field of philosophy of cosmology. Among them are the following. How is the human mind changing with the improvement of human knowledge about the universe? What knowledge and skills should have a person of the future? Is it possible to create a universal human community, members of which will explore space, fly and live beyond the Earth? Can people of various cultures communicate with each other within this community?

For the answers to these issues, it is necessary to carry out theoretical as well as empirical research. In this context, I would like to turn to current cross-cultural studies of communication, in which researchers explore how people from various cultural perspectives establish a dialogue in global times and what challenges they face. In the paper, I focus on the international project of comparing arguing in various countries across the globe. In my mind, its findings are important for two reasons: a substantial and a methodological one.

In the first case, scholars investigate how various cultural features (for example high/low reverence for authority, subjectivism/collectivism, high/low avoidance of uncertainty, more/less confrontational style of arguing, extrovert/introvert, more/less verbose style of communication, etc.) influence the argumentation in daily encounters. To date, the United States, Chile, China, France, India, Malaysia, Mexico, the Netherlands, Portugal, South Korea, Turkey, Ukraine, and United Arab Emirates have already participated in this global project.

The following point could be emphasized about the second reason. Taking into account that cross-cultural studies of argumentation are significantly important in global times, the relevant task is to develop the methodology of such empirical research and to create instruments, which scholars may use.

In this paper, I would like to explore the key characteristics of the methodology of cross-cultural studies of arguing and to justify that such tool as survey widely used in the fields of sociology and psychology can be brought in to fill the gap in the methodology of the empirical studies in argumentation field.

Empiricalization as one the main prospects of argumentation research

It should be noted that it is a problem for the modern theory of argumentation that often it is presented only as numerous theoretical models based on various grounds of reasonableness. For building such models, scholars have elaborated many useful tools. However, the argumentation study cannot be reduced only to the theoretical area. I believe most scholars would agree that nowadays in the field of argumentation empirical investigations are increasingly important.

Let us look at the history of this issue. In 1958 Stephen Toulmin, the founder of the *working logic*, in his epoch-making book *The Uses of Argument* proposed a procedural model of argumentation (Toulmin, 1958). He emphasized “a radical re-ordering of logical theory is needed in order to bring it more nearly into the line with critical practice” (Toulmin, 1958: 253; Toulmin, 2003: 234). It means that his model could work adequately in the different areas of argumentative reality.

In this regard, Stephen Toulmin assumed that not only a theoretical component is relevant to the study of argumentation but also an empirical one is needed. Justifying this view he claimed: “logic ...may have to become less of an a priori subject than it has

recently been... Accepting the need to begin by collecting for study the actual forms of argument current in any field, our starting point will be confessedly empirical” (Toulmin, 1958: 257; Toulmin, 2003: 236-238). In addition, it should be stressed that Stephen Toulmin connected the empirical component with the historical one. He believes that “not only will logic have to become more empirical; it will inevitably tend to be more historical... In the natural science, for instance, men such as Kepler, Newton, Lavoisier, Darwin and Freud have transformed not only our beliefs but also our ways of arguing and our standards of relevance and proof... Grotius and Bentham, Euclid and Gauss, have performed the same double feat for us in other fields” (Toulmin, 1958: 257; Toulmin, 2003: 237). In fact, here Stephen Toulmin bearded in mind that empirical database for scholars may be the history of thought in general and the history of science in particular.

Chaim Perelman and Lucy Olbrechts-Tyteca, who are among the co-founder of the modern theory of argumentation, supported Toulmin’s view. They claimed that the theoretical concepts of their treatment, called *new rhetoric*, had to base on the empirical observation (Perelman & Olbrechts-Tyteca, 1958). Unfortunately, the empirical dimension in their treatment was not developed thoroughly.

Thus, it may be maintained that these scholars in their treatments widened substantially the vision on the empirical component in argumentation studies. However, it is disappointing to note that after that for a long time research in this field was still mainly aimed at theoretical proposals and their philosophical support. Only more recently empiricalization has become a new trend among argumentation scholars. For example, Frans van Eemeren considers *empiricalization* as one of the main prospects of current argumentation research (Eemeren, 2015, 2017). In his opinion, “three major developments in the treatment of argumentation have begun to materialize that open new avenues for research. Although they differ in shape, these developments can be observed across a broad spectrum of theoretical approaches. The three developments I have in mind can be designated as empiricalization, contextualization, and formalization of the treatment of argumentation” (Eemeren, 2015: 5).

Due to the increasing importance of empiricalization, a set of questions arise. Among them are the following. What does empiricalization involve? Could we speak about empirical methodology in the field of argumentation? What do mean the notions: *empirical analysis*, *empirical research*, *empirical approach*, *empirical evidence*, and *empirical method* in the study of argumentation?

It should be noted that a key feature of empirical research is to use empirical evidence as a way of gaining results. The term *empirical evidence* usually refers to the systematic collection and analysis of data related to the field of argumentation. Scholars may involve a variety of instruments to these ends (Khomenko, 2018).

As mentioned above Stephen Toulmin meant by the term *empirical* that his argumentation model could work adequately in the different areas of argumentative reality, particularly in the field of law. Chaim Perelman and Lucy Olbrechts-Tyteca believed that their new rhetoric had to base on such method as an empirical observation.

Many different methods are currently being pursued, allowing for flexibility, when addressing the needs of researchers. In this regard, it could be pointed out on some empirical approaches in the field of argumentation. Among them is historical-textual and the meta-argumentation approaches elaborated by Moris Finocchiaro. He has produced a number of highly regarded works, in which the scholar has revealed the key features of his approaches and showed some applications of own methodological views (Finocchiaro, 1980, 1994, 2005, 2010, 2013).

In empirical investigations of various historical texts, Moris Finocchiaro used the method of alternative conclusion, active evaluation, ad hominem argument, the method of counterexample, the principle of charity, and explanation of the error in reasoning. In his mind, the first three methods are the most relevant for his historical-textual approach of argumentation (Finocchiaro, 1980; 1994; 2005; 2010). Besides, Moris Finocchiaro elaborated the method of meta-argumentation based on the principle of interpretation and evaluation (Finocchiaro, 2013).

In addition, it should be mentioned the cross-cultural approach originated in the US. Dale Hample contributed significantly to drafting a methodological basis for this project (Hample, 2003; 2005; 2018). Dale Hample and other argumentation scholars from various countries have widely explored orientations and understandings of interpersonal arguing. Here scholars in order to collect data often use a survey as an instrument of such investigations (Hample, 2003; 2005; 2018).

Taking into account mentioned above, it could be argued that the term *empirical evidence* is currently used in two ways. In the narrower context, this term is viewed as information or data acquired by observation, experimentation or survey. However, such empirical evidence in itself is not a great value. It can be identified only as material for further investigations.

In the case of empirical evidence in the broader context should bear in mind that here the term *evidence* can be used as a proof of argumentation scholar's standpoint or hypotheses. In this regard, I believe it is interesting to refer to Kant's terminology from his *Critique of Pure Reason* (Kant, 1999).

According to this, theoretical justification, particularly logical proof should be based on a priori analysis. Here it is possible to argue some claim without using empirical methods. Such evidence is based purely on applying various types, forms or schemes of reasoning. As a rule, it relates to some procedures, which are based on certain rules and laws.

In contrast, empirical evidence relies on a posteriorly analysis. It involves that (1) something should be observed, measured, calculated, or tested; (2) all empirical information and data could be analyzed quantitatively as well as qualitatively. Many argumentation scholars combine both forms of analysis to better answer to questions, which cannot be studied in artificial laboratory settings. Conclusions drawn in this way help to give answers to research questions of a certain project. In my mind, term *empirical evidence* could be especially interesting for argumentation scholars in this meaning.

Let us consider carefully what is empirical evidence in cross-cultural studies in the field of argumentation.

Empirical evidence in cross-cultural studies of face-to-face arguing

Nowadays many methodological approaches can be reasonably applied to the goal of understanding how people with different cultural traditions relate to face-to-face arguing. Among the appropriate approaches is the project selected here. Its orientation is to examine predispositions and understandings regarding interpersonal arguing. Its main objective is to collect and analyze the data summarizing fundamental orientations to arguing among respondents. All of the instruments of this research originated in the US. It should be stressed that besides elucidating the argumentation predispositions in a certain country this approach advances the general project of comparing argumentation in various countries across the globe (Hample, 2018). To date, a lot of countries have already participated in this global project (Hample & Anagondahalli, 2015; Hample & Rapanta, 2015; Lewiński et al., 2018; Khomenko & Hample, 2019). This fact allows comparing and generalizing the

data collected in different countries and regions. In 2018, Ukraine joined this international project. It was the first comprehensive attempt to understand and assess the sentiments of Ukrainians towards face-to-face arguing. The main objective of the cross-cultural project was to collect and analyse data summarizing fundamental orientations to arguing among Ukrainians.

Let us consider the key questions concerning the methodology of empirical evidence in mentioned above projects.

Q1. In what way can the data be collected within the international cross-cultural project on face-to-face arguing?

A1. The empirical part of such project includes nationwide surveys. Data can be collected relatively quickly, using a standard set of questions. The polls can be carried out via online (for example, see *Survey-Monkey.com*).

Q2. How are research questions formulated?

A2. The first step in conducting a poll is to formulate the research questions. As examples, we can consider the questions, used in the projects from India, United Arab Emirates, Portugal, and Ukraine.

A. India

RQ1: To what degree (if any) does sex differences influence argumentation in India?

RQ2: What are the relationships among the constructs (argument motivations, argument frames, conflict personalization) for Indians?

RQ3: To what degree (if any) do Indians differ from Americans in their orientations (means) toward argumentation?

RQ4: To what degree (if any) do Indians differ from Americans in the relationships (correlations) among the argumentation constructs? (Hample & Anagondahalli, 2015)

B. United Arab Emirates

RQ1: Does the UAE display the same relationships among variables that describe interpersonal arguing as in other nations?

RQ2: Are the mean scores from the Emirati population comparable to those of other nations? (Hample & Rapanta, 2015)

C. Portugal

RQ1: Do Portuguese men and women differ in their orientations and understandings of interpersonal arguing, as measured by verbal aggressiveness, argumentativeness, argument frames, and personalization of conflict?

RQ2: Do Portuguese and US respondents have different mean scores on the instruments assessing orientations and understandings of interpersonal arguing?

RQ3: What are the correlational systems among the variables in Portugal, and are they comparable to those in the US? (Lewiński et al., 2018).

D. Ukraine

RQ1: How do Ukrainian and US respondents compare in their average responses to items concerning arguing motivations, understandings, and reactions?

RQ2: Do Ukrainian men and women differ in their arguing motivations, understandings, and reactions?

RQ3: Do Ukrainian respondents who chose the Ukrainian language version of the survey differ in their arguing motivations, understandings, and reactions, compared to those who chose the Russian language version?

RQ4: What are the internal associations among arguing motivations, understandings, and reactions for the Ukrainian sample (Khomenko & Hample, 2019)?

As can we see although research questions are different in each specific case, they unite around a common goal of the international project — to examine predispositions and understandings regarding interpersonal arguing. Also, it should be noted that some research questions are internal to a certain country, while also several of these compare it to other countries, participated in this cross-cultural project.

Q3. What was the methodology of questionnaire design?

A3. A survey base on the questionnaire, which is a research instrument consisting of a series of questions for the purpose of gathering information from respondents. As mentioned above, this approach is based on the methodology survey used in the overall global project summarized in Hample (2018). The English language versions of the main instruments can be found in Hample (2018), Infante and Rancer (1982), and Infante & Wigley (1986). Scholars need to translate the origin questionnaire. For example, due to the bilingualism of the majority of the Ukrainian population, two versions of the survey (Ukrainian and Russian) were composed. The participants had a free choice as to which to complete the survey.

The first set of questions in the survey is devoted to ordinary demographics. The sample *Respondent* represents the participants by gender, age, a region of residence, and student/employment status.

The second set of questions deal with argument motivations and is connected with concerned argumentativeness (Infante & Rancer, 1982) and verbal aggressiveness (Infante & Wigley, 1986). Argumentativeness is the impulse to attack the other arguer's premises, reasons, and evidence. Verbal aggressiveness is considered as the predisposition to engage in ad hominem attacks on the other arguer. It also has two subscales, VA-antisocial and VA-prosocial, which need to be analyzed separately rather than being merged into one "verbal aggressiveness" score. These instruments collectively describe people's inclinations to argue about the substance of disagreement and to attack the other arguer personally.

The third set of questions assesses the degree to which people take conflicts personally (TCP). The scales can be found in Hample (2018). The last battery of measures concerns personalization of conflict.

The fourth set of questions is devoted to argument frames, a battery of instrument intends to capture people's understandings of the project of arguing face-to-face (current items are in Hample, 2018). Shortly speaking, argument frames (Hample, 2003, 2005, 2018) is a battery of instruments intended to answer the question: "What do ordinary people think they are doing when they argue?"

Collected together, these measures should give full information about how people in the certain country understand interpersonal arguing, what their goals for arguing are, how they communicate to the other arguer, what their motivations, and what are subjects they are focused on in face to face conflicts.

Q4. Who were the respondents of the nationwide surveys?

A4. Most respondents who participated in the polls in various countries were mostly undergraduates, PhD students, and staff from different universities. In addition, the members of their families, friends, and neighborhoods were the also poll respondents.

Q5. What is the data analysis in a cross-cultural project?

A5. The obtained data can be analyzed quantitatively and qualitatively. Firstly, based on descriptive statistics on all the measurements scholars (1) fully explore the data and (2) compare the average responses to all items, contained in the various nationwide surveys. It is a quantitative analysis.

The second step is to explore the findings qualitatively. The goals of such analysis are (1) to generalize all quantitative results, (2) to draw conclusions, (3) to discuss these conclusions.

Let us illustrate mentioned above in the case of Ukraine-the US project (Khomenko & Hample, 2019). Firstly, based on statistics on all the measurements the project team compared the average responses to all items: (1) mean differences between Ukrainian and US respondents, concerning arguing motivations, understandings, and reactions; (2) mean differences between Ukrainian men and Ukrainian women and between Ukrainian and Russian language choosers; (3) correlations among Argument Motivation Measures (Ukraine), (4) correlations among Argument Frames Measures (Ukraine), (5) correlations among Taking Conflict Personally Measures (Ukraine).

Then the qualitative analysis of the quantitative results allowed the project team to generalize all findings and to draw conclusions. Among them were the following.

First, Ukrainians and US respondents did, actually, differ in their mean responses to the instruments used in the survey. “The standout result was that Ukrainians felt that arguing was a far less civil activity than was the case in the US. This civility finding was paralleled by Ukrainians’ beliefs that conflict tends to damage relationships” (Khomenko & Hample, 2019: 634). Second, we concluded that “Ukrainian men and women were quite distinct in their orientations to the interpersonal argument. Generally, men were more aggressive and women more passive and easily hurt” (Khomenko & Hample, 2019: 635). Third, our conclusion on the point of the surveys’ language, which the respondents choose is that the language made no difference. “To the degree that language preference implies something about national identity, we found no evidence that national identity carried any special predispositions about face-to-face arguing” (Khomenko & Hample, 2019: 635). Also, exploring the question of the internal associations among arguing motivations, understandings, and reactions for the Ukrainian sample, we came to the conclusion, that the Ukrainian results were generally quite conformable to US results. Motivations had US patterns, as did the argument frames and the TCP measures” (Khomenko & Hample, 2019: 637).

Besides mentioned above, the qualitative analysis involves a discussion about the obtained conclusions. You can see the discussion in the case of Ukraine-the US project in this paper (Khomenko & Hample, 2019: 637-639).

Conclusions

In this paper, I have focused on current cross-cultural studies of communication. Their goal is to explore how people from various cultural perspectives establish a dialogue in global times and what challenges they face. I have considered the international project of comparing arguing in various countries across the globe, particularly its methodology and instruments.

Finally, I have identified its methodology as the methodology of empirical evidence. At the beginning, the main scholar’s task is to collect data by conducting nationwide surveys. Then researchers should analyse the database. Based on descriptive statistics on all the measurements scholars (1) fully explore the data and (2) compare the average responses to all items, contained in the various nationwide surveys. It is a quantitative analysis. Then they explore the findings qualitatively. Their goals are (1) to generalize all quantitative results, (2) to draw conclusions, and (3) to discuss them.

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Topology of the Other: Boundaries as a Means of Space Cosmisation

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The article presents a philosophical reflection of the Other within the context of space "cosmisation". The topological methodology suggests the analysis of semantic structures in spatial relation of subjects and their environment. It also assigns the cartography of differentiation relationships inside the humankind and in humankind's search of its own place in the space universe. There have been found algorithms for the topology of relations with the Other in anthropological and cultural aspects. The authors have highlighted the importance of searching for algorithms of communicative and diplomatic protocols of the interaction of the humankind with the principally Other (animal, artificial, space worlds). An analytical instrument for distinguishing the specific forms of interaction became an abstract Alien by Georg Simmel. The Other articulates the relations of distance: it does not go ahead, but it does not fully overpower the freedom of coming and going. The paper proves the necessity of marginality of the Other for activating and renewing the relationships inside the homeworld and relationships between different worlds.

Keywords: topology, space, universe, cosmology, alien, other, homeworld, distance

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Introduction

In the stock of new forms of subjectivity, the Other reveals new aspects of interpreting the difference. The process of perception and understanding of the Other and the Alien is of immediate interest of polyphilosophical studies. It is related to the general methodology of research into the cultural variety. The classic philosophical tradition does not practically investigate the idea of the Other. The "Alien" provides more historical and analytical material than the "Other". The Alien is present in the ideas of everyday consciousness and theoretical thought of various cultural epochs. Zeno reflected on the universalistic perspective of living not in separate communities, with different administration and laws, but on the perspective of common living of "fellow countrymen" under common rules. This subject was considered in the Ancient philosophy as a problem of "barbarians". In addition, it was viewed by the medieval theologians in terms of "alien" religions. The Christian worldview suggests a society

with no aliens and excluded ones, where all are sons of God (those christened by Jesus Christ). In Modern philosophy, this subject was brought up to date in terms of discussing the moral attitude to people of alien world outlooks, religions, cultures and nations. The philosophy of today needs not only theory that allows to adequately and relevantly describe social and cultural processes and a subject's role in them. It needs a theory that allows interpreting the place of the human civilisation in the space universe and its responsibility which goes beyond the terrestrial space solely and shapes the cosmological thinking.

Purpose and objectives

The purpose of this paper is to investigate the levels of topology of the Other — anthropological, cultural and cosmic, as well as to prove the efficiency of the Alien in further civilisation development. The article objectives consist in conceptualising the Other, analysing the basic features, displays, boundaries, the topological role of the Other in the environment and the parameters of his impact on the development of systemic continuity.

Methodology and literature review

Since the Enlightenment, the Alien has been an example necessary for self-identification, a so-called mirror to look at if you want to understand yourself. The concept of the Alien is intensively used by modern philosophers and sociologists: Georg Simmel (Simmel, 2008), Bernhard Valdenfels (Valdenfels, 2019), Jeffrey Alexander (Alexander, 2004), Vince Marotta (Marotta, 2012). Their ideas have influenced the formation of our scientific position. There are different interpretations and applications of this concept. A considerable resource of overcoming the postmodern loss of the subject is in “the explications of the Alien as intra-subjective strangeness... or extra-territorial atopic Alien as a liminal form of identity” (Kozachynska, 2017: 14).

On the basis that “the planet Earth and its organisation is merely an episode of cosmic history in the world existence” (Bazaluk & Kharchenko, 2018), it is to the point to raise the problem to the level of strategy of cosmic thinking that determines metaphysical boundaries. The search of algorithms of understanding the Other that does not belong to the humankind (cosmically Alien, artificial Mind, other in the biological world of the planet) demonstrates an epistemological challenge and hope to meet an unknown intelligent world, which is, however, probably close, similar, understandable and such that perceives us. This angle widens the horizon of the philosophical problem of the Other in gnoseological, anthropological, social and cosmological aspects.

Spatial basis of topology

The spread of spatial discourse caused the sciences to divide the space among them in such a way that it appeared to be fragmented, in accordance with methodological postulates, into geographical, historical, political, economic and cosmic spaces. The theme of interaction space is becoming vitally important for social sciences. But it is the task of philosophy to generalise and unite the problematic points of spatial topics into a single methodological resource which brings interest to topological methodology in the analysis of multidimensional structures of existence and human thinking.

In their origin, most of the spatial surveys are geographical, and this is reflected in the range of concepts and categories, the style of thinking and construction of research models. Space is a general determination of place, area, landscape and territory. No doubt, it has

social meaning within the context of location. In the most abstract way, space is interpreted as an order of location and interaction of things, places and positions. It is the phenomenological experience of space, but not only natural science spatial discourse that is of immediate interest in the field of our research. Space is performative, it is impossible to be investigated out of touch with those who render it habitable, get to know, represent, in isolation from the existing one.

The category of *space* has a long history. It is the Ancient philosophy that articulated the basic interpretations of space. The substantial interpretation presents space as a reservoir, while the attributive interpretation characterises space as an order of things. At first view, space precedes objects and determines the conditions of their possibility. This is how space starts to be viewed as a reservoir of things and processes, as a “container” with bodies and material things that exist inside. Geographically, such an idea makes sense. Moreover, even here, symbolisation turns the concept of geographic space into one of the variants of spatial construction of the world in human consciousness.

In his work “Other Spaces” Michel Foucault (Foucault, 2006) presents a reflection of space in pre-modern, modern and postmodern periods. According to Michel Foucault, the Middle Ages built space of a hierarchical plurality of places: “sacred and profane places, protected and, vice versa, unprotected ones, urban and rural places (related to real human life). In cosmogonic theory, there were super-celestial places, contrasted with celestial ones. In its turn, a celestial place was opposed to a terrestrial place. There were places with things forced to be “replaced” and, vice versa, there existed places where things got their natural location and rest. All this hierarchy, this opposition, this intersection of places compiled what could be roughly called a “localisation space” (Foucault, 2006: 192). The discovery of infinite space and its certain desacralisation by the Renaissance scientists decomposed the localisation of place, having replaced it with *extension*: “now a thing’s place was no more than a point in its motion, absolutely in the same way as a thing’s rest was no more than its motion that was slowed down infinitely” (Foucault, 2006: 192).

In the New time discourse, the Cartesian coordinate system with its geometric definiteness sets a perspective possibility of understanding various dimensions of space. It is still used as a metaphor for describing vertical and horizontal parameters of the social medium, culture and communication. Let us also highlight the importance of Newton-Leibniz understanding of space as a basic one in interpreting the variety of social space. Unlike Isaac Newton’s substantial space, the relative model by Gottfried Wilhelm Leibniz combines space and time. It also suggests a principle of “universal differences” that acknowledges the existence of a great number of monads as substantial units. According to this principle, space is the order of co-existing things that opens up possibilities of the universe. Non-Euclidean geometry develops an idea of space features being dependent on general properties of the matter, and the theory of relativity demonstrates the dependence of space-time properties on the type of motion and interaction of material systems. This has changed the priorities of the scientific community in favour of the relational space-time theory.

Basing on Immanuel Kant’s anthropological study, we understand that in terms of the topological research into the levels of the Other, we should consider not the “space as a whole”, but a specifically meaningful space, a human space filled with senses. In addition, its meaning cannot be narrowed down to a complex of objective determinants, such as territory size, climate or landscape characteristic features. The goal of phenomenological studies is working with not only space but also spatiality. Spatiality became a key conception in modern philosophical and cultural studies, being critically oriented at a “spatial turn” — a

new approach to the philosophical analysis of society, culture, time and history. Within this context, of special interest is the conception of personal space, social distance and social boundaries by Georg Simmel (Simmel, 2008). He is the inventor of a word combination “the sociology of space”. Georg Simmel investigated space as such mastered by man. He also studied the space forms in their social context and correlation with corresponding physical spaces. Our research is based on Georg Simmel’s interpretation of space of the Other.

Topology as methodology of spatial thinking

Spatial relations and forms of spatiality are the subject of research in topology. The topological analysis method enables to take a new look at configurations of any interactions and relations, at their differences and similarities. The method does not bring into the foreground static structures, but production, changeability and plurality of practices.

The term *topology* is rather polysemantic. And this hinders giving its clear definition and application as a philosophical category. Moreover, such polysemantism makes it difficult to develop and use a related methodological strategy. In a broad sense, topology investigates properties of various type spaces. As a part of geometry, topology studies the continuity phenomenon, where the fundamental properties of figures are cohesion and possibility of continuous external figural deformation. Mathematical topology considers invariable properties of spatial objects and their ability to transform within the context of their spatial environment. We view *topology* as a special philosophical category aimed at mental “mapping” of certain semantic structures, their bonds, relations, displays and development vectors. Topology outlines a new reality status, and this makes it possible to build the general theory of space organisation. Topology reveals the principle of constructing the identifications, differentiations and interactions. This principle is presented as *subjects and environment* and it is fundamental in investigating the communication relations. The topoi of a subject and an environment outline their *places* in communication. Besides, they have specific characteristics of closeness / remoteness and direction of communication (way, orientation). Therefore, for example, a topological scheme of communication with the Other is concentrated on the spaces “between” and “around”, what characterises the cultural *transition strategy*. However, the transition process is only possible with outlined and interpreted boundaries of a cultural world that are to be outstepped.

The concept of *culture* is endowed with a power that regulates the world. It is used in the context of regulated general space (cosmos, universe). It as well renders a sense of order created by human actions, a habitable and cultivated human space. It is realised in the metaphor of an oecumene, a native, home, one’s own world that is familiar and limited. This limitedness leads to interpreting the essential bond of culture and the boundary: when emerging in conditions of differentiation and territorial localisation, culture continues, transforms and progresses only in the modus of outstepping its boundaries and expanding its space. Mapping of the homeworld assumes its obligatory structuring, ordering and thus its limitation. Boundaries become a method of homeworld “cosmisation” that articulate certain rules, forms of existence and configuration of relations of subjects of the same cultural system. The toposphere of the traditional lifeworld was depicted in the lines of circles that radiate from the close world to the remote world: from one’s own and familiar to the unknown and alien, from “significant others” to “generalised others”. Various meanings are inscribed in such a scheme: perception starts with reflection of the “self”, then it outsteps its boundaries into the open horizon of the “other”. The toposphere of the modern lifeworld is principally built at joints and boundaries of cultural spaces.

A research into various aspects of the Other requires applying a wide range of methodological developments in this subject. It also needs involving not only topological but also hermeneutic, phenomenological and post-structuralist studies. In order not to become a general place, the concept of the Other is to reveal currently important epistemological motion.

Topological variants of the Other

The contemporary discourse of civilisation topics goes through the topoi of the Alien and the Other as the components of the cultural transition strategy. The philosophical postmodern metaphor of “a subject’s death” is a pattern of the transition strategy. In this sense it is a model concept for grounding the problematic character of transgression, marginality, incomplete plunging into a certain space. Postmodernism is open for narrative variants and this removes raising the issue of the so called correct reading. Stating the crisis of identification that characterises modern forms of subjectivity, after-postmodernism forms a program of subject’s resurrection, reconstruction and repatriation. A Ukrainian scientist Vadym Palaguta highlights the current importance of a new theory of subjectivity which “demonstrates a shift of research emphasis from considering an active, self-sufficient and energetic subject to studying the conditions and generating mechanisms as an initial, basic beginning which precedes the subjective activity itself and its social actualisation” (Palaguta, 2010: 16). It is the mechanisms of subject’s introduction, “through self-identification, into certain symbolic social and spatial formations that determine the conditions and result of “production” of subjectivity. And every time the result changes when a subject “gets into” a certain social and spatial structure” (Palaguta, 2010: 118).

Our research of the Other and the Alien is aimed at developing a strategy of interaction. This is why it has less concern about the conception of transcendental Other as God (for example, according to Emmanuel Levinas). However, it should be noted that “Emmanuel Levinas wrote very deeply about the understanding of the Other as the goal of meaning” (Polishchuk et al., 2018: 122). In her philosophical and anthropological work “Subjectivity: extending heterogeneous spaces (philosophical and anthropological dimension)”, Viktoriya Kozachynska has thoroughly investigated the specific features of modern concepts of identity, selfhood and subjectivity which “radically overpower the metaphysical model of the closed Self as monadic immanence <...> and thus — the idea of subjectivity as a manifestation of the transcendent in the immanent” (Kozachynska, 2016: 179).

We agree with Svetlana Bankovskaya, who explains defining of the Otherness “with a need to affiliate inter-subjectivity as a single reason for objective social reality” (Bankovskaya, 2007: 76). The researcher demonstrates the levels of perception of the Other from a logic category (generalized Other) to a social type, and then to an individual Other (Bankovskaya, 2007: 77). Within the context of contemporary cosmological studies, of current interest is to add a conventional extra-terrestrial Other as well. Such inclusion of a speculative Other outlines the perspective of perception and understanding of species that are biologically and cosmologically different from the human being.

Alienation and incorporation of the Other into the homeworld

According to the scheme of general cultural space, otherness, strangeness can belong to a homeworld, or it can exist beyond its boundaries. The Other presents a way of presence of various people in the world. It outlines a problem of social order and horizonness. If subjects

and objects of a homeworld are perceived with their individual features, then the space of the Other has generalised and typed properties. Marking of the Other and marking off from it — “close, near, far, strange or historically preceding” (Nikolko & Gritsay, 2008: 49) is the first stage in formulating an integral I/WE construct. A marginal form of the alien is an enemy. The rules valid for the other and the alien in everyday life of a democratic society fail with respect to the enemy. The other is not wanted, nobody wants to let him in his own space because he is strange. That is why the problem of social inclusion/exclusion and marginalisation of certain subjects has become so urgent in the contemporary philosophical discourse. Gender studies view this problem in the context of gender-based discrimination, with “attempts to define woman risk excluding or marginalizing some women” (Jenkins, 2016: 394). The problems of racial and ethnic affiliation are also a source of developing the principles of recognition of the Other (Mogensen, 2019; Gordana & Smeriga, 2019).

The problem of understanding starts with acquaintance and getting knowledge of an unknown subject. This approach “is in tune with a general trend in epistemology, where there has been a lot of interest in how understanding relates to knowledge” (Sliwa, 2017: 521). Out of the whole flow of information on the other, we can single out the knowledge necessary for understanding (Wilkenfeld, 2018). One can get acquainted and communicate with representatives of another culture by means of layer-by-layer “removing” of specific signals and codes of a foreign culture. At the time of these actions, a subject reveals in himself similar “layers”. It is the topological method of comparison of “similar to similar” and usage of general cultural topoi that allows a subject to see in a “strange” or “unknown” personality features similar to himself, features that bind and draw individuals together. Marking the domestic and foreign cultural spaces allows to understand the principles and develop the rules of their situational and lasting interactions.

Homeworld is an embodiment of traditional ideas of space. It gives protection, reliability and stability. Contemporary knowledge of the changeable world does not give confidence in the future, it disturbs and makes search for new algorithms of relationships with this world. A human being loses peace and home comfort, he is destined for search and expectation, being not always ready for this. Then, there can be produced nostalgic imaginations on traditional society, established order and rejection of changes. An undesirable meeting with the Other makes a personality or the whole society build and protect the boundaries of the homeworld, defending its integrity and inviolability. This traditional social practice is widely spread and appears normal if boundaries are the means of ordering and “cosmising” of space. Due to the boundaries, a cosmos fences off and protects itself against chaos. However, denial of knowledge, fear of the new and unknown can cause a situation that is called in physics falling behind the horizon of events. The notion of *horizon of events* shows that close to the black hole, nothing can leave its gravitation field. No information is obtained beyond the horizon of events. Crossing the horizon, an object becomes isolated from its Universe and stops existing. Rather, its existence still continues in the black hole space, but for any observer from this Universe this existence is over. The cosmological physicist Stephen Hawking (Hawking et al., 2016) assumed that the black hole does not absorb but only keeps off, “grinds” into radiation the matter and energy. Then the black hole lets them back and transforms in such a way that their original nature is impossible to recreate. This cosmological term can be used in the context of threat of falling behind the horizon of events, after which we shall never be the same. We shall exist, walk, eat, and think. However, in the system of value coordinates of the cultural world we can stop existing. Surface sliding and lack of self-reflection mask the boundaries of the cultural. In addition, it is difficult to perceive the moment of crossing the

horizon. One needs a lot of time to build new bonds and relations that conform to the criteria of the postmodern society.

To avoid falling behind the horizon of events, the humankind needs to learn how to perceive the Other, how to live under unknown circumstances, think over the role of boundaries in contacts and relations and to implement the mechanisms of trust (D'Cruz, 2019). In these conditions, an Alien is not only a stranger; his cultural role gets more complicated. In Georg Simmel's analytical essay "The sociological significance of the stranger", which is a starting point in our reflections of the Alien, the author links the social type of the Alien and the social distance (Simmel, 2008). The German sociologist opposes an alien to a "domestic" person who does not leave the group. However, he differentiates the alien from a "traveller" who comes today and leaves tomorrow. The alien comes today and stays tomorrow. He lives in the group, takes part in its tasks, but still he remains far from the others — "domestic" members of the group. Georg Simmel shows strangeness as an "absolutely positive attitude, as a special form of interaction" (Simmel, 2008: 9). The Alien's location is defined in two sets of coordinates — social and spatial. Each of them changes along the distant axis: social and spatial remoteness, social and spatial closeness. The Alien is perceived as a stranger to the group: though he is in permanent relations with other group members, his "remoteness" is emphasized more than his "closeness". He stays within a group but he does not originate from it. That is why the Alien imports cultural features that are not peculiar of the group initially.

Georg Simmel limits the range of Alien's roles: his mobile and unstable position and groundlessness explain the impossibility of his becoming a landowner (a symbol of rootedness). It is common for him to be a seller, a moneylender, a judge, an arbiter, an interpreter. The German philosopher believed the Alien's role in the group to be very important: as a subject who is not closely connected with the group, being deprived of its bias and prejudice, the Alien fulfils a specific function of a mediator of interaction with the others. Due to a stranger's closeness and at the same time remoteness from others, he is often valued for objectivity, for his ability to look at events and relations at a distance and without prejudice. A stranger can be a man whom we address as a close and trusted person, no matter how paradoxically it may sound, because the social distance between us prevents him from judging us too strictly. Such a conclusion is explained with the fact that the Alien is free from emotional and moral bonding to the traditions and rules of a recipient culture. However, Georg Simmel exaggerates the role of a stranger as an impartial and objective arbiter. In fact, lack of pressure on his judgements and actions, relations with history, habits, tastes as well as his ability to examine the existing relations from outside favour the evaluation that "corresponds to more general and objective ideals" (Simmel, 2008: 11). A closeness and remoteness ratio grants a stranger with a tone of higher objectivity than that existing within the cultural boundaries only. However, this is not a scientific criterion. Moreover, a stranger, as a carrier of certain cultural features and social attitudes, comes under their influence on his perception.

Following Edmund Husserl, Bernhard Valdenfels (Valdenfels, 2019) compares the ethnology of "home" and "foreign" worlds. The world is given to us as an unlocked open horizon that is not limited with a domestic circle. Horizonness is the most important feature of consciousness. As this concept of Husserl is presented in Bernhard Valdenfels's topography, the homeworld functions both as a centre surrounded with further horizons and as a ground the higher levels are built upon. Edmund Husserl depicts toposphere inside the homeworld as circles of various shades of the knowledge sphere, "where I have a more or less good

understanding and where I can get on well with my “fellow countrymen” (Valdenfels, 2019). The sphere of one’s own and familiar is the basis for understanding the new and unknown. The process of mastering the alien is a process of familiarising with his worldview, understanding and domestication (Kolinko, 2018). “We can ask ourselves whether the concentric model of the Native world, as if a trunk of a tree growing the strangeness circles, and separation of internal and external strangeness, conform, even distantly, to our multicultural society. Do not the spheres of Self-Strangeness continuously penetrate into one another in a cultural blend?” (Valdenfels, 2019). The concept of the Alien appears when “our habitable, understandable and accessible world is interfered with new forms of living together which go beyond the boundaries of our knowledgeability, understandability and thus are classified as strange” (Chernyak, 2013:71). Inside a home world, it is always possible to predict the other’s actions related to us and his respond to our actions. In a homeworld, the other, even being strange, is perceived as part of a common history. He is related to common plans, life projects and the future of this cultural whole. He stops being Alien and remains different when he shares with others the task of strengthening and developing a common social world. So, “individuals with different psychological profiles, different interests, and different positions within the national community react to anxiety about the status of the state with they identify” (Ward, 2019: 211).

The experience of the Other and the Alien shows beyond its own boundaries, being in the horizon of certain world experience. Identification of the cultural Self stipulates the presence of the Other, his “invisible presence as a place or field of realisation of the subject discourse” (Palaguta, 2010: 156). Presenting an Alien as a social type leads to a conclusion on necessary marginalisation — a stimulus to develop the social form of life. When a group comes across with an alien, “its members also come across with strangeness among themselves” (Heinke, 2019). While group members are similar in the set of values, their behavioural reactions are individual. This fact of uniqueness of every person, with his own experience and worldview, makes the German researcher Jörg Heinke draw an anthropological conclusion about a stranger, an alien inside each of us” (Heinke, 2019).

Identity is formed in the process of differentiation between oneself and everything that is not oneself, which is beyond. The Other gets into our domestic system of senses and relations due to certain legitimation stages: “identification, communication experience, a habit of communication with the Other (habitus development), reflection of experience of communicating with the Other in consciousness and naturalisation of the Other, its embedding in a comfortable world view” (Nikolko & Gritsay, 2008: 49–50). The Other actualises a personal or a collective Self (in an identical cultural group). Therefore, addressing him, listening to the Other is an important stage of formation of identity, either cultural or national.

The discussion around the “Alien” by Georg Simmel presented in the works Jeffrey Alexander (Alexander, 2004), Vince Marotta (Marotta, 2012), Jörg Heinke (Heinke, 2019) is concentrated around whether this concept can take part in discussing the modern challenges: the state of ethnic groups in western countries, marginality and poverty. The Alien is exposed to analytical procedures mostly from the view of a recipient group. Jeffrey Alexander states that in Georg Simmel’s conception, a stranger cannot be related to those in the exceptional condition (for example, newly arrived poor immigrants). This is due to the fact that Simmel’s category is strongly different from the modern economically disadvantaged or exploited class (Alexander, 2004: 88). We agree with his idea in a sense that, getting into new social conditions and theoretical contexts, the image of an Alien transforms. Representative systems used by the main social and cultural group to build interpretation schemes in relation to

newcomers, cannot be understandable to a stranger. Unfortunately, today an Alien does not represent freedom and liberation that Georg Simmel insisted on. A stranger becomes a rule of a swift-flowing world and often illustrates a behaviour of human indifference to each other. Can we draw a conclusion on disappearance of Simmel's alien as some contemporary authors do (Alexander, 2004; Marotta, 2012)? Though the primary functionalist interpretation of the Alien as an element of a group that defines its boundaries does not reflect modern contexts of his interpretation, such a conclusion seems premature. However, this is the objective and subjective status of the Other that "we and they" polarisation is built on, what stimulates the group to re-examine the canons of its existence. Conceptualisation of strangeness means perceiving a difference in the space of commonness. The level of people's intercultural competence and society's readiness to admit this difference influences the fact how potentially marginal groups are accepted: whether they are dangerous because they are unknown or a possible danger is not caused by their otherness but by their desire to be included in a new social and cultural environment and by their desire of law obedience. In a global and mobile world strangeness gets so widely spread and otherness gets so common (travellers, migrants, nomad workers) that it becomes a norm. However, as local and global conflicts show, it is early to write off this concept, since it will long be much-needed within the context of intercultural relations.

Within the framework of theoretical insights of Martin Heidegger and Bernhard Valdenfels, the basic nature of the Alien is viewed as an intentional failure, when the cultural world is not recognised in his strangeness, resists explanation and rejects interpretation. Commenting on this position, Andriy Artemenko, the author of the conception of identity topology, states that such creation of One's Own image "is based on the procedure of differentiation between something which is known, understandable, interpreted and the rest of the world. Differentiation assumes the exclusion procedure — everything, which is different from One's Own, is excluded from the well-organised view of the world. This is not a boundary or a border, this is indifference that ruins the possible world of the other. This is the methodological plane linearity that does not want to perceive the dimensional environment and considers itself within the surface" (Artemenko, 2013: 42). Treatment of the intentional failure in interaction with the Other is one of the accepted strategies of its perception. This strategy provides for mutual reaction and influence of the cultural context: "They mutually respond to and transmit a wide range of social cues, which get interpreted in a context-sensitive fashion" (Schönherr & Westra, 2019: 29). Also possible are such variants of cultural reaction to the Other as a strategy of domestication which means familiarisation and acceptance. Then the Other is a cultural possibility.

The place of the Alien as a sovereign subject is defined as atopy and gets into the "topos of cultural comparison" only by force (Valdenfels, 2019). Responsive phenomenology suggests a response event, "boundary attention and the most important here is a desire to admit the right of another culture, another people, another person for otherness, strangeness, difference" (Chernyak, 2013: 73). The relation of One's Own and Alien is not presented vertically. It is shown as an intersection of certain independent spaces. The intersection point will be a place of their contact, a space of "boundaries". Bernhard Valdenfels marks external strangeness as alien, which is different from internal strangeness. As to internal strangeness, the general language mechanisms work out. Bernhard Valdenfels's responsive phenomenology suggests a concept of "common territory", identification of both one's own and alien in the response field. Dialogism as a strategy in the "Between" space in relations with the other is of lively interest with contemporary scientists (Bankovskaya, 2007; Khmil & Korkh, 2017; Polishchuk

et al., 2018). A communication problem appears exactly at the moment when a person wants to express himself in relation to others. The process of “Self” identification is opposed to others. Strangeness is not only a social problem of a newcomer in the group or somebody who received new experience and thus a difference. This is also a problem of expectations in relation to other subjects. “Strangeness occurs when the expectations are not met by others” (Heinke, 2019). Jorg Heinke draws attention to a danger of stereotype thinking and superstitions. An Alien constantly brings changes what is perceived by the group as a threat to their homeworld. If a group has weakened resistance mechanisms to Alien’s confrontation or does not have them at all, it becomes highly probable that the group will depart from the traditional inflexible standards, with perspective renewal of its life activity. Communication with the Alien needs self-reflection and tolerance. Contemporary social and cultural realities dictate a new reading of the tolerance principle in cultural, anthropological and other contexts (Callan, 2015; Godfrey-Smith & Kerr, 2019). If group members do not have objective information on the processes inside their world and the external environment, if they do not develop an ability to think critically and work through the new, a difference is perceived as a threat to their world. A corresponding response will be aggression, non-acceptance, and displacement. “If people are sure enough of themselves and their identity and have sufficient possibilities and the ability to handle and interpret information, they are the ones who can win from experiences with the unknown” (Heinke, 2019).

Important in this context is a theme of readiness to accept not only one’s own homeworld, but also unknown and possibly odd worlds. The matter is to find a topological place of earthly organisation in the Universe system. A discussion about the meeting with the extra-terrestrial Alien is held in the field of argumenting a possibility of understanding and non-understanding. In his research into the nature of communication, the British scientist John Elliott from Leeds Metropolitan University has developed a method of determining unknown language structures and their decoding. Having analysed more than 60 human languages, dolphin communication and robot communication, he drew a conclusion on a link between the understanding of human analytical abilities and the development of strategies of identification and understanding of extra-terrestrial messages. “We still have many scripts from our own antiquity that remain undeciphered, despite many serious attempts, over hundreds of years. So, given this, an algorithmic rationale, based on previous research into signal decipherment techniques, is presented. This phased approach will then provide an initial methodology for us attempting to unlock the content of an extra-terrestrial signal, whilst facilitating the dissemination of timely and accurate information to an expectant world” (Elliott, 2011: 441).

The American astronomer Frank Drake proposed a well-known Drake’s equation where he considered the factors important in development of civilisations of our Galaxy. In modern cosmology it is used for evaluation of a possible number other planet civilisations. Stephane Dumas and Yvan Dutil have created a system of message coding that can be used in communication with the extra-terrestrial Alien (Dutil, 2011). Paul Fitzpatrick studies possible communication with conventional extra-terrestrial intelligence, develops algorithms and systems of possible contacts, a communication and diplomatic protocol, assuming friendly, unfriendly or neutral contacts. As early as the end of the 20th century, Marvin Minsky (Minsky, 1985) was convinced that “communication with Alien Intelligence” is possible. To the question “Will we be able to communicate with alien intelligence?”, he gave an answer: “Yes, we will — provided they are motivated to cooperate — because we’ll both think similar ways” (Minsky, 1985: 117). He believes that understanding is based on a search of general algorithms of intelligence functioning. Unlike Marvin Minsky, William Herkewitz articulates

an opposite opinion: “if you follow the logic of the renowned Polish philosopher and science fiction writer Stanisław Lem, after a lot of hubbub and frustration: absolutely nothing. According to Lem’s logic, our species may never be able to read or understand a message from extraterrestrials” (Herkewitz, 2019). Besides, in conformity with the conception of axiological absolutism (Seth & Chad, 2019), if a system faces a danger from outside, it is forced to prefer protection of internal space to perspectives of new levels of identification of the Other. In the opinion of Lazar Seth and Lee-Stronach Chad, the humankind will have to make a choice in keeping with “higher moral consideration” (Seth & Chad, 2019: 98). However, many scientists are still optimistic and they do not give up searching for a universal language of communication in the cosmic space. For instance, LINCOS (Lingua Cosmica) “drafts a detailed scenario for communicating with aliens. He begins with elementary mathematics and shows how many other ideas, including social ideas, might be based on that foundation” (Minsky, 1985: 132). The British philosopher Alistair Isaac draws attention to the hidden effects of information semantics and conventional symbols. Studying them will allow to create “an adequate theory of information content” (Isaac, 2019: 103) that will open new possibilities of mutual understanding.

With a certain degree of fantasy of the research into the space of cosmic communication, their heuristic possibilities and cultural perspectives appear socially significant in a cosmological aspect to understand a clash with the Other and human communication with other communication systems.

Conclusions

1. This paper considers space as a quality characteristic of unfolding the cosmic universum and a platform for subject interaction. Spatial analysis of interaction of various culture subjects proves the transition of philosophical studies from the plane and linear vision of social systems to a principally new topological methodology of considering various spaces in their interrelation with surrounding social landscapes. In terms of topology, invariance and internal change (which is thought as deformation) are not incompatible: most probably, they are closely interrelated. Topology is creation of various order spaces in a way providing for a deformation or a change as transformation continuity.
2. There has been proved the essential role of boundaries in human space cosmisation. Topology ontologises the boundary problem. Boundaries outline the rules and senses of the home world and articulate the exit point to other cultural worlds. Their sense does not reject relations, continuity and nomadism of the contemporary world. However, it emphasises another side of cultural development taking into account the processes of division, filtration and separation.
3. Social experience of the Other and with the Other in the space of cultural intersection has been explicated in the article. It is related to strategic orientation of subject’s resurrection, revealing in the discourse practices of topological relation of a subject and his environment. There has been proved that the concept of the Other is systematically important in investigating inter-civilisation relations. The authors have systematised the range of images of the Other as a social type: historically other, personal or collective, close, alien and enemy. The plurality of ethnological aspects allows to understand that the Other and the Alien can be viewed not only in the sense of “such that can not be understood so far”, but also as sovereign subjects able to assert themselves.

4. The topology of relations of the Alien with the group is connected with his specific functions in the recipient group: a marker of rules relevance, an expert and a motivator for changes. The authors have used Georg Simmel's distance interpretation of the Alien as a synthesis of closeness and remoteness, presence but not integration into the group. It has been summed up that interrelations with the Alien transform from non-acceptance and rejection, escape and indifference to interpretation and recognition. One of the strategies of meeting a cultural stranger (individual or group) is in the desire to familiarise, to render habitable and domesticate.

Gradual understanding of culture as a means of organization of human existence gives depth and scale to the philosophical topological research strategy. The theoretical discourse of "communication between" goes beyond the human culture only into a space of cosmological generalisations. In terms of cosmology, the general order is to integrate every separate phenomenon and every structure with its own limiting order. Topology problematises the place of the Other in the cosmic universe and searches for general algorithms of reaching the mutual understanding with him.

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Learning to be Human: From Philosophical Problem to Humanity Development Metaphor

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This study is an authorial attempt to develop the ideas of the 24th World Congress of Philosophy (China, 2018). This intellectual event aimed to discuss a number of problems within the need to preserve Human (the slogan of the event was the idea of “Learning to be Human”). The authors analyze sociocultural challenges that require rethinking the ways to remain Human, and extend the problematic field to the pressing problem of space exploration that was overlooked by the World Congress participants. The article is an attempt to substantiate the answers to the following questions: Will, and can, Humanity retain its own traditional humanistic authenticity in the context of rapid technological development and space exploration? Is Humanity Capable of Humanistic Development as a whole, and what is the Role of Education and Intellectuals in the Age of Modern Value Turbulence? It has been argued that New Enlightenment can offer an adapted ethical platform for Humanity that can be appropriately transmitted by means of value-updated education tools.

Keywords: humanity, education, education values, civilization development, space exploration, New Enlightenment, World Congress of Philosophy

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Introduction

The organizers of the 24th World Congress of Philosophy, held in Beijing in the summer of 2018, emphasized that this landmark event should act as an intellectual platform to find ways to develop civilization, providing a productive response to the challenges of technology development, the contradictions of globalization: “Learning to be Human” is the

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theme of the 24th World Congress of Philosophy. We believe that philosophers can identify different dimensions of thinking about humans in response to this theme. Nowadays, the advance of modern science and technology not merely improves human life but also causes unprecedented challenges and crises. Conflicts between civilizations and between nations, tensions between individual and community and between different individuals as well as disquiet in each of us are all in need of philosophical wisdom. It is simply impossible to find out any ready-made solutions. However rational reflection and dialogue may help to create a better world and to gain an individual life more adapted to our times” (Learning, 2018). Indeed, modernity, with its unprecedented spread of technology, threatens the possibility of Humanity development, the principles of which were outlined by the anthropological project of the Modern Age. Technological advancement should receive appropriate reflection from intellectual elites who would offer ways to ensure a harmonious combination of “human” and technological. This approach should save Humanity from the rapid and risky steps in the era of “digital barbarism”, returning not only to pre-Modern by content cultural practices, but also to their unprecedented spread using the technological advances of modern digital civilization (Kleszczyński, 2019).

The previous 23rd World Congress of Philosophy, held in 2013 in Athens, was dedicated to the topic *Philosophy as inquiry and way of life*. The organizers of the Congress described the issue as follows: to inquire into the world’s philosophical traditions and compare them in terms of their diverse contributions and possible mutual cross-fertilization; to reflect on the tasks and functions of philosophy in the contemporary world; to emphasize the importance of philosophical reflection for public discourse on global issues affecting humanity” (Philosophy, 2013). Thus, the world philosophical community, whose efforts are united by the activities of the International Federation of Philosophical Societies (FISP), is once again trying to offer a philosophical understanding of the ways of civilization development on a humanistic ethical platform, which would minimize the challenges of the realization of technogenic scenarios and conflicts of intercultural interaction. It is clear that large-scale transformations of civilizational nature are a challenge for education as a sociocultural institute, as well as for the established, traditional practices of transmitting cultural experiences, hence in the attempts to offer ways for Humanity to remain human, an important place is given to the philosophy of education.

The authors of the article also propose to expand the problem under consideration, arguing not only with a wide range of the authors who offer ideas on how to learn to be Human in the modern day. In our view, as participants of the 24th World Congress of Philosophy, there remain complex questions regarding the active exploration of space by Humanity. This is not an indication of the inconsistency of this venerable event with the real needs of humanity; on the contrary, the Congress members focused on the most pressing issues of the civilization development agenda. In our article, we seek to expand the problematic field by enhancing the futurological value of the ideas suggested in the article, which will be of use to Humanity not only as a planetary phenomenon, but also as a phenomenon that unfolds itself on a scale of the Universe. Thus, the authors will try to offer the answers to the following questions: Will, and can, humanity retain its traditional humanistic authenticity in the context of rapid technological development and space exploration? Is Humanity capable of humanistic development in general, and what is the role of education and intellectuals in the Age of Modern Value Turbulence?

A Classic Humanist Project as a Reference Point of the Research

Given the current global problems and prospects for the development of human society, the concept of humanity is of particular importance. Its meaning is revealed in such meaningful projections.

1. Humanity as the core value that determines the horizon of human activity.

In this sense, the concept is determined etymologically, so the basis of its semantics is focused on the normativity of interaction between people in the context of the problem of biological species survival. Thus, Johann Frick analyzes the problem of humanity as an axiological basis for the strategy of human survival. On the one hand, the content of humanity is to increase the number of happy lives of individuals, and on the other, to implement the principle of equality of all people. Therefore, the so-called intuition of neutrality is justly criticized as inappropriate given the ultimate value of humanity itself: “This conclusion would only follow if our reasons for wanting there to be humans in the future were at the same time reasons for wanting humanity to have existed in the pre-historic past. And this, again, would only be true on a conception of final value as something to be promoted. On the understanding of final value that animates the Argument from the Final Value of Humanity, our reasons for wanting humans to exist in the future are not temporally neutral. Rather, they stem from our concern for the survival of those things we value finally” (Frick, 2017: 362). Accordingly, the problem of Humanity survival requires active and decisive action, but it is not of value in itself. This problem has been exacerbated in the light of the active space exploration, since it poses a number of praxeological and ethical problems to Humanity.

The valuable phenomena of human existence are those that are traditionally associated with humanity: love, care, knowledge, and beauty. Therefore, it is natural that the concept of humanity is complex, and it is not limited to the absolutization of one of the components. Yes, for a long time, the essential predication of human was considered rationality. However, if we identify rationality with intellectual development, it is obvious that not only man has such abilities. The behavior of animals, especially social animals, also contains some rationality in the strategies for adapting to and interacting with the world. Thus, at the turn of the millennium, David Woolfson categorically proves the connection between the way of thinking as a certain axiological system and the way of acting as a strategy for achieving this goal. His views are both balanced and optimistic: “For the first time in human history a global consensus on universal societal values may be capable of being formed. This is due to new understandings and our ability to communicate globally. We would in essence be agreeing upon the collective wisdom of humankind at this point in our evolution” (Woolfson, 2000: 193). Therefore, the author foresees significant social transformations in the future: “The current crisis facing humanity presents us with both enormous challenges and tremendous opportunities. In overcoming our challenges, we will emerge with a new society. It will be global, diverse and sustainable. There will be a mega-shift in societal thinking from focusing on the past to shaping the future. From domination, control, confrontation and exploitation to nature’s way of partnership, balance, harmony and sustainability. All of society’s institutions, organizations, systems and structures will be transformed accordingly” (Woolfson, 2000: 200). Thus, this is the understanding of humanity as a specific feature of human being that forms the idea of the impact of this concept on the social system and the realization of the principle of social justice.

2. Humanity as a prerequisite for social justice.

The concept of humanity, in its original meaning, contains a principled position on equality for all people. Human is attributively social, so society is a field of formation and

realization of humanity. Only if human is recognized as a value, a just social system is possible. However, such seemingly axiomatic theses can be employed as mechanisms of manipulation and exploitation. On the one hand, the authors are right when actualizing the problem of the impossibility of progress in the field of values, humanity in particular. But both moral, ethical and legal laws differ geopolitically, historically and retrospectively. Accordingly, the findings of Jack Donnelly, who provided a thorough analysis of the categories of humanity and equality, are justified. In his view, these concepts function as particularistic principles of the hierarchy, as a criterion for belonging to a particular community. In this interpretation, humanity and dignity are the mechanisms of social recognition and respect: “A normative human being is a creature with certain qualities (e.g., virtue, reason, or a soul) that demand recognition and respect. A taxonomic human being is a creature with certain biological features (e.g., Aristotle’s featherless biped). Internationally recognized human rights take it for granted that these two classes are identical and that all taxonomic humans are normative humans (and vice versa). Historically, however, the class of taxonomic humans has usually been much larger than that of normative humans — or, in societies that did not speak of humanity, men of dignity” (Donnelly, 2015: 2).

The content components of humanity, as the core ideals and values, have been applied to various manipulative technologies, both historically and today. It is significant that these manipulations are realized in two ways: as the presence of the Other, the interaction that requires the determinant of humanity (another race, religion, political power, animal, nature, thing, etc.) and as social cohesion based on shared values and goals of life. In this way, the world is divided into “one’s own” and “other’s”, and justifies the appointment of humanity as a unification and combination of all individuals and communities on the basis of common ideals and aspirations.

This integration takes place in the global communicative space of the modern world civilization. Accordingly, John Hartley regards humanity as a substance of human communication and interaction. Such a status of humanity is conditioned by the evolution of semiotic history, in which the concept’s content from static and universal form moves to contextuality and realization. Therefore, the author comes to the conclusion that there is an evolutionary process of new human formation, whose mission is to promote humanity in society: “Messaging humanity” allows us to think about “the message” not as an external packet but as a *constitutive property of humanity*. This property is not new, although it has been precipitated into increased visibility recently because technological and scientific developments have allowed the messaging aspect to be observed more accurately. For instance, where once we could only talk metaphorically and abstractly about entities such as “the reading public,” now we can observe and measure it directly at any given moment, for instance via clickstream and sales-tracking data” (Hartley, 2010: 305). Indeed, it is the communicative discourse that determines the content of the concept of humanity and its trajectory. For example, John Lattimore and Mickey Lauria convincingly argue that the financial indicators of wealth or poverty do not determine the axiology of humanity (Lattimore & Lauria, 2018). Therefore, it is reasonable to believe that humanity is the embodiment of the European paradigm of thinking, behavior, assessments and priorities. That is why there are so many critics of the concept of universal values, the pathos of humanity and the criteria of justice. However, reasonably certain and fair implementation of the humanitarian principle is considered to be the Declaration of Human Rights and the mechanisms for its implementation.

3. *Humanity as a prerequisite for the emergence and worldwide recognition of human rights.*

The concept of humanity is often criticized because of its declarative nature, the lack of clear and effective mechanisms and programs for implementation. Indeed, it is absurd to set any criteria for measuring humanity. However, fruitful and systematic work at the international level on human rights is an important and effective factor in promoting humanity. Daniel S. Malachuk is convinced that the debate on the fundamentality of human rights is not a matter of rationalization, but rather a post-secular axiom of humanity as an undeniable value. This position avoids religious radicalism in substantiating the value of human life and focuses on the belief of the religion of humanity: "The first point is that most human rights histories follow the secularization thesis: a thesis that flatters anti-foundationalist conclusions but is not in fact accurate. The secularization thesis and the human rights histories that echo it are histories of subtraction, according to which the death of God and metaphysics meant the birth of rights. So long as human rights historians continue to subscribe to the secularization thesis we will never be in a position to appreciate what nineteenth-century religions of humanity actually contributed – and could once again contribute – to human rights theory" (Malachuk, 2010: 137).

Of course, human rights are more of a goal than a fact. It is no coincidence that the observance of these rights geographically coincides with those regions where the perception of the principles of humanity has been traditionally and historically formed. Accordingly, Andreas Schüller points out that in the context of numerous local conflicts around the world, the principles of humanity are declarative: "Supporting the need for fundamental standards of humanity, there have been developments in human rights law, such as further interpretations of treaties, e.g. by General Comments of the Human Rights Committee on the Political Covenant, or case-law emerging from regional human rights courts, in particular the European Court of Human Rights and the Inter-American Court of Human Rights" (Schüller, 2010: 760). Thus, the author proposes to prepare a document that, on the basis of international humanitarian law, will ensure the protection of human rights at all levels and even in extreme conditions.

Therefore, in the light of modern events, humanity is of particular importance. On the one hand, its mission is to ensure the free coexistence of humans on the planet with each other and with other species. On the other, it establishes the normative regulation of human interaction. It is fair to note that humanity transmits a certain pattern of thinking, behavior, evaluations, and preferences. In addition, in their content, these samples are Western European. However, what can be countered as an alternative? Assertion of humanity is the soft management of globalization integration processes. However, pointing to a place of origin is not a counter-argument in essence. Therefore, there is every reason to believe that such a scenario is acceptable.

In the course of the analysis of the concept of humanity, of all its contradictions and advantages, there is a stable allusion to the Heidegger concept of human being as a concern. According to this system of fundamental ontology, it is expedient to interpret humanity as a human way of assisting in the realization of another being, in the realization of one's future as a project, as a strategy of survival. In this context of interpretation, any particular principles lose their power and influence. For that reason, in the general sense of the concept, humanity is an existentially human way of realization of the world and the world of being, the self-realization in the horizon of the eternal truth of Being. However, modernity initiates the need to revise the concept of humanity and to review the mechanisms of humanistic development of Humanity.

Image of Human in 21st century: Challenges, Contradictions and Possibilities

The article seeks to resolve the problem of preserving humanity in the genesis of civilization, grounding on traditional (modern) conceptions of man as a carrier of specific ideological orientations, as the embodiment of a certain anthropological project of the Modernity era. Logically, the question arises as to how the sociocultural mechanisms for the implementation of this project can be provided in the new social architecture (Kyvliuk & Svyrydenko, 2017). For us, the research interest is both the very concept of Man for the new socio-cultural way and the mechanisms of its implementation in the current conditions, in particular, the role of education in transmitting humanistic ideals. Modernity calls into question rationality as a tool for resolving moral contradictions, which must be appropriately reflected by philosophy in general and philosophy of education in particular: “In the contemporary space of philosophical options on numerous moral subjects, prime real estate clusters around a doctrine asserting the existence of a surpassingly significant (and usually also unique) moral feature — named by the name of Rationality, with a capital ‘R’ — that is purportedly, even palpably, shared by all members of the human” (Thalos, 2002: 86). Indeed, the marginalization of rationality is able to create favorable conditions in society for the actualization of the dark side of human nature.

In this case, we view human not only through the prism of current fundamental transformations, but also as the embodiment of a certain anthropological project within the framework of active processes of space exploration. Can Humanity, in its ready, modern form, “delegate” space program participants? Are they capable of being carriers of the same anthropological project without pre-preparing for a long stay in small social groups? Can education prepare a person for a long, conflict-free space voyage, and can that person act as a driving force for building a civilization project on other planets?

Traditionally, in implementing an anthropological project, society relies on developed social institutions to provide it (economy, education, family, etc.). However, Humanity is faced with a situation that is difficult to deploy into a real social practice, because it requires a fundamental revision of the status roles of all institutions familiar to society. In its sense, such revision can often lead to a complete neutralization of the value of certain mechanisms, bringing to the forefront of the social progress of new “players”. One way or another, revision of ideas about the place of social institutions is inevitable. At the same time, the intellectuals of the modern world have been emphasizing for several years that the advancement of the new millennium must take place with the involvement of the intellectuals of society (world philosophical congresses can serve as an example in this regard). A prominent thinker of the present, Ralph Dahrendorf, twenty years ago, emphasized that technological progress deprived intellectuals of social status in their own enthusiasm for technocratic ideals, and the new social order can easily go the way, which is destructive to civilization: “Intellectuals are responsible to society. Societies, where they are dumb, are deprived of the future. Intellectuals may or may not wish to be on one’s side in the struggle of blind faith-based positions, though if all of them are on one side, then something is wrong. It is the duty of intellectuals to express clearly existing views and thus to appeal to those who bear the hardships and tribulations of real life. At the end of the twentieth century, the social contract of the Age of Enlightenment between ideas and practical actions may have partially lost its charm, but in no way lost its significance as an engine of freedom ”(Dahrendorf, 1997).

Indeed, intellectuals, universities, and the education system have an important social mission to ensure the impartial search for truth and the preservation of human in society, but the rejection of these ideals is another challenge: society will be deprived of reference points in its own dynamic progress. Accordingly, will education have its own traditional status in the translation of value horizons if their formulation remains beyond intellectual discussions in the educational environment?

New Enlightenment now emerges as a philosophical concept that seeks to preserve the achievements of the Age of Enlightenment, while modernizing it as an imperative for human development in the third millennium. In our opinion, it does not in the least take into account the prospects of comprehending the cosmos, extrapolation of our civilization to other planets, which needs a specific outlook. One of the New Enlightenment apologists is Steven Pinker, and his concept can be briefly described as follows: “Can humanity save itself? Steven Pinker wrote *Enlightenment Now* to prove that the industrial and scientific revolutions have enormously speeded up the rate of social change since the middle of the nineteenth century. We are in fact experiencing a new enlightenment now. He writes about Enlightenment thinkers of the eighteenth century who valued reason, science, humanism, prosperity and peace above all else. In emphasizing that the innate human capacity of sympathy for others can allow us to embrace all humanity, not just one’s tribe, village, ethnicity, state, or small part of the planet, they recognized the possibility of the universal improvement of life” (Sharpe, 2018: 2010).

Contemplating with the space scientists who distance themselves from the problems associated with space exploration, Olen Shevniuk and Olena Matviienko claim: “What is the moral value of the decisions that technology makes? Who should bear moral responsibility for failures in technology and for the consequences of those errors that led to the failures in information and communication technology?... Solving the problem of moral values on board the manned spacecraft is a sine qua non for artistic freedom during a space flight, the quality of the tasks associated with the colonization of the outer space and the development of material, energy and information resources of the universe” (Shevniuk & Matviienko, 2019: 128). Thus, limiting the discourse of Humanity’s perspectives to planetary boundaries is a threat to the implementation of a renewed anthropological project. In our opinion, New Enlightenment should take into account not only the current planetary problems of human development, but also the prospects of extending an updated anthropological project across the Universe.

The logical question arises whether education can teach modern man to think within the cosmic scale, to understand the processes of space exploration in the humanistic tradition, or, for example, within the dehumanist colonial, resource-oriented ideology. Will humanity be able to remain “human” without turning space activities into a struggle for resources when the utilitarian programs of individual states marginalize the interests of Humanity as a whole?

Conclusions

Therefore, the authors managed to consider the problem of “Learning to be Human”, which was themed at the latest World Congress of Philosophy (2018), supplementing its content with the contradictions resulting from space exploration by Humanity. It was possible to emphasize that the ideals of Modernity are threatened by the contradictions of civilizational progress, and Humanity is less and less hopeful about the possibilities of education in ensuring harmonious civilizational progress.

Leading intellectuals of the world emphasize that Humanity should re-vitalize the ideals of Enlightenment in the current socio-cultural context (technological advances, intensive

intercultural communication, etc.) by offering the concept of New Enlightenment. The article attempted to substantiate the ability of New Enlightenment to guide the modernization of society as a whole, as well as to provide an ethical platform for new education that would harmonize social relations in the face of globalization and technological challenges, as well as in the light of the contradictions associated with human development. Classical Enlightenment, formulating an anthropological project several centuries ago, proceeded from the socio-cultural conditions of the time; hence, as an example, it cannot offer universal “recipes” for solving contemporary contradictions of the globalization, technological and space-related agenda in its traditional form. At the same time, New Enlightenment can suggest a personalized ethical platform for Humanity that can be appropriately transmitted by value-updated education tools.

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The Politics of Education and its Impact on the Human Exploration of Mars

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In the article, the authors examined briefly the relationship between the politics and education in the history of culture. As a result, the authors confirmed the relevance of the politics of education. The possibilities of the politics of education to influence the ontology of the younger generations were examined. In particular, the influence of the politics of education on the development of society through the modernization of the teacher training system and the family policy of the State was examined. The authors focused mainly on clarifying the mechanism of influence of the politics of education in public schools. The authors came to the conclusion that one of the ways the politics of education affect the younger generations is creation of the certain “myth-triggered” and maintenance their relevance by using various sets of brain neuro-programming technologies. The authors examined the formation features, the sequence of actions, and the consequences of the impact of the myths-triggered such as “the need for space exploration” and “human exploration of Mars”.

Keywords: politics of education, school politics, space exploration, brain neuro-programming technologies, myth-triggered, human exploration of Mars,

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Introduction

In 1959, while American schools were barred from politics, Thomas H. Eliot presented a study in which he proved that neglecting public school policies was a mistake. In the article “Toward an Understanding of Public School Politics” Eliot proved that a public school policy was a significant domain of policymaking and political power exertion (Eliot, 1959).

The decades that preceded Eliot’s article passed in the United States under the slogan “get politics out of the schools and get the schools out of politics.” Until the 1960s, leaders in urban reform and progressive education in the United States worked to prove that a politics of education does not exist. An attempt was made to impose the point of view that politics and education are not compatible in public school education. As Douglas Mitchell and Lisa Romero note, “The persuasive presentation of this ideology of a schooling system free of politics is properly seen as one of the most successful political strategies in this nation’s history” (Mitchell & Romero, 2017). However, Eliot’s article drew attention to processes that claimed the opposite. These processes were discordant with the assertion that students should be protected from the influence of politics.

Two decades later, Paulo Freire stated that education was political in nature (Freire, 1993). Freire argued that it was wrong to consider education as a neutral ‘mechanical method of instruction’ (McLaren & Leonard, 1993). The point of view of the authoritative teacher in the world crossed out essentially the attempts of American officials and “reformers” in the field of education to redraw the history of education.

Division of politics and education is unnaturally by the nature. It manifests distinctly in the history of education. The first extant theory of education that has survived is set forth in Plato’s book “The Republic”. Plato understood Paideia as shaping of a person’s character in accordance with the dominant ideas and ideals in society. Plato did not separate education from politics. On the contrary, Plato’s education was the main force of government. In Plato’s theory of education, the caste of philosophers who governed the ideal State brought the demos (people) to the Sun or to the image of the Supreme idea by means of the Paideia or *the force of education* (Griffith, 2000).

The close connection between education and politics, on which ancient Greek Paideia was based, has not been forgotten in the history of culture. Oleg Bazaluk investigated the transition of the basic meanings of Greek Paideia into the education of the middle Ages. Bazaluk proved that the Fathers of the Church had preserved the basic provisions of the theory of education of Antiquity, only they had stated them in the new terms (Bazaluk, 2018). Instead of the image of the Sun as the highest idea, the Church Fathers used the power of education to achieve new political ideals and goals.

During the New Age period in European culture, the connection between politics and education had long been regarded as an obvious phenomenon. Education was considered “as the motor of global capitalism and the production of human capital” (Nordensvard, 2014: 340). Each new generation enriched the meanings of education, the ways and means of its impact on humans. However, the existing connection between education and politics was not disputed in the continental history of culture.

Johan Nordensvard claims that neo-liberal education policies are based on neo-liberal discourse. In fact, the modern and widespread image of education has “the political ideology that enforces market rule on more and more aspects of social life all over the world” (Nordensvard, 2014: 340).

The period of “reforming” of American education, when education was artificially isolated from politics, takes a small amount of time in the history of culture. On the whole,

the thousand-year history of education is revealed in the image of continuously evolving relations between education and politics. Views on education and politics, as well as views on the relationship between education and politics, have evolved. In modern society, views on education have returned to the traditions of Isocrates. Education is not considered in the philosophical traditions, which were founded by Socrates, Plato, Aristotle and Neoplatonists. Education is seen as a service sector, i.e. in the traditions of Isocrates and the Stoics.

In the modern world, the main service of education is the formation of certain stable stereotypes of attitudes and norms of behavior that correspond to the ideas, ideals and values of society. Education forms the image of a citizen in accordance with certain cultural values, norms of behavior, or the dominant idea in society. Depending on the form of government in the state, education is used by the political system as the nominal or real power (Svyrydenko & Yatsenko, 2018).

In today's society, *politics delegates some of its functions to education*. In particular, politics transfers to education the most important technologies of influence on the masses that allows us to assert not only the relevance of *politics of education*, but also the real impact of *politics of education* in public school education.

Modern opportunities of politics of education

In the book “Changing Politics of Education”, the authors describe public education's assets and resources, and also prove the fallacy of replacing politics of education with the attributes of the modern so-called “educational reform”. Michael Fabricant and Michelle Fine proved that high stakes testing and market mechanisms such as incentives, choice, and competition are only undermine learning and constrict educational opportunity (Fabricant & Fine, 2015).

Criticizing “educational reform” in the USA, Fabricant and Fine point to one of the reasons for the erroneous attitude to politics of education and underestimation of its capabilities. *Politics of education should be considered as schooling in the context of world economic and political ideology and practice, and not in corporate style*. And this is just one of the reasons. Fabricant and Fine believe that the rejection of politics of education leads to the rejection of public education and the glorious history that public education has carried out, is carrying out, and will continue to carry out in society. According to Fabricant and Fine, the rejection of politics of education will lead to “a strong increase mightily expanding the inequalities of wealth, darkening the futures of the dispossessed, and cannibalizing what remains of democratic spirit in a corporate society” (Fabricant & Fine, 2015).

The book by Fabricant and Fine reveals not only the possibilities of politics of education. It calls for action. The authors suggest the concrete steps to organize the influence of politics of education in public school education.

In the American tradition, the possibilities of politics of education are considered mainly in relation to the possibilities of state school institutions. However, taking into account how important the school period is in the formation of the key worldviews of a person, we can argue that politics of education influences key processes of the life of society, such as political modernization of society, features of the development of political institutions and political relations, etc.

For example, politics of education has a direct impact on the modernization of teacher training. Teachers are taught new technologies to influence the formation of unconscious and conscious behavior of younger generations. They learn to communicate effectively, to form appropriate habits, preferences, inclinations, etc. Politics of education turns teachers

into important actors in strategies for adapting a person to the characteristics of the existing political system (Nesterova, 2017). With the help of teachers and an appropriately selected school curriculum, the current political system forms in the younger generations a political ideology and image of a higher idea. Through the training of teachers, their professional qualities and political convictions, the political system ensures the continuity and necessary modernization of the foundations of society. Politicians and government executives use a wealth of methods and methods of politics of education to form their own strategies in the worldview of the younger generations, which are planned to be implemented in the near future.

Politics of education has a direct impact on family policy of the State. The family policy features are revealed in the article by Denys Svyrydenko and Dariusz Tulowiecki (Svyrydenko & Tulowiecki, 2018). The family creates an emotional environment in which the worldview of the child is formed. Building and maintaining an adequate family support policy just depend on politics of education. Politics of education forms the attitude towards the family as a social value, and as a feedback, the family provides the evolution of the political system as a macro-social system. Influence on the family eliminates a number of key risks for society and the political system. For example, the problem of low (or high) fertility, which can lead to violence, divorce, migration, and other uncontrolled processes that destabilize civil society and the political system. The family creates favorable (or unfavorable) conditions for involving children in new ideas that the political system plans to implement in the near future. This may be the idea of digitizing society, or, for example, the need for space exploration.

Politics of education has the ability to regulate access to information. Providing the priority of this or that information, its accessibility, quality, visibility, perception, etc., the political system forms an emotional attitude to the ideas that are priority for it. For example, through comics, children's literature, films for children, etc., one can form realism (or vice versa, not realism), artificial intelligence, and space technologies (Soroka & Kurkova, 2019).

The formation of the realism of the idea of creating artificial intelligence and its use in space technologies in the school period leads to the formation of a sustainable behavior strategy in the adult period. From a childhood dream, an idea passes into a goal and a way of life. The society receives a highly qualified specialist in the field of information and communication technologies, whose direction of self-realization was formed precisely by politics of education.

The mechanism of the influence of politics of education on younger generations: the creation of myth-triggered and their actualization

Despite the obvious advantages of the book by Michael Fabricant and Michelle Fine, from our point of view, the mechanism of influence of politics of education on the younger generations has a different fundamental basis. This basis is not in the plane of interpersonal communication or communication between social institutions and social groups. This basis is in the plane of influence of politics of education on neurobiological processes and psychology of a person. In fact, this influences on the ontology of man and leads to the formation of stable views and motives of behavior. This influence turns into a key force in the shaping of man even in complex and variable conditions of social influence. It determines the direction and limits of human self-realization.

We believe that the mechanism of influence of politics of education on the younger generations should be considered as the influence of neuro-programming technologies. In the article “The Importance of the Brain Neuro-Programming Technologies in National and Regional Security Strategies,” the authors consider the history and features of the formation of the brain neuro-programming technologies in the history of culture (Fatkhutdinov & Bazaluk, 2018). According to the authors, the brain neuro-programming technologies originate in the ancient ideas about education. At those times in Ancient Greece, education was considered as a technology for shaping human behavior in accordance with a certain ideal. With each generation, the brain neuro-programming technologies evolved. New opportunities for their application opened up. Neuroscience studies revealed the features of formation of the foundations of the human worldview, thereby improving the brain neuro-programming technologies and their impact on the brain. As it follows from the study by Vasyl Fatkhutdinov and Oleg Bazaluk, at present the brain neuro-programming technologies have become applied skillfully in the creation and implementation of national and regional security strategies. With their help, it is possible to form attitudes towards national minorities (tolerance or intolerance of views), neighbouring Nations (aggressiveness or peacefulness) and other cultures (tolerance or rejection). The intensive development of the brain neuro-programming technologies allows politicians to regulate the orientation and opportunities for self-realization of the younger generations.

Svitlana Balinchenko’s research reveals one of the mechanisms of influence of brain neuro-programming technologies on the human brain. With the help of Balinchenko’s research, we can explain more easily the mechanism of influence of politics of education on the younger generations. Balinchenko had explored two important issues that revealed the role and importance of politics of education in modern society. First, the ability of mass media to create myths and using myths to disrupt communication in society. Second, Balinchenko considered the variety of possible mechanisms for overcoming the myths (Balinchenko, 2019).

Thus, one of the ways of making impact on younger generations by politics of education is creation of certain “myth-triggered” (in Balinchenko’s terminology) and maintain their relevance.

The sequence of actions of politics of education when creating the myth-triggered “the need for space exploration”

Let us consider the sequence of actions of politics of education when creating myth-triggered, which is conventionally called “the need for space exploration”. This myth-triggered is formed under the influence of the brain neuro-programming technologies, relevant for children, adolescents and youth periods.

The myth-triggered, called “the need for space exploration”, forms in the worldview of the younger generation a whole network of stable stereotypes of views associated, for example, with the beliefs that space exploration:

- a) is the only way to save humanity in the terms of expanding Universe;
- b) will open access to the resources of space, without which humanity is doomed to self-extinction;
- c) will allow to make a new industrial revolution, which will bring humanity to a new qualitative level of development and open access to new material benefits;
- d) will open up opportunities for space colonization and provide interaction with extraterrestrial civilizations.

The political system uses the possibilities of politics of education to actualize the created myth-triggered. It turns it into an ideology of a schooling system. In public school education, a whole range of activities is carried out, which has the following sequence of actions:

1. The brain neuro-programming technology as the priority goal is established in teacher training and retraining courses. Teachers, as the key actors in neuroprogramming, aim to formulate the concrete myth-triggered in schools. Teachers are taught to form a stable understanding of space exploration in schoolchildren of different ages as the only possible way of human self-rescue.
2. Through existing communicative relationships, there is the same effect of politics of education on parents, the second key actors in neuroprogramming. Parents are taught a new myth-triggered. An information matrix is created around the parents, the key idea of which is the idea that the future of the child is possible only in the emerging market of space services. Parents are trained to create conditions in the family that facilitate the emotional perception of the myth-triggered child.
3. Special literature, films, music, and other media that most effectively convey the myth-triggered to the child during school hours are selected. This literature is made to be accessible for the child as much as possible, while information that denies or destroys the myth-triggered is isolated as much as possible.
4. The political system uses the possibilities of mass literature and television to create an information matrix around the child outside the school. The child receives confirmation of the myth-triggered in the usual emotional environment of his family, friends, in the images of heroes and idols close to him.
5. Every minute around the child, during the entire wakefulness of the brain lasting for years and decades, an information matrix has been operating, which has a continuous impact on the emerging brain. It forms the neurobiological basis of the myth-triggered.
6. The older the child becomes, the more effective the incentives that encourage self-realization of the internal potentials according to the myth-triggered begin to act. At the same time, more serious condemnation meets self-realization, which does not correspond to the created myth-triggered.

As a result of the complex of actions and their all-encompassing nature, which organizes the politics of education, the myth-triggered about space exploration as the only “right” way of evolution of society, moves into a stable system of views. The political system uses the myth-triggered and the possibilities of politics of education to turn the idea of “the need for space exploration” into a way of life. Self-realization of new generations focuses on space exploration. Detail beyond the borders of the planet is seen as the norm.

Thus, space exploration as the myth-triggered, actualized by the politics of education, drives the transformation of all spheres of human civilization: the political system, social institutions, economy, and culture.

In our study, we do not aim to assess the “correctness” or “incorrectness” of the myths-triggered created and operating in modern society, with the help of which politics of education influences the evolution of society. We investigate the features of the influence of politics of education on a person’s lifestyle. The creation of the myths-triggered and their actualization, is a proper example of the possibilities of politics of education. The action of the myths-triggered reveals the scale of the influence of politics of education on the spheres of human activity.

Creation and actualization of “human exploration of Mars” as the myth-triggered

Let us consider another idea that politics of education forms in the younger generations in our time as the myth-triggered. This is “human exploration of Mars” as a stable system of views that allows us to justify the actions of governments and the huge material resources that are spent on the implementation of this idea.

The first ideas of human exploration of Mars originated in the 50s of the twentieth century. During that period, large companies representing the entertainment industry actively invested it. This is interesting tells Jack Stuster (Stuster, 2019). At that time, the scientific community perceived the idea of human exploration of Mars as a bad idea. Jack Stuster talks about it very interestingly (Stuster, 2019). At that time, scientific communities perceived the idea of human exploration of Mars as *mauvais tone* (inappropriate practice).

The attitude of scientists to the idea of human exploration of Mars and human settlement in space changed dramatically after the first space flights of the astronauts and especially after the flights and landing of the American astronauts on the Moon (Krichevsky, 2017). The active creation of “human exploration of Mars” as the myth-triggered, caused and supported by the competition between the USA and the USSR, two superpowers of that period, began.

The created myth-triggered was actively implemented in public school education by using the possibilities of politics of education. The result of the impact of politics of education on the younger generations was the fact that by the end of the 20th century — the beginning of the 21st century, “human exploration of Mars” as the myth-triggered, began to determine the way of life of new generations. Governmental and non-governmental organizations, and research teams were created to work on the embodiment of the myth into reality. In practice, the created and updated myth-triggered led to the following results. The NASA Authorization Act of 2005 articulated a new strategy for the nation’s space program by specifically stating that “The Administrator shall establish a program to develop a sustained human presence on the Moon, including a robust precursor program, to promote exploration, science, commerce, and United States preeminence in space, and as a stepping-stone to future exploration of Mars and other destinations” (Human exploration of Mars, 2009). Recognizing the need for an updated and unified reference architecture for human exploration of Mars, NASA Headquarters commissioned The Mars Architecture Working Group (MAWG) in January 2007 to develop the Mars Design Reference Architecture 5.0 (DRA 5.0). The Mars Design Reference Architecture (DRA 5.0) describes the systems and operations that would be used for the first three missions to explore the surface of Mars by humans.

NASA created and actively operates The Mars Exploration Program Analysis Group (MEPAG) (<https://mepag.jpl.nasa.gov/>). At the NASA workshop, which took place in late February 2017, the scientific investigations associated with the human exploration of Mars in the next 35 years were presented. (Niles et al., 2017). At the workshop, a summary of the findings of the Human Science Objectives Science Analysis Group, or HSO-SAG chartered by MEPAG in 2015 to address science objectives and landing site criteria for future human missions to Mars were presented. Currently, NASA’s plan to land astronauts on Mars in the mid 2030’s would allow for robust human exploration of the surface in the next 35 years. We expect that crews would be able to traverse to sites up to 100 km away from the original landing site using robust rovers. The main argument for the need for the human exploration of Mars was called A human mission to Mars would present an unprecedented opportunity to investigate the earliest history of the solar system, as well as to investigate scientific

questions ranging from the nature of the impact history of the solar system to the origins of life (Niles et al., 2017).

Numerous subsequent research studies address various aspects of human exploration of Mars. For example, Ja'Mar A. Watson in his study benchmarks the Mars DRA 5.0 by quantifying its mission utility in satisfying mission objectives derived from human exploration of Mars community consensus. Watson proves that the DRA's mission utility is limited due to a lack of its consideration during design (Watson, 2019). Jack Stuster considers several NASA risks by identifying the work that will be performed during an expedition to Mars and the abilities, skills, and knowledge that will be required of crew members (Stuster, 2019). Professor Mihai G. Netea and his co-authors reviewed a set of safety measures to prevent, diagnose and eventually treat infections with Martian microorganisms (Netea et al., 2019).

Thus, we can state that half a century after its creation, "human exploration of Mars" as the myth-triggered became an everyday way of life. Thanks to the possibilities of politics of education this myth-triggered turned into a reality that in a decade will be embodied in the first settlements on Mars.

Conclusions

In the article, the authors examined the possibilities of politics of education to influence the evolution of society and its foundations. The authors analyzed one of the ways of this influence: the creation of the myths-triggered, which through the sets of brain neuro-programming technologies form stable stereotypes of views and human behavior. The authors examined the features of formation, the sequence of actions, and the consequences of the impact of the myths-triggered, such as "the need for space exploration" and "human exploration of Mars". Thanks to the possibilities of politics of education, these myth-triggered have become a reality. Currently, they determine the direction and limits of self-realization of modern society.

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Section Four

COSMOS AND HISTORY

The Ethics Laws as a Basis for Building a Cosmic Civilization. The Sofia Republic

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The authors investigated the relevance of consequentialism in commercial space exploration as well as in the actively developing space market. The authors conclude that space expansion and colonization of space objects will lead to a revision of the foundational consequentialism provisions. Consequentialism, formed during the history of terrestrial civilization, loses its effectiveness under conditions of space commercialization. The basics of planetary thinking are different from those of cosmic thinking. Therefore, considering the meaning of the terms “cosmic expansion” and “colonization of the cosmos” through the existing theory of consequentialism faces serious contradictions. There is a range of problems that are not explored in modern philosophy and ethics due to the lack of an empirical basis for philosophical analysis.

Keywords: consequentialism, commercial space exploration, space commercialization, “New Space” ecosystem, space market, moral rightness

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Introduction

In the “Nicomachean Ethics” Aristotle shrewdly referred the intellect, knowledge and *techne* to the rational part of the soul, and the ethical virtues such as ethics and politics — to its irrational part. The closest followers, such as Cicero, have changed and “improved” Aristotle’s understanding of the soul and virtues to such an extent that from the point of view of modern neurophilosophy it is perceived as far-fetched and baseless.¹ In previous study, we have shown that the intellect, knowledge and *techne*, as the *arete* existentials, are the fundamental structures of Dasein-mentality-about’s being, which form a three-level block organization of Intelligent Matter, *the existence* (Bazaluk, 2019). However, the unhiddenness concentrated in the *arete* existentials, is just a *possibility*, an unrealized potential of Dasein-the-One’s being. It is realized only under the influence of “the irrational part of the soul.” The “irrationality” of ethical virtues is explained by the fact that, unlike existence, truths concentrated in ethics and politics are not immanent to the being of Dasein-mentality-about. They are absolutized in the current Dasein’s being and manifest as natural selection, as the main reason *for the moulding of existence from lack of education* (απαιδευσία) *in Plato’s understanding*.² Ethical virtues are the key characteristics of regulatory compromise that establish the boundaries of freedom of individual self-realization in Dasein’s being. *Ethics laws* form the basis of ethical virtues.

In ancient Greece, the term “ethos” (ἦθος) meant disposition, character, and temper. It was used to describe individual beliefs or ideals correlated with certain habitual forms of social behavior.³ Aristotle underlined that the ethics he proposed was not so much a contemplation about good living as a way to create this good living (Aristotle, 1983). The ethics of Antiquity set norms that brought society together and allowed people to live better.

Aristotle’s understanding of ethics is also relevant in the Modern Age. We consider ethics as the absolutized truths of the current Dasein’s being, in which the factors and causes of the complication of Dasein’s being manifest as natural selection. This is the key unconcealedness of Dasein-Intelligent-Matter’s being that is carried away by the idea of man, and eventually acquires the prescriptive power of laws. Absolutized truths do not always correspond to ἀλήθεια as unhiddenness. Sometimes they are just its shadows. However, due to the fact that education preserves and even enhances their visibility in the cultural ideal, they do not need to be liberated and, accordingly, correlated to unhiddenness. Education presents them as evident unconcealedness of being, as “*the correctness of the gaze*,” absolutizing and empowering them. In the rank of ethics laws, absolutized truths form the steady boundaries of freedom of self-realization of the being of Dasein-mentality-about as the potential of Dasein-the-One’s being. In fact, they turn the being of Dasein-Intelligent-Matter into a matrix, in which the potentialities of *arete* existentials are liberated according to the established sample. The effectiveness, efficiency and expediency of the ethics laws determine the quality of Dasein-Intelligent-Matter’s being in Dasein-the-One’s being.

All key representatives of Plato’s line considered ethics laws.⁴ Some ethics laws have remained relevant for thousands of years and will keep it in the future, because they are the essence of the key timeless unconcealedness of the being of Dasein-Intelligent-Matter of

¹ See Ilsetraut Hadot’s scheme (Hadot, 2002: 68).

² See (Plato, 1994; Heidegger, 1986).

³ The word “ethos” have had other meanings too, however, they are not of interest to our research.

⁴ For example, Aristotle (Aristotle, 1989); Immanuel Kant (Kant, 1964); et al. See (Bazaluk et al., 2018).

the Earth. This is the source, the root cause, “the fundamental trait of beings themselves.”⁵ They are highlighted in a retrospective analysis of the history of the presence of cosmic civilization in Dasein’s being. It is for this reason that the theories of Plato’s line are based on the knowledge of a historical man. “A nation that forgets its past has no future.”⁶ Knowledge of the history of the presence of cosmic civilization opens up the possibility to contemplate the unhiddenness of the moment, and contemplation of the unhiddenness reveals a lighting in the being, a *Lichtung* that makes the highest idea visible.⁷

The Ten Commandments as the decisive ethics laws

We refer the Ten Commandments to the decisive ethics laws, with the help of which the being of Dasein-Intelligent-Matter of the Earth for thousands of years has regulated the ontological orientation and limits of self-realization of Dasein-mentality-about’s being. We consider the Commandments from a wider perspective than the precepts that were given to Moses by God on Mount Sinai. For us, each commandment is the key unconcealedness of Dasein-Intelligent-Matter’s being (Bazaluk, 2016). On the one hand, the Commandments are absolutized in the current Dasein’s being, the Commandments are embedded in the potentialities of arete existentials. Hence, they are the essence of the active principle, *the existence*. The philosophers of ancient Greece, the Roman Empire, Christian and modern civilization contemplated the Commandments as the unhiddenness of being. As absolutized truths, they were present in the ideals that we have designated by metaphors: “imitation of a hero”, “imitation of a wise ruler”, “man of faith” and “intelligent person.” In each Commandment, the factors and causes of the complication of Dasein-the-One’s being manifest themselves in unity and wholeness, establishing a strict order of presence and care, a close relationship between the Dasein-mentality-about’s being and the being of Dasein-Intelligent-Matter, between the active principle and natural selection, between the potentialities of arete existentials and the cultural ideal. At the same time, each commandment possesses the power of the law, by which the being of Dasein-Intelligent-Matter of the Earth establishes the limits of self-realization of the being of Dasein-mentality-about, thereby forming a certain pattern of manifestations, a *matrix*. *The influence of the ethics laws on the liberation of the potentialities of arete existentials is decisive*.

Thus, the foundations of building a cosmic civilization are revealed to us. Cosmic civilization is built on the key unconcealedness of Dasein-Intelligent-Matter’s being, which is equally manifested in the active principle and natural selection. Cosmic civilization is based on the compatibility of the boundaries of individual and collective freedom of being, the regulatory compromise between the truths of the Dasein being’s experience, concentrated in the potentialities of arete existentials, and the absolutized truths of current being, concentrated in the cultural ideal. The nature of the origin of a cosmic object does not matter. The key factors of regulatory compromise are the physical processes for Dasein-Innert-Matter’s being and the chemical processes for Dasein-Living-Matter’s being. Whereas cosmic civilization is built on the *knowledge* of the unconcealedness of Dasein-the-One’s being, the basis of which is formed by *psychic* processes, neuroevolution and noogenesis. It follows that the cosmic civilizations that have a longer history of presence and care in Dasein’s being, possess great knowledge of the truths of the Dasein-the-One being’s experience. This knowledge and the technology built on them allow civilization to transcend into the cosmic power and expand its

⁵ See (Heidegger, 1986).

⁶ The phrase is ascribed to Winston Churchill: <http://famousquote.com/winston-churchill/>

⁷ See (Heidegger, 1961).

presence in the Universe. If the Earth's civilization only opens up the possibility of building the Sofia Republic, then cosmic civilizations with a longer history of presence and care in Dasein's being are already carrying out cosmic expansion.⁸ Accelerating the expansion of the Universe, discovered in the late 1990s, which describes the Lambda-CDM model, from our point of view, proves the formation of a new order of Dasein-the-One's being, in which the being of Dasein-Intelligent-Matter is a significant actor of presence and care.

The basis for building the Sofia Republic

Currently, the Earth's cosmic civilization possesses the knowledge of ten key unconcealedness of Dasein's being, based on which it can build the Sofia Republic on any cosmic object, regardless of the nature of its origin. Let us briefly consider the knowledge of the Ten Commandments, or "*the correctness of the gaze*", which ensures the Sofia Republic building on Earth. We shall previously clarify the terminology, taking the example of the phrase, "God is Spirit, and His worshipers must worship Him in spirit and in truth" (John 4:23–24). In our terminology, God is the being of Dasein-the-One, which establishes the ontological orientation and limits of possibilities of the being of Dasein of Innert, Living, Intelligent and any other state of Matter (Plotinus, 1952). The being of Dasein-Intelligent-Matter is the emanation of Dasein-Living-Matter's being, a new way of presence and care of Dasein-the-One's being. Along with other states of matter, it is the "Spirit" of Dasein-the-One's being. The "The "Truth" of Dasein-Intelligent-Matter's being is that by cognizing and creating in Dasein's being, it establishes a new order of Dasein-the-One's being, in which it appears to be the significant actor of presence and care.⁹ Having achieved the qualitative state of *the Sofia Republic*, the being of Dasein-Intelligent-Matter transcends into cosmic power. In the term "Sofia Republic" we concluded not only the ideas of Plato about building the Home of Ideas in the Kingdom of Heaven and Augustine about the City of God, as well as the new liberated unconcealedness of Dasein's being that follow from the philosophy of the cosmos. The main function of the Sofia Republic lies in formation of the ontological orientation and limits of self-realization of Dasein-mentality-about's being and the being of Dasein-Intelligent-Matter in accordance with the idea of a man who transforms the Universe, and in establishment of the boundaries of the regulatory compromise that provide the maximal self-realization of Dasein-mentality-about's being as the potential of Dasein-the-One's being.

The Sofia Republic is based on the knowledge of the key unconcealedness of human being that is concentrated in the Ten Commandments, or *the Ethics Laws*:

The First Law: "Thou shalt have no other gods before Me" (Exodus 20:2). The First Law absolutizes the idea, ideal and values of "Those Who Transform the Universe." It provides the only possible way to ascent towards the image of the highest idea: *the authenticity of Dasein-mentality-about's being and the being of Dasein-Intelligent-Matter is the essence of transcendence into cosmic power*. Transcendence as a way of life appears to be the essence of the presence and care of Dasein-mentality-about's being and the being of Dasein-Intelligent-Matter, and the essence of *serving* Dasein's being. Only the maximal self-realization of Dasein-mentality-about's being as the potential of Dasein-the-One's being provides a continuous and non-linear complication of the being of Dasein-Intelligent-Matter of the Earth in the expanding Universe. Serving the other "Gods" or ideas, ideals and values is the essence of *Being-towards-death* (Sein zum Tode). The First Law establishes new boundaries of

⁸ See (Krichevsky, 2017; Sukhonos, 2019).

⁹ See (Khmil & Malivskiy, 2018).

regulatory compromise that provide the *self-assembly* of Dasein's individual manifestations in the Sofia Republic, or in the power that transforms the Universe.

The Second Law: "Thou shalt not make unto thee any graven image" (Exodus 20:4). The Second Ethics Law excludes the consideration of the absolutized idea, ideals and values of "Those Who Transform the Universe" as "idolatry," cult, fetish, and deification. Epigonism and plagiarism, just like imitation, copying, monkeying, etc., are ways of *inauthentic* existence. They are the essence of *das Man*, because they exacerbate the concealedness of cosmos and limit the manifestations of existence.¹⁰ The Second Law argues the opposite: the absolutization of the idea, ideals and values of "Those Who Transform the Universe" should be seen as a lighting, *Lichtung*, which points the way to the unhiddenness of being. This is the way from the glare of fire in the cave to the radiance of the Sun outside the cave. This is the unique and only possible way to liberate the existence from the hiddenness. The Dasein's being is not characterized by typicality, mediocrity and banality of manifestations. The being of Dasein-Intelligent-Matter creates the being of Dasein-mentality-about as an exceptional, inimitable and unique potential of presence and care. The value of the imitation of a Hero, Christ or Those Who Transform the Universe, lies in an already designated lighting that excludes errancy and fear. The value of an absolutized idea is in self-programming for outstanding results and within the designated boundaries of authentic freedom of self-realization.

The Third Law: "Thou shalt not take the name of the Lord thy God in vain" (Exodus 20:7). To transcend into cosmic power, i.e. to *ascend* towards the idea, ideals and values of "Those Who Transform the Universe" and *think about* the ascent are two different ways of life. They reveal the essence of the authentic and inauthentic existence. The Third Ethics Law draws a clear line between the *Selbst* and the *das Man*, comparable to the difference between the life and death of the individual Dasein's being. The Law sets the priority of action (*præxis*) over discourse (*lógos*). The Law defines: the authentic self and care are the *transcendence to the cosmic power*, the essence of which is to *overcome* the concealedness of the cosmos. The inauthentic existence is limited to *thinking about* the image of the highest idea and the possibility of transcendence. The value of the being of Dasein-mentality-about is determined by the completeness of self-realization as the potential of Dasein-the-One's being, which more eloquently sums up the results of individual being and indicates its significance in the current Dasein's being. To ascend towards the idea, ideals and values of "Those Who Transform the Universe" is, first of all, self-forcing, self-complication and self-programming for outstanding results, which do not need representation, conversation and advertising. It is a conscious concentration on the action, and on the end result. It is self-liberation from the darkness of lack of knowledge, overcoming the fear of contemplation of the unhiddenness of being, which requires determination, concentration and mobilization of internal potentials. "They will ask thee how to traverse life. Answer: like crossing an abyss, upon a taut string, beautifully, carefully, and fleetly" (Roerich, 2000).

The Fourth Law: "Remember the sabbath day, to keep it holy" (Exodus 20:8). The Fourth Ethics Law establishes: when ascending towards the Sun, the being of Dasein-mentality-about

¹⁰ Safranski gives a criterion to distinguish a real religion from substitute religion, which was established by Carl Bry in the beginning of the 20th century: "A genuine religion educates Man for reverence for the inexplicability of the world. In the light of faith, the world grows bigger, and also darker, because it retains its mystery, and Man sees himself as part of it. A man remains insecure even about himself. For the "monomaniacs," that is, for the adherents of the "masked religion," the world, on the contrary, shrinks. Such a man "in each and every thing finds only the confirmation of his opinion," and he defends this opinion in the struggle against the whole world and his own doubts with the fervor of a religious fanatic" (Safranski, 2005: 216).

must be inhered within and mastered in the abodes in order to be convinced of the “correct vision.”¹¹ It means *inhering within an abode* that everywhere and primarily has a hold in what perdures” (Heidegger, 1986: 273). The Fourth Law affirms the need of inhering within an abode, as an important condition for gaining wisdom. The Law creates conditions for introspection, self-assessment, self-control, self-regulation, etc. It forms the specific qualities of Dasein-mentality-about’s being, necessary for the liberation and enrichment of existence. They include the ability to abstract and control self-realization, assess the effectiveness and results of self-realization, analyze and adjust the way of the ascent towards the Sun. The Law helps to form “the look from above,” about which Pierre Hadot wrote:¹² to consider serving the idea, ideal and values of “Those Who Transform the Universe” in the unity with the past, present, and future. The Law reduces the likelihood of errors, miscalculations and omissions; avoids the transformation of serving into fanaticism; and also enhances the astuteness of vision of the Sun and things in the rays of its radiance.

The Fifth Law: “Honour your father and your mother, so that you may live long in the land the LORD your God is giving you” (Exodus 20:12). The Fifth Law affirms the crucial role of heredity in forming the ontological orientation and limits of Dasein-mentality-about’s being. It turns to the origins of individual being. The Law establishes the only possible way to the most complete liberation and enrichment of the truths of the Dasein being’s experience, concentrated in the potentialities of arete existentials. It defines the way of authentic existence and vision of the *lighting*, as a personal invitation to ascend towards the top and contemplate the unhiddenness of being. “Honour your father and your mother” is a way of knowing the *history* of Dasein-mentality-about’s being. This is an appeal to the root cause of individual being, and an awareness of the boundaries of freedom of self-realization.¹³ It follows from the Law that the ascent towards the Sun begins with the knowledge of the fundamental ontology, or with the *anthropologization of Dasein*. In fact, the “ascent towards the Sun” turns out to be an *immersion* in the ontology of Dasein-mentality-about’s being to liberate the arete from the concealedness.

The Sixth Law: “Thou shalt not kill” (Exodus 20:13). The being of Dasein-mentality-about is the act of creation of Dasein-the-One’s being. The accidental or deliberate elimination of the being of Dasein-mentality-about is tantamount to annihilation of the potential of Dasein-the-One’s being. It is perceived as an attempt on the foundations of being. This is evil, which must be suppressed on a planetary and cosmic scale. The Sixth Law establishes that the authenticity and inauthenticity of the being, the Selbst or das Man, are the emanations of Dasein-the-One’s being, therefore they have the right to be. Even Being-towards-Death is a way of life that liberates the way to unhiddenness. As a contrast and antipode, Being-towards-Death confronts the transcendence of the being of Dasein-mentality-about in cosmic power. It creates the conditions for choosing a way of life. The Law “Thou shalt not kill” not only imposes a taboo on the destruction of individual being, and also prepares the being of Dasein-mentality-about to overcome the “...fear of life, of a life that one suddenly becomes aware of in its whole contingency.”¹⁴ The power of the presence of Dasein-mentality-about’s being is achieved not by the elimination of competition, and by *transcendence* to such levels of individual perfection that allow one to become *above* “murder.”

¹¹ See (Heidegger, 1986: 270).

¹² See (Hadot, 2005).

¹³ See (Eliopoulos, 2019).

¹⁴ See (Safranski, 2005: 229).

The Seventh Law: “Thou shalt not commit adultery” (Exodus 20:14). The Law affirms the key role of the family and the responsibility of family members for the quality of Dasein-mentality-about’s being. It follows from the Law that the authenticity of existence and the completeness of self-realization of Dasein-mentality-about’s being as the potential of Dasein-the-One’s being, directly depends on the influence of the parents and close environment. Family members are the first to realize liberation of the arete potentialities and, accordingly, ensure the quality of the acquired Dasein. A family in the Sofia Republic is considered as an ideal environment that provides:

- a) Control and regulation of the quality of individual genetic programs. The compatibility (or incompatibility) of parental genetics determines the quality of ontogeny of the newborn “mentality about”.
- b) Formation of the ontological orientation and limits of self-realization in accordance with the idea, ideal and values of “Those Who Transform the Universe”.
- c) Responsibility for the newborn “mentality about,” for its acquisition of Dasein, as well as complete self-realization as the potential of Dasein-the-One’s being.

The Seventh Law obliges parents to remain the main actors in neuroprogramming, until “mentality about” is 21 years old. The birth of a child in the family, and the harmonious formation of the structure, functions and manifestations of Dasein-mentality-about’s being, are considered as a consciously chosen way of life. It imposes on them responsibility for the child’s “correctness of the gaze” formation.

The Eighth Law: “Thou shalt not steal” (Exodus 20:15). The Eighth Ethics Law affirms the ownership of any manifestations of the being of Dasein-mentality-about in the logosphere and technosphere.¹⁵ The liberation and enrichment of the truths of the being’s experience, concentrated in the potentialities of arete existentials, is measured by time, which is the main value of Dasein-mentality-about’s being. The theft of the products of self-realization of Dasein-mentality-about’s being turns into the theft of time, in the devaluation of the meaning of individual presence. The theft reduces the completeness of self-realization of the being of Dasein-mentality-about as the potential of Dasein-the-One, because it zeroes out the products of self-realization. The theft affects the openness of the being of Dasein-mentality-about before the being of Dasein-Intelligent-Matter of the Earth, and also reduces the effectiveness of presence and care. On the other hand, theft will not replace the value of the experience of self-cognition and creation in being; therefore, it will not bring any benefit to the person who committed the theft. The Eighth Law provides for the conditions of *individual* transcendence into cosmic power.

The Ninth Law: “Thou shalt not bear false witness against thy neighbour” (Exodus 20:16). Authentic existence is the transition from errancy to a conscious choice of an individual way of life. It is a way of mistakes and achievements; a way of competition for spaces and resources; and a way of expanding the boundaries of freedom of self-realization. Authentic existence is always associated with overcoming the resistance of others, with going beyond the boundaries of the established and habitual, with transitions from one abode to another and the mastering of new abodes in which someone is already present. The Ninth Law protects authentic existence from insincerity, slander and falsehood. These are hidden forms of aggression that are aimed at eliminating a competitor, creating privileges for a false witness and his manifestations. The Ninth Law affirms the significance of *individual* presence and care, during which only a unique and special set of truths of the Dasein being’s experience

¹⁵ See (Bazaluk, 2016).

is revealed, concentrated in the arete existentials. Martin Heidegger may have been the first to draw attention to the “blurring” of the boundaries between “truth” and “untruth,” when making the transition from the use of the ancient Greek term “ἀλήθεια” to “verum” in the Middle Ages, and to “truth” in the Modern Age.¹⁶ The Ninth Law equates perjury with inauthenticity, thus emphasizing the boundaries between truth and untruth.

The Tenth Law: “You shall not covet your neighbor’s house. You shall not covet your neighbor’s wife, or his male or female servant, his ox or donkey, or anything that belongs to your neighbour” (Exodus 20:17). The Tenth Law establishes clear boundaries of freedom of self-realization of the being of Dasein-mentality-about. A taboo on the desires of other people’s results of self-realization, merits and achievements, is a necessary condition for the *self-assembly* of the being of Dasein-mentality-about in a new quality of presence and care, in *the Sofia Republic*. In the Holy Scriptures it is repeated several times: “Trust not in iniquity, and cover not robberies: if riches abound, set not your heart upon them. God hath spoken once, these two things have I heard, that power belongeth to God, And mercy to thee, O Lord; *for thou wilt render to every man according to his works*” (Psalm 61:11-13). The idea “*for thou wilt render to every man according to his works*” is a key idea in understanding the quality of Dasein-mentality-about’s being and Dasein-Intelligent-Matter’s being. The taboo on greed, self-interest and desire of other people’s property, elevates the value of *individual* self-realization as the potential of Dasein-the-One’s being. The Tenth Law ensures communication and cohesion of the being of Dasein-mentality-about in a power that transforms the Universe.

Conclusions

Thus, the Ten Commandments, like the Ten Ethics Laws, form the basis of the Sofia Republic and create the conditions for the transcendence of being of Dasein-Intelligent-Matter of the Earth into cosmic power. The Ethics Laws are fundamental characteristics of the *letting-be* of the being of Dasein-mentality-about and the being of Dasein-Intelligent-Matter. The second “irrational part of the soul,” *politics*, gives effectiveness to the Ethics Laws.

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¹⁶ See [Heidegger, 1986].

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Cosmocracy and Culture in Valerian Muraviev's Works¹

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The article deals with the concept of culture as a cosmocracy, which is put forward in the works of Valerian Muraviev, one of the leading representatives of the 1920s cosmism. It presents the evolution of Muraviev's view on the phenomenon of culture from the early articles to the philosophical mysteries "Sophia and the Centaur" and "The Culture of the Future." The connection of Muraviev's constructions with the projective philosophy of Nikolay Fedorov, the ancestor of cosmism, with the idea of the anti-entropical essence of culture, which is characteristic of the representatives of cosmism, is shown.

Keywords: philosophical and artistic creativity of Valerian Muraviev, philosophy of cosmism, culture of the future, cosmocracy, projectivism

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Valerian Muraviev (1885–1930), a Russian philosopher, political writer and diplomat, is one of those 20th-century thinkers whose entire body of work is only finding its place in the history of philosophy. An heir to the renaissance in the Russian religious philosophy and at the same time one of the prominent representatives of the 1920s cosmism, a man whose ideas were incompatible with the official Soviet ideology, he was doomed to write with little hope to share his ideas. Only one of his works created in the post-revolutionary period (the most prolific years for the writer) was published, at the author's expense — the treatise titled "Mastery over Time as the Main Purpose of the Scientific Organization of Labor" came out in 1924 in Moscow. The rest of the texts were unknown for decades and found their first readers and researchers only in the 1990s (Aksenov, 1992; Muraviev, 1998; Muraviev, 2011).

Muraviev's philosophy is an indispensable part of the cosmic thought of the 20th century, that stems from the "Philosophy of the Common Task" written by Nikolai Fedorov (1829–1903), a thinker who laid the foundation for a new understanding of man — as somebody not only being an organic part of the macrocosm, — a small universe himself, and thus

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metaphysically equal to the cosmos, — but also an acting one, with the creative power to explore the universe and transform it. Man is in a state of constant development — from the prehistoric times: living exactly like those who lived before, watching the starry sky, creating myths about the Cosmos and making it his own, and ‘accommodating’ the souls of his fathers in the stars; from the ancient and medieval magic that made natural forces obey his word and gesture; through the development of science making our knowledge of the world more profound — man, according to Fedorov, is moving closer to really acting in the world, enlarging the scope and powers of it. “A child of the tiny Earth, an *observer* of immense space, of the worlds in that space, must become their *dweller* and *ruler*” (Fedorov, 1995, 243) — wrote Fedorov thus determining the route from what exists to what should exist, from the present order of things, in which forces of life and growth are intertwined with those of decline and decay, to the future, transformed order in the world where “life is actually living” in all its forms.

Fedorov thought the transforming activity of man in the course of history and in the nature, that he called ‘regulation’, meaning conscious governing in the world based on the profound knowledge of natural processes, to be a prerequisite to the world’s transition into a more complete, ideal state. The area of regulation, which the philosopher opposed to the exploitation of resources, should be expanded, first, to the scale of the planet, then — to the scale of the surrounding Space, and, further, to the whole universe. Expansion in space, at that, is indispensable from man’s ability for regulation growing in the course of time, which is related in Fedorov’s system of ideas with pushing back the boundaries of death — by creating a long-living and then — immortal generation and raising all people, who have ever lived, from the dead. When this double restriction of man — in time and space — is overcome and natural processes are regulated on the scale of the universe, the “soulless star worlds looking at us coldly and somewhat sadly” (Fedorov, 1995: 202) will become inhabited by the resurrected generations and the universe will be transformed into a living Cosmos vibrant with creative energy. And a symbol and at the same time a *project* of this universe, “in which everything originally dead is revived and in which everything brought to life has become the consciousness and governing power of a creature that used to be blind” (Fedorov, 1995: 236) is, according to the philosopher, the church. The synthesis of arts — architecture, fresco, icon painting, singing, the arts of word and movement — accompanying the main Christian sacrament, that of the Eucharist, is understood in Fedorov’s philosophy as a prototype for the future union of all spheres of man’s action and creation around the principle purpose of resurrecting generations of people who lived before us, regulating the nature, transforming the earth and the cosmos into the Kingdom of God. The humankind perfecting itself internally and externally and gaining the ability to live “in the whole universe” is shown in the “Philosophy of the Common Task” as a “complex artist” of the creation and, according to the thinker, all the resurrected generations will take part in this cosmic, universal artistic and creative act — no longer using the local, earthly material but that in the vast space of huge worlds. (Fedorov, 1995: 401). Thus, Christianity acquires a cosmogonic nature and is seen as a religion that leads man and the being to perfection.

Fedorov’s “Philosophy of the Common Task”, whose two volumes were published in 1906 and 1913 by his followers (Fedorov, 1906; Fedorov, 1913) became the foundation for Muraviev’s ideas (Hagemeister, 1988: 318341). Other influences include Henri Bergson’s philosophy of time and Georg Cantor’s set theory Aksenov, 2001: 207; Russian Cosmism, 1993; 188–189): they laid the basis for his concept of regulation of the time flow, put forward in his book “Mastery over Time”. The being is viewed as a hierarchy of sets: every creature

or object is a set of elements, and at the same time is included, together with other creatures and objects, into sets of a higher level. Time, at that, is an indicator of the dynamics of these sets, which makes it potentially reversible and manageable; the skill of reconstructing unique combinations of elements that form these sets — be it a man, an animal, a thing, a natural or cultural object — makes it possible to reverse the course of time, to “resurrect” all that there was and lived.

Another source of inspiration for Muraviev’s thought was the Anglo-American pragmatism. The ideas of Charles Pierce, William James, John Dewey were seen through the prism of Fedorov’s ones. Fedorov was not only striving for a philosophy of action rather than a philosophy of contemplation, but also extending the very notion of “action” and viewing it in the framework of Christianity, from the point of view of the Divine “construction” and by representing the humankind as a collaborator of God on “reconstructing the world into the splendid imperishable being it was before its fall” (Fedorov, 1995: 401). Thus, according to this task, the transforming action of the humanity is extended to the whole cosmos. “Philosophy of action” developed by Muraviev since the early 1920s had the same scale. Action was viewed in the eschatological framework and applied to all the creatures in the universe, its result being the “resurrection” (Muraviev, 2011. 2: 304).

For Muraviev, whose theory, following Fedorov’s ideas, combines action and faith, pragmatism is only possible if it includes idealism. The new “method of cultural creation”, says the thinker, should be based on “the combination of the word, the thought and the action”, which is “an inexhaustible source of creativity” and is, in this sense, of a deeply religious character (Muraviev, 2011: 369). This is because religiosity, as seen by Muraviev, is beyond any denomination or an established form of a rite. Religiosity is a principle of a person’s worldview, a link between man and the world, in which a feeling of oneness with the cosmos and a desire for perfection are intertwined. It is feeling yourself part of that “cosmic growth” of the world, the development, the “increasing complexity and transformation of the nature”, that Vladimir Soloviev wrote about in his works (Soloviev, 1988: 630).

The combination of the mind that thinks and the mind that believes, the conscious action of which is to lead the humankind (an idea characteristic of the Russian religious philosophy) led to Muraviev’s reconsidering and restructuring the very methodology of classical philosophy, as well as its postulates. In his texts he uses both the philosophical categories (the All, the multiple, the being, the Absolute, time, space etc.) and the fundamental concepts of theology (God, the Kingdom of God, Sobornost, theosis, divine grace etc.) the first extending their scope through the second and vice versa. The philosopher creates a new logic based not on a “concept” but on a “name” and thus giving an opportunity to fuse the particular and the general, the part and the whole, and presents his view of the world as an hierarchy, a ladder of names embracing the reality in its dynamics and leading to the Name of the names, i.e. to God. Finally, like his predecessors, representatives of the 19th century cosmism — Nikolaj Fedorov, Aleksandr Sukhovo-Kobylin, Vladimir Solovyev — Muraviev consistently introduces projectivism in philosophy not only by emphasizing the concept of the due but also by insisting that it is vital to implement it, and the due is seen as indispensable from blessing and perfection (Shishkin, 2007). Thinking about the world becomes a project of its transformation. Hence the titles of his works: not a “Philosophy of Time”, but “Mastery over Time”, or, in the first edition, “Overcoming Time”; not “Philosophy of the History”, but “Mastery over History”; not “Philosophy of Culture”, but “The Culture of the Future”.

Culture is one of the subjects that unite all the parts of Muraviev’s complex body of works, that are multidimensional and of different genres, from the above-mentioned treatises

to “Sophia and the Centaur” (1921–1925), a philosophical mystery written in the form of Plato’s dialogues, from the play called “Death’s adviser” (1927) and the science-fiction novel “Isle Buyan” (1928) to social-political articles printed in such literary magazines as “Russkaya mysl” (“Russian thought”), “Russkaya Svoboda” (“Russian Liberty”), “Narodopravstvo” (“Popular sovereignty”), “Zarya Rossii” (“Russia’s Dawn”), the book of essays “From the Depths” (“Iz glubiny”); from reports and reviews that appeared, often anonymously, on the pages of the “Organizatsiya truda” (“Labor management”) magazine to philosophical aphorisms “buried in a desk drawer”, the very form of which was a manifestation of the philosopher’s principle of the relation between the part and the whole, the One and His Hypostasis.

The understanding of culture as a tradition, as something where the “humankind’s memory” is enshrined, as the continuity of generations (the article “Unknown Russia”, 1914) (Muraviev, 1998: 25–45) that was characteristic of Muraviev’s early works and was similar to the ideas of the Slavophiles, was replaced in his more mature works — the philosophical mystery “Sophia and the Centaur” (1924–1925), the “Mastery over Time” (1924) and his work “The Culture of the Future” (1926) — with regarding culture as a cosmogonic force that overcomes entropy and death, transforms the being, perfects man. Between the starting point of the development of the philosopher’s thought and its end, brought, first, by the arrest in 1929 and then, by his death from typhoid fever in the exile next year, there is a number of milestones and each of them (which makes Muraviev’s viewpoint special) is not abandoned, but, though transformed, takes part in the final synthesis.

Among these milestones, of special significance are Muraviev’s articles in the weekly magazine “Russkaya svoboda” (“Russian Liberty”) (1917), written in the year that began with the demise of the tsarist autocracy and the declaration of liberties and rights, and ended in the Bolshevik revolt. Soon after the February Revolution Muraviev, full of social enthusiasm, expresses his belief in the opportunity to revitalize Russia, to create the supreme, communal² forms of state organization based on spiritual unity and formulates “an ideal of a culture-based state”, which “is a combination of people’s particular aims all melted into the harmony of their uniquenesses” (Muraviev, 1917: 21). This ideal is opposed to the common, already established model of an “economics-based state” tailored to fit the “imperfect” man who needs material incentives and whose life is based on his, private, interests. The “economics-based state” with its down-to-earth, secular objectives downplays culture, leaving it the role of a sponger. The other, higher model, the “culture-based state”, places culture in the focus of the development and sees it as a basis for action. And the culture itself changes. It is no longer a culture of individuals who burst ahead leaving behind the pitiful, illiterate mass of people behaving automatically — it is a “communal culture” (Muraviev, 1917a: 19).

Muraviev understands that the ideal he declares goes beyond the conventional model of the state and that the legal-economic principle the autocracy is based on is replaced with a religious-ethical one. He follows, literally, the course in the country’s evolution set by Fedor Dostoevsky in his novel “The Brothers Karamazov”: transforming the state, “from a society almost heathen in character into a single universal and all-powerful Church” (Dostoevsky, 1972–1990. 14, 61). Muraviev repeats Dostoevsky’s words with one significant addition — he names the tool for this metamorphosis: “The church — this is the ultimate ideal for the state. <...> It is the Church that the Russian Revolution has as its outcome, to which it makes progress through culture” (Muraviev, 1917: 22). Culture, in Muraviev’s view, is like yeast that

² “Communal” is used here and later to translate the Russian adjective “соборный”, which is closely related to the notion of Sobornost (“Соборность”), a free spiritual unity of people both in religion and in the secular life, characterized by brotherhood and mutual love.

ferments the dough of history, alters people's feelings and thoughts. Moreover, in a state that is being transformed into the church culture reveals a quality that has been neglected through centuries of secularization: it becomes a religious action thus representing its etymological sense: 'cultura' ("tilling", "cultivation", "taking care").

It was not long, however, before the hopes that the February revolution would make for a new, mature way of life, in which "law" would disappear "taken over by culture" and culture would become "religion" (Muraviev. 1917: 22) faded away. Social tension was aggravating and Muraviev strived in vain to show the ideologists of the "class socialism" that it was impossible to build a well-balanced society on the gap between social strata; in vain was he repeating that achieving equality through forced uniformity is anti-cultural; that the right for hatred deforms the personality and awakens that very base, malign force that culture is meant to cleanse and improve. Then came the October 1917, bringing the dissolution of the Constituent Assembly, the horrors of the civil war, chaos and destruction in the country. This was the period when Muraviev created the first drafts for his "Sophia and the Centaur", with apocalyptic images of desolation and the end of life: the desolate, grassed-over Kremlin, knocked-down crosses, demolished buildings, desecrated churches, squalid, beast-like people resembling Herbert Wells's Morlocks who fight for food — and the cynocephali, the new superiors, people with dogs' heads zooming in the air on motorbikes. The black gap, the collapse of the state, loss of historical consciousness and man's degradation to a beast-like condition — these are the consequences of the loss of a religious dimension of life, of the culture, that "assembles" the society and man.

It was, in a sense, an antithesis to a thesis voiced on the pages of the "Russkaya Svoboda". However, Muraviev did not stay long at this point: the position of denial giving right for the underground "sitting-with-the-hands-folded" (Dostoevsky, 1972–1990. 5: 108), as well as a life of a dreamer were not for him. At the same time, the soviet power was starting to reassemble and restore the country and its destroyed economy. In his debate with Trotsky, that unfolded in the end of 1919 — beginning of 1920, Muraviev attempts to define historical construction on a different, higher scale once again: he is prepared to partially accept the Bolsheviks' position, but emphasizes their narrow-mindedness in what refers to their ideas and the construction that is determined and prescribed by the new ideology. In the philosopher's view, the Third International is an emasculated, secularized Third Rome, an attempt to create a false pseudo-theocracy having nothing in common with the truly religious dimension of life, an attempt to create a new proletarian culture without realizing what the ultimate purposes of culture are. At the same time, Muraviev, disposed to action and projectivism, expresses his readiness to take part in the new construction, hoping to expand its scale. Even more so, the life-building public sentiment of the time was much stronger than that of the authorities. According to Svetlana Semenova, "one can speak of a general post-revolutionary, cosmic, active-evolutionist current of thought", of "new themes of the universal labor, of radical transformation of the world and the human nature, of combating death and achieving mastery over space" (Semenova, 2001: 11) that there were in the air at the time.

In 1922 in his poem "the Fourth International" Vladimir Mayakovsky came up with the slogan of "the third revolution of spirit" that should follow the October. Mayakovsky was apt to express the sentiment of many of his fellow literary workers who were wishing for not only a social but also a planet-wide transformation, for a reasonable, creative regulation of the matter, for the future immortal humankind breathing life into the universe. Such dreams were voiced by the poets of the "Kuznitsa" ("The Smithy"): Ivan Filipchenko, Mikhail Gerasimov,

Vladimir Kirillov; were represented in the early works of Andrey Platonov; those of Sergey Yesenin and Nikolay Kluev, Velimir Khlebnikov and Vladimir Mayakovsky himself. The “biocosmic” movement headed by an anarchist poet Aleksandr Svyatogor (Agienko) and a political writer Pavel Ivanitsky, who was interested in Fedorov’s ideas, came up with the slogan of “immortalism” and “interplanetarism”, reproducing the philosopher’s idea of the urge to overcome the two fundamental restrictions for the humanity, those of space and time, on a different level (Nikolaj Fedorov, 2008: 405–418, 1103–1105). Artists, architects, engineers, suprematists and constructivists, were making projects for the future, cherishing the dream of “a man able to fly”, of space cities and settlements on the Moon and Mars (The Avantgarde, 2014), and Vasily Chekrygin, an intellectual artist relied on Fedorov’s theanthropourgic aesthetics and placed a future man-artist, who would be the planner and helmsman of the creation, regulating and creating its own nature, making it no longer suffering and mortal, but immortal and perfect, in the centre of the new art (Chekrygin, 2005: 214).

It was in the framework of this cosmic-transformational current of the Russian philosophical thought of the late 1910s — early 1920s, which Muraviev’s theory started to develop. At that time he acquainted with Fedorov’s “Philosophy of the Common Task” and his belief that philosophy can not only think of the future, but also make a project of that future, gained a new, unwavering pillar. Muraviev found a close relation and similarity between his understanding of culture and Fedorov’s one: the thesis of the necessity to turn from the culture of the “false resurrection” to the culture that would be able, coupled with scientific knowledge, to restore life and become a “re-creature” (Semenova, 2004: 334–335), and that, at the same time, would not be confined to the earth, but spread farther, to the universe; of the “Copernicanist architecture” to become an art of space construction and of increasing regulation of “the Solar and other star systems for the sake of restoring them and governing them by reason” (Fedorov, 1995. 2: 243).

Fedorov, at that, views the space action of the humankind from a religious perspective, not a one-dimensional, secular one, presenting it as keeping the commandment “to take possession of the land” that was given to Adam when he was created, as obedience to Christ’s will “Be perfect, <...> as your heavenly Father is perfect” (Matthew 5:48). This is of special importance for Muraviev, who endows culture with a religious perspective. Since the acquaintance with Fedorov’s ideas had been made, Muraviev’s intuitions about the future synthetic religious culture were given a creative impulse. In his notes about religious and philosophical subjects, in his philosophical diary of 1920–1922 and in the first drafts of the “Sophia and the Centaur”, the image of the Church takes on a truly cosmic dimension, goes beyond the boundaries of time and history and expands so that it equals to the image of the universe in which the death and division are overcome; to the image of the “new heaven and the new earth” given in the last chapter of the “Revelation”; and also to Gnostics’ mystical way of viewing the Plerome. “All the worlds, all the hierarchies of living creatures are related in the cosmic church” (Muraviev, 2011. 1: 499). It embodies not simply a perfect organization of the society, but a perfect syzygy organization of the being, coming to replace the “double impenetrability” of creatures and things, which Vladimir Soloviev regarded as a sign of the fallen world (Soloviev, 1988: 540–541); it embodies the complete unitotality, the absolute life. The Church is the universe in a state of being perfect. At the same time, it exists in a historical dimension, as a dynamic all-encompassing unity; it is a Hodegetria leading the world and man on their way to theosis. She allows persons, who are like separate atoms, who do not remember being all initially kindred and, therefore, are in a sense ‘incomplete’, ‘not integral’, ‘fraction-like’ — She allows them to feel themselves not merely parts of the whole,

but the whole, since, according to the “law of the hypostases”, a microcosm for Muraviev, (as well as for Plotin, whom he considered the greatest thinker of the Hellenic period) “is at the same time <...> a macrocosm viewed from a specific perspective” (Muraviev, 2011. 1: 499). Muraviev’s philosophical-visionist essay “Man in Life” (“Человек в жизни”, 1925) depicts a new man, equal to the universe in his inner, spiritual power, who reveals it in action: “This is Adam Kadmon from the ancient books, who has become aware that he is a Microcosm, driven by a single urge and strong with a great power, like everything that goes to space and finally finds its place in the creation” (Muraviev, 2011. 1: 50). Every person, at that, is related to all the other ones and to myriads of living creatures in the world, related “not by some one part of themselves, as it is sometimes the case with earthly unions, but wholly, with all their being and action” (Muraviev, 2011. 1: 50).

In his “Man in Life” Muraviev literally reproduces the idea of the “cosmic growth”, which Vladimir Soloviev spoke of; the ladder of life that appeared in Henri Bergson’s “Creative evolution” that influenced Muraviev’s thought no less than Fedorov’s “Philosophy of the Common Task”. For Bergson the “*élan vital*”, that determines the upward development of life forms, is characteristic only of living creatures (“an animal relies on a plant, a man rises over animals, and the humanity, in time and space, appears as an enormous army that is running by our side, in front of and behind of us, carrying its burden, able to overcome any resistance and many impediments, perhaps, even death” (Bergson, 1998: 264)). Muraviev reproduces the intuitive thinking of the ancient philosophers about the living Cosmos on the new stage of development and, sharing his understanding of personalism with Nikolaj Lossky, who endows everything that exists, even an electron, with a potential for personality, and from his perspective the creative, upward movement is proper to any elements of the universe: “Our space, with all the worlds and their inhabitants, as numerous as grains of sand on a seashore <...> is not static, but carries out a great work by joined forces” (Muraviev, 2011. 1: 51). It is this “great work” that, in Muraviev’s view, is “culture” in all its scope. Culture is seen as a process of transforming the universe, bringing it closer to the state of the Church, the world’s enlightenment.

The same image of the culture as a “common task” and a “liturgy beyond cathedrals” that defeats evil, chaos and death appears in the philosophical mystery “Sophia and the Centaur” (finished in the same year, 1925), in the heroine’s dialogues with her companion Kitovras and the constructors of the “New Bensalem”. This culture of transfiguration is opposed to previous cultures, that “were based on aggressive exploitation, on using and keeping the divisions”, as it “makes all the members of the humanity participate in the transformation of the world, unites them in the common rhythm of a powerful, cosmic endeavour and resurrecting, by their joined force, all the living ones. What is more, it gives all the world’s creatures an opportunity to become “creatures intelligent and conscious”, so that finally “all the nature is involved into the great process of transformation of the world, mastering time and creating a new heaven and a new earth” (Muraviev, 2011. 1: 393).

Along with the mystery, in which the idea of a universal, communal culture that brings about the world’s transformation was expressed fully and comprehensively, without reference to the censure, Muraviev was working on the book “Mastery over Time as the Main Purpose of the Scientific Organization of Labor” (1924). As distinct from the religious works that were doomed to be “buried in a desk drawer”, this book was designed to be allowed for publication in the Soviet Russia. In this book, Muraviev, relying on the *sapienti sat* principle, strived to explain the cosmic scale of social action that was a subject of his debate with Trotsky. The task was of current importance then, as Trotsky in his speech at the fifth anniversary of the

Sverdlov Communist University declared against cosmism in proletarian poetry when he was speaking about the essence of revolutionary character of life and about the role of the teacher of the new man, who carries the idea of revolution. He also made a clear statement that any “cosmic” revolution striving “to build bridges, yet unknown and unheard of, to other worlds in space”, is out of question; that a constructor of the future is a “concrete man of this time” and that there is not an abstract, cosmic, but a quite special, historical and political sense behind it (Trotsky, 1923). Muraviev disagreed with Trotsky once more, being against such a simplification; he emphasized that a true revolutionary character of life involves not only a social, but also an ontological shift and that “the day after the revolution is the day to master nature” (Muraviev, 2011. 2: 390; for more detail, see: Gacheva, 2017). Thus, in his book with a name suiting well the general mood of the 1920s, the time of the inspiring idea of a scientific organization of labor, he endows the transforming human activity with cosmic, ontological character by understanding labor as a planet- and space-scale transformation, as a collective action that perfects social relations and, what is more, the being itself.

In this book, as well as in the collection of articles called “Laborology” (1924), compiled together with Aleksandr Gorsky and Nikolay Setnitsky, his like-minded fellow cosmists, organization of labor, viewed from the perspective of Fedorov’s projectivism, becomes the “organization of the world-impacting” (“организация мировоздействия”; the term coined by Aleksandr Gorsky) — (Gorsky & Setnitsky, 1995: 143)), and “transformation of space” and the establishment of a “cosmocracy and and pantocracy” of the humankind, giving life to nature and transforming it “from an uncontrollable and chaotic world devoid of reason and full of conflicting forces into a world as a perfect whole permeated and governed by reason” (Muraviev, 2011. 2: 145) are declared the ultimate purpose of culture.

The cosmists of the 1920s, Valerian Muraviev included, spoke, like Nikolay Fedorov, Vladimir Soloviev, Sergey Podolinsky and Nikolay Umov before them, of the anti-entropic nature of labor and cultural activity of the humankind. The same ideas were expressed by Pavel Florensky. In his Auto-abstract written in the mid-1920s for “The Encyclopaedic Dictionary of the Granat Russian Bibliographical Institute”, he defined the bases of the creative outlook in the following way. The major law governing the world is the Second Law of Thermodynamics, the law of entropy viewed in the broad sense, as a law of the Chaos in all the parts of the universe. The world is opposed by Logos, the source of negative entropy. Culture is a conscious struggle with the levelling process in the world; it consists in isolating and slowing down that process in the universe and increasing the potential in all areas, it being the essential prerequisite for life, as opposed to the equality as death (Florensky, 1988: 114). Muraviev views culture in exactly the same way, as a basis for organizing the world, its ‘cosmisation’ as a transforming and creating (in religious terms — transfiguring) activity of man. It is far from being excessive or unnecessary; it is as an important element of the being as life and consciousness, essential for preserving and increasing them.

Thus, creating culture is seen as an evolutionary duty of man that (the idea that Muraviev did not mention in his “Mastery over Time”, but expressed in his obscure works on religion and philosophy) at the same time, is his religious duty. Like Fedorov, who addressed his idea of the common task “to the religious and the secular, to the believers and atheists” (Fedorov, 1995. 1: 35), Muraviev develops his idea of culture in two frameworks: the pages of the mystery and the philosophical diary are devoted to culture as a theanthropic communal creation process and addressed to his fellow religious and philosophical thinkers, while the “Mastery over time” and other works ready to be published in the Soviet Russia ‘speak’ to a person of that time, who rejects the religious dimension of his action, and it is the active-

evolutionary sense that comes to the fore in it. Both discourses, however, involve the idea of cosmic, creative type of action itself.

Muraviev distinguishes between two types of creative culture viewed as a tool for the world's transformation. The first one, called symbolic, is closely related to the projective nature of culture and is most readily realized in philosophy, science and art, since these areas investigate reality, create ideal projects of world transformation. The second one, the "real culture", includes "those types of activity that actually — not symbolically — change the world around us.). These are: economics, production, agriculture, technology, medicine, eugenics, applied biology, pedagogy etc." (Muraviev, 2011. 2: 133). These two cultures are divided now, but in the future culture, with its consciously set purpose of regulation, the "theoretical and symbolic activity" and the real, labor-related one will go hand in hand, and what is only a symbolic acting now should grow into a real "creation of life".

The concept of culture as cosmocracy reaches its maturity in Muraviev's work "The Culture of the Future" (1926). In this book the philosopher, relies on his doctrine of messianic acts by which he understands acts of history, uniting the individual and the general action and considers different aspects of the future cultural work: "the ethical and spiritual transformation of man", the "the physical transformation of man", "the transformation of social groups", "the transformation of things", "the transformation of organisms", "the transformation of the space wholes" (Muraviev, 2011. 2: 640). In this work, as well as in the article preceding it, "the General Productive Mathematics" (1923), the philosopher, following Fedorov's ideas, insists that regulation should have an effect not only on the world around, but also on the psycho-physical sphere. A synthetic culture striving to overcome time and space, establish "cosmocracy and pantocracy" of the humankind, should purposely develop applied sciences dealing with "an issue of perfecting man biologically", "transforming and renewing" his physical nature (Muraviev, 2011. 2: 137–138). He anticipates the future development of a "special kind of art connected with the improved anthropology", calling it "anthropourgy" (Muraviev, 2011. 2: 137–138). The cultural-transformational action reaches its apogee, combining the symbolic and real practice in the same act, making for the active appliance of the achievements of medicine, chemistry and genetics in the process of perfecting the human organism. "Perhaps, in the future, new combinations will be invented, without any of the disadvantages of the modern organic matter. New bodies will be created, more flexible, powerful, and more mobile. They will move at enormous speed, they will consume light and the gravity will affect them at a lower degree. At the same time, they will be able to think, and feel, and touch, and act over a distance" (Muraviev, 2011. 2: 177). Muraviev even predicts the possibility to control the process of the appearance of a new life: there will no longer be any "unconscious birth", but that resulting from a collective "communal" act of creation: "as musicians in an orchestra achieve a good ensemble, and the combination of the inspiration, temperament and technique of each person gradually gives rise to the symphony they perform, the creators of the new man should unite in the same harmonious revelation of the mentioned ideal (Muraviev, 2011. 2: 175).

Interestingly, the "transformation of organisms" was to take place, according to Muraviev, not only within technology and science, but also as a result of the inner, psycho-physical regulation. In addition, he anticipated such a course in the development of the spiritual and mental spheres that would make it possible, like yoga practices, to control one's own organism by power of thought and spirit; moreover, a "wireless connection" would be achieved to other people, and to animals, and to "the infinitely little creatures" in the world, up to atoms and molecules, as well as "guiding them towards a religious and cosmic ministry" (Muraviev, 2011. 1: 499).

With all the futuristic daring and sometimes radical character of Muraviev's ideas of the 1920s the notion of tradition, dominant in his early works on culture, is still present here, but in a new, more profound version. It manifests itself in a most clear way in Muraviev's handling of the subject that was of the highest importance for Fedorov — that of the resurrection. The past is not rejected by the philosopher, who does not support the idea of the linear progress, does not pass into oblivion. It stays in memory, is imprinted on the name, on the 'recipe' for a thing and can, therefore, be recreated and resurrected.

At the end of his book "The Culture of the Future" Muraviev writes about that remote future of the human activity when it could expand beyond the Earth. As distinct from the "Man in Life", in which the philosopher presents his ideas of the cosmic future in the form of a mystical-allegorical vision, reminding of the Old-Testament prophets and famous mystics, like Emanuel Swedenborg, the "Culture of the Future" depicts events that could well appear on the pages of a science-fiction novel — and this genre, unlike the fashionable fantasy fiction, is of a predictive, projective character. Inspired by the famous image of the Earth transformed into a spaceship, that appears in Fedorov's "Philosophy of the Common Task", Muraviev imagines how our planet, "like a spaceship operated by earth-navigators", "would not go in an orbit determined from outside, but follow the course chosen by scientists relying on their own complex calculations"; how "the conscious dwellers of planets would have the opportunity to communicate and together develop a plan to conquer the Sun" and how after that they would become sun-navigators and go, by a controllable Solar system, to other star worlds" (Muraviev, 2011. 2: 225, 226), meeting on their way dwellers of other galaxies, also conscious creators. And, as a response to possible skepticism reminding that modern science and technology have their boundaries, he argues, (his ideas in keeping with those of the projectivists Nikolaj Fedorov, Konstantin Tsiolkovsky, Vladimir Vernadsky): "we know from experience that these boundaries are not absolute, and there is every evidence that they will be pushed forward at an increasing pace, and intelligent creatures will follow farther, conquering space" (Muraviev, 2011. 2: 226).

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Human Education towards Goodness. The Potential of the Kantian Concept of “Perpetual Peace” in Shaping Future Peaceful Relations among Nations

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Immanuel Kant is the author of the project of “perpetual peace” as a concept for a global federation of states remaining in peaceful relations towards each other. According to the philosopher, in order for such a federation to be possible at some time in the future, individual states need to be institutions which respect their citizens’ right of self-determination. An additional necessary condition for the future implementation of “perpetual peace” is the appearance of at least one state with a republican system of government. The German thinker saw that as the first step towards realising “perpetual peace”. According to Kant, “perpetual peace” is not only limited to the existence of a certain set of institutions, appropriate laws, or external relations among states and individual people. “Perpetual peace” chiefly demands that people internalise the following obligations: 1. peaceful conduct towards others; 2. hospitality; 3. fairness; 4. respect towards the self-determination of others; 5. self-sufficiency; 6. respecting the freedom of others; 7. refraining from actions which might raise distrust in others. Based on those requirements, the philosopher suggests that the fundamental condition for a future existence of “perpetual peace” is the proper moral education of people.

Keywords: Immanuel Kant, “perpetual peace”, human, human obligations, education, future peaceful international relations

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Introduction

In the search for possible solutions to the current challenges faced by humanity, and also those which could be posed in the foreseeable future, it always seems prudent to reach to the thought of time-honoured authors. It would be an error to reject their heritage solely for the reason that they lived in different circumstances and the given challenges were completely unknown to them and, hence, one would not expect to find anything valuable

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in their deliberation in the context of our current and foreseeable problems. As it turns out, the achievements of many thinkers of distant times contain useful potential for adequately addressing the existing or expected challenges of contemporary life. For example, the thought of Immanuel Kant is helpful in one area currently undergoing lively debate, that of copyright protection (Kieliszek, 2016: 9–23). The works of another great German philosopher, Johann G. Fichte, is pertinent in the solving of problems brought on by the modern process of globalisation (Kieliszek, 2018: 83–91).

Among the many challenges faced by humanity at present, one of the most pressing is without a doubt the question of conditions, which would increase the likelihood of future peaceful relations among nations. And so — reflecting the conflict between the adherents of liberalism and communitarianism — one of these conditions seems to be the recognition of the ontic–functional status of the nation as a natural community, which guarantees the protection of an individual’s freedoms, and allows an individual to achieve fulfilment as a social being (Kieliszek, 2017: 9–20). The search for other conditions necessary for a future global peace leads one to analysing, among others, the works of Immanuel Kant. This author’s formulation of the influential concept of “perpetual peace” laid the foundations for the creation of such important international organisations as the United Nations and the European Union (Świrski-Czałbowska, 2005: 70; Przyłębski, 2011: 105–118). Furthermore, Kant — similarly to Thomas R. Malthus — was realistic in his assessment that a complete and enduring elimination of conflict among people is not possible, even if the conditions were met in the future for peaceful shaping of human interactions (Kieliszek, 2019: 1–10). We may therefore expect in Kant’s work some interesting recommendations for what should lie at the centre of humanity’s interests if we aim to successfully decrease the number of international conflicts in the future, while simultaneously respecting human liberty.

Crucial to the discernment of this potential in the enormous heritage of Kant is noting the import of his distinction between culture and civilisation. Far from being just another nicety in Kant’s thought, this distinction sheds light on the idea of “perpetual peace”, allowing us to capture its depth and potential for shaping future relations between nations to be as peaceful as they can possibly be.

The intention outlined above determines the course of the present discussion. Firstly, Kant’s idea of “perpetual peace” will be briefly described. The distinction between culture and civilisation will then be outlined, as proposed by the German philosopher. Subsequently, the Kantian concept of “perpetual peace” will be presented in the light of this distinction; specifically, it will be shown that the order of “perpetual peace” has two “strata”, those being the cultural stratum and the civilizational stratum and, furthermore, that it rests on a foundation of specific moral values. In the later course of the paper, the Kantian concept of human education towards goodness will be outlined. Finally, the potential of Kant’s thought for the future shaping of the international order in peaceful ways will be presented.

An outline of Kant’s idea of “perpetual peace”

The Kantian concept of “perpetual peace” presents a vision of a world-wide federation of states with republican systems of government, which remain in stable peaceful relations with one another (Kant, 2011: 447–448). According to Kant, the formation of this global federation should be the constant goal of humanity (Kant, 2011: 454–459). In turn, the initiation of the process leading to “perpetual peace” would be the creation of the first state with a republican system of government. Kant postulated that this first republic would “infect” other states with

its governmental system, beginning with its neighbours, which would eventually lead to the global federation of states and the inception of “perpetual peace” (Kant, 2012a: 345).

The philosopher postulated that the rules of a republican order are liberty, equality and equal standing under the law for all citizens. A republic has the most desirable form of social organisation for countries, since it is a system, which respects human self-determination. Furthermore, in a republic, citizens are treated as both the means and the goal of a society’s existence, and they treat their own interests on a par with those of others and of the community as a whole. Finally, according to Kant, a state with a republican system of government is a just state (Kant, 2012a: 339–340).

For analogous reasons, an association of republican states into a federalist-type union is considered by Kant to be a desirable form of international order, since it is an order based on the freedom, equality and the subjection of member states to equal laws. Individual members of a federal union have a completely equal status, which enables the just conduct of their mutual relations (Kant, 2011: 448–449). Furthermore, a federation guarantees the independence of each country, and its interests are treated by other countries on a par with their own, and those of the whole union (Kant, 2012a: 356).

Kantian distinction between culture and civilisation

Kant’s thinking is characterised by many distinctions, many of which have a dichotomous character. The most famous of these are such pairs of terms and entities as: 1. *a priori* and *a posteriori*; 2. phenomenon and noumenon; 3. analytic propositions and synthetic propositions; 3. senses and intellect; 4. time and space; 5. morality and legality.

On the other hand, the distinction made by the philosopher from Königsberg between culture and civilisation is raised only on rare occasions. Meanwhile, it is quite a consequential distinction, if only because of how typical this understanding and presentation of culture and civilisation became in German philosophy (Betz-Bornstein, 2012: 17–18; Tarasiewicz, 2011: 80–81). Furthermore, it sheds light on Kant’s concept of “perpetual peace”, allowing one to see that it is, at its core, a moral project.

As described above, Kant had a profound impact on the establishment of the distinction between culture and civilisation, typical for the later German literature. It is worth noting, that this distinction was not adopted in the francophone and English language traditions, where the two terms are, for the most part, used interchangeably. Both terms are used by non-German scholars to denote the material artefacts of human construction, the set of social institutions, and the entirety of external interpersonal relations, to the almost complete exclusion of the internal sphere of human life. Meanwhile, for the Germans, who have been shaped by Kantian intuitions, “culture” refers primarily to the internal sphere, while “civilisation” refers to the material effects of human activity, the system of social institutions, and the sphere of external human relations shaping a given community. The sphere denoted by “civilisation” is also perceived by the German thinkers as a reflection of the ideas, values, or convictions adopted internally by the members of the community (Skrzydlewski, 2001: 340; Krapien, 2005: 133).

According to Kant, the internal sphere of human life is essentially shaped in the process of education, or upbringing. This means that the way a given person is educated profoundly impacts the attitudes which will be adopted by them, what convictions they will hold and what use they will make of their freedom. In Kant’s view, in the process of education, each person is enculturated, in the sense of being equipped with particular patterns of behaviour, convictions and values (Kant, 1999: 41; Kant, 2005: 299–300).

In turn, benefiting from the material creations of human activity, social institutions, and external relations between people serves, according to Kant, to civilise a human being. The sphere of civilisation, in addition, makes manifest the internal values, convictions, and stances held by people (Kant, 2012: 34–35). One can therefore say that, in the Kantian understanding, culture is the ideological substrate of civilisation.

Cultural and civilizational “stratification” of “perpetual peace”

The distinction between culture and civilisation outlined by Kant allows one to see that the order of “perpetual peace” which he postulates, presents itself as “stratified”, i.e. that it is composed of a cultural stratum and a civilizational one.

This means that the Kantian vision of a republic and of the global federation is not merely limited to the appropriate external organisation of given institutions, solutions or the outward relations between citizens and individual countries. The Kantian project of republic and federation also involves a substrate which can be identified as “culture”, in the Kantian understanding of the term. In other words, “perpetual peace” does not only concern the sphere described by Kant as “civilisation”, meaning the given set of institutions, laws and modes of cooperation between its entities (Kant, 2012: 35–36). The project also includes specific convictions, values and patterns of behaviour, which have been internalised by people (Kant, 2012: 40–41).

Furthermore, in the light of the Kantian distinction between culture and civilisation, one could say that the philosopher rested the outward organisation of the republic and the global federation on something internal to them, this being the very values, convictions and modes of behaviour which each person adopts as their own and which, in aggregate, are understood by the Kantian term “culture”. In this light, the (internal) cultural substrate is primary with respect to the stratum of civilisation, organising the outward form of the republic and of the global federation in “perpetual peace” (Kant, 2012: 40).

It seems justified to say that according to Kant, the necessary condition for the realisation of “perpetual peace” is not so much the proper external organisation, regulating the interactions between the country’s citizens, or between the participating countries, as it is a more internal adoption by people of proper convictions, values and patterns of behaviour (Kant, 2012a: 344–345). This poses the obvious question: what convictions, values and, specifically, patterns of behaviour (In Kant’s terms — maxims, i.e. general moral rules of behaviour) would, in the opinion of the philosopher, lay the foundations for “perpetual peace”?

Kant’s vision for the moral foundations of “perpetual peace”

According to Kant, the internal sphere of human life is generally regulated by four classes of moral duties: 1. perfect duties of a person towards oneself; 2. perfect duties towards others; 3. imperfect duties towards oneself; 4. imperfect duties towards others. All four classes regulate human behaviour by indicating what a person must do under any circumstances, and if they leave some latitude (imperfect duties), it is not in the sense of their operation being suspended, but only in giving a person a choice as to the way in which they will be satisfied (Höffe, 2003: 168–183).

In the light of Kant’s heritage, one may say that among these four classes of duties, the realisation of “perpetual peace” (which is a project for regulating relations among people) rests first and foremost on perfect duties towards others. According to Kant, these are the only duties, which regulate human interaction and at the same time bind the individuals

subject to them in equal and reciprocal ways. Other classes of duties seem secondary to the project of “perpetual peace”, since they regulate the relation of a person to oneself, and thus do not concern interpersonal relations at all (as in the case of perfect and imperfect duties towards oneself); or, as in the case of imperfect duties towards others, in spite of concerning interpersonal relations, they do allow relative prioritising of certain areas of their operations versus other areas (depending on finite human abilities in the given circumstances), and thus are not equal and reciprocal in nature (Kant, 2011: 501–503, 533–538, 570–572).

Bearing in mind the above suggestions, as well as Kant’s remarks on the general conditions for “perpetual peace”, one might create the following catalogue of the moral duties (maxims) foundational to the order of “perpetual peace”: 1. peaceful conduct of people towards each other; 2. hospitality towards strangers; 3. fairness towards others; 4. respecting others’ self-determination; 5. striving towards self-sufficiency, i.e. living at our own cost, and not that of others; 6. respect for others’ autonomy; 7. strictly refraining from actions which might raise distrust in others (Kant, 2012a: 333–349). The adduced duties belong to the class of perfect duties towards others, since they regulate interpersonal interactions and they are equal and reciprocal for both parties.

The philosopher from Königsberg seems to be expressing the view that the condition for the realisation of “perpetual peace” is a peaceful, hospitable and fair conduct among people, while respecting others’ self-determination and autonomy, striving for self-sufficiency, and cultivating trust. In other words, until these patterns of behaviour become ubiquitous among people, “perpetual peace” will remain nothing but a dream. In consequence, we now reach the question of the Kantian project of popularising proper behaviours in people.

Kant’s concept of human education towards goodness

According to Kant, a human being differs from the animals by being born not fully formed. A new-born human is equipped with merely the seeds of humanity, and requires not only feeding and care but, just as importantly, the help of other people, e.g. those with more life experience, in developing his or her own humanity to the fullest. Hence, in his work *On Pedagogy*, the philosopher postulates that a human being should be exposed to four external influences during development: 1. the practice of discipline and obedience; 2. teaching various practical skills; 3. civilising; 4. moral education (Kant, 1999: 41–50).

The first of the mentioned influences is intended to harness the natural human wildness and the tendency to act in ways harmful to the individual and the society at large. According to Kant, discipline consists primarily in negative interaction with the pupil, since it involves various forms of coercion from the pedagogues. The second influence serves to equip the individual with skills, such as reading and writing, which will be helpful in reaching goals and performing tasks. The third interaction is intended to socialise the individual, to prevent them from committing illegal acts, to allow them to garner respect and sympathy, and to display good manners. Finally, the fourth interaction should direct the individual to select good goals in life, i.e. such that could be considered worthy and morally valuable by anyone. Especially, individuals should be taught to fulfil perfect and imperfect moral duties towards themselves and others. The common goal of all four influences is to bring an educated individual as close as possible to the ideal of human perfection.

The philosopher noted that should the process of education be limited to only the first three of these four influences, human beings might be with relatively little effort trained similarly to animals, i.e. to have mechanically inculcated in them what should be done in a given situation for the actions to be harmless or beneficial for the individual and others, as

well as socially acceptable. But that condition of a human being would still be undesirable, since the person would not be using their own reason, following internally accepted maxims, but would only obey externally imposed rules of behaviour (Kant, 1999: 50). Crucial in the formation of humanity in a person is, according to Kant, the fourth influence, because it releases, in concert with the other three pedagogical influences, the capacity within a human being for a rational and maxim-driven use of their own freedom. One could say that Kant views moral instruction as decisive in the success of the educational process, while the other areas have a secondary importance (Kant, 1999: 54–55).

In his analysis of moral instruction, Kant observed that utmost care should be taken to eliminate in pupils vices such as, e.g. jealousy, ingratitude, satisfaction at the misfortune of others, meanness, unfaithfulness, squandering of wealth and health, disrespect for others, stinginess, sloth and lack of compassion. On the other hand, one should cultivate in them virtues such as: diligence, fairness, peaceful disposition, temperance, magnanimity, charity, and self-control. According to Kant, the first three of these are especially important, since they belong to the so-called virtues of duty, i.e. they are consistent with perfect and imperfect duties towards oneself and others. This means that, unlike virtues of merit (e.g. magnanimity, charity, self-control) and virtues of innocence (e.g. temperance), the virtues of duty are a necessary condition of moral uprightness, since they indicate what a human being must be like to be considered morally good at all. Virtues of merit and of innocence, meanwhile, are only an “addition”, elevating the individual to even higher levels of goodness (Kant, 1999: 79–91).

Among many practical indications offered by the philosopher regarding the process of moral instruction, a noteworthy suggestion is that from the earliest age pupils should learn to use their freedom in such a way so as not to harm themselves or others. As the child grows up, the requirements in this matter should be systematically raised (Kant, 1999: 53–54). Kant also recommends that in the process of moral instruction one should avoid both punishment and reward, especially excessive, since that will lead to self-interested and inauthentic stances in the pupil, instead of leading to the love of goodness for its own sake. A good way for the pedagogue to inform the pupil whether their conduct is moral or not would be approval in the first case, and disapproval in the second (Kant, 1999: 79–82). Furthermore, since the process of moral instruction is one of the most difficult undertakings, Kant demanded that the instruction of the next generation be entrusted to experts, rather than random people (Kant, 1999: 49). In turn, the experts themselves should rather inspire young people with the example of their own lives, than merely instruct them to behave well with theoretical moralising or harsh discipline (Kant, 1999: 52). Kant’s proposition of creating the “moral catechism” is also worth discussing. The philosopher postulated curating examples of situations explaining the moral course of action, with the expectation that as little as one hour is reading a day would make great strides towards moral edification of the populace (Kant, 1999: 89–90). The thinker also suggested that education should continue until a child turns 16, since this is the time when a person is most “malleable”, i.e. responsive to external influences of the pedagogues. For older individuals, other means are indicated, such as watching performances of literary plays, or reading particular books, as well as the indirect education by the proper sanctions of the positive law. However, moral instruction of adults — according to Kant — can no longer be as direct as in the case of children and adolescents (Kant, 1999: 53).

In Kant’s view, the principal task of education is the formation of a human being in such a way that they consistently act according to appropriate maxims and, in particular, that they fulfil moral duties. This process should, then, lead people to become diligent, fair, and peaceful towards others. This leads one to conclude that, according to the philosopher, the

realisation of “perpetual peace” is directly contingent on subjecting subsequent generations to the proper educational process and popularising desired behaviour patterns among the people.

Conclusions

Based on the discussion above, it is possible to conclude that Kant felt that the best way to achieve the fullest peaceful relations among people depended on proper moral education. The philosopher seems to suggest that the education of future generations towards goodness needed to be treated as a cornerstone in the realisation of “perpetual peace”. In other words, if “perpetual peace” is to ever become a reality, it will not be merely as a result of appropriate political or economic agreements, or military solutions, but thanks to the educational elevation of human morality to the proper level.

Following Kant’s intuitions in this regard, one could postulate that among the many initiatives undertaken by various state, regional, international, and global institutions in their efforts towards peace, initiatives for moral education must not be overlooked. In the future, constant care must be taken to promote among people the dispositions of peaceful coexistence, hospitality towards outsiders, fairness, respect for the self-determination of others, self-sufficiency, respect for others’ freedom and the inclination to foster mutual trust. Those future initiatives may take the form of properly profiled national educational programs in schools, academic conferences or films presenting appropriate contents.

This proposal seems especially timely now, since distrust of outsiders, noticeable in the context of the continuing waves of migrants arriving in Europe, breeds feelings of constant threat and uncertainty in many people, which in turn often leads them to become callous or even aggressive towards others. It is also easy to see the extent of cruelty and mercilessness that contemporary people are capable of. It is still not uncommon for a nation to attempt to subjugate another nation, or even to attempt to eradicate it. Furthermore, nowadays people sorely lack moral authorities and role models worthy of emulation. Finally, in the light of Kantian thought, one might fear that a significant threat to peaceful relations among people is the noticeable disarray of moral systems in the world, widespread consumerism and the focus of people merely on material, short-term gains.

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Evald Ilyenkov's Cosmological Reflections

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The article attempts to interpret the work "Cosmology of the Spirit" by the 20th century Russian philosopher Evald Ilyenkov (1924-1979). The analysis of this early text allows one to assert that its central thesis — "the matter cannot exist without thought" — proves the liberation from dogmatic, naturalism-oriented statements of official dialectical materialism. Liberation occurs as substantiation of the cosmic role of the reason. Liberation assumes poetic form, what is peculiar of this text. Thematically and problematically, it is a cosmological essay, but the thought here is built poetically, what is characteristic of the threshold forms of breaking the tradition and ordinariness. In this sense, "Cosmology of the Spirit" is perceived as finding a way to the main problems of creativity, what became thinking to Evald Ilyenkov. The authors have drawn a conclusion that the poetic character of Ilyenkov's cosmological reflections proves the work on surmounting both the official dogma and the down-to-earth ordinariness of everyday life. Cosmological problems take the thinker to the space of understanding the mission and sense of thinking rather than understanding the narrow technology utilitarian issues that the instrumental mind is busy. It was noted, that starting from the middle of his essay, Evald Ilyenkov prefers the term "thinking spirit", what removes the vulgar naturalistic understanding of the matter. It is thinking that becomes an important and effective cosmological actor. This gives grounds to speak of the noological nature of Ilyenkov's reflections, within which the main topic of his further creative activity is crystallised.

Keywords: Evald Ilyenkov, Spinoza, "Cosmology of the Spirit", thinking, poetry, liberation work of mind

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Introduction

An immediate incentive to analyse this subject can be the Slavoj Zizek's work *"Evald Ilyenkov's cosmology: the point of madness of dialectical materialism"* (Zizek, 2018). By its nature, it is rather an emotional response and an account of inspired associations related to the author's own philosophical attitudes than a focused consideration of the problems Evald Ilyenkov was concerned. At once Slavoj Zizek notes the special position of Evald Ilyenkov whom he considers to be a thinker trying to surmount both the style of Soviet dialectical materialism and the western Marxists' emphasis on social practice, by entering the "transcendental horizon which overdetermines our entire approach to reality, nature included" (Zizek, 2018). Slavoj Zizek states that such an approach "locates human practice in a wider frame of cosmology, but without regressing to a naïve realist ontology" (Zizek, 2018). It is significant that, objecting to Evald Ilyenkov, Slavoj Zizek centres the problems of subjectivity ("radical negativity" as the core of subjectivity). According to him, "this neglected dimension, foreclosed by transcendental thought, then returns in the real as the phantasmagoria of a total world-destruction" (Zizek, 2018). However, in spite of his initial view on reality as a self-regulated Whole, the central problems of Evald Ilyenkov's article seem to be somewhat different. This is a question of place, role and mission of the thinking mind in the Universe that has always been within the philosophical reflection. Every epoch gave an answer to such an inquiry. Therefore, the text by the famous 20th century Russian philosopher Evald Ilyenkov *"Cosmology of the Spirit"* is interesting for us even today as evidence of intensive brainwork, which, under political and ideological pressure, liberates itself from the official mainstream of its time. Liberation occurs as substantiation of the cosmic role of reason, what is prompted by the name itself, with a similarity to Hegel's *"Phenomenology of Spirit"*.

The place of *"Cosmology of the Spirit"* in Evald Ilyenkov's creative legacy

Evald Ilyenkov's works have been the focus of our attention since the students' time. Moreover, it is the work with his texts that became a thought-forming factor. Critical and analytical re-evaluation of the tradition that evokes reflection to the basis of one's own thought is viewed as an important component of the philosophical discourse. This is expressively proved by the philosophical attitudes of Immanuel Kant whose critical method does not make the subject of investigation as a centre of thought. The central subject of thought is the ability to perceive and reveal the primary basis of an act of thinking (Kant, 1964: 75-76). What philosophical tradition can Ilyenkov's creative legacy be referred to and what is the relation to it of *"Cosmology of the Spirit"*? How comprehensive is his own identification indicating "the principles of dialectical materialism" (Ilyenkov, 2107: 164)? These questions are evoked by the genre of the article that sounds as a bold challenge — "A Philosophical-Poetic Phantasmagoria" (Ilyenkov, 2107: 164). This genre by no means fits the tradition of the Soviet *diamat* (dialectical materialism). Alexei Penzin's version indicating that this specification is a means of protection (Penzin, 2018) is to some extent persuasive. Although, in all appearances, this text was not written for publishing. In this sense, it is not a means of protection from outside judgements but rather a gesture of liberation of one's own imagination. The sincerity of the Marxists' position is in little doubt. This makes even more surprising the atmosphere of suspicious distrust around his works in the Soviet Union, as most of Ilyenkov's investigators note. What is dangerous about Ilyenkov's philosophical attitudes? The most persuasive seems

a statement by Gennady Lobastov that “Ilyenkov was expelled from the faculty not because of his thinking and speaking in a different way. He was expelled just because it was he who was thinking. And thought itself was strange to practically all who pursued their activities in official philosophy, where thought was intolerable” (Lobastov, 2004b: 142). In other words, the official power authorities were suspicious about the statement that the central role of thinking was the main cause of philosophy. It is thinking that does not stop in its movement in front of unpleasant and unacceptable or shocking conclusions, what is demonstrated in *“Cosmology of the Spirit”*. An interesting aspect of importance of this work is shown by Alexei Penzin who reminded that philosophy starts with a feeling of astonishment. In this context, *“Cosmology of the Spirit”* is viewed as an intellectual thought-provoking shock: “The materiality of the philosophical text is itself nothing other than the durability of the astonishment it produces across generations. The persistence of an astonishment-effect is what makes a text classic” (Penzin, 2017). Gennady Lobastov points that *“Cosmology of the Spirit”* contains Kant’s problems of the “starry sky over the head” and “a moral law inside me” (Lobastov, 2004a:272). These two dimensions evoke astonishment that gives birth to an act of real philosophy. This act is understood as a constructive element of the mode that our mind can live in and which becomes a special subject of reflection in professional philosophy (Mamardashvili, 1991:59). Ilyenkov’s early text sets pace and scale of his thought what are the ordered universe and space.

The name of Evald Ilyenkov became a meme, though its notional trail is diverse. Evald Ilyenkov is still often associated with communist ideology that imitates philosophy and is known as diamat (dialectical materialism) and histmat (historical materialism). Due to this, it is important to set one free from the Soviet heritage that prevents from entering the world’s intellectual (and civilised) space. However, the recent review of philosophical publications in European journals has shown interest in Evald Ilyenkov’s legacy. His first article published as early as the 1950s was translated into Italian (Maidansky, 2015: 94). In addition, western thinkers kept strong attention to his ideas in the years that followed (Colletti, 1961; Bakhurst, 1991; Oittinen, 1992; Oittinen, 2011; Oittinen, 2014; Lotz & Cole, 2012; Vivaldi, 2017). Evald Ilyenkov formed his thought in the space of Europe-oriented philosophy. First of all, this does not refer to thematic objectless but rather to the method of organising the thought. This is “in Kantian view, a persistent spirit of criticism and self-criticism, with a strong feeling of respect to the human personality, its work, mind and culture” (Maidansky, 2015: 93). However, it would be a pressing stretch to oppose his thought to the Russian philosophy, which, according to Maidansky, ignores Spinoza’s advice: not to cry, not to laugh and not to curse, but to understand, and cultivate the emotional reception of the world against the logical thinking (Maidansky, 2015: 93-94). For all that, the interests of Ilyenkov’s thought are dominantly focused on Logic. The capital letter he used in this word indicates its special status: Logic centres on anthropological problems, on birth and formation of human personality as a unique individualisation of the universal what leaves behind the rough antinomy of individualism and collectivism. Ilyenkov’s thought accepts as natural and organic the philosopheme of unitotality that is immanent in antique cosmology. Though Ilyenkov does not use this concept, the structure of his thought highlights the principle of perfect totality of plurality. This principle is characterised with complete interpenetrability and at the same time interdivisibility of all its elements (trans-rational unity of divisibility and interpenetrability), when the universal is not nominal and secondary, designed and derived, but when it is a specific reality (the soul of the single). At the same time, the full-weight existential reality is a human being. The substantiation of thinking “as an absolutely highest form of motion

and development” (Ilyenkov, 2017: 167), when it is understood as “the highest degree of organising the interaction, a threshold of complication of this organisation” (Ilyenkov, 2017: 167), contains the principle of unitotality as its internal figure of thought. This does not conform to the rules of formal logic, as in this case the law of the excluded middle fails. The principles of such thinking in Russian philosophy are called “antinomic monodualism”. Many researchers note the invariance of Evald Ilyenkov’s conception of the universal to Hegelism — tendencies of withdrawal (or elimination) of Kantian transcendentalism, panlogical immanentisation threatening with totality, which is also characteristic of the religious thought that is oriented at unitotality and caught in pantheism over and over again. This context contains the ideas of totality of Truth, Good and Beauty that come to the world through human acts (or activity with its essential differences).

Hegelism is essentially corrected by the activity theory as a base for the cultural and historical process. In *“Cosmology of the Spirit”*, we deal with a cosmic and historical process. Here it is important to understand history not as a synonym of evolutionary variability but as epigenesis — the notion that is used by Georges Florovsky with regard to human personality formation. This notion assumes “an original new formation, the beginning of essentially new, the growth of being” (Florovsky, 2002: 434). In his early work, Ilyenkov does not measure the cultural and historical process in such a way. However, an active role of thinking is one of the main conditions of his cosmological reflections.

It may be this secret affinity that prompted negative attitude to E. Ilyenkov’s ideas just from the opposite side. Network revolutionaries, who did not reveal their names in keeping with the political reporting tradition, exposed Evald Ilyenkov of turbid teleological hylozoism, popovshchina (religious superstitions) and minority idealism (Against Ilyenkov, 2013). Many researchers noted the internal consonance of *“Cosmology of the Spirit”* with the traditions of Russian cosmism not as a natural science school but as a religious and philosophical study (Mareev, 2015; Vivaldi, 2017).

The story of publishing this early text written by a post-graduate student (in the late 1950s) has been repeated more than once and it is known well (Mareev, 2015; Vivaldi, 2017). The first incomplete *“Cosmology of the Spirit”* was published in 1988, and its complete version came out in 1991. Sergey Mareev accounts for an earlier version of this text that was not admitted to publishing after E. Ilyenkov’s death, without which, as he states, “it is essentially incomplete Ilyenkov” (Mareev, 2015: 156). Quite logical here are interrelated questions. What aroused Theodore Oizerman’s suspicion who was more carefully cautious than vigorously aggressive? Why is Ilyenkov incomplete without this text? Which statements are the most seditious? If Vesa Oittinen speaks of Ilyenkov as an orthodox heretic (“orthodoxe Häretiker”) (Oittinen, 2003: 120), which theses are orthodox and which prove the heresy?

The content of the main ideas of this early work is fully revealed only in Ilyenkov’s later works. First, we shall study the text itself.

Orthodox and heretic aspects of *“Cosmology of the Spirit”*

The first paragraph of *“Cosmology of the Spirit”* expresses the idea, which becomes central for Ilyenkov’s completely creative work: “Committing no crime against the axioms of dialectical materialism, one can state that the matter constantly possesses thought, constantly thinks itself” (Ilyenkov, 2017: 165). He then substantiates this thesis in conformity with the statements that are well known and common to Soviet thinkers. These statements are based on the quotes from Friedrich Engels’s *“Dialectics of Nature”*. The first primary thesis is understanding of the matter as a substance, which is infinite in time and space, a substance

which “engenders thinking creatures, constantly reproduces, now here now there, an organ of thinking — the thinking brain” (Ilyenkov, 2017: 165). In the context of later discussions of Evald Ilyenkov and David Dubrovsky, especially attractive is the statement “thinking brain”. Sergey Mareev notes that terminologically E. Ilyenkov is still in terms of the *diamat*, what proves the fact that it is the early Ilyenkov (Mareev, 2015: 162). Indeed, the mature Ilyenkov does not refer to this statement. However, it is significant that in the middle of the early text the “thinking brain” receives a name “thinking spirit” which is used synonymically. There is no explanation to this fact in any commenting interpretations that we know about. It may indeed be an inessential moment of thought movement, since the principle of identity of thinking and being, which is underlying for Ilyenkov, removes the radical duality. Investigating Spinoza’s reception by Evald Ilyenkov and Heinrich Batishchev, Vesa Oittinen notes Ilyenkov’s attraction to Hegel and Spinoza as supporters of monistic outlook. Vesa Oittinen states: “Similarly to Hegel’s ‘removing’ Kant’s dualism by introducing the concept of Spirit (Geist), half a century before Spinoza surmounted the mind-body dualism *exensio* and *cogitation*” (Oittinen, 2011: 14). However, one can see here a concretisation of the concept of thinking, which means understanding of *how* thinking works. Ilyenkov further fixed this fact using the concept of the ideal as a special objectivity. In our view, it is explication of the ideal that made Ilyenkov’s contribution to the world philosophical thought.

The text has one more concretisation of the “thinking brain” — a thinking creature that was specified and developed later. Ilyenkov highlighted more than once that it is not the brain that thinks. It is the *man* who thinks with the help of the brain. Nevertheless, what *underlies* the fact that the man thinks using the brain — the most complex *substance* in the universe? The man thinks not because he does have brain, but because he is to realise quite a real process in his life, which is not limited to serving his biological programs only. The man *works*, that is performs a certain activity that is not programmed in his *genofond*. In the process of working, he communicates with other humans in terms of a type that is different from the type fixed in the genetic program. Moreover, it is this process that needs the “thinking brain” that, by the way, became such in anthropogenesis. This statement is read in Karl Marx’s *Economic and Philosophic Manuscripts of 1844*, which were known since 1932 and appeared in the Soviet Union in 1956. Nevertheless, “*Cosmology of the Spirit*” does not mention them. The same is stated by Sergey Mareev (Mareev, 2015). Evald Ilyenkov convincingly developed and proved these ideas in his works that followed.

As the next point, Ilyenkov mentions the “understanding of thought, of thinking matter, as the supreme [absolutely highest] form of motion and development” (Ilyenkov, 2017: 167), what in its turn assumes the lower threshold as well. This statement, which acts as a mediator in the hypothesis of the cosmological role of thinking, can be challenged and seen as unsuccessful (Finogentov, 2016: 21-22). However, it can be explicated in terms of Spinoza’s understanding of substance as such that has got two necessary and equal attributes: thinking and extension, unlike the simplified mechanistic materialism representing that “the existence of thought is *contingent*, not necessary” (Penzin, 2017). Ilyenkov goes back to this point several times underlining the following statement. “The appearance of the thinking spirit within the framework of the big universal circle is not at all something accidental that, *pari passu*, could simply not exist, but an internal and assumed condition of its own realization. Otherwise it is not an attribute but only a ‘mode’” (Ilyenkov, 2017: 184). As we see, even at this stage of hypothesis revealing, the centre is the Ilyenkov’s idea of the cosmic role of thinking, which is not accidental. This sounds a heresy for evolutionary materialism: “matter cannot exist without thought” (Ilyenkov, 2017: 166). Persistently emphasizing the

attributiveness of thought, Ilyenkov introduces it into the cosmological process. He does not take into account such understanding of thinking that is viewed as a purely human ability. Here his thought is consonant to the antique thought that gives the Mind (“noys”) a central role. In his works on antique thought, Alexey Losev uses words derived from the Greek root: *noeo* — “I think”, *noetos* — “thinkable”, *dianoia* — “thinking”. He pays attention to the nature of this Mind — “it is the first time that all these comparing and contrasting acts are not made by a human subject but by existence itself” (Losev, 1992: 541). Alexey Losev uses the term “noology” in differentiating the cosmic and human thinking. He calls noological the conceptual structures in which thinking plays the central role. This is the way he calls Aristotle’s aesthetics, as “for Aristotle, the Mind is the highest beauty, and formally this Mind means thinking” (Losev, 1975: 733). Considering the role of thinking as a necessary factor of the cosmic process, one can speak of the noological nature of Ilyenkov’s cosmological reflections.

The reference to the term “noys” allows one to speculate about the name of the essay and the appearance of the term “thinking spirit” in the middle of the text that is used as a synonym for the “thinking brain”. Traditionally, the Russian thought translates “noys” as a spirit, what emphasises the thinking and intelligence aspect of spirit.

However, there still is a question of why the “thinking brain” is the highest form of motion of the world matter. In other words, in the context of ideas expressed in later works that substantiate the role of sociality for human formation (Ilyenkov, 1984: 325-326), one should speak of the “social form of motion”. In his text, Evald Ilyenkov does not give any final convincing answer. If we consider the term “social form of motion”, we can possibly find an answer. Its nature is such that it is not simply based on the nearest, organic form, being its user. Like the previous forms, the social form is based on all forms of matter motion. It is not just one of the forms — it is “a form of the forms”, since it integrates them inside itself. And the basic process inside is their *mutual transformation* (what is labour, production, industry). In other words, the social form of motion (that is a human way of life) is based on the big universal circle. It is not just the use of motion forms; it is their *transformation* into each other. Therefore, any new form, even if only assumed, will be included into the transformation process. It is at this point the big universal circle is closed on itself. It has nowhere to strive, it returned to itself — to the process that reproduces it, realises it and continues in its existence. This is why this process is possible to understand (to comprehend): it itself strives for such understanding. It is to realise itself — both in its activity and in the thinking of generations of *conscious* creatures.

In his early text, Evald Ilyenkov does not define the nature of thinking. In his later publications dedicated to Spinoza, Evald Ilyenkov explicates such understanding of thinking that is correlated with activity. To understand this activity, one needs the condition of universal interaction: “Man, however, the thinking body, builds his movement on the shape of any other body. He does not wait until the insurmountable resistance of other bodies forces him to turn off from his path; the thinking body goes freely round any obstacle of the most complicated form. The capacity of a thinking body to mould its own action actively to the shape of any other body, to coordinate the shape of its movement in space with the shape and distribution of all other bodies, Spinoza considered to be its distinguishing sign and the specific feature of that activity that we call ‘thinking’ or ‘reason’” (Ilyenkov, 1977: 29). Thought is capable of not moving in conformity with its specific structure but in line with shape and distribution of other bodies, and finally of all bodies in the universe, in other words, to move in line with the universe logic. Thought, as an ability to move in compliance with essential features,

can read any new dimensions of the universe. One can assume the following: the statement that the “thinking brain” (and this is understood as thinking, remember how the “thinking brain” turned into the “thinking spirit” in the middle of the text) as the highest form of movement is a way to understanding the essence of thinking. In addition, we should be clear in one thing. Though Ilyenkov supports the position of gnoseological optimism, elimination of such position does not deny the ability of thought to move in compliance with essential features of any object, since the assertion of incomprehensibility is possible as understanding of the incomprehensible, and this becomes the cause of the so understood thought. This aspect of the Russian philosophy has been considered in detail by Simon Frank in his work *“Incomprehensible”* (Frank, 1990).

Dialectal understanding of development removes the inevitability of linear progression of development, since, as Ilyenkov states, “the gradual character of development is not the only form of development” (Ilyenkov, 2017: 169). Progression conforms to evolution graduality that has mechanistic nature. The dialectal view conforms to the circular nature of infinity what should not be understood in terms of space and geometry. Let us take a risk and state that if linear graduality is understood as evolution, then the circular nature of infinity conforms to emanation. The energy effectiveness of emanation matches the action of the Whole. This action is never fixed empirically. Without it, thinking as a movement in the subject’s essentiality turns into rational relativist sliding from one to another. When it is carried to its logical limit, it causes essential stability to disappear. When Slavoj Žižek speaks of the insanity of dialectal materialism, this corresponds to a cosmic victim of humanity. However, we believe that, from his perspective, this can be as well referred to understanding of the universe as such that has essential stability. Slavoj Žižek considers admission of essential stability to be naïve realism. He indicates the point from which a cosmic victim is no longer inevitable: “there is no reality as a self-regulated Whole, that reality is in itself cracked, incomplete, non-all, traversed by radical antagonism” (Žižek, 2018). Moreover, this is his last statement here. In our view, explication of the essence of thinking that Evald Ilyenkov pays all his further attention to, also postpones the logical inevitability of victim.

“Cosmology of the Spirit” as a prose poem

The most shocking and paradoxical is the consequence of the third philosophical and theoretical premise (“all that exists is worthy of destruction”) (Ilyenkov, 2017: 171). In conformity with this, a cosmic mission of thinking creatures is to surmount entropy and bring the cooling space back to its initial fire-like condition. In other words, it means literal execution of the principle “in my end is my beginning”. Evald Ilyenkov himself marks the poetic nature of his text. Let us remember Rainer Maria Rilke: “the hero is immortal. To him, the death itself is a desirable pretext — he is reborn in his death” (Rilke, 1977: 287). Well-known is Ilyenkov’s aesthetic sensitivity and the significance he endows art in his following works. This makes the second half of the text sound consciously and convincingly if it is read as a work of poetry, what assumes the respective ways of perception. There are poetic scientific essays in the history of philosophy. In this case, it is a work of poetry written as a cosmological essay. The lines of the text have a clear rhythm and expressive poetic images: “But no efforts will save it from death in the hurricane of global ‘fire’ that, at some point, will return the volcanic youth to our global island” (Ilyenkov, 2017: 176).

If judged by his memories, Evald Ilyenkov is not disposed to mystical religiousness by his order of mind. However, he fully admits and accepts the freedom of aesthetic creative work. Since Ivan Turgenev’s time, the genre of prose poems has been authoritative. *“Cosmology*

of the Spirit” is close to prose poems in its theme as well (“Threshold” (Turgenev, 1982b: 147-148)). Even by its fate, Ivan Turgenev’s poem “Threshold” is much like Ilyenkov’s text: in the same way, it was not admitted for publishing, being distributed illegally. On the day of Ivan Turgenev’s funeral, it was thrown about as proclamation. A demonstrative postscript goes with the translation of the poem into French: “poetic depiction of a deeply tragic life of a Russian man devoted to his motherland” (Turgenev, 1982a: 496-497). Despite this, it is quite clear that the poem was inspired with heroic mood of revolutionary narodniks (members of a 19th-century socialist movement in Russia who believed that political propaganda among the peasantry would lead to the awakening of the masses and, through their influence, to the liberalization of the tsarist regime) whom Alber Camus called “scrupulous killers” (Camus, 1990: 245). He pays main attention to this movement in his book *“Rebellious man”* which was written at the same time as *“Cosmology of the Spirit”* — in the 1950s. The first lines of the book tell about crimes motivated by fearless logic. In the poem *“Threshold”*, it is the lines about being ready to commit a crime that were crossed out by Mikhail Stasyulevich. It is art that has the tragic absurdity of revolutionary activity as an adequate means of perception. Moreover, it does not matter what the author wanted to say. Important is what was said.

Nevertheless, poetry does not exist for logical analysis. Michel Welbeck notes that “physicists, having talked to journalists about various scattering spectra, Gilbert spaces, Hermite operators and other similar things their publications usually deal with, start constantly praising the language of poetry” (Welbeck, 2003: 35). He then paradoxically asserts that the level of modern science much more conforms to the language of poetry that breaks cause-and-effect relations and plays with dangerously explosive absurdity, which creates a new sense.

One can note that crisis historical periods, which can be called epochs of worldview revolutions, epochs of breaking the existing type of thinking, are characterised with a return to metaphorical poetry of philosophy. At the origins of philosophy are pre-Socratic philosophers and Plato. The subsequent break of antique type of thinking is attributed to Christianity rooted in the Bible, which holds true the genuine poetry. One can argue whether the Renaissance epoch is a change of the worldview type or the whole New time is just an abstract one-sided absolutisation (and thus distortion) of Christianity. However, the poetic component of Renaissance philosophical conceptions is obvious. Classical paradigm is cardinally changed by Friedrich Nietzsche who (in his telling) chose a hammer as a philosophising method and he uses it in the poetry *“Thus Spoke Zarathustra”*. One can assume that the thought acquires poetical nature in breaking the tradition and ordinariness. In this sense, *“Cosmology of the Spirit”* is perceived as finding a way to the main problems of creativity, what became thinking to Evald Ilyenkov. It is remarkable that his life’s work became Logic, including ethics, which, in this context, is not a normative, but a behavioural and activity science. *“Cosmology of the Spirit”* proves that his thought, being nurtured by Marx’s and Hegel’s works, since this time has one more dialogue partner — a person holding the same views. In addition, this person is Spinoza. Afterwards Ilyenkov checks every important step of his thought with Hegel and Spinoza (Maidansky, 2017: 136).

The ideas of repaying a cosmic debt became a reason for various constructions that are not necessary to be discussed in detail. It is not necessary, like Zsizsek and Penzin, to take communism as a central condition and to say that this is the way to substantiate the “cosmological necessity and the role of Communism” (Penzin, 2018). That is not the case that Ilyenkov does not use the word “communism”, which, on the other hand, can be used to name the genuine human system described by Ilyenkov. It is a system with such activity conditions

that include a classless society and flourishing of spiritual and material culture (Ilyenkov, 2017: 189). Following Boris Groys, there is also no need to read closely the pagan content and to see in “*Cosmology of the Spirit*” the revival of the Aztec religion of Quetzalcoatl who “sets himself on fire to reverse the entropic process” (Penzin, 2018). It is possible to draw the same analogy with “*Revelation of John the Theologian*”, or to refer to Heraclitus. To some extent, mythology can be referred to as well. However, it should be specified that the thing be in some primary non-reflexive bases of consciousness, to which Alexei Penzin possibly applies a colourful description — “Exercise in Communist Subjectivity” (Penzin, 2018). To be more specific, one should speak of *heroic* subjectivity, which has much broader cultural and historical bases and is expressively presented in any revolutionary ethics, not in the communist ethics only. The specific features of heroic ethics, in comparison with sober ascetism, have been analysed by Sergey Bulgakov in the article, which is part of the “*Vekhi*” (“*Landmarks*”) collection. In this article, he reveals the danger of intellectual revolutionary heroism stating that unfortunately there is so much of it in history (Bulgakov, 1993).

In concluding, we shall consider the Lotz and Cole’s research with an expressive name “*Spinoza, Ilyenkov and Western Marxism — meeting the challenges of the global crisis*”. This work convincingly shows that Ilyenkov’s appeal to Spinoza’s philosophy, with its strict philosophical form, has political sources — both were the children of their days, but they were in a deep conflict with dogma supporters (Lotz & Cole, 2012). It is noted that Spinoza is interpreted by Ilyenkov dialectically. This is opposed by the interest to Spinoza from the side of ideologists of globalism. In accordance with this, Spinoza’s monism becomes a method for substantiating the global political and economic challenges of capitalism, for which Spinoza’s notion of immanence is used (Lotz & Cole, 2012). This is contradicted with the following statement: “Spinozan-Ilyenkovian dialectics can offer a way out of the logjam of 21st century philosophy by researching the dialectics of contemporary globalisation and its crisis” (Lotz & Cole, 2012). In view of this, “There is a materiality about the re-emergence of interest in Spinoza at this particular moment in history together with the renewed study of Ilyenkov. Together they constitute the ground for a development in logic that acts as a liberating force in what is an historic, simultaneous global crisis in ecology, economy and politics” (Lotz & Cole, 2012). Ilyenkov’s thought is placed into the context of the liberation work of mind as a necessary element of antiglobalism. However, this formulation of the question that points at the potential of Ilyenkov’s and Spinoza’s philosophy goes beyond the scope of the present research.

Conclusion

As a conclusion from our text, there are two most significant theses. First, Ilyenkov’s cosmological reflections have a clear poetic nature. This by no means assumes unserious attitude to his early article. On the contrary, the article appears to prove the work of mind on surmounting both the official dogma and the down-to-earth ordinariness of everyday life. Cosmological problems take the thinker to the space of understanding the mission and sense of thinking rather than understanding the narrow technology utilitarian issues that the instrumental mind is busy. This becomes a preliminary step for understanding the attributiveness of thinking. It is thus the second important thesis. The leading topic of this poetic essay is a fearless and responsible nature of thinking as an attribute of material universe. All scientific and technical views of Evald Ilyenkov are dedicated to understanding a man as a creature who actively sets his living conditions and this activity is in the central focus. As it was noted, starting from the middle of his essay, Evald Ilyenkov prefers the

term “thinking spirit”, what removes the vulgar naturalistic understanding of the matter. It is thinking that becomes an important and effective actor, what gives grounds to speak of Ilyenkov’s noological cosmology.

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Nostradamus's Prophecies and Uncertainty of Future

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The article interprets Michel Nostradamus's quatrains in terms of the eventeme theory developed by the author. An eventeme is an abstract possibility of various single events. The main hypothesis of the article is that Nostradamus described eventemes as single events and filled them with details, thus making an illusion of a prophecy. It was not the only method of Nostradamus's work, though. Believing in recurrence of historical events, Nostradamus extrapolated past events to the future. This paper analyses some quatrains representing single manifestations of a certain eventeme. The article contains a fragment of the quatrain table where the author reflected both event-driven and eventematic content of the Centuries. The research demonstrates the differences between a prophecy, a foresight and a prediction. The author justifies a thesis on impossibility of exact prediction of single events due to uncertainty of the future.

Keywords: Nostradamus, event, eventeme, prophecy, prediction, uncertainty of future

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Introduction

Michel Nostradamus is one of the cult characters of the world culture. No doubt, it is the apologetic tendency that predominates in investigating the Provençal prophet's creative work. However, we have joined the critical tendency. The modern researchers who sided the critical tendency are Pierre Brind'Amour (Brind'Amour, 1993), Elmar Gruber (Gruber, 2003), David Shephard (Shephard, 1986), Peter Lemesurier (Lemesurier, 2003) and Anna Carlstedt (Carlstedt, 2005). With some reservation, we could refer to the critical tendency a work by Aleksey Penzensky (Penzensky, 2007).

In this research, we are going to apply to quatrain investigation our own methodology of history's philosophical interpretation. The main point of the methodology is a concept of "eventeme" that we have introduced in the scientific world (Yeremenko, 2005). Having applied this concept to quatrain analysis, we shall try to demonstrate how it works in interpreting historical events and facts. We are also going to justify the possibility of

predicting abstract event figures and principal impossibility of predicting single events with rational methods.

Eventeme Concept

We believe in seeming principal uniqueness and soleness of any historical event. We are of the opinion that the principle that unites events and allows to generalise them is not only possible to find but it should be found. Such a principle is a clear structure of events. We suggest the name “eventeme” for the basic event classes that differ in their structural features.

Among the modern thinkers, Gilles Deleuze and Reinhart Koselleck are the closest in understanding the essence of an eventeme. Gilles Deleuze views a battle as a model of “an event in its point”. “Besides, the battle itself floats over its own field. It is neutral in relation to all its actualisations in time, it is neutral and dispassionate to winners and losers, cowards and men of courage; and thus it is even more frightening. It is never in the present, but it is always either about to happen or it has already happened. A battle is perceptible for an anonymous will only — a will the battle has inspired itself” (Deleuze, 1995: 128-129).

One can say that in the same way as the “neutral and dispassionate” battle described by Gilles Deleuze is related to single battles, a “neutral and dispassionate” eventeme is related to single events.

In another episode of Gilles Deleuze’s discourse, he does not only guess but actually introduces a concept of eventeme, without naming it an “eventeme.” “Events are ideal. Novalis states somewhere in his works that there are two courses of events: one of them is ideal; the other one is real and imperfect. Examples can be ideal Protestantism and real Lutheranism. However, this difference is not between the two types of events, it is rather a difference between an ideal event and its status quo spatiotemporal realisation. It is between an event and an accident. Events are ideal singularities communicating in the same Event. Thus, they are true eternally. Their time is never the present that urges them to happen. Events are rather invariably in the boundless Eon, in the Infinite” (Deleuze, 1995: 74-75).

If to briefly set forth the main point of our vision of history, we will have to state again: there are seemingly two strata, or two dimensions, or two levels of history: a level of constantly continuing forms, or structure-forming principles, or empty “reservoirs” of events — and a level of real single events.

In Reinhart Koselleck’s works, an important part is differentiation of single events and stable structures that make the events possible. Each single event taken as a whole is unique, the one and only. However, event structures recur in history. On the one hand, they are internal structures of events, on the other hand — they are structures of event sequences. Reinhart Koselleck names these structures in different ways: “formal categories” postulated as conditions for possible stories (Koselleck, 2005: 159); stable event models (Koselleck, 2005: 164); recurring formal structures (Koselleck, 2006: 233); continuous structures of historical experience (Koselleck, 2006: 246).

On Methods of Michel Nostradamus’s Work

In terms of the eventeme theory, we can formulate the main hypothesis of our research. Michel Nostradamus described eventemes as single events and filled them with details, thus making an illusion of a prophecy. Moreover, the Provençal prophet would fill the quatrains with various, sometimes controversial details. At the same time, he strived for multivalued uncertainty of details, to knowingly provide for multiple interpretations of the quatrains.

Here two explanations are necessary. First, we are not eager to say that Michel Nostradamus developed a theory of eventemes and used it consciously in composing his quatrains. Believing in the event recurrence, Michel Nostradamus understood that it is possible to single out a common sense of similar events, so to say, to abstract from details, and then, vice versa, to fill with details. The eventeme approach is as though implied in the idea of event recurrence.

This is followed by the second explanation. We by no means assume that all the quatrains are composed by the “eventeme” method. We believe that Michel Nostradamus practised several ways of composing his predictions. 1. Describe past events as future events. 2. Describe the abstract sense of an event (eventeme) as a single event. 3. Describe single events on the assumption of understanding the general tendency of event development. 4. Describe the visions he sometimes saw.

Among the modern investigators, the eventeme method is best analysed by Anna Carlstedt in her work “The Oracular Poetry of Nostradamus: Language, Style and Genre of The Centuries (Carlstedt, 2005).

Anna Carlstedt singles out three main themes of Michel Nostradamus’s prophecies: war, government (secular and clerical) and catastrophe. These are subdivided into the following subthemes: 1) war: battle, victory, defeat; 2) government: governor assassination, proclamation (accession to power) of a new governor, bad government; 3) catastrophe: disease, hunger, natural cataclysms (Carlstedt, 2005: 113). In general, we consider Anna Carlstedt’s classification to be successful. The themes singled out by the Swedish researcher, as well as some other themes, are what we call eventemes.

Michel Nostradamus extrapolates to the future the realia of his time, which is the peculiarities of social and political, religious and cultural life of the 16th century. This is what Pierre Brind’Amour and Elmar Gruber paid attention to. For instance, Pierre Brind’Amour characterises The Centuries in such a way: “This work of Nostradamus makes sense; I would rather say it is transparent. It reflects the deepest obsessions of the people of that time: a fear of natural cataclysms (earthquakes, floods, droughts...) and their absolutised forms (deluges, overall fire, the end of the world), a fear of diseases (especially plague), a fear of war (wars with other states, the Turkish threat in particular, religious wars, civil riots), anxiety of tokens (births of monsters, comets, eclipses), a fear of seeing the Antichrist, etc. These obsessive ideas combined with ordinary political troubles (this day one prince is killed, that day another prince is imprisoned, the other day sees a conspiracy) make a large part of The Centuries” (Brind’Amour, 1993: 5-6).

If to assume that there are not only absolutised forms of ideas, but also absolutised forms of real historical events, these will be eventemes.

Eventematic Figures In the Quatrains

All the quatrains have more or less clear eventeme structure what is reflected in our table of quatrains. Some of the quatrains are almost simple description of a clear eventeme. Almost simple, but never, since Michel Nostradamus always somehow saturated a quatrain with details. This saturation has a double goal. First, details create a feeling of a reliable prediction: if a prophet sees the details of an event, no doubt he sees the event itself. Second, details darken the sense of the event, creating a field of various interpretations. The variety of interpretations is conditioned by, firstly, the variety of details what increases the probability of coincidence of any detail with reality. Secondly, details themselves are often unclear; they are saturated with metaphorical or symbolic sense, thus providing for a possibility of various interpretations.

Nevertheless, some quatrains are “more” eventematic than others. For understanding the essence of a historical change itself, quite interesting is Quatrain III, 46:

The sky (of Plancus' city) forebodes to us
Through clear signs and fixed stars,
That the time of its sudden change is approaching,
Neither for its good, nor for its evils.

Thus, celestial signs predict to a certain town (in Aleksey Penzensky's opinion, this town is Lyons, as it should be read a “Plancus's town” since Lyons was founded by Lucius Munatius Plancus (Penzensky, 2007: 244)) sudden changes (metamorphoses), and these changes will lead to neither the good, nor the bad (as assumed by Aleksey Penzensky — “neither the best nor the worst” (Penzensky, 2007)). How can this be possible? Any change, especially a historical change is a turn for the better or for the worse. It is wrong: such an approach is too evaluative. If we want to realise the pure essence of a change, we should, so to say, “Leave aside” evaluative judgements. A change is a transition of this into that, if it is a quality change, or it is the appearance of elements of that in this, if it is a quantity change. It is not always possible to evaluate this and that as the best and the worst. With this approach, we darken the essence of the change itself. When we think of a change “neither to the good nor to the bad”, we think of an eventematic essence of the historical change.

Some quatrains can illustrate the binary structure of an eventeme. Let us take Quatrain VIII, 65:

The old man disappointed in his main hope,
will attain to the leadership of his Empire.
Twenty months he will hold rule with great force,
a tyrant, cruel, giving way to one worse.

At first sight, there is nothing special about it: a trivial eventeme “a change of a governor”, more precisely “a change of a tyrant”. But further specification is hampered. As assumed by Miroslav Adamchik, we find a difference in Line 4: “A ruthless despot who replaced even a worse despot [leaving behind himself even a worse one]”. It is not clear: whether a ruthless old man will replace even a worse tyrant, or vice versa, he will be replaced by even a worse one. We are still in difficulties: whether the prediction concerns “from the frying pan and into the flame”, or “from the flame and onto the frying pan”. It is clear that both variants are not good, but there is a difference between them, though.

It is not impossible that the abovementioned ambiguity is caused by an inaccurate translation. But it is not also impossible that Michel Nostradamus deliberately strived for the ambiguity of statements, making them possible to interpret in two ways: either a repulsive governor will be replaced by a bad one, or a bad governor will be replaced by a repulsive one (let us remember the classic of the genre — the prediction by the Oracle of Delphi to Croesus, the king of Lydia, concerning that, having crossed the boundary river, he will destroy a powerful kingdom).

Some of the researchers came close to understanding the eventeme methods of studying the quatrains. It is surprising that such understanding did not hamper their apologetic attitude to the “prophetic” gift of Michel Nostradamus. Quatrain IY, 83 describes the escape of a military leader in a night battle:

Combat by night the valiant captain
 Conquered will flee few people conquered:
 His people stirred up, sedition not in vain,
 His own son will hold him besieged.

The word “valiant (captain)” is used ironically, of course. John Hogue comments on this quatrain in the following way: “Considering the fact that over the past 440 years there were more than a thousand wars with a countless number of night battles, the incident mentioned in the quatrain can take place in any of them” (Hogue, 2002).

Absolutely correct! But then it is not at all possible to consider this quatrain to be prophetic. If we analyse the eventeme “night battle” or say “vengeance to the commander who fled”, then their eventematic feeling will appear rather impressive. Then what exactly does Michel Nostradamus predict?

Sometimes an event described in a quatrain resembles not only an eventeme but also a mythologema or a stable image of various literary traditions. For instance, Quatrain X, 43:

Too much good times, too much of royal goodness,
 Ones made and unmade, quick, sudden, neglectful:
 Lightly will he believe falsely of his loyal wife,
 He put to death through his benevolence.

So, regarding events: a far too kind king, having believed a slander, puts to death a faithful wife. First of all, here we deal again with an ambiguous, if you prefer, a double eventeme in one quatrain. What is the sense of the situation: “execution of a faithful but slandered wife” or “excessive kindness is ruinous”? One can interpret this as a concretisation of an abstract eventeme in a variant: “excessive kindness is ruinous, for example, a kind king puts to death a slandered wife” (compare with X, 35). If to focus on the execution of the slandered wife, we will have a motive of sufferings of an innocent virtuous woman that is widely spread in mythology and literature: Psyche created by Apuleius, suffering abandoned wives in medieval ballads, Hero and Desdemona created by William Shakespeare and others.

Among the eventematic quatrains, of special interest is Quatrain IX, 66:

There will be peace, union and change,
 Estates, offices, low high and high very low:
 To prepare a trip, the first offspring torment,
 War to cease, civil process, debates.

Here is a complete set of eventemes — to fit every taste: peace, union, changes, end of war (struggle); lower classes will rise, higher classes will fall (as assumed by Miroslav Adamchik: “States and Churches will rise from the low and fall from the high”). Here is a certain travel (pilgrimage) as well, an even more mysterious fruit; here is a civil process, pleadings (debates?). In general, the story goes on in all its shapes and sizes. It is very convenient for bringing various events under such “predictions”. An eventematic sense of the quatrain can be formulated as follows: “up and down the wheel of fortune”.

Eventemes and Tendencies

Aleksey Penzensky suggests the following idea: “Investigation of “Prophecies” shows that Nostradamus was able to foresee global tendencies but he gave in to particulars” (Penzensky, 2007). We do not want to be hypercritical, but we are of the opinion that Michel

Nostradamus could not see clearly the global tendencies, but if to call things as they are — he could see the tendencies in a quite unsteady and vague way. His vision abounds in mistakes: he often “foresees” a tendency, which will fade away in the future. At the same time, he completely ignores a tendency that will soon appear and become powerful. It is obvious that the Provençal prophet did not predict the shift of the power centres in the world politics. He says practically nothing about the USA, Russia; he remains silent about China and Japan. The lion's share of the quatrains is dedicated to the Mediterranean: there is such an impression that Nostradamus considered this region to be the most important arena of world events in the immediate and distant future. The Provençal prophet does not as well foresee the crashes of thrones and feudal orders, the triumph of the commons, and the development of industry on the rails of the bourgeois economic system.

Here, of course, an objection suggests itself: how could he not foresee the crash of thrones? The Centuries are just stuffed with pictures of rebellions, revolutions, overthrows and executions of monarchs and other social cataclysms of the kind. That is right! However, this is not a crash of thrones as such. This is not the collapse of monarchy as a system of state. A monarch's overthrow, a change of dynasty, dying away of a rank family — a similar whirl of events is projected by Nostradamus to the future. However, why does not he say anything about France, which is to turn from monarchy to republic, or England, which is to become a constitutional monarchy but actually a republic? Why does not he predict that the Holy Roman Empire, the German nation will be replaced by a more consolidated German state, but it will be a republican state. Why is there not a word about the republic of the USA — the 20th century master of political destinies? Repeatedly, Nostradamus paints vivid pictures of religious wars. However, why does not he say anything about the lowering intensity of religious conflicts in the 18th-20th centuries? Consequently, Michel Nostradamus predicts exactly eventemes: wars, revolts, revolutions, conspiracies, repressions, natural disasters and cataclysms, epidemics, etc. However, he does not predict tendencies in a strict sense. Understanding a tendency as a social and historical phenomenon naturally blends with a linear world outlook. For the cyclic worldview, such understanding is unnatural. In the cyclic world, there are actually no tendencies in the full sense of the word: any tendency exists only inside the cycle — it is either an ascending or a descending cycle movement. This is the conviction in recurrence of historical events that prevented Michel Nostradamus from predicting the tendencies of the nearest stages of the worldwide historical process, saying nothing of the distant future tendencies.

Uncertainty of the Future: Prophecy, Foresight or Prediction

A contemporary Nostradamus scholar Vladimir Rokhmistrov assumes that prophecy is possible only in case the future already exists. If the future does not exist, no prophecy is possible — what is only possible is to “mention the possible effect of deeds based on the knowledge of laws of development of any actions” (Rokhmistrov, 2006). In our opinion, the future does not exist in terms of events, it exists in terms of eventemes. Consequently, an event-driven prediction is impossible, what is only possible is an eventematic prediction.

Vladimir Rokhmistrov's position looks rather strange. On the one hand, he believes that a criterion of prophecy truth is a coincidence of all details with real events (Rokhmistrov, 2006a: 18). Then, one prophecy will match one event, for it is difficult to imagine various events with all details coincided. However, Vladimir Rokhmistrov does not only object to multiplicity of interpretations of each quatrain, but also insists on such multiplicity, if we understood it right. In his opinion, Michel Nostradamus's texts assume writer's and reader's

co-authorship, what allows to create ever new interpretations of The Centuries. At the same time, binding the quatrains to real events specifies their sense (Rokhmistrov, 2006a: 17).

We believe that such an approach looks quite vulnerable. If we not only can but also must alter the sense of the quatrains depending on single events, then anyone can predict anything. We insist on the certainty of prophecy. Both a prophet predicts this and only this event or he does not predict anything. If somebody predicts an eventeme, this is not a prophecy, since to make such a “prediction” one must only know the repeating figures of historical eventivity.

A foresight and a prediction are scientifically sustainable; they are based on the analysis of tendencies, the probability theory. Ideally, they assume calculations (compare “predictive power of science”, “scientific prediction”, “and scientific forecast”). Prophecy is a mystic ability, which is based on superrational vision of future single events.

When trying to understand the prophecy phenomenon, Vladimir Rokhmistrov puts quite a correct question of the influence of the expressed prediction on the real course of events. Suppose, a negative prediction was expressed, which was followed by some preventive steps, and the prediction did not come true. Is such a prediction true? (Rokhmistrov, 2006a: 389). Vladimir Rokhmistrov suggests such a variant answer. If we extend to the maximum the boundaries of time duration back and forward, then we see the world in its six-dimensional (?! — A. Ye.) extension. We need this knowledge to prevent things that can cause a tragedy. It is as if we fixed a porch, so nobody would break a leg on it. Before we fix it, we realise what it will be like afterwards (Rokhmistrov, 2006a: 402-403).

Let us analyse Vladimir Rokhmistrov’s considerations on the porch and the broken leg. Prophecies are possible in the predetermined world only. They are possible only in case it is predetermined whether this porch will be fixed or not, in case it is predetermined whether this man will break a leg or not on this porch, etc.

What is more, different worlds can have different variants predetermined, but every single world will have only one predetermined variant. All in all, there are four possible variants:

1. The porch will be fixed, but A will break a leg on it.
2. The porch will not be fixed, and A will break a leg on it.
3. The porch will be fixed, and A will not break a leg on it.
4. The porch will not be fixed, but A will not break a leg on it.

If out of a set of predetermined worlds we single out a subset of worlds where the individual A and the porch exist, then for the whole subset there are possible only the four variants mentioned above. Moreover, in every single world, out of this subset, only one of the four variants is realised.

In an undetermined world, this porch can be both fixed and unfixed, A can both break a leg on it or not, etc. That is for a subset of undetermined worlds the four combinatorial variants of the porch and the broken leg are not relevant at all.

The author of these lines believes that our world is exactly like this. We live in an undetermined world. Consequently, prophecies are impossible in our world, possible are foresights, predictions and prognoses.

Let us make an ally with Aristotle who believed that it is impossible to determine the truth of positive and negative judgments on accidental future events (Aristotel, 1978; 101, 19a 17-20). Such events are not predetermined. They “source from both decisions and certain activities”; therefore, accidental future events can have equal “possibility to be or not to be” (Aristotel, 1978; 101, 19a 7-11). If we agree to this, we admit that prophetic judgments in the strict sense of the word are impossible.

In Aristotle's vivid description of possible argument of fortune-tellers, one can see, so to say, the "irony of history": "But nothing prevents anybody from stating, ten thousand years ahead, that this event will happen. And nothing prevents another fortune-teller from rejecting this prediction. And thus, it is necessary that any of these (predictions) was correct then. However, it does not matter whether anybody will express such contradiction or not, since it is clear that things will happen in their own way, not matter what one fortune-teller states and another one rejects" (Aristotel, 1978: 101, 18b 32-38).

In this imaginary argument, one of the fortune-tellers will prove right and the other one will prove wrong. However, is there any way for a fortune-teller to prove right? There is. First, many predictions should be made. Second, and most important, is that one should predict different, both opposite, variants of event outcomes. So, a set of predictions should be constructed just about like this: "town A will collapse", "town B will resist", "X will win a battle", "Y will lose a battle", "tyrant Z will come to power", "tyrant Q will be overthrown", etc. Third, one should express knowingly true predictions: "there will be a war", "there will be an epidemic", "there will be a drought", "there will be an earthquake", etc. A prophet making such "predictions" will surely be in a win-win situation. And if he manages to saturate his predictions with various controversial and at the same time mysterious details, his success will be stunning.

This is what Michel Nostradamus did.

A Table of Quatrains

We have built a table of all quatrains in *The Centuries*. The table reflects event-driven content of the quatrains, details as well as eventematic sense. As an example, we give a short fragment of the quatrain table.

Number	Event-driven sense	Details	Eventematic sense
1X.61	A chieftain, with his relatives (with his relatives brought?) will be captured on a seacoast; Messina siege; bad rewards to the Maltese	Seacoast, evil deed, chieftain, tied up, relatives, brought, Malta, Messina, besieged, badly rewarded	Chieftain's arrest; unworthy reward
1X.62	An outstanding leader of crusaders will set free one third of them	Great man, Sheramonagore, crusaders, dependent on, Oppi entries (a town? opia?), Mandragora, Rogon, one third is set free	Part of the troops is set free
1X.63	Protests, tears, sorrows and changes on the French land	Protests, tears, howl, loud cries, terrible sorrows, changes, Narbonne, Bayonne, Foix, Mars, several rounds	War disasters
1X.64	A Balkan will cross the Pyrenees; there will take place a most cruel land and sea battle, impossible to escape	A citizen of Ematia (a citizen of Thessalia? A Balkan?), Pyrenean mountains, will cross, Narbonne, sea, land, dreadful battle, captain (cardinal?), find no shelter	Grand land and sea battle

1X.65	A man will be captured and taken abroad; there will burst out discord; a great man will be accused and a worthless man will be glorified	Surrender, Luna (town? Luna location?), captured, taken, foreign land, unripe fruit, great discord, great man, accusations, glorification	Capture; accusations of the great man, glory to the worthless man
1X.66	Peace, union, changes, end of war; classes will rise and fall; travel (pilgrimage), first fruit; civil process, discussions (citizens will continue debates?)	Peace, union, change, classes, bottom-up, top-down, travel (pilgrimage), first fruit, civil process, discussions, end of struggle (war?)	Up and down the wheel of fortune
1X.67	People who came down from the mountains will meet on a rock; Peter carries a certain message (?) (a protest?); Romans will unite religiously	Mountain tops, Lieser suburbs, port, Valent rock, one hundred people, new palace, Peter, Cre, Romans (citizens of Rome?), notification, religious banner	Religion unites (a new prophet?)
1X.68	In the years of tyrant rule a noble man (a woman?) will be prosecuted; soldiers will hide in the forest (make an ambush?)	Eimer mountains, darkness, noble man (a woman?), grief, Sona, Rona, soldiers, forest, shelter, St. Lucia day, fearful throne	A tyrant prosecutes the nobleman
1X.69	A disastrous hail will kill two thirds of Grenoble refugees	Wai fountain, Brel (Brels?), arrogant men, Grenoble, Lyons, Vienna, disastrous hail, one third of survivors	A natural cataclysm kills refugees
1X.70	On the day of accession to the throne (coronation?) Vienna citizens (Viennese?) will be hacked to death by Romans	Thrust armour, flares, hidden, Lyons, day of accession to the throne, Vienna citizens (Viennese?), hacked to death, Latin cantons	Insidious attack

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