

**INTERNATIONAL SOCIETY OF
PHILOSOPHY AND COSMOLOGY**

PHILOSOPHY & COSMOLOGY

Volume 26



Kyiv, 2021

Philosophy and Cosmology, Volume 26

Academic Journal

ISSN 2518-1866 (Online), ISSN 2307-3705 (Print)

The State Registration Certificate of the print media KB No. 20780-10580P, June 25, 2014.

<http://ispcjournal.org/>

E-mail: bazaluk@ispcjournal.org

It was printed in the manner of scientific-theoretical digest "Philosophy & Cosmology" since 2004.

*It was printed as Academic Yearbook of Philosophy and Science "Философия и космология/
Philosophy & Cosmology" since 2011.*

It was printed as Academic Journal "Philosophy & Cosmology" since Volume 12, 2014.

Printed according to the resolution of Scientific Board of International Society of Philosophy and
Cosmology (Minutes of meeting No. 6 from January 21, 2021)

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Section One

INERT MATTER

The Moon: New Data and Hypotheses of Origin

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Avchenko, Oleg and Anna V. Aseeva (2021) The Moon: New Data and Hypotheses of Origin. *Philosophy and Cosmology*, Volume 26, 5-24. <https://doi.org/10.29202/phil-cosm/26/1>

A summary of the latest data on isotope geochemistry of the lunar rocks shows that their silicon, oxygen and refractory metals isotopic composition are no different from terrestrial one, indicating a single source of origin of both Earth's and Moon's substances. At the same time, the isotopic signature of the volatiles along with rubidium, zinc, gallium, potassium, iron in lunar rocks is fractionated considerably, showing heavy isotope enrichment compared to Earth's ones. Kinetic isotope effect, underlying this phenomenon, occurs during the process of lava degassing when volatiles emits from the magma surface to the vacuum of space. Thus, conditions of the crystallization of lunar rocks deviate significantly from those of Earth.

We consider the formation of the Moon following Marakushev's fission theory. In the view of the theory, the Moon has been spun from proto-Earth, while a necessary impulse moment reached due to a proto-Earth's initial fluid veneer. This event dates to approximately 50 Ma from the moment of the

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Solar system formation and coincides with the beginning of the proto-Earth's core impulse segregation. The future Moon consisted of the relatively light silicate material, but also included a portion of the proto-Earth mantle. Meanwhile, other reasonable hypotheses of the Moon formation, such as impact and evaporation theories, are powerless to explain all the peculiarities of the isotopic signatures of the lunar rocks as well as the genesis of the Galilean moons.

Keywords: lunar rocks, isotope geochemistry, Moon formation, proto-Earth

Received: 1 October 2020 / Accepted: 29 October 2020 / Published: 29 January 2021

Introduction

According to the official sources of NASA, during the Apollo program, 382 kg of rocks have been transported from the Moon's surface to Earth. Being studied carefully (along with 326 g of lunar material brought by Uncrewed spaceflight of Soviet Luna program: Luna 16, 20, 24), it was revealed that the Moon and Earth have common early history within the interval of 4-4.5 billion years. However, there are no terrestrial rocks of that time, except for the single zircon crystal. Meanwhile, new compelling evidence on the structure and isotopy of the Moon are available nowadays. Thus, revision of this data in the light of the most widely debated theories of the Moon origin will shed some light on the earliest Earth's history and is the objective of this report.

Facts concerning the Moon

Among the Solar system's inner planets, which include Mars, Earth, Venus and Mercury, Earth is the only one with its own massive satellite, The Moon. Even though Mars has two satellites, Phobos and Deimos, both are tiny bodies of irregular shape.

According to recent estimates, the distance from Earth to the Moon is 384,400 km. The Moon's average density (3.34 g/cm³) is similar to the density of the Earth's upper mantle (3.30-3.40 g/cm³). Interestingly, the average Earth's density rated to the normal pressure (1 atm) is approximately 4.45 g/cm³. Such a distinction is caused by Earth's massive iron and nickel core, which is 32% of the total Earth's mass. According to Kuskov and coauthors, who generalized a large block of geophysical data, the Moon's core radius was 350-380 km (for an iron core hypothesis) and 500 km (for an iron-sulfide hypothesis), respectively (Kuskov et al., 2008). They also estimated the content of iron, which is 10-12% of the total Moon's mass. The value of iron and silicate ratio does not exceed 0.4-0.5, which is one of the least known in the Solar system, i.e., the Moon is exceptionally iron-depleted. Besides, the Moon does not have any regular magnetic field, but there are elongated residual magnetic fields, as it has been revealed by the lunar magnetometers of Lunokhod-2 and Apollo 12, 14, 15, 16.

Based on the seismic data, Nakamura (Nakamura, 1983) suggested the model of the Moon structure which consisted of crust (58 km thick), upper mantle (58-270 km), middle mantle (270-500 km) and lower mantle (500-1000 km). Due to its rotation, the Moon has a slightly flattened shape; its polar diameter is 3,471.94 km, while the equatorial diameter is 3,476.28 km, which is about a quarter of the Earth's diameter.

Another feature is the presence of the dark patterns on the Moon's surface, so-called "lunar seas," along with the fair patterns of "lunar continents." Dry seas of the Moon are young geological structures and cover nearly 16% of the total area. Its average height is at 2.5 km below than the height of the lunar continents, so dark mare basalts have flooded

these lowlands. The deepest depression (8 km depth) locates on the dark side of the Moon. It is of great interest that the difference between the deepest and the highest points accounts for 16 km.

Numerous craters cover the surface of the Moon. There are more than 17,000 large craters (up to 3,500 m in diameter), and most of them are on the lunar continents. These craters are evidence of intensive meteorite bombarding. Interestingly, the dark outer side of the Moon has many more craters than the visible one. In addition, the Lunar Reconnaissance Orbiter of NASA discovered 40 craters filled with frozen water at least 2 meters thick in the North Pole of the Moon. The Moon is moving away from Earth at 38 mm/year, caused by kinetic energy loss (on a side note, this loss is related to the Moon tidal pull).

Fearful by the first constructors of lunar vehicles, thick layers of dust did not materialize, but a thin coat (no more than 1 cm) of regolith was presented. Regolith is like cement and binds together so heavily that the portion of this substance can hardly be poured from a test-tube under room conditions (Hazen, 2019).

The age of the Moon is 50-70 million years from the beginning of the Solar system formation (Galimov, 2013). Since the beginning of the Solar system formation dates from $4,567.3 \pm 0.16$ Ma (Connelly et al., 2012), the age of the Moon is 4,517- 4,497 Ma or roughly 4.507 billion years. All existing isotope-geochronological methods estimate the age of Earth at 4.56 billion years. In other words, the Moon is just a little younger than Earth itself (no more than 30 million years, according to Connelly et al., 2012), and this fact should be considered when we hypothesize about the Moon's origin.

Bellucci and coauthors have recently published a paradoxical outcome of the study of an unusual zircon from the lunar breccia N 14321 brought by Apollo 14 (Bellucci et al., 2019). Surprisingly, the signature of redox potential, as well as the values of crystallization temperature and pressure of this zircon, corresponded to not lunar, but terrestrial origin. This zircon was in paragenetic relations with quartz and feldspar, which is irregular for lunar rocks. The isotopic age of the zircon was 4,011 Ma, while the age of bulk rock varied from $4,110 \pm 200$ Ma to $4,090 \pm 110$ Ma.

Characteristics of lunar magmatic rocks

Samples of lunar rocks brought to Earth usually are breccia's, regolith, and rocks with clear evidence of metamorphic impact events. Furthermore, most lunar rocks were obtained from the Moon's surface. This layer underwent intense metamorphism due to meteorites bombardment, resulting in melting and even evaporation of rock-forming elements as well as fluid degassing. In other words, the petrological data available, may not be representative information about initial rocks which have been and, still, are in the Moon's depth beneath the regolith layer. However, our knowledge of lunar and terrestrial geology, petrology, and geochemistry are not comparable in general terms. That is why data on the geology of the Moon should be considered as preliminary, which requires further verification and addition.

Magmatic rocks, represented basalt, gabbro, anorthosite, etc., predominate on the Moon, while ultrabasic, intermediate, and felsic rocks are far more limited. Lunar rocks are depleted in alkaline (0.1-2 wt. %) and silica (34-53 wt. %) in comparison with terrestrial ones (Bogatikov et al., 1985).

Ilmenite basalt, dolerite, and gabbro, which determine the minimum silica content, occur much more frequently on the Moon than on Earth.

Mafic rocks, in particular, their extrusive varieties, formed vast plateaus on the Moon and were found in every sample point by all Apollo missions.

Lunar continents and seas have a different composition. Continents predominantly consist of intrusive igneous rocks such as anorthosite, plagioclase gabbro, olivine gabbro, and troctolite, while volcanic rocks are limited. In contrast, lunar seas are composed mainly by volcanic rocks, including picobasalts, picrodolerites, olivine basalts, ilmenite basalts, and dolerites, whereas plutonic rocks like olivine and ilmenite gabbro are rare (Igneous rocks, 1985). Nevertheless, Alexey Marakushev assumed that all lunar rocks represented exclusively by volcanic formation, both crystalline and glassy, so, considering this, the use of the term “plutonic” for lunar rocks is unreasonable (Marakushev, 1999).

It is of great interest that rich in potassium oxides, phosphorus, rubidium, and lanthanides bipyroxene basalts, co-called KREEP-rocks, were revealed in the central parts of the lunar continents (Bogatikov et al., 1985). Besides, a new type of Very High Potassium (VHP) basalts (with potassium oxide content more than 0.5 wt. % and $K_2O/Na_2O > 1$) presented at the 46th Lunar-planetary scientific conference (Roberts & Neal, 2015). The details of their origin remain unclear, but its potassium enrichment is probably related to the secondary metasomatic processes.

The principal minerals of lunar rocks are plagioclase, clinopyroxene, olivine, cristobalite, tridymite, orthopyroxene, ilmenite, and spinel group. Interestingly, clinoenstatite, a common mineral for lunar rocks, is extremely rare on Earth. It can be found only in some exotic rocks of the boninite and marianite group.

Minerals with volatiles are of secondary importance, but still present in some varieties of the lunar rocks. In the first approximation, lunar rocks are richer in TiO_2 and FeO than the terrestrial analogues, but some of these rocks are almost identical chemically. However, ilmenite-olivine and ilmenite varieties of lunar basalts have no analogues on Earth (Igneous rocks, 1985). Following Marakushev’s hypothesis (Marakushev, 1999), the Moon’s core is similar to iron meteorites. The Moon’s mantle is composed of dunite-like rocks, the lunar crust consists (from bottom to top) of analogues of terrestrial diogenites, howardites and eucrites.

Isotope geochemistry of lunar rocks

Since the Isotope geochemistry of lunar rocks plays a crucial role in choosing one or another hypothesis of the Moon formation, we will consider this interesting topic in more detail.

The isotopic composition of some lunar and some terrestrial rocks is almost the same. For instance, there was found a close similarity of the isotopic compositions for all three oxygen isotopes (Wiechert et al., 2001; Spicuzza et al., 2007; Hallis et al., 2010; Young et al., 2016), as well as silicon (Fitoussi & Bourdon, 2012; Georg et al., 2007), chromium (Lugmair & Shukolyukov, 1998), titanium (Zhang et al., 2012), zirconium (Schönbächler et al., 2005a; Schönbächler et al., 2005b) and tungsten (Touboul et al., 2007; Touboul et al., 2015; Kruijer et al., 2015) in both these celestial bodies.

It is of great importance that the isotopic characteristics of refractory elements such as titanium and zirconium are nearly identical in the samples from the Moon and Earth. Therefore, the value $\epsilon^{50} Ti\%$ (1) is almost constant in the Earth samples and accounted for $+0.01 \pm 0.01$ and average (Zhang et al., 2012). For that study, terrestrial rocks were represented by two basalts, one andesite, one ilmenite, and one titanium standard (Utah Ti).

$$\epsilon^{50} Ti\% = \left[\left(\frac{{}^{50}Ti}{{}^{47}Ti} \right)_{sample} / \left(\frac{{}^{50}Ti}{{}^{47}Ti} \right)_{rutile} - 1 \right] \times 10^4 \quad (1)$$

In contrast to terrestrial rocks, the isotopic composition of titanium in meteorites, varies significantly with average values of $+3.07 \pm 0.07$ for carboniferous chondrites, -0.58 ± 0.05 for regular chondrites, -0.17 ± 0.06 for enstatite chondrites, and -0.92 ± 0.06 for achondrites. Nevertheless, in most samples of lunar rocks (a sample of 24 samples) the isotopic composition of titanium is remarkably similar to that of earth samples. The lunar rocks for that study were represented by basalts (8 samples, high- and low in titanium), ilmenites (6 samples), one pyroxene and regolith (9 samples). Only a few lunar samples showed a measurable deviation, reaching $\epsilon^{50}\text{Ti} = 0.23 \pm 0.04$. However, these variations can be explained by a lasting effect of cosmic radiation on the lunar surface proven by the correlation of $\epsilon^{50}\text{Ti}$ with the isotopes of samarium and gadolinium. Zirconium, which is one of the most refractory elements, that is why cosmic radioactive emission along with radioactive decay of chromium and tungsten has a minimal effect on it (Leya et al., 2003; Akram & Schönbächler, 2016); and that is why zirconium is the almost ideal system for defining of the material source for the Moon and Earth, whether it will be a common source or different ones. Based on 28 analyses of five lunar samples (two rocks and three minerals) and 73 analyses of five terrestrial samples (two zircons and three rocks), it was concluded that the isotopic composition of zirconium in both lunar and terrestrial rocks is nearly the same (Akram & Schönbächler, 2016). The lunar probes were sampled from the titanium-rich mare basalts, while two ilmenites and one pyroxene represented minerals. The terrestrial rocks included basalt (BHVO-2), andesite (AGV-2) and shale (SCo-1); and minerals were represented by zircons from the Australian Archean rocks (4.01 and 3.4 billion years ago). It was revealed that the isotopic composition of zirconium in these terrestrial (E) and lunar (M) samples coincides with the limits of measurement accuracy: $\epsilon^{91}\text{Zr}\text{‰} = \text{E}: -0.07 \pm 0.02, \text{M}: -0.08 \pm 0.03, \epsilon^{92}\text{Zr} = \text{E}: -0.06 \pm 0.02, \text{M}: -0.04 \pm 0.02$ и $\epsilon^{96}\text{Zr} = \text{E}: 0.06 \pm 0.04, \text{M}: 0.09 \pm 0.06$. Thus, the evidence above indicates with high probability that the Moon and Earth had a common source.

Nonetheless, the behaviour of isotopes of volatile components in the lunar rocks differs from those of terrestrial. Recent studies revealed that the Moon's substance is enriched with heavy isotopes of chlorine (Barnes et al., 2016; Stephanta et al., 2019), rubidium (Pringle & Moynier, 2017), potassium (Wang & Jacobsen, 2016), gallium, and zinc (Kato & Moynier, 2017) in comparison with those of Earth. In other words, the isotopic composition of these components is strongly fractionated. The isotopic fractionation is also characteristic of iron (Poirasson, 2007).

Let us consider the published data on chlorine, rubidium, gallium, and zinc as an example. Moon rocks have a much heavier chlorine composition compared to rocks of the Earth, although the isotopic ratio of chlorine in them $^{37}\text{Cl}\text{‰}$ (2), varies widely (Fig. 2, Barnes et al., 2016). Thus, the isotopic composition of chlorine of various lunar basalts is much heavier in comparison with terrestrial rocks.

$$\delta^{37}\text{Cl}\text{‰} = \left[\left(\frac{^{37}\text{Cl}}{^{35}\text{Cl}} \right)_{\text{sample}} / \left(\frac{^{37}\text{Cl}}{^{35}\text{Cl}} \right)_{\text{SMOC}} - 1 \right] \times 1000 \quad (2)$$

Interestingly, continental lunar KREEP basalts, norites, troctolites and granulites have the highest values of $\delta^{37}\text{Cl}$, varying from $+25$ to $+35\text{‰}$. There are high bulk concentrations in these apatite samples (1-1.4 wt %), which noticeably exceeds the Cl content in apatite of terrestrial rocks (Fig. 2). Moreover, high $\delta^{37}\text{Cl}$ concentrations (from $+12.8 \pm 2.4$ to $+10.1 \pm 3.2\text{‰}$ on average) were also found in melt inclusions in pyroxene and olivine from the lunar basalts (Stephanta et al., 2019).

As chlorine, the isotopic composition of rubidium in lunar rocks is noticeably enriched with a heavy isotope in comparison to terrestrial rocks. Thus, the value of $\delta^{87}\text{Rb}\text{‰} = [({}^{87}\text{Rb}/{}^{85}\text{Rb})_{\text{sample}} / ({}^{87}\text{Rb}/{}^{85}\text{Rb})_{\text{standard}} - 1] \times 1000$ in the Earth's rocks changes from -0.09 to -0.16 (with average -0.12 ± 0.06) (Pringle & Moynier, 2017). While, for lunar low-titanium basalts, the average $\delta^{87}\text{Rb}$ value is equal to $+0.06 \pm 0$. The difference in average values of $\delta^{87}\text{Rb}\text{‰}$ between lunar and terrestrial rocks is $+0.17 \pm 0.13$. The Earth's rocks sampling consisted of four basalts, one andesite and one granite, whereas the Moon's rocks sampling included three low titanium basalts, three titanium-rich ones and one norite.

Similarly, the isotopic composition of gallium, by Chizu Kato and Frédéric Moynier, is also enriched with the heavy isotope in a few studied samples of lunar basalts (Kato & Moynier, 2017). Namely, the value of $\delta^{71}\text{Ga}$ (3) varied from 0.15 to 0.57‰ in four samples of high-titanium basalts and from 0.09 to 0.32‰ in three low-titanium basalts, while the average value of this ratio in the terrestrial rocks is equal to 0.00‰ . At the same time, there were two samples from lunar basalts surprisingly rich in a light gallium isotope.

$$\delta^{71}\text{Ga}\text{‰} = \left[\left(\frac{{}^{71}\text{Ga}}{{}^{69}\text{Ga}} \right)_{\text{sample}} / \left(\frac{{}^{71}\text{Ga}}{{}^{69}\text{Ga}} \right)_{\text{standard}} - 1 \right] \times 1000 \quad (3)$$

However, according to Kato and Moynier, there is also a moderate but pronounced correlation between the heavy isotopes of gallium ($\delta^{71}\text{Ga}$) and zinc ($\delta^{66}\text{Zn}$) in lunar samples; in other words, enrichment of gallium and zinc with heavy isotopes (Fig. 3).

Three of the most reasonable hypotheses of the origin of the Moon

Simple theories of the Moon's formation, such as the theory of gravitational captured body; the accidental capture of the Moon; and the simultaneous co-accretion of the Moon and Earth from planetesimals, are powerless to explain many peculiar facts concerning their relationships. For example, the substantial similarity of the Moon's volcanic rocks to those of the Earth in terms of isotope composition, the whole rock iron depletion of the lunar rocks, and, consequently, the relative enrichment of the Earth's mantle with iron. However, there are three hypotheses for the Moon formation, capable of explaining the most critical aspects of the geochemistry and physics of the Moon.

The standard Giant-impact theory

The hypothesis of a giant impact event, a collision between Proto-Earth and a Mars-sized planet, called Thea, which occurred about 4.5 billion years ago, is the leading theory of the Moon formation (Hartmann & Davis, 1975; Cameron & Ward, 1976; Benz et al., 1986; Agnor et al., 1999; Canup, 2012; Stewart, 2016). All existing variations of this theory include two main phases; firstly, modelling of impact event with the subsequent formation of a debris disk; secondly, an accretion of the debris, resulting in the formation of the Moon itself. The results of such simulation depend on many factors, some of which remain uncertain. For example, the mass and speed of the Earth's rotation may differ significantly from the current one a few billion years ago. Besides, the mass and velocity of Thea are indefinite, as well as the angle at which Thea crashes into Earth. The melting degree of both colliding Earth and Thea is also unknown. All plausible scenarios consistent with the data observed require that the arriving body tangentially strike Earth instead of a frontal impact. That is why Thea could not be on the Earth's orbital plane.

According to Canup, the most probable collision scenario requires Thea's mass equal $1/6$ of this of Earth, wherein $4/5$ of the Moon's substance should come from Thea (Canup, 2004). Consequently, Thea's initial chemical composition was as close to that of Earth as the Moon at present. Nevertheless, it means that Earth and Thea should be formed in close orbits and similar distances from the Sun to absorb the same substance. That is why the question arises: Is it possible to have two large bodies in the same orbit? Next, could not one body simply absorb another?

In 2015, Alessandra Mastrobuono-Battisti and her team calculated 40 models of the last stage of planetary accretion. It was initially predicted that bodies with equidistant orbits, relatively the Sun, should have a close composition; however, the modelling showed that there is an only one-in-three chance that Thea has the same chemical composition as Earth (Mastrobuono-Battisti et al., 2015). Thus, in the light of this hypothesis, a close resemblance between terrestrial and lunar volcanic rocks seemingly does not have any contradictions. Since a hypothetical catastrophic collision occurred after the Earth's core was formed, the standard impact theory can explain such facts as the high angular momentum of the Earth-Moon system, the Earth's axial tilt and low iron content in the lunar rocks. Besides, iron concentrated in the Earth's core and the Moon formed from the stony matter in the Earth's mantle. Therefore, as Ian Stuart claimed, in order to have a consistent variant in impact theories, in terms of both chemical composition and momentum, we cannot do without a large attacking body (Stewart, 2016).

The fission hypothesis

Proposed by Charles Darwin's son George Howard, in the 19th century, the fission theory states that the Moon formed for the account of the separation of a piece of the Earth's substance by centrifugal force. The theory proposed that at the initial stage, the molten Earth rotated so rapidly that a part of it eventually was detached. Moreover, building on his calculations, George Darwin predicted that the Moon must gradually move away from the Earth, as confirmed by up-to-date estimates of the distance from Earth to the Moon.

However, by the 1930s, its inconsistency had been proved, as the total angular momentum of the Earth-Moon system is insufficient to cause rotation instability even for liquid Earth; otherwise, it could lead to the partial loss the Earth's substance by centrifugal force (Stewart, 2016). However, these calculations relied, of course, on the mass of the present-day Earth.

A well-known Russian petrologist and academician Alexey Marakushev injected fresh momentum to the fission theory, hypothesizing that proto-Earth mass was far beyond than now (Marakushev, 1999). He developed his original hypothesis in his later years, and the hypothesis is still hardly known to the scientific community. As the authors tend to support this very theory of the Moon formation, we consider it in detail.

The general structure of the Solar system is described as follows. Firstly, the outer envelope is surrounded by a vast majority of small cometary bodies, such as the Clouds of Horta and Kopeir Belt (which are close in physical condition and location to Pluto). Next, there are giant planets with water and helium-hydrogen fluids, namely, Uranus (14.6 in units of the Earth's mass), Neptune (17.2), Saturn (92.2), and Jupiter (317.9). Finally, they followed by degassed planets of the Earth group, occupying a circum-solar position — Mars (0.1074), Earth (1.0), Venus (0.8150) and Mercury (0.0558). Besides, there is an asteroid belt between Jupiter and Mars, consisting of numerous debris of independent stony-iron planets or, perhaps, satellites lost by main planets.

There are two key ideas in Marakushev's theory. First, it is a posit that the planets of the Earth group initially (at the protoplanetary stage) had giant fluid veneers, later lost under the solar wind. The latter, composed of protons and electrons, is moving away with supersonic speed from the Sun, reaching the distance of 200 AU. Within the framework of this model, Proto-Earth is naturally integrated into the Gain-planet system by its diameter, mass and momentum (Fig. 4, Table 1).

The second key idea concerns the physical and chemical effect of fluid-silicate immiscibility inside proto-planets, which led to the differentiation of protoplanets into dense, heavy iron-stone cores and less dense fluid shells. Dense components, like MgO, SiO₂, Fe, FeO, Ni, etc., were mainly concentrated in the core, but their content in gaseous dust cloud was initially low. That is why the stony-iron cores of the planets are small in comparison with the total size of the giant planets.

Indeed, these Marakushev's ideas are very reasonable (Marakushev, 1999). Thus, massive fluid Jupiter-sized planets, surrounded by small stars like Sun, have been recently discovered as a result of precise measurements of the Doppler effect using "Advanced Fiber Optic Echelle spectrometer" (Mayor & Frey, 2003; Noyes et al., 1997; Powell, 1997).

For example, two groups of researchers, studying the Doppler spectral variation of 51 Pegasi star, found a planet near half-sized Jupiter by mass (Powell, 1997). At the same time, Neil Tyson & Donald Goldsmith mentioned a giant exoplanet almost twice the mass of Jupiter, which rotates around the sun-like star HD 73256 at an average distance of only 3.7% of the distance between Earth and the Sun (Tyson & Goldsmith, 2008).

Also, a series of experiments have been conducted in order to prove the fluid-silicate immiscibility effect (Marakushev, 1999). Differentiation, or liquid immiscibility, was experimentally modelled, using the material of "Tsarev" chondrite (Marakushev, 1999). A distinct fractionation of matter (exposure time — 5 hours, temperature — 1400°C, the pressure of the water-hydrogen mixture — 400 MPa, hydrogen molar fraction — 0.65) into three zones have been achieved, namely, mafic, ultramafic, and metallic. Sharp borders separated all zones. Interestingly, the ultrabasic layer includes rounded extractions (drops) of the metallic phase. These droplets precipitate by gravity, forming the lower layer composed of nickel-iron and sulfides with the minor impurities of silicate material. This fractionation, following Marakushev's opinion, is broadly similar to chondrite differentiation into chondras and matrix.

Table 1. Main characteristics of the Sun, Earth, Proto-Earth, fluid giant planets and Pluto. They are summarized after (Marakushev, 1999) and (Smulsky & Krotov, 2015).

Parameters	Sun	Earth	Proto-Earth	Jupiter	Saturn	Uranus	Neptune	Pluto
Average distance from the Sun, a.i.	0	1.00	1.00	5.203	9.539	19.18	30.06	39.75
Period of circulation, years		1	1	11.86	29.46	84.01	164.8	247.7
Rotation period, day	27-32	1.0	0.4	0.411	0.426	0.459	0.668	6.38
Orbital speed, km/s	0	29.8	29.8	13.1	9.6	6.8	5.4	4.7
Mass (Earth=1)	333000	1	570	317.82	95.28	14.56	17.28	0.11

Diameter, km 10^5	13.91	0.127	2.5	1.43	1.20	0.518	0.49	0.03
Density, g/cm 3	1.41	5.52	1.3	1.3	0.1	1.47	2.27	1.0
Gravity (Earth=1)	28	1.00	4.3	2.64	1.15	1.17	1.18	
Impulsive moment, kg·m 2 /sec		$7.2 \cdot 10^{33}$	$3.8 \cdot 10^{39}$	$0.7 \cdot 10^{39}$	$1.3 \cdot 10^{38}$	$2.5 \cdot 10^{36}$	$2.3 \cdot 10^{36}$	$9.9 \cdot 10^{28}$

Overall, chondrites are iron-rock meteorites, which structure fixed the process of fractionation of meteorite substance into tiny silicate droplets (chondras) and a nickel-rich matrix. Chondrites are therefore fragments of stony-iron planets in the very early stages of their evolution. Thus, the experiments, as well as chondrite meteorites, could evidence Marakushev's idea.

According to this theory, the planetary system of the Solar System initially consists of several homogeneous giant planets, including the near-solar planets of the Earth group. Masses of the Protoplanets accounted for (in units of Jupiter): Proto-Mercury (3.4), Proto-Venus (2.8), Proto-Earth (2.52), Proto-Mars (2.13), Proto-Jupiter (1), Proto-Saturn (0.3), Proto-Uranus (0.05), and Proto-Neptune (0.05). During evolution, these planets have differentiated into fluid shells and iron-silicate cores due to the fluid-silicate immiscibility phenomenon. Separation of the heavy planet's core was impulsive and accompanied by the removal of lighter silicate material into satellite systems under centrifugal forces. Relatively lighter iron-depleted material concentrated in satellites, enriching the cores of protoplanets with iron. Circum-solar protoplanets with giant fluid veneers could generate massive stone satellites, and this separation only increased the proportion of iron in their molten cores. Thus, Proto-Earth has been once a giant planet with a helium-hydrogen fluid shell, like up-to-date Jupiter, and was the parental planet of modern Earth and the Moon (Marakushev, 1999).

The Moon Proto-Earth mass ratio at the beginning of the Moon's birth, obviously, is insignificant by analogy with the Io-Jupiter system, for which it equals 3.9×10^{-5} (Avsyuk, 1996). The loss of the Proto- Earth's fluid veneer by the solar wind changed the initial mass ratio to today's value (1.2×10^{-2}), which, consequently, caused a weakening of the Earth's gravitational field and losing small Earth's satellites (only the large Moon remains). Other giant circumsolar Protoplanets (Proto-Mercury, Proto-Venus, and Proto-Mars) have also lost their fluid shells as well as previously formed systems of small satellites. These satellites were lost on the protoplanetary stage, which determined their iron-silicate ratio since they were composed of relatively light silicate. By the total iron-nickel ratio (in wt. %), the circumsolar planets form a raw: Mercury — 66, Earth — 36, Venus — 32, Mars — 25. Thus, the initial mass of the solar system was, evidently, much larger than the current. The fluid-silicate melt substance of the future Moon had been separated (along with the Proto-Earth mantle's captured piece) even before the giant Proto-Earth lost its fluid shell.

Further, the Moon eventually evolved by the strong gravitational field of Proto-Earth, which controlled the endogenous activity of the Moon over 4.5-3.2 billion years. During that period, the Moon's molten core has been forming, accompanied by its enrichment with iron. This durable process caused the raising of fluid plumes from the molten core and replacing the primary crust by newly forming volcanic depressions ("seas"). The latter, interestingly, mainly occurs on the visible side of the Moon. Thus, the Moon's asymmetrical structure, expressed by the presence of the volcanic depressions and thinner crust on the visible side, developed in the earliest stages of its evolution.

About 3 billion years ago, the Moon, due to the hardening of its core, the cessation of degassing and elimination of fluid flows from the core, consolidated almost entirely. An end of volcanism, consequently, led to the loss of the magnetic field, and The Moon has become an endogenously passive (“dead”) planet.

The hypothesis above is a consistent variant of the Moon’s origin requiring no attacking body, taking into account such facts as the close isotopic composition of volcanic rocks of both Earth and the Moon, the unusually large the Earth-Moon angular momentum, and the relative depletion of the Moon with iron. The hypothesis embraces the main features of the formation of the Moon and other satellites of the Solar System; it represents an entirely new point of view on the evolution of the Protoplanets and their subsequent transformation into the planets we know today.

Evaporation hypothesis

The hypothesis of simultaneous formation of Earth and the Moon as a dual system due to dust cloud collapse was proposed and developed by Erik Galimov and his team (Main trends of geochemistry, 1995; Galimov et al., 2005; Galimov, 2008; Galimov, 2011; Galimov, 2013; Galimov, 2019). This theory’s central point is the depletion of the Moon in iron and some volatile components due to evaporation and accumulation of the cloud into two condensed bodies with different iron content. Nothing is surprising about the process of evaporation of rock-forming elements and iron, since experiments (Hashimoto, 1983; Markova et al., 1986) have shown that during the melting of chondrite (as the closest to the original cosmic substance which formed the planets) subsequent to the most volatile components, such as compounds of carbon, sulfur, chlorine, the alkaline metals (K, Na) begin to evaporate and then the iron. Further evaporation will cause volatilization of Si, followed by Mg. Ultimately, the melts will be enriched by the least volatile elements like Al, Ca, Ti. However, there were two inconsistencies to solve in this hypothesis. The first problem is to defy how and why one dust cloud separated into two fragments, large, which has become Earth and, small, the future Moon? The second question concern with the composition of both fragments. Why is Earth not so depleted with iron, silicon, and magnesium as the Moon, if they, by this hypothesis, formed simultaneously from the same dust cloud?

The Moon, according to Galimov, is highly depleted with such components as K, Na, Rb, Fe and, especially, Pb compared to the Earth (Galimov, 2011). The depletion of the Moon with iron and lead is explained by Galimov by a peculiar mechanism of evaporation when the substances evaporate not from the surface of the Moon but relatively small bodies or particles. Thus, it came to pass; the process of evaporation does not leave any traces of isotope fractionation (Galimov, 2011; Galimov, 2019). The absence of isotope fractionation during evaporation is explained by the fact that the isotope fractionation levels reflect the thermodynamic (rather than kinetic) isotope effect, which is exceedingly small at high temperatures.

This situation may be realistic in a high temperature collapsing cloud of hot scattered particles in equilibrium with their saturated steam, which means that evaporation occurs in a closed system. Steam passes into the outer zone of the cloud, and the loss of components occurs “layer by layer” as the cloud shrinks. The squeezed steam flees away by the directed flow of solar wind. Meanwhile, the idea of a closed system is inapplicable to a melt released into Earth orbit and vaporized into outer space; nevertheless, it is quite consistent with the processes in a cloud of particles. When the evaporating particles are surrounded by their

vapors, the cloud, as a whole, is a closed system. It compresses by gravity and then collapses. After that, the evaporated substance squeezes out; so that the remaining particles became depleted in mobile elements. Therefore, there are almost no signs of isotope fractionation. The collapse of a cloud of particles was simulated by computer modelling (Galimov et al., 2005; Le-Zakharov & Krivtsov, 2008).

However, the simulation indicated the forming of a central body with increasing temperature; there was no fragmentation of the cloud in modelling the first stage. In other words, there was one body instead of the dual Earth-Moon system. The angular momentum of this system was insufficient to divide the entire body of the cloud into two fragments. However, if we take into account the effect of evaporation, the situation changes fundamentally. Evaporation from the particle surface causes a repulsion effect, leading to rotation instability, which can be a reason for the formation of two hot bodies (Galimov et al., 2005). After fission and segregation of these two bodies, the mass of matter remains in the surrounding cloud of particles.

At the same time, both fragments, the future Moon and Earth, were depleted in mobile elements and iron at almost the same degree. However, computer simulation has shown that if one fragment is (arbitrary) a little bit more massive than the another, further accumulation of substance proceeds extremely asymmetrically (Galimov et al., 2005). A larger nucleus grows much faster. As the difference in size increases, the difference in accumulation rates of rest matter of the cloud increases exponentially. As a result, a smaller nucleus changes its composition only slightly, while a larger nucleus (the future Earth) withdraws nearly all the primary substance of the cloud. The latter eventually acquires a composition very close to the primary chondrite substance, except for the volatiles and the most mobile components that leave the collapsing cloud irretrievably. The loss of the volatile components, in this case, occurs not only due to evaporation into space, but also due to the extraction of the residual vapour by the collapsing cloud without any noticeable isotope fractionation. Summarizing, the partition of the cloud into two fragments along with the Moon's depletion in iron and other mobile components compared to the Earth explained with the special mechanism of evaporation of mobile components from a collapsing cloud of particles, minimizing or, even, prohibiting isotope fractionation. Galimov's hypothesis for the first time proposed a mathematical solution for the dual Earth-Moon system under real physical parameters.

Discussion

Geochemical features of the isotope behaviour in the Moon's rocks are determining factors when choosing a reliable and inconsistent hypothesis of its origin. Even though the isotopic composition of oxygen, silicon, chromium, tungsten titanium, zirconium in the lunar and terrestrial rocks, differ slightly, the affinity of the isotopic compositions of such elements as titanium and zirconium is particularly significant. This fact evidences a single source of origin of the Earth's and the Moon's substances, which all three hypotheses above substantiate. Thus, it is clear that the Moon originated from a substance similar in composition to that of Earth rocks.

At the same time, the isotopic compositions of mobile components in the Moon's and Earth's rocks, such as chlorine, rubidium, gallium, zinc, potassium and even iron, as we have already mentioned, are different.

The fact is that the isotopic composition of these components in lunar rocks enriched with heavy isotopes or, in other words, is strongly fractionated, which can be explained by the *kinetic isotopic effect, due to the dissipation of mobile components into the open space.*

Fractionation of chlorine (Fig. 2), gallium, and zinc (Fig. 3) is particularly indicative. Thus, the concentration of heavy chlorine in the Moon apatite is in order of magnitude higher than in terrestrial ones.

However, this isotopic fractionation of a wide range of elements contradicts Galimov's hypothesis. This theory assumes a particular mechanism of evaporation of mobile components from the collapsing cloud, minimizing or, even, excluding fractionation of isotopes (Galimov, 2011; Galimov, 2019). Next, another Galimov's idea about the super-depletion of the Moon in mobile components is also objectionable. For example, the bulk chlorine content in apatite from some lunar magmatic rocks exceeds the chlorine content in terrestrial apatite (Fig. 2); hence during this lunar apatite crystallization, chlorine potential was higher compared to terrestrial basalts.

Besides, there is direct evidence of the presence of volatiles in lunar magmatic; for example, volcanic glasses, contain numerous microvacuoles with minerals of volatile components such as galite, sylvine, and althamite (Bogatikov et al., 1979). This association of glass and chlorides is not secondary, as it does not conform to impact fractures. In addition, numerous studied samples containing impurities of fluorine, chlorine and sulphur prove that and some of them 'undoubtedly formed during endogenous mineral formation. There were findings of rhodium iodide, hydroxy chlorides, antimony fluoride and chloride compounds, as well as barite and celestine. These findings prove a very active role of halogens and sulphur, and, probably, indicate the presence of gaseous oxygen in mineral genesis (Mokhov et al., 2007).

The crucial role of chlorine in the processes of lunar mineralization is emphasized since it can serve as a transport component during the element transfer in a gas environment, as well as halides and sulphur (Ashikhmina et al., 1979). Based on a quantity of various halogen-containing phases, this process is quite common on the Moon.

Interestingly, the water content in alkaline feldspars of the so-called lunar granites (sample Apollo 15405) reaches 20 ppm (Mills et al., 1979), which is comparable to ones from the Earth's rhyolites, where these values vary from 10 to 1000 ppm (Johnson & Rossman, 2004). The zircon age of these lunar granites is 4.3-3.9 Ga, i.e. crystallization of lunar rhyolite magmas occurred after the formation of the Moon itself and could not have come from dry melts. Thus, the isotopic fractionation phenomenon, along with the fact of the presence of mobile and volatile components in lunar rocks, contradicts the ideas of Galimov and does not allow to accept his hypothesis of the Moon formation.

Currently, variations of the impact hypothesis of the Moon formation are the leading theories. However, there were difficulties. The main problem is that the striker's substance must be very close to the terrestrial ones in the isotopic composition of refractory elements. Therefore, the striker must take the same orbit as Earth and then collide with it tangentially, forming the Moon mostly at its own expense (of matter 80% or more). Despite a 30% feasibility of this impact event, according to computer simulation, the uncertainties of such a mechanism for the Moon's formation are at least alarming.

Moreover, Galimov emphasized the low probability of coincidence of the impactor matter with the Earth's one in the isotopic compositions of oxygen and the hafnium-tungsten system as a difficult or even insurmountable problem (Galimov, 2011). We are convinced that the impact theory is an artificially introduced one, as they say, "ad hoc," and is of little use to explain, for example, the formation of the Galilean satellites of Jupiter.

The fission hypothesis of the Moon formation, in our opinion, is the most plausible (Marakushev, 1999). It assumes the same isotopic composition of refractory elements in

terrestrial and lunar rocks. Also, it does not contradict the isotopic fractionation of volatile and mobile components. At the same time, the Proto-Earth mass is sufficient to provide the necessary angular momentum for detaching of the Moon by centrifugal force (Table 1). Besides, the lunar mass was detached at the protoplanetary stage of the Proto-Earth simultaneously with the beginning of the impulse separation of the Proto-Earth's heavy core. This event dates to about 50 million years from the beginning of the Solar system. A relatively light silicate material was given to the future Moon plus a captured part of the Proto-Earth mantle.

This hypothesis clearly explains the bulk iron depletion of the Moon. At the same time, iron content in the Earth's mantle is currently estimated at eight wt. %, while for the Moon, these estimates are 12-13 wt. % (Kuskov et al., 2018). Therefore, Earth's core formation was spread over time and had eventually completed after the Moon separation, which led to the fact that the current of iron content in the Earth's mantle is different from that of the formation of the Moon. During the period of 4.5-3.2 billion years, the formation of the Moon's core continued, accompanied by magmatism and the formation of volcanic depressions ("seas") and uplifts ("continents") caused by fluid plumes from the melted core. The formation of lunar volcanogenic rocks with subsequent evaporation of volatile and mobile components into the open space followed by the kinetic isotope effect, which in turn caused the isotope fractionations. About 3 billion years ago, the Moon entirely consolidated; its core got hard; so fluid flows and volcanism dissipated; fluid shell and own magnetic field were lost.

Marakusev's fission hypothesis is also capable of explaining the formation of other planets' satellites in the Solar system. As an example, the developed satellite system of Jupiter demonstrates the difference between massive satellites of the inner zone and small satellites of intermediate and outer zones. Galilean satellites, Callisto, Ganymede, Europe, and Io, are on the inner zone, and are peculiar only to Jupiter, varying in density from 1.8 to 3.5 g/cm³. Interestingly, the density of satellites increases as they approach Jupiter — 1.8-1.9-3.1-3.5 (g/cm³), respectively. For instance, Io has a diameter of 3,640 km, density of 3.5 (g/cm³), distance to Jupiter 422,000 km and mass 8.9×10^{22} . In comparison, the Moon has almost the same parameters (equatorial diameter — 3,476.28 km, density -3.34 (g/cm³), distance to Earth — 384,400 km and mass $7,347 \times 10^{22}$ kg. This fact underlines the probable analogy between the mechanisms of formation of the Moon and Io as well as other Galilean satellites. It also evidences the fission hypothesis of the Moon formation and makes us think that 4.5 billion years ago, Proto-Earth looked like Jupiter now. Note that the Proto-Earth's angular momentum was five times more than this of today's Jupiter (Table 1), and, to create such an impulse, modern Earth should rotate at the rate exceeding two revolutions per second. Therefore, no impact hypothesis is required to increase Proto-Earth's angular momentum and explain the Moon's separation from Proto-Earth. In our opinion, Marakushev's hypothesis of the Moon formation is, firstly, free from contradictions, secondly, in agreement with the available factual material on the isotopic composition, thirdly, able to explain the formation of other satellites of the Solar system, and, finally, the most rational.

Conclusions

1. The Earth and the Moon have a single source of origin of their composing substance, which is proved by the close isotopic composition of oxygen, silicon, chromium, tungsten, titanium and zirconium.
2. The isotopic composition of the volatile and mobile components of lunar rocks, such as chlorine, rubidium, zinc, gallium, potassium, iron, is distinctly fractionated and enriched with heavy isotopes, which is explained by the kinetic isotopic effect

when these components dissipate from the surface of magma into the vacuum of space.

3. The origin of the Moon is considered in the light of Marakushev's fission hypothesis, which assumes the Moon separated from the Proto-Earth. Due to the fluid veneer, Proto-Earth's mass exceeded the mass of modern-day Earth more than 500 times, which created the necessary angular momentum. This event dates to about 50 million years since the beginning of the solar system. It coincided with the beginning of the impulse separation of the Proto-Earth's heavy core. The future Moon was composed of relatively light silicate material but included the part of the Proto-Earth's mantle.

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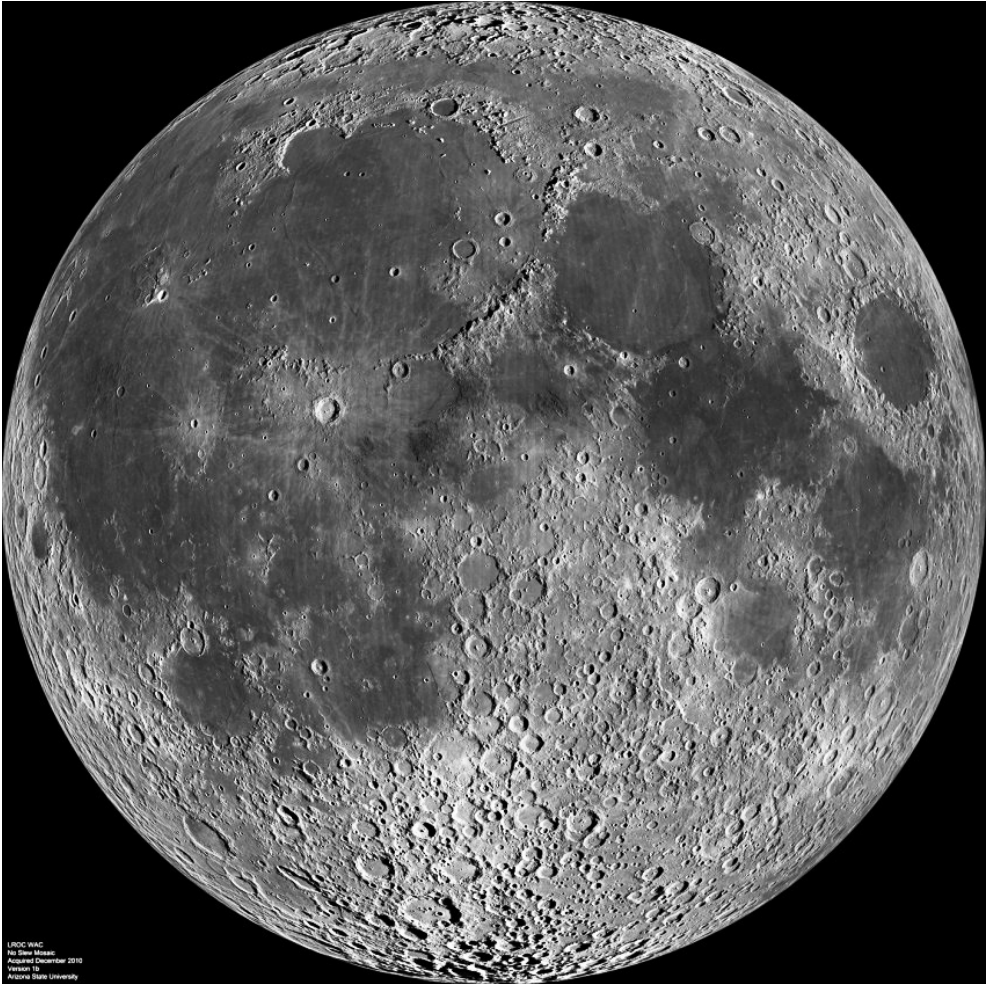


Fig. 1 The nearside of the Moon (a combination of 1300 images made by NASA lunar orbiter) demonstrates dark patterns of volcanic depressions (lunar seas) and numerous meteorite craters of different sizes. <https://apod.nasa.gov/apod/ap110303.html>

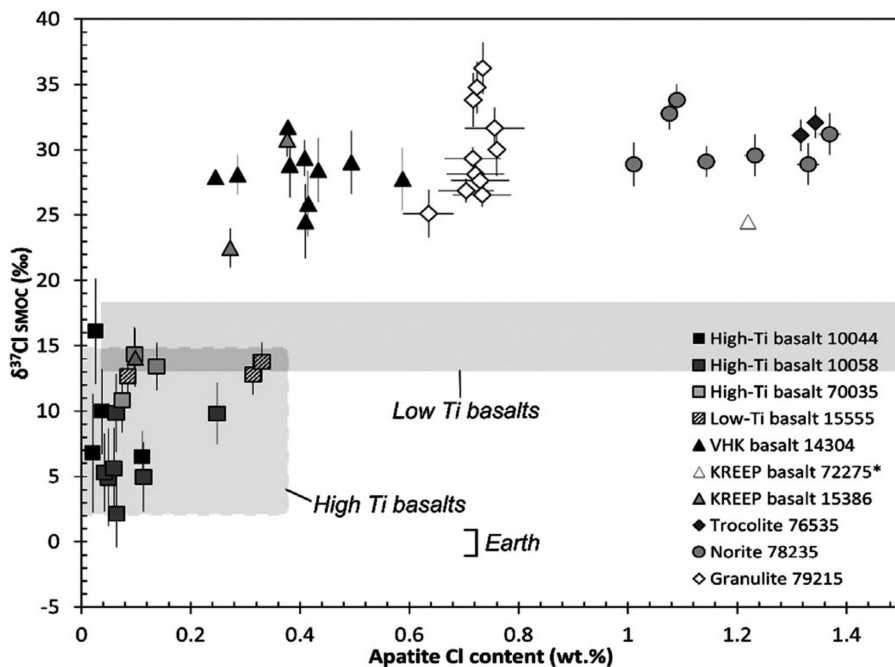


Fig. 2. Value of $\delta^{37}\text{Cl}$ SMOC‰ in lunar apatite rated to apatite chlorine content, according to (Barnes et al., 2016).

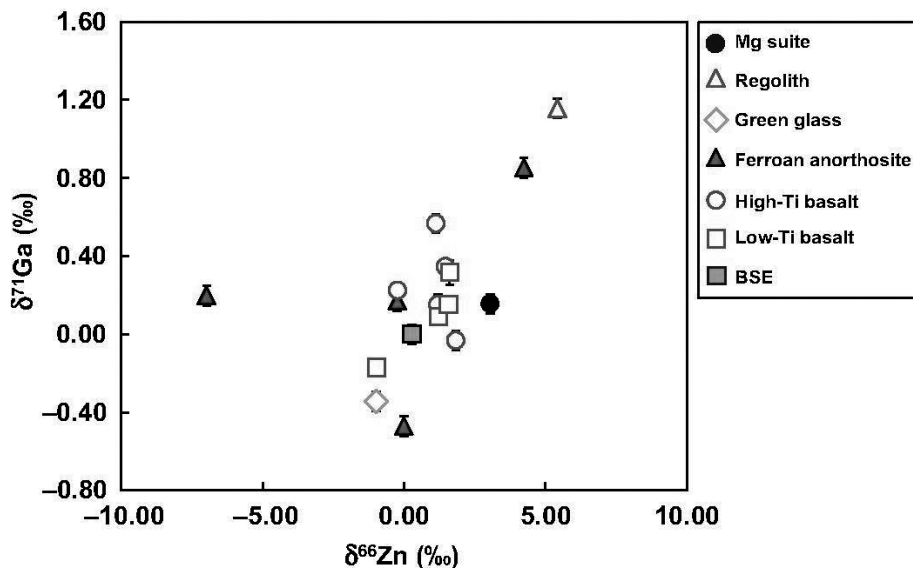


Fig. 3. The correlation between gallium and zinc isotope composition in lunar samples with the highest values of ($\delta^{71}\text{Ga}$) and ($\delta^{66}\text{Zn}$) in the lunar regolith (after Kato & Moynier, 2017). BSE (Bulk Silicate Earth) is the bulk silicate composition of Earth.

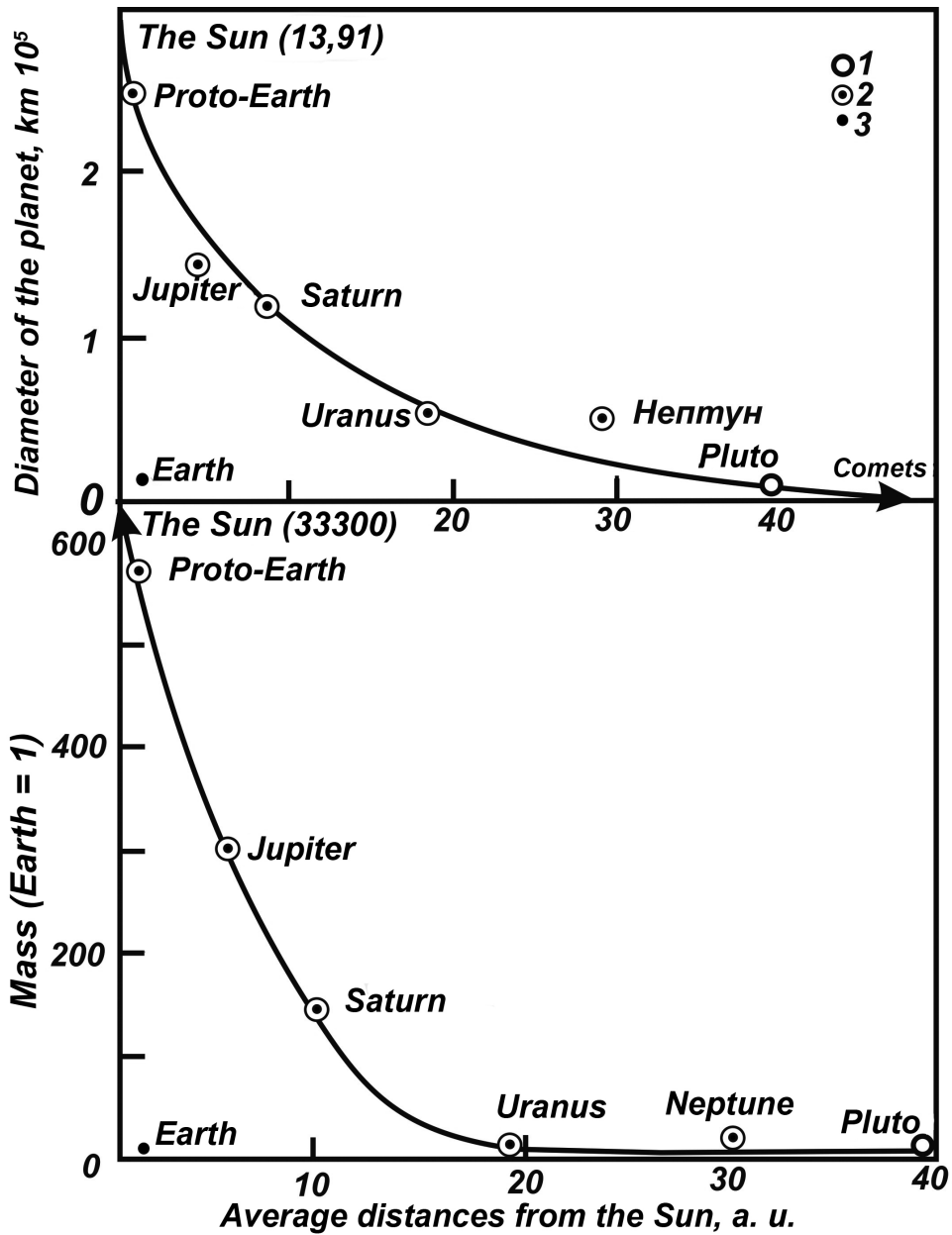


Fig. 4. The hypothetical position of Proto-Earth among the planets of the Solar system by their diameter and mass (Marakushev, 1999). 1-ice comet-like planets; 2-planets stratified with iron-rock nuclei and giant fluid shells; 3- modern Earth.

Space Doctrine and the Future of the Space Industry

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Soroka, Larysa (2021) Space Doctrine and the Future of the Space Industry. *Philosophy and Cosmology*, Volume 26, 25-34. <https://doi.org/10.29202/phil-cosm/26/2>

The article analyses the modern and retrospective international and national regulations in the field of space activities. It is emphasized that the long-term program of space research proves the maturity and competence that we have yet to demonstrate. The development of such a program (rather, doctrine) is beyond the preparation of a formal document. The challenges we have outlined are about the role of the space doctrine in the system of conceptual documents defining the areas of the space sector's sustainable development. In the study, the dialectical materialist method of in the cognition of the objective reality enables to analyze of comprehensively doctrinal provisions in developing the concept "Space doctrine." The empirical research was based on the statistical and analytical materials: World Trade Organization Annual Report 2019, the Roscosmos State Corporation for Space Activities for 2018, Aeronautics and Space Report of the President — Fiscal Year 2019 Activities, the statistical data and reports of the State Space Agency of Ukraine (SSAU) for 1997-2020. The study leads to a number of conclusions. The implementation of the future Space doctrine should be a shift from the initial state of affairs to the new model of space activities and the sustainable development of the space industry. The study reveals three levels of Space doctrine: basic, strategic, and tactical (operational).

Keywords: space doctrine, national space interests, social benefit, sustainable development, innovations, public-private partnership, space technologies

Received: 19 October 2020 / Accepted: 28 November 2020 / Published: 29 January 2021

Introduction

The extension of boundaries after man's entry into outer space has determined the concept of "Space Doctrine." It has raised many questions for scientists. One is the cognition of the nature of law as a special instrument for social engineering of space activities. Moreover, this concept should be not only a regulator and a key mechanism for managing the shift of civilization to a sustainable future. It develops under the all-encompassing integration of space technologies and services into the daily lives of people.

The long-term space action plan is the confirmation of the maturity and competence that we have yet to demonstrate. The development of such a program (rather, doctrine) is beyond the preparation of a formal document. The challenges we have outlined are not much about the provisions or formulations to be considered, but about the role of the space doctrine in the system of conceptual documents that define political decisions (Activity Reports, 2020). Therefore, the technology of space doctrine development requires methods proven in other countries.

We have analyzed practices applied in the adoption and implementation of the space doctrines USA (Air, 2006; Lupton, 1988; Aeronautics, 2019), PRC (White, 2000; White 2011), the Russian Federation (Annual Report, 2019), the United Kingdom (Hughes, 2018), the Republic of India (Gurbachan, 2016). It has shown that the governments of these countries encourage policies that require a nationwide focus on job creation related to space activities. The pursuit of leadership, according to the old standards, is the past. The focus is on reducing budget expenditures and increasing public-private partnerships in space projects. Cooperation between all sectors of the economy and spheres of public life must promote and optimize the combined civil, military and commercial exploitation of space. Such cooperation will best meet the national interests of any country.

When developing new national goals and realizing the national interests, the following three questions should be answered:

1. Degree of human presence: how widely and in what quantity they will be present in space.
2. Commercial potential: an economic level of new, permanent income of the space activities.
3. Ensuring sustainability: the extent to which government is able to create civilian, commercial and military space potential that would comply with established norms, standards and international regulations in space.

Therefore, the design and implementation of the future Space Doctrine should be a shift from the initial state of affairs to the new model of space activities. Moreover, its elaboration requires considering the specific role of the space activities in the social and economic development of society as a factor of various innovative technologies interaction.

The development of the Space Doctrine of Ukraine exemplifies that government representatives, together with specialists from the space industry (but not limited to) and scientists, should use the synergy of efforts to optimize and promote common national space ideas and strategy. The government's key role is to develop core capabilities and technologies to ensure positive outcomes in the future through a sound investment, political and regulatory strategy. Various sectors of the economy must commit to investing in science and technology in order to promote national space activities as a key element of a nationwide development strategy. Using knowledge and resources, the scientists will master the existing technologies and products, and create new ones for their further commercialization.

The structure of the Space Doctrine

We offered the structure of the Space Doctrine based on the experience of the top space countries that have systematically developed and are developing space doctrines throughout the entire period of the space activity. The doctrine has three levels: first, the basic space doctrine is adopted, second, strategic doctrine (on its basis,) and third, tactical (operational) doctrine.

Basic space doctrine

Basic space doctrine (a kind of space Constitution) defines the most fundamental strategic basic provisions; which, based on the long-term sustainable innovative development of the consumer-focused space activities, will indicate the movement vector and their future use (strategic, tactical and operational doctrines are based on the basic doctrine).

All space activities must also be subordinated and correspond to the main national priorities (economy, security, science, education, and improving citizens' quality of life), i.e., they must be the part of the national doctrine and the part of the international community (international cooperation and collaboration). However, as we have repeatedly stated (Soroka, 2019; Soroka, 2020) if space technologies and services do not work or improve the citizens' quality of life (Babcock, 2019), they are not worth spending taxpayers' money.

The main strategic vectors of the space activities, which must be clearly defined in the basic Space Doctrine, are the following:

1. A clear understanding of the place and role of the space activities (whether it is of high-priority or not) in the economic system of the state, and whether it is in the national interest.
2. Setting goals (for example, setting a long-term economic goal — ensuring sustainable revenue growth from space activities, patents commercialization, etc.).
3. Identifying tools for their achievement (for example, stimulating the new markets creation through lending, tax benefits, public-private partnership (Malysheva & Hurova, 2018), and giving the preference to the cooperative model for the project's implementation).
4. Creation of innovation development actors (for example, the information on the list of technologies that have been developed under its leadership and projects that have become available to other developers and manufacturers is annually published on the NASA website (NASA, 2020). In fact, it is a well-structured catalogue of technologies that promotes innovative development of private space companies).
5. Creation of the monitoring procedure, analysis of the goals achievement and results (which will be used for the revision of strategic, tactical and operational doctrines).

Therefore, the basic Space Doctrine must meet three main vectors. It must be utilitarian, socially-oriented, and respond to modern worldview changes. These vectors are defined through the specifying of the strategic, tactical, or operational strategies development.

Strategic space doctrine

Strategic space doctrine is developed and agreed upon in reliance on the basic doctrine. It is an integrated set of decisions on the choice of activities, ways of goal achievement, key competencies, and systems of work organization (Lupton, 1988). Strategic doctrine specifies the provisions of the basic doctrine in the short term (10-15 years), defines the optimal ways of space activities development and offers a roadmap to achieve the target goals. In order to determine the promising areas of space activities correctly, it is necessary to hold regular opinion polls among the population (Associated, 2019), and develop a space legal ideology on their basis, to carry out explanatory work among the people on the importance of the space industry development (Funk & Strauss, 2018).

It is necessary to combine the efforts of many specialists to adequately assess the effectiveness and the need for public funds to implement the strategic project. This is an inter-industry problem and it requires resources and a systematic approach and direct coordination by the country's top leadership.

As already mentioned, strategic doctrine must correspond to the three vectors established in the basic doctrine, namely: utilitarian, social and ideological.

The utilitarian vector is specified by establishing clear mechanisms, rules, standards, requirements for the implementation of space activities. Currently, there are pressing issues concerning the adoption of regulatory documents: space objects certification; rules for the registration of the spacecraft; the issue of permits for certain types of space activities; a combination of filing a declaration on the implementation of economic activities with compulsory licensing of the space activities; regulations on the procedure for exercising control and supervision over the space activities safety; provision on the procedure for filing a negotiations notice, notification of the concluded agreements (contracts); provision or instruction on the procedure for registering agreements (contracts); regulations on the procedure for notification of agreements (contracts) concluded between private and foreign entities regarding space activities; adoption of updated procedures and rules for compulsory insurance in the field of the space activities. Nevertheless, experience has proven that excessive regulation of any activity can lead to its stagnation; therefore, the transition from excessive government regulation to self-regulation based on clear and understandable rules will give a boost to the commercial space activities development.

The social vector of the basic Space Doctrine will be implemented through the discovery of the creative potential of the young, attracting them to space projects (currently, we observe an outflow of young specialists in the space industry), through the popularization of successfully implemented space projects (creating space YouTube channels, holding space summer camps). In European countries, and certainly in the USA, the People's Republic of China and the Russian Federation, the achievements of the space industry are the points of national pride; the majority of the population knows about these achievements (Funk & Strauss, 2018), unlike most of the Ukrainians.

The worldview vector is specified by understanding the cosmization of our life in general and through the process of cosmization of law through its transformation. The process will be realized through new development approaches to the holistic concept of the universe and the concept of the organic unity of the whole world and its close connection with space through the creation of new legal standards based on sustainability (Martinez, 2019), safe, innovative and inclusive development of humanity.

As Tatiana Ursul aptly noted, the expansion of the cosmization of legal science and practice is one of their development strategic promising trends during the formation of the space civilization, and the emergence of new and development of existing countries leaders in space and the space expansion of the humanity. In the longer term, terrestrial jurisprudence, alongside the space expansion of humanity, with the development of new forms of organization of the space systems of power and law, will presumably progressively evolve into broader space jurisprudence and legal science — into legal science as space civilization sciences (Ursul, 2018: 289).

The need to change worldviews towards sustainable development should also be noted. In our papers, we have repeatedly stated that modern politicians lack the political willpower to explain the need to give up growing consumption for future generations' sake to their citizens. Humanity will recover from the habit of living beyond means only due to serious

crisis, under conditions of limited consumption (Ursul, 2018).

Thus, the administrative and legal basis underdevelopment of a new Space Doctrine should be the guidelines for ensuring the long-term sustainability of space activities, which will help achieve safe and sustainable development of the space activities in the long run (Soroka, 2020).

Furthermore, the implementation of the space science projects should be realized, taking into account the latest trends in globalization, as the implementation of the ambitious space projects is possible only through international cooperation (Science, 2020a). The deepening of the relations based on science and technology, forming a common strategy for long-term sustainable cooperation in the space industry, may bring to a new development level and increase its global competitiveness in the long run (Science, 2020b).

It is important to note the creation and use of artificial intelligence in space activities. We have proven that artificial intelligence is a basic form of scientific and technological progress that can bring significant social benefits (Soroka & Kurkova, 2019). However, its development in a legal void is unacceptable. Various public and private stakeholders, as well as the politicians at the local, national and international levels, should ensure the compatibility of development and deployment of artificial intelligence with the protection and enforcement of fundamental human rights and freedoms (Benedek & Matthias, 2013). The lack of legal regulation of the creation and use of artificial intelligence, and based on its space technologies, any country, can lead to legal and ethical problems in the field of the observance of human rights and the person and the citizen.

Tactical space doctrine

Tactical and operational space doctrines (short-term, 3-5 years) describe specific space activities (e.g., development and production of launch vehicles; development and production of rocket engines, satellite and television services, satellite Internet services and sales of services; satellite navigation and sale of services, services for Earth observation, sale of images and services, etc.). These doctrines can either regulate one type of space activity or can be combined with other types to achieve detailed space goals. The tactical (operational) doctrine specifies persons responsible for their implementation and sets deadlines and funding sources. This doctrine is effective in implementing a specific space program or scientific project.

Systemic measures aimed at developing and implementation of new strategies provide modification of the current legislation (foremost, the Law of Ukraine “On Space Activity” (On Space, 1996)), organizational decisions, development of interagency activities, adoption of program documents at various levels. Among the most important process documents are the tactical (operational) doctrines.

Thus, it is necessary to develop and adopt program documents, which provide, chiefly, the rationing of the following basic activities:

1. Implementation of the national and international scientific and technical projects in the interests of certain priorities of the space activities. The base document is the space doctrine of Ukraine.
2. Development of the space industry, provision of branch management: assistance in the international markets, reforming of the enterprises, cross-sector coordination, creating conditions for public-private partnership, work loading of the enterprises, furthering of the industry interests in government agencies and the international institutions. The basic document is the space doctrine of the reforming and

development of the space industry of Ukraine, which is being jointly developed by the Ministry for Development of Economy, Trade and Agriculture of Ukraine, the State Space Agency of Ukraine (SSAU), the National Academy of Sciences of Ukraine (NAS of Ukraine) and Ukroboronprom (UOP), and approved by the Cabinet of Ministers of Ukraine.

3. Space activities in the interests of the national defense and security, implementing the target projects on the creation of the equipment and technologies and developing advanced technologies. The basic document is the strategic space doctrine, developed jointly by the Ministry of Defense of Ukraine and the State Space Agency of Ukraine (SSAU), and approved by the National Security and Defense Council of Ukraine. It is the basis of the relevant section of the state defense order.
4. Implementation of the promising projects in the interests of the outer space research and application are the advanced fundamental and applied researches. The basic document is the strategic space doctrine, developed by the National Academy of Sciences of Ukraine (NAS of Ukraine) and relevant research organizations and design-engineering department.
5. Development of the ground-based infrastructure is coordinated with the activities of the National Scientific and Technical Space Program of the National Space Facilities Control and Test Center for the support and development of ground centers. The basic document is the strategic space doctrine, approved and funded by the State Space Agency of Ukraine (SSAU).
6. Validation and initiation of annual national projects in the field of space activities (Gorbulin, 2020).

Therefore, when forming the Space Doctrine of Ukraine, it is necessary to take into account both the national space interests and the peculiarities of modern international space activities.

First, nowadays, the paradigm of space activities is shifting from the idea of space leadership to the priorities of sustainable development and consumer orientation. However, until all the countries of the world understand that the sustainable development of terrestrial civilization combined with the sustainable development of space activities can make a difference to humanity (Martinez, 2018), we will face the confrontation in space races between space-faring nations (Patel, 2020). Therefore, in order to create reliable protection of the national space interests, it is necessary not only to create conditions for scientific and technological progress and economic development, but also to provide the activities with competent legal support. As experience has shown, as illustrated by the confrontation between the two states (USSR and USA), the first stage of the technological race in space was won by the USSR. Nevertheless, without giving or developing the legal basis for its space activities, the USSR, and then the Russian Federation, which inherited and continued the Soviet policy in space activities, has strategically lost to the USA. Now we are witnessing how the planned strategic policy of the United States regarding the legal confirmation of its national interests in outer space requires the world community to adapt to their rules (Executive Order, 2020).

Secondly, the space industry has already become an integral part of the real economic sector, financial, information and social spheres, and its development is largely determined by the needs of the modern information society (Science, 2020b). Therefore, it is necessary

to develop and adopt other strategic documents on the settlement of digitalization, robotics, and the use of artificial intelligence on the basis of the adopted Space Doctrine in the near future. After all, the use of space technology in combination with artificial intelligence and other information technologies is the major component of the Fourth Industrial Revolution (Javaid et al., 2020).

We should remind that the First Industrial Revolution had taken place in the late 18th century, when steam-operated machines were put into mass production. The Second Revolution took place in the late 19th century. It is associated with the use of the electric drive. The Third Revolution began in the 70s of the 20th century. It has received an impetus with the advent of computer technology and information and communication technologies (Hart, 2020). We are now witnessing the beginning of the Fourth Industrial Revolution; the large databases, accumulated during the Third Revolution with artificial intelligence and space technology, will help to proceed from simple computation to autonomous decision-making based on the “find and offer” principle (Big Data, 2018).

Third, in the modern world, sustainable development and security problems can be solved only in the context of space technologies development. When we have been analyzing the sustainable development goals (THE 17, 2020), approved by the UN, we could not help but notice that they were developed using a problem-based approach. There is a problem that needs to be solved (defense strategy). First, the global challenges faced by the world community, are outlined and then solving these challenges is considered as the goal setting. In fact, this general technique is effective for setting the agenda. Let's take into account that the previously adopted Millennium Development Goals have not been fully implemented (Millennium, 2015). We can assume that Sustainable Development Goals will not be fully achieved either. Therefore, we believe that after 2030 new universal goals will require a new approach and methodology. It is more progressive, as it focuses on looking for new ideas and technologies for goal achievement and is more proactive than a problem-based approach. For example, goal setting is the adaptation and use of space technologies and artificial intelligence. This new goal is not an attempt to identify a universal problem and find a solution to solve it, but rather an approach to the new opportunities with the help of technology (Human Decisions, 2018). With the benefit of space technology, in the nearest future, people will have better opportunities to live in a sustainable and secure society, both on the Earth and in space (Report, 2019).

Fourth, nowadays, space activities play the role of a scientific driver not only for the public sector of the economy, but also for private business (Report, 2019; Space2030, 2018). Therefore, the Space Doctrine as the fundamental strategic document should establish effective mechanisms for obtaining investments in the public-private partnership and international cooperation for the existing assets: manufacturing and experimental capacities, intellectual property, etc. The experience has proven that scientific solutions, developed and implemented by Ukrainian space industry specialists can naturally complement both Ukrainian and world business in various economic realms with high-tech solutions. They can promote the innovative development of agro-industrial, transport, information and communication, mining and metallurgical companies.

Conclusion

The conducted analysis of the current and retrospective strategic documents in the space industry and the current challenges facing the world community and Ukraine people enables us to draw the following conclusions.

A clear understanding of the space capabilities value, not only for national defense but also for the general national well-being, will allow for establishing a clear position on the strategic development of the space activities, based on the Space Doctrine designed.

The implementation of the future Space Doctrine should be a shift from the initial state of affairs to the new model of space activities.

The study proposes the three levels of the Space Doctrine of Ukraine.

The first level is a basic space doctrine. The basic doctrine defines the most fundamental strategic provisions. They will indicate the vector of movement and how to use it in the future, based on the long-term sustainable, innovative development of the space activities with its focus on the consumer. The vectors must be the following: utilitarian, socially-oriented, and correspond to modern worldview changes. They are specified through the development of strategic, tactical, or operational strategies.

The second level of the Space Doctrine is strategic. The strategic doctrine is developed and agreed upon based on the basic doctrine. This is an integrated set of decisions on the choice of activities, ways to achieve goals, key competencies, and work management systems. The strategic doctrine specifies the provisions of the basic doctrine in the short-term future (10-15 years). It determines the optimal paths for space activities development and proposes a roadmap for achieving the target goals.

The third level of the Space Doctrine is tactical or operational space doctrine. The tactical space doctrines are short-term, for 3-5 years, describing specific types of space activities. For example, development and production of launch vehicles; development and production of rocket engines; satellite and television services, satellite Internet and sales of services; satellite navigation and sale of services, services for earth observation, sale of images and services, etc. This doctrine can either regulate one type of the space activities, or they can be combined with other types to achieve detailed space goals. The tactical doctrine specifies persons responsible for their implementation, sets the deadlines and funding sources.

In the context of the Space Doctrine of Ukraine, the study proposes to consider both national space interests and the peculiarities of modern international space activities in developing updated strategic documents for the space sector.

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From Philosophy of Cosmos to Space Policy: Contemporary Issues and Trends

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Vashkevich, Viktor and Viktoriya Timashova (2021) From Philosophy of Cosmos to Space Policy: Contemporary Issues and Trends. *Philosophy and Cosmology*, Volume 26, 35-45. <https://doi.org/10.29202/phil-cosm/26/3>

The paper aims to study the connection between the philosophy of cosmos and space policy. The authors argue that the research of the philosophy of cosmos stipulates the space policy research. Philosophy of cosmos studies the influence of knowledge about the Universe on human ethics. The more humans reveal for themselves the structure of the Universe and understand their place in it, the more the acquired knowledge affects space activities. The article discloses current trends in space policy that determine the perspectives for the exploration of the Universe. The authors substantiate space policy trends with the history and experience of cooperation between NASA and commercial structures. The features of the U.S. space policy development over the past five years are investigated. The results of the analysis lead to the conclusion about the dominant role of governments in modern space policy, even despite the involvement of private companies in space activities. The example of the United States proves the expanding influence of space policy in the national policy of the state due to the perspectives of the space industry, its high technological capacity and the increase in the number of jobs.

Keywords: philosophy of cosmos, space policy, cosmology, space policy perspectives, commercial space policy, NASA

Received: 2 October 2020 / Accepted: 15 November 2020 / Published: 29 January 2021

Introduction

The paper studies the connection between the philosophy of cosmos and space policy. The authors argue that the research of the philosophy of cosmos stipulates the space policy research. The research subject of the philosophy of cosmos is well beyond the narrow limits of cosmology. Philosophy of cosmos studies the influence of knowledge about the Universe on human ethics and discloses new perspectives of human civilization development. The more humans reveal for themselves the structure of the Universe and understand their place in it, the more the acquired knowledge affects their plans of the Universe resources exploration. Space activities are determined and regulated by the state policy. The authors investigate the influence of the philosophy of cosmos on space policy, as well as current trends in space policy that determine the perspectives for the exploration of the Universe.

Issues in the philosophy of cosmos

Contemporary issues and trends in the philosophy of cosmos are presented in the review article of Christopher Smeenk and George Ellis (Smeenk & Ellis, 2017). It is worth attention that the English-language literature makes use of three interchangeable terms to designate the discipline that explores the conceptual foundations of the Universe. They are “philosophical cosmology,” “philosophy of cosmology,” or “philosophy of cosmos.” The most frequent one is the “philosophy of cosmology.” The research subject of philosophy of cosmology is “the explanatory scope of cosmology.” It involves (Smeenk & Ellis, 2017),

1. Research status of the Standard Model.
2. Research of the general version of underdetermination.
3. Explanation of the nature and purpose of the origin of the Universe.
4. Anthropic reasoning and multiverse.
5. Verification of cosmological models.
6. Opportunities of the human implications of cosmology.

The term “philosophy of cosmology” is promoted by Cambridge University Press, which annually publishes the results of long-term international collaboration between leaders in cosmology and the philosophy of science (The Philosophy of Cosmology, 2017). Cambridge University Press clearly identifies the subject of the research in “philosophy of cosmology.” It is limited to physics and astronomy, cosmology, relativity and gravitation, history, philosophy, and foundations of physics (The Philosophy of Cosmology, 2017).

It is worth noting that the term “cosmology” was first coined in 1730. The study of “*Cosmologia Generalis*” by the German philosopher Christian Wolff has survived to this day. Cosmology developed as a branch of philosophy and is literally translated as “space exploration.” Therefore, in its literal meaning, the term “philosophy of cosmology” implies a philosophical understanding of the space exploration results. It is an even narrower discipline than cosmology, based on metaphysics, epistemology, and logic.

For this reason, the equivalence and interchangeability of the terms “philosophy of cosmology” and “philosophy of cosmos” are questionable. In the first case, a narrow aspect of cosmology is considered, namely, the *philosophy* of cosmology. In the second case, the cosmos becomes the subject of philosophy research. Cosmology is just one of the scientific disciplines that explores the cosmos as the Universe. Therefore, the use of the term “philosophy of cosmos” suggests a completely different scale of research into the Universe. Philosophy of cosmos unites scientific knowledge of cosmology, astronomy, physics, etc.,

as well as a purely philosophical reflection based on the methodology of metaphysics, epistemology, logic, etc.

Thus, we argue that the terms “philosophical cosmology” and “philosophy of cosmology” are indeed interchangeable. They emphasize the field of cosmology research and involve the use of philosophical methodology within the boundaries of a specific scientific discipline. However, the term “philosophy of cosmos” has a different semantic meaning.

First, the use of the term “cosmos” frees philosophy from subjection to cosmology, as in the case of using the terms “philosophical cosmology” and “philosophy of cosmology.” The cosmos is studied not only by cosmology, but also by many other scientific disciplines. Therefore, the use of the term “philosophy of *cosmos*” emphasizes *that philosophy explores cosmos in order to use the knowledge gained for a better organization of earthly civilization* (Bazaluk & Kharchenko, 2018). Philosophy acts as a platform on the basis of which scientific knowledge about the Universe is combined and systematized. Knowledge about the Universe is transformed into a specific frame of reference and promoted as a special discourse and way of life (Bazaluk & Kharchenko, 2018). For example, consider the course of Philosophy of the Cosmos, which is currently offered by The Australian National University (Canberra) as an undergraduate course (Philosophy of the Cosmos, 2020). This course is taught to students of the Mathematical Sciences Institute. The course assumes that upon successful completion, students will have the knowledge and skills to (Philosophy of the Cosmos, 2020):

- a) demonstrate an understanding in the outline of the history of cosmology and contemporary cosmology;
- b) demonstrate a conceptual understanding of relativity theory;
- c) appreciate that many of the theories underlying modern cosmology are contentious;
- d) understand what would be involved in further study in the philosophy of science and cosmology; and
- e) make a habit of an educated questioning of scientific orthodoxy.

As it can be seen, the *Philosophy of the Cosmos* course includes the results of cosmological research and gives them a specific practical focus.

Second, the use of the term “philosophy of *cosmos*” conveys the complexity of the relationships between cosmology and history. By history, we mean, first of all, social philosophy. The term “philosophy of cosmos” embraces the scope of social philosophy developed under the influence of continuously updated knowledge about the cosmos. For example, the richness of the relationships that have developed between cosmology and social philosophy is conveyed by “Cosmos and History: The Journal of Natural and Social Philosophy.” The subject field between cosmology and social philosophy can be described as follows: “The tension between cosmology, conceiving the cosmos as an immutable, timeless order, and history, concerned with actions, intentions, conflicts and the rise and fall of individuals and communities, has been at the core of virtually all intellectual and political oppositions throughout the history of European civilization. What is required is a combination of natural and social philosophy, transcending all disciplinary boundaries, concerned with the fundamental issues of understanding the cosmos and our place within it as historical agents” (Cosmos and History, 2020). The articles presented in the journal reveal that the real influence of knowledge about the cosmos on the development of the way of human life.

Third, we use the term “philosophy of *cosmos*” for a reason indicated by Alfred Kracher (Kracher, 2020). Kracher pointed out that humans are part of the Universe and the result

of evolutionary processes within it. The acknowledgment of this fact determines human behavior and makes people dependent on the results of space exploration. It is here that the foundations of human behavior and decisions are formed regarding spaceflight and using the cosmos for scientific, commercial, and military purposes.

Thus, the use of the term “philosophy of cosmos” reveals the real connection between knowledge about the Universe and the attitude of humans to the cosmos. Space policy is the main manifestation of this connection in practice.

Space policy perspectives

Philosophy and politics were created and seen by Plato as a whole (Plato, 2020). In fact, space policy is the logical conclusion of the research of philosophy of cosmos in practice.

Space policy was developed in the 1960s as a result of ideological competition between the United States and the Soviet Union. Space exploration was viewed primarily as an image of the state, emphasizing its power and greatness. Outer space was a continuation of foreign policy and underlined the intellectual and technological superiority of the state. Henry Lambright claims that even decades after the collapse of the USSR, ideology and national image remain the basis of the U.S space policy (Space Policy, 2002).

Contemporary issues of space policy are illustrated by the journal with the same name. *Space Policy* draws on the fields of international relations, economics, history, aerospace studies, security studies, development studies, political science and ethics to provide discussion and analysis of space activities in their political, economic, industrial, legal, cultural and social contexts (Space Policy, 2020).

As one can see, space policy covers a wide aspect of interdisciplinary knowledge, the main feature of which is its practical orientation. Space policy is closely related to economic and defense policy and is governed by space law.

Space policy determines and regulates space activities. Over the past several decades, space activities have gone beyond the boundaries of research institutes and ended with the creation of the space industry.

The scale of space activities is growing rapidly, as evidenced by the growing complexity of the main regulatory acts (Drozd, 2019), as well as the Space Foundation Annual Report 2019 (Space, 2019). The document reveals the accents of modern space policy. Pay attention to the following conclusions (Space, 2019):

1. Space policy perspectives. The global space economy grew more than 8% in 2018 that amounted to \$414.75.
2. Emphasis on the development of the commercial use of the cosmos. Currently, the cosmos use is more than 79% of the space economy. It is nearly \$330 billion.
3. 81 countries are involved in space activities as of 2019. 40 Spaceports are in use, and 10 more are in the final stages of construction.
4. Space Economy employs more than 1 million workers (as of 2017).

In the 21st century, space policy has undergone significant changes (Petronia & Bianchi, 2016). It still remains the hallmark of highly developed countries and occupies an important place in the development of state and regional strategies for sustainable development. However, an increasing number of world countries began considering space policy as a priority direction of their sustainable development. From our point of view, the relevance of space policy is explained by two reasons:

1. The dependence of national security on the degree of space policy development.
2. The increased influence of the space industry on the economic development of the state.

Both reasons can be considered in more detail.

Space policy and national security

In the last decade, the role of the state in space activities has been steadily declining, giving way to commercial activities. However, governments reserve the right to control and regulate. This is done within the framework of national policy, of which the space policy is a part. President Trump highlighted the key role of space policy in government policy as follows: “Our travels beyond the Earth propel scientific discoveries that improve our lives in countless ways here, right here, at home: powering vast new industry, spurring incredible new technology, and providing the space security we need to protect the American people” (President, 2018).

The United States is currently the leading space power. In 2018, the U.S. government space budgets amounted to 11.6% (\$48.31 billion) and Non-U.S. government space budgets — 9.1% (\$37.58 billion) of the total budget of the space economy (Space, 2019). Therefore, using the example of the National Space Policy of the United States of America, the scale of the influence of the U.S. government on the space policy can be considered.

An analysis of the regulatory acts proves that the U.S. government determines the space policy. Each president of the United States reserves the right to determine the space policy. For example, the decision of President George W. Bush (2001–2009) opened the way for commercial structures in NASA programs (Commercial, 2014). President Barack Obama (2009–2017) expanded the commercial sector’s ability to transport crew to and from the Earth orbit. President Donald Trump (2017–2021) in The National Security Strategy clearly defined that “the United States must maintain our leadership and freedom of action in space” (National Security Strategy, 2017).

Consider the sequence of actions by the Trump administration to strengthen the U.S. leadership in space activities. Between January 2017 and December 2020, the Trump administration initiated a series of documents that identified the U.S. space policy. Each document is aimed at consolidating the U.S. leadership in space activities, as well as implementing the stated provisions of The National Security Strategy. Here is a brief review of the adopted documents:

1. Space Policy Directive 1, December 11, 2017. The directive is called “Reinvigorating America’s Human Space Exploration Program.” The document changes the space policy of the previous President Obama and contains NASA instructions on how to create a base on the lunar surface for the purpose of human exploration of Mars (Reinvigorating, 2017).
2. “National Space Strategy,” March 23, 2018. The document unequivocally emphasizes the priority of the United States in space exploration, as well as the direct connection between the space policy and national security policy. “President Trump’s National Space Strategy works within his broader national security policy by putting America’s interests first” (President, 2018).
3. “Streamlining Regulations on Commercial Use of Space,” Space Policy Directive-2, May 24, 2018. The document reforms commercial space regulations and appoints the Department of Commerce in charge of space activities in the

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- commercial space sector (Streamlining Regulations, 2018).
4. “National Space Traffic Management Policy,” Space Policy Directive-3, June 18, 2018. The document clearly states that for decades, the United States benefited from work in space to strengthen national security. The document aims to strengthen the U.S. in space exploration, in particular, “establishes agency roles and responsibilities for space situational awareness and space traffic management” (National, 2018).
 5. “Establishing a U.S. Space Force,” Space Policy Directive-4, February 19, 2019. The document initiated the creation of the U.S. Space Force as part of the U.S. Air Force. According to the document of the U.S. Space Force must ensure unhindered access and freedom of action of the United States and its allies in space during peacetime and across the entire spectrum of conflicts (Establishing, 2019). The document predetermines the Establishment of United States Space Command as a Unified Combatant Command, thereby establishing that U.S. officials will lead any future space military operations (Establishing, 2019). It is worth noting that the initiative of the Trump administration was supported by the U.S. Congress in 2020.
 6. “Executive Order on Encouraging International Support for the Recovery and Use of Space Resources,” April 6, 2020 (Executive Order, 2020). The document clearly indicates that the United States does not recognize The Moon Agreement (Agreement, 1979). The USA will be guided by its own policy and internal laws regarding the extraction of resources on the Moon and other places in the solar system, especially concerning commercial exploration, recovery and use of such resources (Executive Order, 2020).
 7. “Cybersecurity Principles for Space Systems,” Space Policy Directive-5, September 4, 2020. The document focuses on ensuring that all components of space systems are under the full control of the U.S. government. It concerns the space systems that provide “global communications; positioning, navigation, and timing; scientific observation; exploration; weather monitoring; and multiple vital national security applications” (Cybersecurity Principles, 2020).
 8. “National Space Policy of the United States of America,” December 9, 2020 (National Space Policy, 2020).

Pay attention to the first two tasks that must be performed by The United States Space Force. They emphasize the direct connection between Space policy and national security (Establishing, 2019):

1. “Protecting the Nation’s interests in space and the peaceful use of space for all responsible actors, consistent with applicable law, including international law.” It is worth mentioning that The United States Space Force is created primarily to protect “the Nation’s interests,” where “applicable law” ranks first and “international law” — only the second. The document confirms the prerogative of U.S. law over international law. It allows The United States Space Force to be guided in space conflicts mainly by the provisions of its own legislation.
2. “Ensuring unfettered use of space for United States national security purposes, the United States economy, and United States persons, partners, and allies.” Pay attention to the phrase “Ensuring unfettered use of space for United States national security purposes.” This task initially creates a conflict of interest, especially

taking into account the document “Executive Order on Encouraging International Support for the Recovery and Use of Space Resources,” adopted on April 6, 2020 (Executive Order, 2020). A significant part of the 81 states participating in space programs is not partners and allies of the United States. Therefore, for example, the development of the resources of the Moon in the foreseeable future gives a reason for using The United States Space Force.

Commercial space policy

Oleksandr Svetlichnyj and Diana Levchenko revealed the problems of space exploration by individuals and companies that have stepped up space activities. The authors paid attention to the fact that space objects and natural resources should belong to all of humanity and not to individual states or private enterprises. The adoption of the legislation of the United States and Luxembourg on the legalization, production, use, and appropriation of the space resources by private enterprises, on the one hand, fully complies with international obligations. However, upon closer examination, it turns out that they violate the principles governing the activities of states in the exploration and use of the cosmos, space resources, including the Moon and other celestial bodies, “which are not subject to national appropriation, neither by proclaiming sovereignty, nor by uses or occupation, nor by any other means” (Svetlichnyj & Levchenko, 2019).

Over the past decade, the U.S. government has been actively engaging private companies in space activities. It should be noted that most of the regulatory documents that form the basis of the space law are concluded at the state level and provide only interstate regulation. The foundations of space law do not imply the participation of private companies in space activities. Therefore, at present, the participation of private companies and the commercialization of space research is regulated by national laws. The use of private companies in the space policy allows the United States not to formally violate international agreements, on the one hand. However, on the other hand, the U.S. government regulates commercial space activities, effectively monopolizing the future development of the resources of the Moon and Mars.

The U.S. space policy uses the following mechanisms to influence the private sector of the space industry:

1. Public-private partnerships in which the government and the private sector share the risks and rewards of investing in space activities.
2. Influencing government agencies to purchase services from specific private companies.
3. Concluding traditional contracts with the fixed price for services and products of private companies.

Using NASA as an example, consider a relatively short history of public-private partnerships in the space sector. The impetus for the development of the public-private sector of the U.S. space activities was provided by President George W. Bush’s decision in 2004 to abandon the space shuttle program. NASA was tasked with solving the problem of delivering cargo and crews to the ISS as soon as possible. It was the first time when private companies have been involved in solving this problem.

The first commercial cargo flights began in 2012. This outstanding success was achieved as a result of competition between two private companies: Space Exploration Technologies (SpaceX) and Rocketplane Kistler (subsequently replaced by Orbital Sciences Corp. (OSC)). In 2016, a third company, Sierra Nevada Corporation (SNC) was recruited to participate in

the transportation of space cargo. The Commercial Orbital Transportation Services report presented the history of the Commercial Crew & Cargo Program Office from 2006 to 2013 (Commercial, 2014). Two main features can be highlighted, which subsequently changed the space policy (Commercial, 2014):

1. It turned out to be beneficial for state corporations to share risks with private companies in the early stages of developing new space projects. The prospect of cooperation with the state encourages private companies to invest heavily in new space projects. On the one hand, there are prospects for obtaining government orders. For example, SpaceX and Orbital Sciences Corp. both invested about \$800 million in the development of the COTS program. However, two years later, SpaceX received a government order for \$1.6 billion, and Orbital Sciences Corp. — for \$1.9 billion. On the other hand, the prospects for the technological progress of private companies opened up. For example, in 2006, the number of SpaceX employees was up to 160. In 2020, the number of employees was up to 8000 people despite the fact that SpaceX focuses exclusively on high-tech production that reduces the amount of human labor.
2. It turned out to be profitable for state corporations to lease spaceports and launch sites, as well as to hire private companies to provide space services. For example, NASA concentrated its potential on global projects, while private companies acted as contractors in the maintenance and development of ready-made space projects. The total development cost of SpaceX's Falcon 1 and Falcon 9 rockets is estimated at approximately \$ 390 million. In 2011, NASA estimated that it would cost the agency \$4 billion to develop a rocket like the Falcon 9 launch vehicle. It is worth noting that SpaceX and Orbital Sciences Corp. experienced certain problems with the execution of NASA contracts. On July 5, 2015, the seventh launch of the SpaceX's Falcon 9 rocket was unsuccessful. The third flight of Orb-3 on October 28, 2014, ended in failure. However, all these failures did not affect the interests of the state and were overcome by the efforts of exclusively private companies.

President Obama had a key influence on Crew Transportation Concepts and Technology Demonstration. In 2010, he made a decision to expand the capabilities of the commercial sector to support transportation of crew to and from the Earth orbit, which was unpopular at NASA. The President's decision forced NASA to conclude contracts with five private companies and involve them in the development of commercial manned space flight capabilities. In February 2010, NASA signed contracts with five private companies for a total of about \$50 million. These are (NASA, 2010):

1. Blue Origin will receive \$3.7 million.
2. The Boeing Company will receive \$18 million.
3. Paragon Space Development Corporation will receive \$1.4 million.
4. Sierra Nevada Corporation will receive \$20 million.
5. United Launch Alliance will receive \$6.7 million.

In April 2011, contracts were signed with four more private companies: Blue Origin, Boeing, Sierra Nevada and SpaceX.

On August 3, 2012, NASA officially announced that Boeing, SpaceX, and the Sierra Nevada were the winners of the Commercial Crew Integrated Capability (CCiCAP) awards. The above companies received funding to develop an integrated crew transportation system.

The system included the creation of spacecraft, launch vehicles, and ground systems. Boeing obtained \$460 million, SpaceX — \$440 million, and the Sierra Nevada — \$212.5 million.

On September 16, 2014, NASA started the last phase of Commercial Crew Transportation Capability (CCtCAP). Contracts were concluded with Boeing (\$4.2 billion) and SpaceX (\$2.6 billion) to complete the commercial crew development program. The first test launch of astronauts aboard SpaceX's Crew Dragon commercial system took place on May 30, 2020.

Conclusions

The conducted research allows the authors to draw the following conclusions:

1. Philosophy of Cosmos stipulates space policy. Philosophy of Cosmos systematizes the exploration of the Universe and opens up space resources for human exploration. Philosophy of Cosmos makes outer space accessible to humans. Even now, the resources of the Moon and Mars have fallen into the scope of interests of highly developed states, which regard them as a continuation of national policy and economy.
2. Space Policy stipulates space activities. The study justifies the key role of space policy in national policy. Using the example of the United States, the authors proved the expansion of the influence of space policy due to the involvement of private companies in space activities and the creation of the space industry. Currently, the space industry is regarded as the most promising sector of the economy, capable of ensuring sustainable development and prosperity of the state.

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Section Two

INTELLIGENT MATTER

Ensuring Biosphere Balance in the Context of Agricultural Waste Management

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Andreichenko, Andrii, Svitlana Andreichenko and Nataliia Smentyna (2021) Ensuring Biosphere Balance in the Context of Agricultural Waste Management. *Philosophy and Cosmology*, Volume 26, 46-61. <https://doi.org/10.29202/phil-cosm/26/4>

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The article focuses on the relationship between the state of the biosphere and the development of non-waste agricultural production. The objective character of the increasing level of the agricultural business activity's intensity, which generates considerable waste, intensifies adequate resource use. The accelerated development of the non-waste production at the agriculture becomes relevant for the rational combination of this business's effectiveness, ecological safety and social orientation of the business and economic activities. The study specifies the role of science for setting up the "science — technology — non-waste agriculture — society" system. The article considers the importance of non-waste agricultural production for the rational use of raw-materials and energy at the "raw materials — production — consumption — secondary raw materials" cycle and the ecological balance in the biosphere, thereby taking us closer to noosphere. The features of the "mental" attitude to the agro-residues' problem at the national and global levels are disclosed. The article highlights the complex economic, social, ecological, and institutional indicators necessary for the effectiveness of agricultural non-waste production.

Keywords: biosphere, resource efficiency, agro-residues, agricultural production, noosphere, circular economy

Received: 27 September 2020 / Accepted: 2 November 2020 / Published: 29 January 2021

Introduction

The highest form of rational environmental management is such as human activity, characterized by almost entirely the use of natural resources, which does not pollute the environment and product wastes, and finally returns to nature without breaking its state. The state of the current resource consumption and size of agricultural wastes leads to the conclusion that one of the ways of efficiently solving the problem of adequate natural resource use and environmental protection is non-waste agricultural production. Implementation of the non-waste agricultural production will ensure the rational use of all the components of raw materials and energy and the ecological balance in the biosphere.

Many factors cause the scientific research relevance of the non-waste agribusiness development, the main of which is the need for national and international food security; the importance of environmental preservation in the conditions of the increased intensity of the natural resources use; the objectivity of rising anthropogenic impact on the environment owing to the accelerate scientific and technical progress and vigorous implementation its results into the business practice; the need for the harmonization of the economic, ecological, social and institutional spheres of human activities, which are directly or indirectly involved into the production and marketing the agricultural products; balancing of the results of the manufactures, consumers, business sector and society considering the equality of the current organizational and legal business forms on the market basis.

The complexity of the modern socio-economic and ecological relations and processes occurred while the implementation of non-waste agricultural production significantly raises the importance of developing its methodology (Kucher, 2017; Kravchenko et al., 2020; Andriushchenko et al., 2020). Wide-ranging fundamental issues at the non-waste agricultural production, which are caused by the new socio-political and socio-economical conditions, require its emergent expounding on the basis of the new methodology.

One of the main obstacles to the Ukrainian sustainable development of the agricultural sphere is the resource gap (Bilan et al., 2017; Awwad, 2018; Yatsenko et al., 2019). But

subsistence practices show that this deficit is artificial. Nowadays, a vast amount of resources is not used, namely wastes. The enormous funds are being used to reduce the negative impact of the wastes on the environment. Meanwhile, even greater funds are used for precious mining commodities, which is not strictly necessary if we use an appropriate non-waste technological approach. This implies the need for solving the task of the transformation of the waste into resources. One of the necessary tools of this task's achieving is shifting to the primary use of secondary resources and implementing the non-waste and resource-efficient technologies in agriculture. Thus, the expenses could be transformed into profit. In such a case, the resolute and coherent policy aimed at the economic promotion of the agricultural branch and enterprises to secure the primary resources and replace them with secondary ones, is necessary.

Therefore, it is necessary to look for the most appropriate way to use the agro-residues to emerge from the current negative situation in this sphere (Nitsenko et al., 2018; Jiang et al., 2019). So, non-waste production is the link between nature and economic activity, which determines their balance. Its main goal is to achieve the most effective use of natural resources, conducted simultaneously with concern for future generations.

The research aims to provide a modern conceptual understanding of the interconnection between the state of the biosphere and non-waste production development in the agricultural business. The article presents methodical aspects of the non-waste agricultural production; the links between the effective functioning of the non-waste agricultural production and the study of the noosphere are disclosed; the features of the "mental" attitude to the problem of the agro-residues at the national and global levels are described; the approaches to the assessment of the non-waste agricultural production's development are proposed.

Theoretical basis

Theoretical and practical research in waste management has been emerging since the beginning of the twentieth century. In the 1930s, Bruttini and Fersman have focused their attention on the necessity of the effective use of all countries' overt and covert resources, among which is the huge amount of industrial and agricultural waste and trash (Bruttini, 1931; Fersman 1932).

Bruttini assumed that in case of calculating the cost of losses from the non-use of useful qualities of raw materials, at least approximately, huge figures would appear. Achieving a more rational and intensive use of waste would result in hundreds of millions of public savings in any country (Bruttini, 1931).

The concept of non-waste production was proposed and developed by scientists in the 1950s and 1960s. It was noted that the development and implementation of non-waste technological processes as a major factor of environmental protection from industrial pollution and the rational use of natural resources require careful economic evaluation of the effectiveness of decisions and capital investments. This is especially important because society is not interested in either damaging or increasing capital construction costs because of the extra cost of its maintenance (Gromov et al., 1983).

The problem of the non-waste technologies implementation and non-waste production gained increased attention in the 1980s and 1990s. In those years, the shift to low-waste, non-waste and resource-saving technologies was made. It is defined as the most perspective direction of scientific and technological progress. According to Balatckii and Voloshin (1983), a high degree of production efficiency can be achieved by means of an intensification of public production with reuse or harmless disposal of waste. In the field of production

and consumption, based on economic laws, all aspects of human activity are confronted. The transition to low and waste technologies is a complex process that has the main objective of achieving a closed production and consumption system. Yuri Lebedinskii, Yuri Skliankin, and Pavel Popov assessing the economic characteristics of non-waste production, highlight the following important economic objectives which can be achieved as a result of its implementation: (a) saving “resources for production,” (b) saving “resources for life,” (c) intensification of the use of all material resources involved in economic turnover (Lebedinskii, 1990).

Ukrainian scientists give some aspects of the problem of the non-waste technologies application in agriculture attention.

According to Viatkin (2010), the introduction of non-waste production technologies is an urgent need for those agricultural enterprises that generate a large amount of waste in the production process. Ukraine has a highly developed agricultural sector, in particular crop production, which annually generates a large number of various wastes. Some of the waste is used for the needs of agriculture (organic fertilizer, litter and livestock feed), some for other sectors of the economy, and the rest of the biomass is left unused and often recycled (incinerated, dumped) without any benefit. Much of the unused biomass seems appropriate to involve in energy production (Geletukha & Zhelyezna, 2014).

To ensure sustainable development of the state and quality waste management, it is of utmost importance to respect the principle of formation of environmental consciousness of people, based both on their own behavior and on the promotion of “ecological culture” among others; the principle of greening the socio-economic environment, which implies the creation of institutional conditions for the formation of ecological culture both in the generation system and in the process of waste disposal; the principle of the implementation of the objective function of the system, which provides for the economic benefits of waste management, which are positioned as raw materials for recycling processes in production systems, as well as social effects; the payback principle, which is a motivational component in attracting investment to the construction of utilization capacities for both foreign and national investors (Kolodiichuk, 2017; Sokiran, 2019).

The problem of the shift to the cycle economy, including the questions of rational waste management in the agricultural business, is within the scope of scientists’ interest worldwide.

In some EU countries, the term “pure or more pure technology” is used instead of “low and non-waste technology.” For manufacturing processes, pure production involves the saving of raw materials and energy, the elimination of toxic raw materials, as well as the reduction and decrease of toxicity of all emissions and waste before they leave the process. For the final manufactured goods, a pure production strategy focuses on reducing their negative impact on the environment throughout the life cycle: from raw material production to final disposal of the product. Pure production is achieved through the use of know-how, technology improvement and/or a change in the attitude towards the usual reality (Bjerke, 2014; Osaulenko et al., 2020).

Murray, the author of the concept “Zero Waste,” emphasized: “The idea that waste could be useful, that it should come in from the cold and takes its place at the table of the living, is one that goes far beyond the technical question of what possible use could be made of this or that. It challenges the whole way we think of things and their uses, about how we define ourselves and our status through commodities, by what we cast out as much as by what we keep in” (Murray, 2002).

According to Pauli, the author of the concept of the blue economy, which had become the

new trend of the twenty-first century, “Our economy is stressed because our material world operates on the basis of physical resources we do not have, and waste we have nowhere to hide” (Pauli, 2012). “With any luck, what we will realize is that making waste is not the problem we must solve. If a living species do not generate waste, it is most likely dead, or at least very ill. The problem we have, and that we must address, is that we waste the waste we create. Consider that the conversion of waste into nutrients both requires and generates energy. While we are always looking for sources of energy for commercial and home applications, ecosystems never need to be wired. No member of an ecosystem needs fossil fuel or a connection to the grid to achieve output, nor is waste an outcome in natural systems. In nature, the waste of one process is always a nutrient, material, or energy source for another. Everything stays in the nutrient stream. Thus, the solution not only to the environmental challenges of pollution but to the economic challenges of scarcity may be found in the application of models we can observe in a natural ecosystem. Perhaps we can turn the dilemma into a solution by broadening our perspective and abandoning the concept of waste” (Pauli, 2012).

However, the issue of the implementation and development of non-waste production has not yet been illuminated sufficiently. Existing studies cover a certain range of issues of this complex problem, but ignore the non-waste agricultural production development’s conceptual aspects.

Results

Non-waste production is the agricultural production’s type, which uses raw material and energy in the most rational and comprehensive manner in the cycle “raw materials — production — consumption — secondary raw materials” in such a way that any environmental factors do not violate its normal functioning. Such interpretation particularly reflects the essence of the processes, relevant to the modern agricultural sector’s real economy. The above-mentioned definition is not based on the hypothetical possibility of non-waste production per se. Still, it implies that any industrial process is accompanied by the wastes generation, which could be transformed into a consumption product or environmentally friendly component. Non-waste agricultural production provides for achieving the highest level of economic, social and ecological restiveness of such production. The economic, social and ecological benefits from the implementation of non-waste agricultural production into the business practice are:

1. Economic benefits: reduced production cost price and improved quality of the agricultural products; costs reduction for the raw materials, energy, fuel, water; costs reduction for cleaning wastewater and agricultural waste recycling; reduced ecological penalties; minimizing transport costs; revenue growth.
2. Social benefits: improving working conditions and increasing security of the workplace; risk reduction for the staffs’ health; generation positive public opinion; the increasing reputation of the domestic entities at the non-waste agricultural business.
3. Ecological benefits: reduced production resource-intensity; reducing the amount of the agricultural wastes; reduced use of land zoned for the agricultural wastes; emission reduction; improving the nation’s health.

Shift to non-waste agricultural production is the objective process, closely linked to decreasing natural resources and energy use. Today, accelerated research in this field and its results at the business activity become important requirements.

Methodological aspects of the non-waste agricultural production development

The fullest use of agro-residues is the important scientific, technical, and economic challenge of our age. Resolving this problem will be key in achieving effectiveness and balance at the agricultural and agribusiness. Diversity of features characterizes specific agricultural wastes, and it causes the complexity of the management of involving these residues into the business practice. So, it is important to focus on this process by using particular methods at different management levels (Nitsenko et al., 2019; Ostapenko et al., 2020).

Implementation of the non-waste agricultural production into the business practice provides for the research of the following blocks:

- a) theoretical, conceptual and methodological support of the non-waste agricultural production implementation, which involves researching the essence and the concept of non-waste agricultural production, demonstration of the differences between the non-waste and low-waste production, classification of the agro-residues according to different criteria on the basis of reviewing Ukrainian legislation and rules of European law;
- b) analysis of the current state and tendencies of the agricultural business development, including resource-saving technologies use at this sphere, market resource and assessment of the product's competitiveness of the non-waste agricultural production;
- c) organizational and economic support of the non-waste production formation and development, i.e., research of such organizational form of non-waste agricultural production, which allows to increase the production volume and to diversify the assortment; to decrease the expenses for agricultural production; to decrease the cost price for the additional product with the same commodities expenditures; to improve the effectiveness of the fixed capital use and the investment savings;
- d) investment, innovation and marketing ensuring of the non-waste agricultural production, which is an integral part of the technological and organizational decision-making process at the non-waste agriculture;
- e) increasing the economic, social and ecological resultiveness of the non-waste agricultural production, which is key to the competitive development of the non-waste agricultural business entities and the national economy, in general. Thus, the task is to correctly choose the economic, social and ecological resultiveness criterion of the non-waste agricultural production and find ways to improve it.

It should be mentioned that science is one of the leading drivers at the process of socio-economic development of the level of non-waste agricultural production. In a plane of our research, science is the basis of the “science — technology — non-waste agricultural production — society” system's development. Advances in science and technology provide great opportunities for modification of the methods used by agricultural production on the basis of its technological improvement in combination with the most complete and cost-effective use of the material, human and financial resources. The continuous broadening of the range of theoretical and practical issues and increased focus on the methods and tools

of scientific and practical activity is typical for the development of scientific cognition. There is a growing understanding that receiving significant results depends directly upon the basic theoretical position, more precisely, on the principles-based approach to the problem statement and defining the common directions of scientific research. Science and practice should consolidate their efforts for providing the shift of agriculture towards non-waste production through the improvement of technological, economic and organizational facilities.

Research of the non-waste agricultural production's development as the component of the scientific study of noosphere

Achieving the harmonious development of nature and society is the key issue of the theory of developing noosphere (Petinova, 2014; Melnyk, 2018; Nitsenko et al., 2018; Tytarenko, 2019). Development of the joint vision of humanity, which should secure this harmonious development, is high on all the countries' cooperate actions. The concept of noosphere characterizes changes occurring in the biosphere influenced by the human. It is of great importance in theory and practice.

Vernadsky has defined the biosphere as the holistic geological envelope of the Earth, populated and qualitatively changed to create and improve liveable properties. In his opinion, humanity is a strong geological force and is faced with the challenge of the biosphere's transformation in its own interest. And noosphere is such a new state of the biosphere (Vernadsky, 1987).

Investigations conducted by academician Alexander Fersman — a colleague of V. Vernadsky — and many others have shown that practical human activity nowadays does not get us any closer to higher intelligence, despite significant scientific achievements, and even pull away us from it. The natural environment degrades technogenically. History of the twentieth and the beginning of the twenty-first centuries is characterized by (a) two World Wars and the threat of nuclear war, which could destroy the human civilization; (b) human's inability to reject from the wars as the way to address the conflicts; (c) further extension of the nuclear weapon. These trends demonstrate that the question of the continuous bottom-up development of humanity is far from reality. Since the pattern, identified by James Dwight Dana and which argues the inevitability of occurring noosphere, is typical for the biosphere and could be realized by different human species and civilizations. Thereby, we cannot argue, that *Homo sapiens* is one, who will finally achieve the goal of the shift from biosphere towards noosphere. Much needs to be done, especially in human minds, to bring forward the prediction of Vernadsky about the mental sphere developed in harmony with nature. It remains to be seen that humankind will be able to transform according to the principle of noosphere interaction with nature (Zahorodnyi et al., 2011).

Studying the different aspects of the noosphere concept's development allows proving its importance to address the global challenges to human development in the twenty-first century, among which is the sensible attitude to the agro-residues and resource-savings problem. Solving the problem of rational nature resource use and environmental protection is possible only by improving the recycling methods, neutralization, and utilization. Implementation of the non-waste agricultural production will ensure the rational use of all the components of raw materials and energy at the complete cycle "raw materials — production — consumption — secondary raw materials" and the ecological balance in the biosphere, thereby taking us one step closer to noosphere.

The ideology of the conduct with agricultural wastes: national and global aspects

The necessity of the scientific understanding of the ideology of conduct with agricultural wastes at the national and global levels is due to its affiliation to the public consciousness. Public consciousness is the attitudes and value system of the different social groups and classes, politically, legally, philosophically, ethically, artistically and religiously oriented (Melnik, 2018; Tytarenko, 2019; Osaulenko et al., 2020). Its main goal is consolidating or changing the existing public relations. Due to its logical function, ideology largely determines human behavior and actions to realize the socio-economic and ecological problems of society. An ideology based on the non-waste production principle influences its development and changes production mode through human activity. The key idea of the agricultural non-waste ideology is to ensure their integral highly technological recycling and minimize their negative impact on the biosphere.

Murray is one of the world's leading experts on economic conduct with the wastes and the author of the Zero Waste concept. The Zero Waste concept has its origins in the Japanese industrial TQM concept (total quality management) (Murray, 2002). Its background is the "zero defects" idea, the "approach whereby producers have achieved results as low as one defect per million." Transferred to the arena of municipal waste, Zero Waste forces attention onto the whole lifecycle of products. Zero Waste encompasses producer responsibility, ecodesign, waste reduction, reuse and recycling, all within a single framework. It breaks away from the inflexibility of incinerator-centered systems and offers a new policy framework capable of transforming current linear production and disposal processes into "smart" systems that utilize the resources in municipal waste and generate jobs and wealth for local economies. In his book, Murray has emphasized that "Waste has suddenly become an issue too important to be left to the waste industry. It is seen no longer as simply a sectoral matter — though the waste industry itself has been put under pressure to change. Rather, waste like energy and water is now recognised as pervasive, connecting as it does to every sector of the economy. ... As the questions have widened, so has the response. There has been a shift from the concentration on pollution control to a broader policy of "Zero Waste." "Zero Waste" as a concept has only recently been applied to waste management." So, his main idea is that waste must be useful not only for the waste industry but also for other economic branches. And this is one of the defining features of the postindustrial era. On his opinion, "Waste — both in its process of generation and its treatment — thus takes a central place in strategies of industrialized economies. ... Resource productivity is becoming a major theme of environmental policy" (Murray, 2002).

A significant number of national and international bodies have proposed and implemented the idea of non-waste production and some of them have adopted it in the National Environment Plans or Strategies (e.g., Australian, Dutch, UK governments).

Ukrainian state institutions, public environmental organizations and others, including the private ones, do not sufficiently draw attention to this problem. Therefore, the problems in the conduction with wastes became not only the prerogative of the industry, but also of the general Ukrainian national culture. In Ukraine, in comparison with the developed and highly developed countries, it so happened that there is a huge volume of wastes and there is no waste infrastructure and management (National strategy, 2018).

Thus, it is essential to undertake the retrospective analysis of the conduct with agro-residues in different countries.

Already in 1930, attention was paid to the idea that the non-use of industrial and agricultural wastes would amount to the wastage of the resources without obtaining proper equivalent. At the same time, the number of industrial wastes has increased in proportion to the industrial production's growth, and industrialization of agriculture, which all this time has been developing, has created new types of wastes, which could be the valued commodity for the new industries, the new fodder base for livestock and the basis for new chemical fertilizers (Bruttini, 1931).

American and West European experience has demonstrated that agricultural waste recycling has become the inexhaustible raw materials source.

In the early 1970s, a significant change took place in animal housing technology. Most European and American countries have refused the straw-based systems and moved to the hydraulic system for manure collection. First of all, it was caused by the refusal to use physical labour in the manure collection process. Hereby, the expenses for the floor cleaning, transportation of the straw to the animal shelters, its refreshment, and further transportation to the field could not be offset by a better harvest. Besides, the microclimate in the building has been deteriorating due to the permanent contact with hummus in an open humus channel (Loehr, 1981).

Not only the USA was concerned with the problem of environmental pollution, namely agricultural wastewater, but also Belgian, Bulgarian, French, Polish, USSR's governments have developed requirements for classification of the main water resources. Many countries have set standards for draining industrial wastewater.

In the late 1970s, Raymond Loehr has emphasized that the state desire to improve the environment's needs from the agricultural entities to decide on the patterns of production and pay considerable attention to waste management (Loehr, 1981). This idea is still urgent for the beginning of the twenty-first century.

In 2014, the issue of changes in the environment, which resulted from economic activity, was the main focus at the World Economic Forum in Davos (World Economic Forum, 2014). More than 30 meetings of the forum focused on climate changes, investment in environmentally sound production, "smart" waste management, and the circular economy's capacities.

A closed-loop economy (in other words — circular economy or non-waste economy) becomes a research subject not only of the highly developed countries, but also developing ones (e.g., China, India, Brazil, and so on). Such a type of economy is considered the potential strategy of society's development and designed to improve its welfare. Such an economy's main idea is to reduce the state's dependence on raw-material and energy resources. Circular economy functioning is modelled on the natural ecosystem example, in which there is no waste.

The circular economy is the concept directed at reducing the material dependence (so-called "loop") and extending the service life of the materials due to their prolonged and wider use (Yi, 2003; Musina & Kvasha, 2014; Pubule, 2014; Nitsenko et al., 2018). The circular economy system provides the long-term retain products' value-added, minimizes, or even nullifies waste production. In this, resources remain in the economic circulation even after the expiration date and are used for creating new value-added all over again. Shift to the new economic system with waste reuse requires changes in the chain of creating value-added — form the product's design to the new business models, from the new ways of wastes transformation into the resources to the new conduct models of the consumers (European Commission, 2014; Jiang et al., 2019; Ostapenko et al., 2020).

From the beginning 2010s, there has been an upsurge in interest in the cycle economy. It is a result of the significant ecological challenges of the twenty-first century, among which are resource gap (namely strategic one, such as rare earth elements) and the negative impact on the environment of industry and unsustainable consumption. The main economic reasons for this increasing interest are price volatility (and its growth) for the goods and potential economic benefits from the new markets with the model of circular economy (Taranic et al., 2016).

In December 2015, the European Commission adopted the plan of action for the economic shift towards circular till 2019. This plan implies that this model becomes the general strategy of the EU sustainable development.

In 2016, the Center for European Policy Studies (CEPS) presented a study *Understanding the Circular Economy in Europe, from Resource Efficiency to Sharing Platforms: The CEPS Framework* (Taranic et al., 2016). It has determined such advantages of the economic shift towards circular one: (1) ecological benefits; (2) cost savings from decreasing the demand for natural resources; (3) additional economic benefits received from establishing new markets.

German, Japanese, Swedish, South Korean, Swedish, American, Danish, Chinese, and Baltic governments have developed, adopted and are realizing the state plans and strategies of the circular economy creation and development on the basis of the resources recycling.

Ukraine still needs urgent reformation of waste management's legal and economic basis, including the agricultural sphere. It should be done using world experience. The problem of the agricultural wastes in Ukraine needs the new vision's development:

1. Sustainable waste management should become the strategic part of the agricultural entities.
2. Agro-residues should be considered as the source of secondary material and energy resources.
3. Agricultural waste generation in production and consumption is needed to minimize.
4. It is necessary to ensure the maximum recycling and utilization of agricultural waste by introducing effective non- or/and low-waste technologies.
5. It is necessary to define resource reuse methods (recycling methods).
6. Agricultural non-waste management must be started by planning rational use of natural resources and agricultural production.

Methodological approaches to the resultiveness evaluation of the non-waste agricultural production

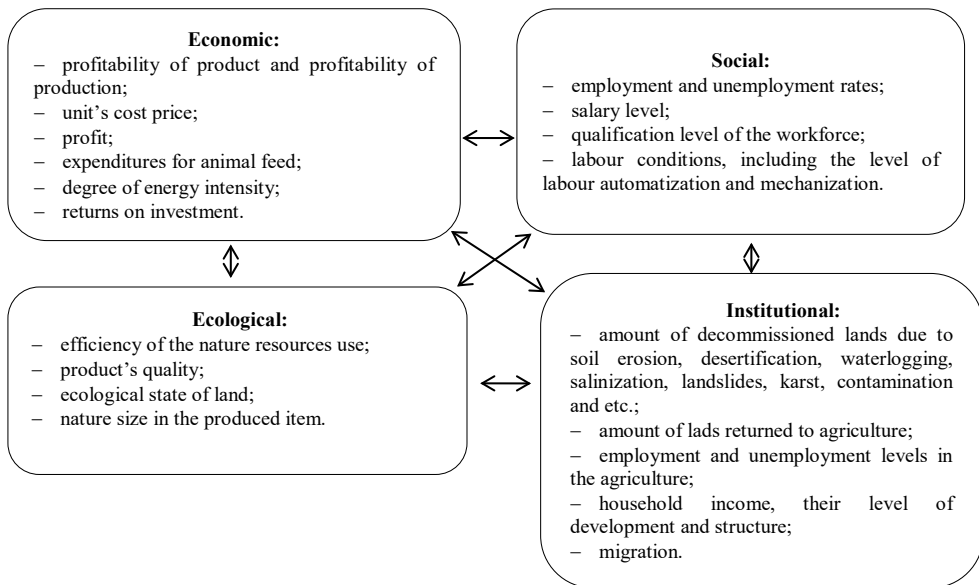
The changes taking place in the Ukrainian agricultural sphere, due to the transition to a market economy, Ukrainian membership in World Trade Organization (WTO), association with EU, necessitated seeking the modern methodological approaches to the resultiveness evaluation of the agricultural non-waste production's development. Thus, the study of the methodological support of the economic, ecological, and social effectiveness of agricultural non-waste management is the key issue of this research.

Still, the universal criterion for evaluation of the production's waste degree has not been proposed. Different production areas have their corresponding criteria. Thus, non-ferrous metallurgy widely uses the rate of complexity, i.e., the ratio of components, extracting from raw-material, which are processed their whole amount relatively. Some industries use the degree of raw-materials and materials used in the technological processes. For example, there is a stripping ratio in mining, which refers to the ratio of the waste material volume required

to be handled to extract some tonnage of ore. In a number of chemical industries, there is a waste ratio with the special its determination. As a result, a particular technological process is ranked by non-waste, low-waste, and traditional characteristics.

It is necessary to evaluate the economic resultiveness and effectiveness of the agricultural waste management's development by the set of indicators that characterize non-waste activities' contribution to the final economic performance.

Different ways can calculate the non-waste management's effectiveness: (1) measuring the absolute economic efficiency of the expenses for the environmental protection; (2) measuring the relative efficiency of the expenses; (3) determining payback periods of the additional capital expenditures. Besides these, there are also combinations of these methods. Thus, agricultural non-waste production is part of the general problem of rational nature resources' use, environmental protection, and increasing the production's effectiveness and organizational level. Hence, the resultiveness of the agricultural non-waste production needs to be evaluated by the complex of indicators, reflecting economic, social, ecological, and institutional features of the researches object (see Figure 1).



Thereby, the economic resultiveness of the agricultural non-waste production is evaluated by the indicators, determining general features of the resource base's scope and the results of this economic and business activity, cash, and in-kind.

The main resources of the agricultural non-waste production are (a) labour; (b) land; (c) material; (d) financial; (e) technical and technological; (f) informational; (g) innovative resources. The efficiency of their use shows the ability to make products and is evaluated by comparison of the volumes of received goods and resource expenditures.

The degree of product's competitiveness of the agricultural non-waste production and degree of the non-waste agricultural entities' competitiveness is the integral indicators of economic resultiveness.

Resultiveness of the agricultural non-waste production could also be evaluated by the indicators of social resultiveness, which is not limited to material well-being (Bilan et al., 2017; Yatsenko et al., 2019; Osaulenko et al., 2020). We shall notice that the deteriorating living conditions of the population in the highly polluted area because of agro-residues creates socio-economic conditions for the shift towards non-waste production. Evidence of the negative social impact of pollutants is primarily evident in the population's health. An integral indicator of the social resultiveness of the agricultural non-waste production is the improvement in the living conditions and life expectancy.

Human as a part of nature is closely related to the environment. Ecology and technology are the two areas, the mutual influence of which develops in the process of society's and its productive forces development. The highest state of technological development must be its "greening." Its main goal is to maintain ecological balance in the implementation process into the business practice of such industrial processes, which guarantees the maximized high-quality production. This objective is met by means of the agricultural non-waste technologies implementation.

Evaluation of the institutional resultiveness of the agricultural non-waste production includes the following indicators: the existence of (a) formal society's institutes (law, property, power), and (b) non-formalized institutes (traditions, customs, mentality).

The transition of agriculture towards a non-waste structure is the objective requirement of its intensification. It is the degree of non-waste in agriculture that most accurately displays the level of economic intensity, technological and technical progressiveness, and production organization. The existence of a link between inputs of materials and the effectiveness of material and labour resource use indicates that non-waste technologies implementation is essential for recourse, funds, and labour maintaining economy. The focus on the Zero Waste Concept in agriculture leads to (a) growing efficiency of the material and raw-material use; (b) reduction of the labour intensity and capital-output degree at the final product; (c) reduction of the expenditures for environmental protection; (d) increased productivity; and (e) increased social benefits.

Discussion

It is important to emphasize the complexity and value of the tasks of Ukrainian and other countries' business transformation into non-waste agricultural production, which are put before our science and practice. It is necessary to push the research in the right direction and to provide practical orientation, in other words, to carry out in-depth and focused research of a certain sphere. The concept of the non-waste agricultural production's development, in turn, directly impacts the scientific and technical activity and defines its directions and, even, its results. Finding solutions to the transcend differences related to ecological, economic, and social problems due to the excessive number of agro-residues is possible only by the agricultural business refocusing on its development's non-waste direction.

Efficient non-waste agricultural production needs for balancing the interests of agricultural business and the state of biosphere. Environmental protection is an integral part of the non-waste agricultural production's implementation process. The economic, ecological and social components of effective agricultural production have a single integrated system. Understanding the scope and the nature of the ecological problems, their correlation with the operating conditions of agriculture allows defining necessary resources that are needed for their solution.

Studying the various aspects of the concept of noosphere formation enables to prove its importance for addressing global challenges to human development in the twenty-first century, among which is the sensible attitude to the agro-residues and resource-savings problem. Implementation of the non-waste agricultural production will ensure the rational use of all the components of raw materials and energy at the complete cycle “raw materials — production — consumption — secondary raw materials” and the ecological balance in the biosphere.

Ideology owing to its logical function largely determines human actions to realize the socio-economic and ecological problems of the society. Ideology, based on the non-waste production concept, will influence its development and is able to change the mode of production through the activity of the humans supporting this idea. The key idea of the ideology of the conduct with agricultural wastes must be ensuring their complex high technological recycling and minimizing the negative impact on the biosphere.

There is no infrastructure of the conduct with wastes in Ukraine, unlike in the other developed countries. The conditions under which the scope of agricultural wastes accumulation exceeds the scale of their recycling, utilization, or neutralization lead to the ecological crises and hamper the country's economic development. The experience of the conduct with agricultural wastes of the developed countries is very illustrative. Since the 1970s, the countries have made many efforts to create low- and non-waste technologies for processing raw materials and production. USA, Great Britain, Canada, Poland, Japan, and some other countries effectively use the huge volume of agro-residues on the ecosystem model.

Ukraine needs the urgent reformation of the legal and economic systems, which regulate the use of the waste, including the agricultural sphere, taking into consideration the world and European experience. Inadequacy of existing methodological base of the analysis of technological, technical and organizational progressivity of the agricultural production complicates the optimal business decision-making process. Underestimation of the effect of agricultural waste use does not allow business entities to receive complete data about the by-products' feasibility and waste industrial recycling. As a result, agriculture suffers considerable economic losses. Systemic application of the non-waste agricultural production of the European development level in Ukrainian practice is a challenge for the leaders of our country. Nevertheless, ensuring the proper state regulation in this sphere and the creation of the necessary organizational and economic conditions is the important step towards addressing complex problems of the country's sustainable development.

Conclusions

The article presents conceptual, theoretical principles of ensuring a balance between the biosphere and development of non-waste production in the agricultural sector. The examination of questions of the non-waste agricultural production promoting has been carried out through the consideration of such “blocks”: methodological aspects of the non-waste agricultural production development; the link between the efficient functioning of non-waste agricultural production and the noosphere teaching, which are aimed at achieving the development of nature and society; the ideology of the conduct with agricultural wastes; methodological approaches to the resultiveness evaluation of the non-waste agricultural production.

The triad of properties of non-waste agricultural production has been proved: 1) to extract the most valuable and complex components of raw materials, transforming them into useful

products; 2) to ensure the social effectiveness of agricultural production; 3) to eliminate or minimize the harm done to the environment as a result of production and economic activity.

Results of the evaluation of the non-waste agricultural production development's effectiveness are the basis for the managerial decision-making process regarding the selection of ways of the non-waste agricultural production's development; rationalization of the non-waste agricultural production's organization; search for the ways and methods of achieving agricultural business efficiency and its forecasting on the future; creation the system of informational and analytical support of non-waste agricultural production's functioning; ecological balance in the biosphere.



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The Sophia Republic: The Special Theory of Education

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Bazaluk, Oleg (2021) The Sophia Republic: The Special Theory of Education. *Philosophy and Cosmology*, Volume 26, 62-76. <https://doi.org/10.29202/phil-cosm/26/5>

The article explores education as a policy, as a power that moulds in a man “the correctness of the gaze.” A theory that we have called the special theory of education reveals the first image of education. The special theory of education considers education as a moulding matrix. The matrix consists of sets of special impact technologies by means of which it liberates the truths of the Dasein being’s experience hidden in the arete existentials. The special theory examines the Sophia Republic policy, i.e., the power that regulates the ontological orientation and limits of self-realization of Dasein-mentality-about’s being in accordance with the absolutized idea, ideal and values of “Those Who Transform the Universe.”

Keywords: special theory of education, Sophia Republic, Heidegger, Plato’s paideia, Dasein-mentality-about, Dasein-the-One

Received: 5 June 2020 / Accepted: 1 August 2020 / Published: 29 January 2021

Introduction

Immanuel Kant, one of the key thinkers of the second stage of the development of the theories of education of Plato’s line, wrote: “The prospect of a *theory of education* is a glorious ideal, and it matters little if we are not able to realise it at once. Only we must not look upon the idea as chimerical, nor decry it as a beautiful dream, notwithstanding the difficulties that stand in the way of its realisation” (Kant, 1900). The philosophy of the cosmos, the theories of “Evolving Matter” and noogenesis, have allowed us to establish and consider the three main features that distinguish the theories of education of Plato’s line from the theories of education of Isocrates’ line (Bazaluk, 2019; Bazaluk & Balinchenko, 2020). The liberated truths of the Dasein being’s experience, as well as their consideration and systematization by neurophilosophy methods, have revealed to us two images of education in Plato’s line. The first image is education as a *policy*, as a power that moulds in a man

“the correctness of the gaze.” A theory that we have called the *special theory of education* reveals the first image of education. The special theory of education considers education as a moulding matrix. The matrix consists of sets of special impact technologies by means of which it liberates the truths of the Dasein being’s experience hidden in the arete existentials. The special theory examines the Sophia Republic policy, i.e., the power that regulates the ontological orientation and limits of self-realization of Dasein-mentality-about’s being in accordance with the absolutized idea, ideal and values of “Those Who Transform the Universe.” The second image of education is a “glorious ideal” (Kant, 1900) to which a man ascends individually. A theory that we have called the *general theory of education* reveals the second image of education. The general theory considers education as *an individual* ascent to the image of the highest idea. For the general theory, education is a consciously chosen way of life, which we have called *transcendence into cosmic power*. The general theory examines the liberation of arete as *a self-dependent and self-sufficient* constitution of existence that changes the order of the Universe. Let us consider the key provisions of the special theory of education.

Axiomatics of the special theory of education

Five axioms lie on the basis of the special theory of education.

The first axiom follows from the philosophy of the cosmos. *The being of Dasein-the-One is the cosmos formed by universes, or the special order of universes*. As the modern philosophical teaching about the being of Dasein-the-One, the philosophy of the cosmos allows us to consider any universe as continuously and nonlinearly complicating order inside and between a certain number of states of matter. For the being of Dasein-the-One, the being of Dasein of any state of matter is a new way of presence and care. Therefore, each new state of matter, as a new manifestation of the Dasein-the-One’s being, not only complicates the order of being of the previous states of matter, and also concentrates the previous experience of Dasein’s being in itself. To become part and to create a system in the “mother” state of matter, each new state of matter should possess two basic qualities: (1) the possibilities to make full use of the material, energy, and information resources of the “mother” state of matter; and (2) the possibilities to transform the “mother” system in order to create conditions for continuous and non-linear block complication of its own structure and functions, i.e., to create the “daughter” system. The being of Dasein-the-One is the coexistence of many universes that are at different stages of continuous and non-linear complication. Each Universe consists of at least five states of matter: Y-Matter, Inert Matter, Living Matter, Intelligent Matter and X₁-Matter. All five states of matter are formed sequentially at an interval of approximately 3 billion years (Bazaluk, 2016).

The second axiom follows from the “Evolving matter” theory. *The being of Dasein-the-One is the complication of the structure of matter, the types of interaction, and the environments, though in the unity and struggle of opposites*. Speaking about the being of Dasein-the-One as a complication, the author means complication of three components of physical reality: 1) the structure of matter; 2) the types of interaction (relations) between the structures of matter; 3) the environments in which complication of these structures and interactions are carried out, and which, to a varying degree, determine environmental characteristics (Bazaluk, 2016: 35). The complication of any state of matter is based on three factors and two causes. The author attributes the factors of complication to (Bazaluk, 2016: 136):

- a) Continuity of self-complication of the structure, the types of interaction and the environments of any state of matter, supplemented by blocks of continuous

self-complication and the principle of dominance of continuous block self-complication.

- b) Non-linear complication of the structure, the types of interaction and the environments of any state of matter, which is added by the factors: hierarchical non-linear complication and direction of non-linear hierarchical complication.
- c) Isolation of complication.

The author attributes the causes of complication to (Bazaluk, 2016: 136): a) Active principle, which is inherently the basis for the initial elements of any state of matter and forms self-complication; b) Natural selection as the impact of the external environment. Interaction of the active internal principle of any state of matter with natural selection as the impact of the external environment forms a regulatory compromise or the being of Dasein.

The third axiom is *the idea of a man who transforms the Universe* that follows from the philosophy of the cosmos. The Intelligent Matter of the Earth, represented by man and society, is one of the five states of matter that form the Universe. The being of Dasein-Intelligent-Matter concentrates in itself the experience of Dasein's being of the previous states of matter: Y-Matter, Inert Matter, and Living Matter. It defines the structure, functions and manifestations of Dasein-Intelligent-Matter's being, as well as its ontological orientation and limits of self-realization in Dasein-the-One's being. Structurally and functionally, Intelligent Matter is created to cognize the Universe and create in it. The being of Dasein-Intelligent-Matter of the Earth liberates the knowledge of the experience of Dasein-the-One's being through cognition and creation. It learns to manage the resources of Y-Matter, Inert Matter and Living Matter, as well as to use their power in the struggle for existence. Competing for the presence in the Dasein-the-One's being, the Intelligent Matter influences the continuous and non-linear block complication of Dasein's being of the previous states of matter. By its presence, the Intelligent Matter establishes a new order of Dasein-the-One's being, in which it becomes an important actor of presence and care.

The fourth axiom follows from the theory of noogenesis. *Human life is the being of Dasein-mentality-about*. In the term "being of Dasein-mentality-about," we concentrated the scientific and philosophical knowledge of ontology of human being, with all the richness of Heidegger's Dasein meanings, the philosophy of the cosmos and modern neuroscience knowledge. The being of Dasein-mentality-about is a new way of presence and care of the being of Dasein-the-One. The being of Dasein-mentality-about allows us to consider the possibilities of neural-ensembles of subconsciousness and consciousness as a cosmic power. The antropologization of Dasein-mentality-about's being has discovered arete. Arete, in our understanding, is the boundary separating the being of Dasein-mentality-about and the being of Dasein-Intelligent-Matter from Dasein's being of any other state of matter. It is from the arete that noogenesis, the idea of man and the meaning of human life originate. Arete consists of existentials: intelligence, knowledge, and techne. Each arete existential corresponds to a certain quality of the three-level block organization of "mentality about" and encloses the defining combinations of the individual being of Dasein as the potential of Dasein-the-One's being. In general, the intelligence, knowledge and techne reveal the being of Dasein-mentality-about as the existence, or as an active principle, as the *potential of presence and care of Dasein-the-One's being*.

The fifth axiom of the special theory of education proceeds from the fact that the aletheia as "unhiddenness" is unable to liberate itself from the concealedness of the cosmos. It needs to be liberated from the outside. The only power that can extract it from the concealedness

and turn it into aletheia as “truth” is the power of natural selection. Education, as a policy, possesses the power of natural selection. It is based on the absolutized truths of the current being. Education, as a policy, is a moulding matrix. The effectiveness of the matrix is provided by sets of special impact technologies. *Education as a policy influences the transition of the aletheia, liberating and enriching above all that aletheia as “unhiddenness,” which corresponds to the absolutized truths of the current being.* The ability of education to influence the transition of the aletheia allows it to independently establish the ontological orientation and limits of self-realization of Dasein-mentality-about’s being as the potential of Dasein-the-One’s being. The transition of the aletheia from “unhiddenness” to “truth” turns into the formation of *“the correctness of the gaze”* (Heidegger, 1986).

Let us consider the special theory of education.

The basics of special education theory

In the special theory, education is considered as *sets of special technologies of influence on continuous and non-linear block complication of the structure and functions of the “mentality about” in order to form the orientation and limits of self-realization in ontogeny.* In the special theory, education is considered as a power for natural selection. It is a *policy* that liberates the truths of the Dasein being’s experience, concentrated in the arete existentials, according to a certain ideal way, or *“correctness of the gaze”* on the image of the highest idea.

Martin Heidegger determined the key ideas of the special theory in work “Plato’s Doctrine of Truth” (Heidegger, 1986). If Plato laid out the basis of the paideia in the seventh chapter of the “Republic” in the dialogue between Socrates and Glaucon (Plato, 2020), Heidegger laid out his understanding of education by analyzing the ideas that Plato had put into this dialogue (Heidegger, 1986). About three thousand years have passed between considering the basis of education. However, despite the change of persons and theories, the authors say one thing. They discuss the features of the transition of the ἀλήθεια (Liddell & Scott, 1940) from unhiddenness to truth. Plato and Heidegger consider education, or, more exactly, philosophy, as the highest level of education, as politics. In Plato’s view, politics is a way of moulding a lack of education (απαιδευσία) to education (παιδεία). In Heidegger’s view, politics is the cause of “unrest” in hiddenness, the moulding “correctness of the gaze.” Thus, the special theory of education considers philosophy as a policy, or *a power that liberates the truths of the Dasein being’s experience, concentrated in the arete existentials, and transforms them into truths of the current being.*

Contemplating the unhiddenness of the moment in between Plato’s paideia to the late Heidegger’s work, the author discovers the following in the history of culture. The truths of the Dasein being’s experience, concentrated in the arete existentials, are unable to liberate themselves and gain the power of presence. It becomes obvious *that aletheia, as unhiddenness, needs to be liberated from the outside.* It is this fact that is fundamental in the special theory of education. The development of theories of education from Plato to Heidegger is *a continuous complication of understanding the role of philosophy as the highest level of education, in the transition of ἀλήθεια from unhiddenness to truth.* Philosophy as politics extracts the truths of the Dasein being’s experience from hiddenness. It has the power to mould existence from lack of education (απαιδευσία). It has an understanding of *education (παιδεία)* as a man-made image formation in likeness. Philosophy transforms the *lighting* into a way of life aimed at gaining true liberty.

Scientific understanding of the reason why aletheia as “unhiddenness” needs liberation from the outside is revealed in the “Evolving matter” theory (Bazaluk, 2016). The third

complication factor shows that the structure, the types of interaction, and the environments of the existence of any state of matter tend to isolation. The meaning of isolation of complication corresponds to Plotinus' view for "self-assembly" (Plotinus, 1952). However, the scientific component of this problem is much more fully revealed in Heidegger's philosophy.

According to Heidegger, *aletheia* as "unhiddenness" is the essence of existence, which is being under its own control (Heidegger, 1997). It tends to isolation and insularity on itself. *Aletheia* as "unhiddenness" is essentially only the letting-be of being, and not the very being. It is true liberty. It is hidden in the *arete* existentials, and it demands liberation. Plato proposed a way that the author designated by a metaphor "*philosophy-as-a-way-of-life*" in order to transform the letting-be of being into the authentic being of *Dasein*-mentality-about. It provides for the following. People, who were able to get out of the cave and see the Sun on their own, gained wisdom outside the cave. Plato called these people *philosophers*, and the state they acquired was *φιλοσοφία* (Plato, 2020). In modern senses, mastering philosophy is tantamount to gaining the supreme power of the presence of being, or *Da-sein* (Safranski, 2005). Following Heidegger, we use the term "Da-sein" to emphasize the aspiration of *Dasein*-mentality-about's being to the objectification of its presence. "Da-sein" is the orientation towards a self-dependent and self-sufficient constitution. It is the power of natural selection maximally concentrated in the individual being.

Thanks to politics, *philosophy-as-a-way-of-life* gained the power, by which it moulded the lack of education of the *demos* into a special kind of education (*παιδεία*). Philosophers established the characteristics of education. In this way, the *philosophy-as-a-way-of-life* manifested itself as a moulding matrix in which the liberation of the existence of those who remained in the cave took place according to a certain pattern (ideal).

Philosophy-as-a-way-of-life self-assembled the *Dasein*-mentality-about's being into the *Dasein*-Intelligent-Matter of the Earth's being, or in the *Republic*. It moved it from region to region towards a *lighting*, or a way out from the cave. It is for this reason that Plato has always regarded philosophy as an action (Hadot, 2005). Philosophy, as a way of transforming *ἀλήθεια* from unhiddenness to truth, was the main system-forming idea of a philosophical tradition. This is the *creation of the Republic as a moulding matrix for the forced arete liberation in accordance with the cultural ideal*. The cultural ideal concentrated the knowledge obtained by philosophers outside the cave, or in our terminology, the unhiddenness of *Dasein*-the-One's being.

Plato has proved in the "*Republic*" that the existence of the *demos* can constitute only under the influence of the outside (Plato, 2020). The constitution is possible only in the *Republic*, in which philosophers have elevated the unhiddenness of *Dasein*'s being into the ethics laws and sought their absolutization by the policy of coercion. In essence, philosophers created the conditions for the action of natural selection. With its help, the truths of the *Dasein* being's experience, concentrated in the *arete* existentials, were not just liberated. They were liberated in a certain way, in accordance with the absolutized truths of the current *Dasein*'s being, concentrated in a cultural ideal. In this way, philosophers regulated the correspondence of the *aletheia* of *Dasein*'s being as "unhiddenness" and "truth." In Plato's *Republic*, philosophers authoritarily established the ontological orientation and limits of the possibilities of self-realization of *Dasein*-mentality-about's being as the potential of *Dasein*-the-One's being.

Plato proposed a way of transforming the *aletheia* from "unhiddenness" to "truth." It has been used effectively in rising generations' moulding for several millennia (Platonov, 2013). It remains relevant in education until now, being the basis of elite education. However, "*philosophy-as-a-way-of-life*" as a way of liberation from the concealment of the truths of

the Dasein being's experience, concentrated in the arete existentials, depends entirely on the quality of knowledge obtained outside the cave, i.e., from the *philosophy of the liberators*. The way proposed by Plato brings to the fore the value of philosophers, not philosophy.

The practice has shown that the liberation of aletheia as “unhiddenness” by philosophy-as-a-way-of-life proved to be dangerous for philosophers. The fact is that ἀλήθεια as “unhiddenness” and the basis of being itself was often very different from the absolutized truths of the current being. Therefore, philosophers were forced to consciously sacrifice themselves, defending the correspondence of “unhiddenness” to the absolutized truths of the current Dasein's being, or replace the essence of the liberated truths of the experience of Dasein being. It was discovered that the philosophy-as-a-way-of-life as a policy could not control the liberated energy of the existence of those who remained in the cave. In the *Republics* created by the philosophers-rulers, philosophy-as-a-way-of-life really liberated the existence from insularity by the power of politics. It really turned the letting-be of being into a full-fledged being of Dasein-mentality-about. However, the liberated cumulative energy of the existence of “those who remained in the cave” swept away the liberators in its path, and the way of achieving the cultural ideal proposed by them, and sometimes the ideal itself, transformed beyond recognition. It is for this reason that the liberators — the philosophers, the Church Fathers, and the politicians — have passed from the action, from liberation *policy* and the existence of those who remained in the cave moulding, to *discourse* on philosophy-as-a-way-of-life. The way of gaining σοφία outside the cave or the *power of politics*, in practice, was possible neither for the rulers of the Roman Empire, nor for the Church Fathers of the Middle Ages. Moreover, it was not possible for the politicians and political parties of the Modern Age. There was a substitution of the essence of Plato's philosophy. Philosophy continued to be considered as the highest level of education. However, in philosophy, the significance of Logos was ascended, instead of action, politics. In fact, the ideas of Isocrates and sophists prevailed in the philosophical tradition (Isocrates, 1980). Having lost the status of *politics*, philosophy also lost the *power of natural selection*. Up to the present day, apologists for authoritarian rule have been trying to prove that one can overcome the concealment of being and liberate the aletheia as “unhiddenness” by the power of the Logos. *However, the Logos does not have the power of natural selection.*

The second stage of the development of the theories of education of Plato's line is associated with the revival of the understanding of philosophy as a politics. Martin Heidegger has made a huge contribution to the return of the natural power of philosophy (Safranski, 2005; Sheehan, 2014). Heidegger was forced to rethink Plato's key ideas in order to restore the power of natural selection to philosophy. Exploring Heidegger's works, Safranski showed how close he was to Plato's ideas about the key role of philosophers-rulers (Safranski, 2005). This was manifested, for example, in the decisive factor. In Heidegger's view, the “unspoken effect of its atmosphere” would be the decisive factor. Heidegger believed that the teaching staff would have to “*be effective mainly through what and who they are, and not through what and about what they 'speak'*” (Safranski, 2005: 376). However, despite the acceptance of the idea of philosophy-as-a-way-of-life, Heidegger discovered a new way of transforming the aletheia from unhiddenness to truth. Heidegger acknowledged that philosophy-as-a-way-of-life was a backbreaking burden for rulers — philosophers, the Church Fathers and politicians. Plato's idea to endow the image of a philosopher with the power of politics is a utopia. It is tantamount to concluding the power of a downpour in a raindrop or the power of a hurricane in a wave crest. The most that philosophers are capable of is to *discourse* on philosophy-as-a-way-of-life. For this very reason, it is correctly to consider the philosophers-

rulers to be *the potentials* of the *policy* of existence liberation of “those who remained in the cave” than as a power of liberation.

Heidegger proved that the ultimate possibilities of philosophy lie in “*existence’s alert awareness for itself*” (Safranski, 2005: 179). In essence, philosophy is the cause of “unrest.” It independently and without any help liberates the structures of existence: Being-in (In-Sein), attunement (Befindlichkeit), understanding (Verstehen), falling prey (Verfallen), and care (Sorge) (Heidegger, 1997). Heidegger established *how* philosophy overcomes the hiddenness of being and extracts the truths of the Dasein being’s experience from it.

The author relies on Heidegger’s ideas and develops them. The author affirms that philosophy is the essence of aletheia as “truth.” Philosophy is present in it as an entity. The entity is conditioned by the care of Dasein-the-One’s being about the aletheia as “unhiddenness” that is hidden in the arete existentials. The nature of philosophy is explained by the peculiarities of the manifestations of factors and causes of the complication of Dasein-the-One’s being. They contrast the aletheia as “unhiddenness” and “truth.” Being the essence of aletheia as the “truth” of the current Dasein’s being, philosophy is a natural source of dissatisfaction and disturbance of aletheia as “unhiddenness.” As the power of natural selection, philosophy continuously influences the truths of the Dasein being’s experience, concentrated in the arete existentials. It provides, first and foremost, a break through the concealment of being of that “unhiddenness” that corresponds to the “truths” of current being. By this, philosophy provides a regulatory compromise.

The influence of philosophy on the concealment of being is all-encompassing and versatile. It is for this reason that philosophy cannot be regarded as a way of life and be of any system-forming nature. Philosophy is independent of the liberators’ philosophy quality, because it is conditioned by aletheia as the “truths” of the current Dasein’s being. They *independently* reveal themselves and declare their presence. For philosophy, any of Dasein-mentality-about’s being is the subject of influence and, at the same time, the instrument of influence on the concealment of being. Aletheia as the “truths” of the current Dasein’s being declares itself, “forcing” the being of Dasein-mentality-about” to elevate it into the ethics laws. It follows the conclusion that *philosophy* itself is the politics and power of natural selection, and the philosophers-rulers are its *guides*. Philosophers show the example of *serving* aletheia that independently declares oneself as “truth” and a strong *belief* in the cultural ideal in which it self-assembles.

Thus, in the special theory, philosophy is considered as a natural source of unrest in the concealment of being. It is the essence of the aletheia as the “truth” that independently declares itself, protrudes with sharp angles in the current Dasein’s being, and, actually, forms the matrix of Dasein-Intelligent-Matter’s being. Aletheia as “truth” gives philosophy the functions of the *formative matrix*, or the Sophia Republic policy. Philosophy as a policy primarily liberates and enriches the aletheia that corresponds to the absolutized truths of the current being, concentrated in the cultural ideal. Only in this way, philosophy influences the life choices of the rising generations and forms in them the “*correctness of the gaze*.” “The subject of the philosophical question is human existence, the question being about the character of its Being” (Safranski, 2005: 175).

The special impact technologies

Thus, in the special theory of education, philosophy is considered as the cause of unrest in hiddenness. The more actively the philosophy manifests itself as the Sophia Republic policy, the fuller the liberation and enrichment of the truths of the Dasein being’s experience,

concentrated in the arete existentials, are. Philosophy uses different technologies in the policy of unrest. They are opened up to the Dasein-mentality-about's being as they become learned and created in the Dasein's being. We have used the term "*special impact technologies*" to define the influence technologies of philosophy on the aletheia that ensure its transition from "unhiddenness" to "truths." With the phrase "special impact technologies," we have defined a certain set of methods that combine special knowledge and technologies to turn the aletheia into "truths." We use the term "technology" in a broad sense: as the art of fulfilling purpose (Clough et al., 2013). Special impact technologies include neuroprogramming technologies, educational technologies, as well as information and communication technologies. Let us briefly consider their possibilities.

I. Neuroprogramming technologies.

In our understanding, neuroprogramming technologies are specific means, methods and tools that form the defining unconscious and conscious motives of individual behavior in accordance with the "correctness of the gaze." Neuroprogramming technologies change the structure and functions of the neural-ensembles of subconsciousness and consciousness in ontogeny due to a stable and long-term effect on neurons, neural populations and neural connections. First of all, neuroprogramming technologies include *a set of technologies based on the ideas of the school of Soviet psychologists Vygotsky-Leontiev* (Vygotsky & Luria, 1993; Vygotsky's Educational Theory, 2003; Derry, 2013; Leontiev, 1983). The ideas of Lev Vygotsky and Alexei Leontiev left a noticeable mark in the history of psychology. Their competition with Jean Piaget's ideas (Piaget, 1994; Piaget, 1994a) in the middle of the 20th century allowed psychology to reach a new level of development. However, in recent decades, the ideas of the Vygotsky-Leontiev school have been actively used to create authoritarian moulding matrices. In them, the newborn "mentality about" is considered as a "blank slate" on which society "prescribes" an individual ontogeny program. This approach excludes the aletheia liberation as the "unhiddenness." It provides for the formation of the ontological orientation and limits of the self-realization of Dasein-mentality-about's being exclusively on the aletheia as the "truths" of the current being. In authoritarian moulding matrices, personal interests are subordinate to the interests of society. The principle of subordination of the minority to the majority prevails in them. In fact, they form a mass consciousness with an increased aggressive attitude of the worldview: suspicious and biased attitude to other ideologies, absolutization of ideological doctrines and willingness to defend them by force.

Neuroprogramming technologies include technologies *related to the development of neurosurgery and cyberculture*. We are talking about technologies to create cyberspace, which provide for expanding the possibilities of Dasein-mentality-about's being to cognize and create in Dasein-the-One's being by combining neural-ensembles with digital devices. The involvement of digital technologies in the structure and functions of the brain greatly expands the characteristics of consciousness (Mann, 2020). In cyberspace, new possibilities of the brain-computer interface (BCI) are opening up, which makes it possible to consider computers and other digital devices as digital tools for personal liberation and transcendence. Cyberspace expands the possibilities of communication, allows a person to create and participate in alternative communities, etc. (Castells, 2009; Leodolter, 2017). On the other hand, digital technologies expand the possibilities of controlling the presence and care of Dasein-mentality-about's being. They facilitate the management of the transition of aletheia from "unhiddenness" to "truths," which education as a policy manages. Digital technologies allow to control and regulate with even greater efficiency the ontological orientation and self-

realization of Dasein-mentality-about's being.

Neuropsychopharmacology holds an important place in neuroprogramming technologies. We are talking about the technologies of using psychiatric (psychoactive), as well as neurologic (non-psychoactive) pharmacology-based methods as a way of influencing the transition of aletheia from "unhiddenness" to "truths." Studies in neuropsychopharmacology have allowed to:

- a) Significantly expand knowledge about the nature of human thought, mental abilities like learning, memory, and perhaps consciousness itself.
- b) Establish the features of neurotransmission and to influence the process of communication (synaptic transmission) between two neurons.
- c) Develop drugs that increase working memory and information flows to the brain; increase perseverance, attention, performance, etc. (Klingberg, 2010; Leary & Stuart, 2002).
- d) Uncover the mechanisms and influence anxiety disorders, affective disorders, psychotic disorders, degenerative disorders, eating behavior, sleep behavior, etc.

We refer *psychometrics* to neuroprogramming technologies. The private company Cambridge Analytica (CA) used its capabilities. Since 2013, this company has been engaged in data mining and data analysis from social networks for the electoral processes (Cambridge Analytica, 2020). It is widely believed that Donald Trump's victory in the 2016 US presidential election and the outcome of the 2016 Brexit referendum are the consequences of the activities of Cambridge Analytica. In fact, studies concerned with the theory and technique of psychological measurements have been carried out for more than two centuries (Borsboom, 2005). Attempts to measure psychological attributes like intelligence, personality, and attitudes, led to a number of discoveries that allowed the creation of three major models of psychometrics: a) classical test theory; b) true scores, latent variables theory; c) item response theory and representational measurement theory (Borsboom, 2005; Kosinski et al., 2013; Kosinski et al., 2015; Youyou et al., 2017). Thanks to psychometrics, the being of Dasein-mentality-about was digitized. A methodology has been created for assessing and improving the effectiveness of special impact technologies. For instance:

- a) Big Five personality theory makes it possible to identify the Dasein-mentality-about's being thanks to the main traits of the "Big Five." They include openness (how ready are you for the new?), conscientiousness (how much are you a perfectionist?), extroversion (how do you feel about society?), agreeableness (how friendly are you and ready to cooperate?), and neuroticism (how easy is it to drive you out of your wits?). Based on these measurements, it is possible to establish the quality of the self-realization of Dasein-mentality-about's being as the potential of Dasein-the-One's being.
- b) Internet, social networks, entertainment, shopping, information search and other manifestations of the being of Dasein-mentality-about mediated by digital devices and services, on the one hand, have enriched the ability to cognize and create in the logosphere and the technosphere. On the other hand, they allowed to digitize the Dasein-mentality-about's being and measure it with structured and unstructured Big Data methods.
- c) Michal Kosinski, David Stillwell, and Thore Graepel proved that "easily accessible digital records of behavior, Facebook Likes, can be used to automatically and accurately predict a range of highly sensitive personal attributes including sexual

- orientation, ethnicity, religious and political views, personality traits, intelligence, happiness, use of addictive substances, parental separation, age, and gender” (Kosinski et al., 2013).
- d) The markers of identification of the being of Dasein-mentality-about and methods of their analysis, established in psychometrics, have opened the possibility to measure special impact technologies with specific psychometric indicators. Scientists have learned to determine the effectiveness of neuroprogramming. They have learned to achieve the maximal quality of neuroprogramming in ontogeny by selecting appropriate sets of special impact technologies.

II. Educational technologies.

Educational technologies occupy a significant place in special impact technologies. In 1923, a professional association of educators was established. The Association for Educational Communications and Technology (AECT) is engaged in the study, planning, application, and production of communications media for instruction (Association, 2020). In AECT, educational technologies are defined as “finding better ways to help people learn” (Association, 2020). In our understanding, educational technologies expand the possibilities of philosophy to cause unrest in the concealedness of being. They influence the transition of the aletheia selectively, first of all, liberating, enriching and enshrining the aletheia as “unhiddenness” that corresponds to the absolutized truths of the current being. Educational technologies enhance the learning abilities of “mentality about.” They develop their abilities to analyze, design, develop, implement, and evaluate processes and tools. Modern educational technologies are based mainly on the theories of behaviorism, cognitivism, and constructivism, which were developed in philosophical traditions. Educational technologies include theories and practices of integral education, theories of precision teaching, theories of mastery learning. As educational technologies the following ones are used:¹ e-learning; instructional technology, information, and communication technologies in education (ICT); educational technology (EdTech); learning technology, multimedia learning, technology-enhanced learning (TEL), computer-based instruction (CBI), computer-managed instruction, computer-based training (CBT), computer-assisted instruction or computer-aided instruction (CAI), internet-based training (IBT), flexible learning, web-based training (WBT), online education, digital educational collaboration, distributed learning, computer-mediated communication, cyber-learning, and multi-modal instruction, virtual education, personal learning environments, networked learning, virtual learning environments (VLE) (which are also called learning platforms), m-learning, ubiquitous learning, and digital education).

In general, educational technologies specialize in the moulding of a man’s character according to a certain pattern or cultural ideal (Khmil & Popovych, 2019). *The selectivity of the influence* on the transition of aletheia from “unhiddenness” to “truths” appears to be the distinctive feature of educational technologies. Selectivity means selective aletheia liberation in accordance with established characteristics of education (παιδεία). This approach transforms the nature of the aletheia transition from natural to artificial. *It allows us to consider the aletheia transition from “unhiddenness” to “truths” as technology.* The experience of Dasein’s being concentrated in the arete existentials is liberated and used

¹ en.wikipedia.org/wiki/Educational_technology, 2017. We should note that the methods and tools that are used by individual special impact technologies are repeated, making it impossible to demarcate them.

exactly to the extent that education as a policy allows. *Da-sein* and the quality of individual presence and care in the current Dasein's being become dependent on the quality of education and the technologies used by it. The ability of education to selectively influence the aletheia transition has allowed to create a market for educational services. The effectiveness of educational technologies has become the subject of market relations.

III. *Information and communication technologies (ICT).*

Information and communication technologies enable users to access, store, transmit, and manipulate information. They create the conditions for the integration of telecommunications (telephone lines and wireless signals), computers as well as enterprise software, middleware, storage systems, and audio-visual systems. Information and communication technologies perform the following functions:

1. Ensure the self-assembly of aletheia, which has made the transition from “unhiddenness” to “truths” in the cultural ideal.
2. Carry out the absolutization of the aletheia as “truths.”
3. Enhance the effectiveness of the influence of education as a moulding matrix on the constitution of existence.
4. Expand the influence of education on the population. They turn education into an instrument of Republic policy.

In recent decades, information and communication technologies have been successfully studied. From 2009 to the present, the International Telecommunication Union (ITU) annually publishes the “Measuring the Information Society Report” (MISR). In the Reports, an objective assessment of the effectiveness of states information and communication technologies is provided, the areas of success stories, and areas that need further improvement are highlighted (Measuring the Information, 2017). The special ICT Development Index (IDI) of information and communication technologies has been developed. The Index is used to monitor the effectiveness of information and communication technologies. It is measured based on internationally comparable data and agreed methodologies. For example, the 2017 ICT Development Index assesses the effectiveness of information and communication technologies in 176 countries in three respects: the built infrastructure, the state-wide use, and the quality of user skills. The ICT Development Index allows to:

- a) Make comparisons between countries and over time.
- b) Countries to track their own year on year progress.
- c) Make policy adjustments to grow their countries' telecommunication/ICT sector depending on the results.

The results of studies of the Index-2017 showed that the average value for all countries in the Index increased by 0.18 points between IDI 2016 and IDI 2017, reaching 5.11 points. The results obtained allow us to predict the approach of the second digital revolution. The revolution will be caused by the introduction of four key technologies: the Internet of Things (IoT), cloud computing, big data analysis, and artificial intelligence (AI). The revolution is supposed to change the organization of business, government and society (Measuring the Information, 2017).

Conclusions

A number of important rethinkings follow from the special theory of education. Let us highlight the following.

Firstly, it becomes apparent that the being of Dasein-Intelligent-Matter of the Earth moulds several dozen matrices created by education as a policy. Each matrix is built on the ethics laws that have formed in world history. The matrices use different sets of special influence technologies that ensure aletheia transition from “unhiddenness” to “truths” in accordance with the “correctness of the gaze” on the image of the highest idea. As a result, from the cosmos, the being of Dasein-Intelligent-Matter of the Earth looks like a set of heterogeneous cultures that reproduce the being of Dasein-mentality-about with different ontological orientation and limits of self-realization. Of course, there is a connection between the matrices, or *intercultural communication*. However, different ethics laws and politics disunite the cumulative potential of Dasein-Intelligent-Matter of the Earth’s being and prevent it from self-assembling in the Sophia Republic. In the history of culture, there is a tendency to integrate moulding matrices. The number of matrices is decreased and ethics and policy laws are being unified. The process of integrating educational matrices has been called *globalization*.

Secondly, the special theory clarifies the object, subject and purpose of education. Philosophy as a policy of unrest in the concealedness of being is the object of education. The influence technologies on aletheia that ensure its transition from “unhiddenness” to “truths” or otherwise the features of liberation and enrichment of the truths of the Dasein being’s experience, concentrated in the arete existentials, are the subject of education. The arete liberation in accordance with the absolutized truths of the current Dasein’s being, concentrated in the cultural ideal “Those Who Transform the Universe,” is the main purpose of education. It is achieved by addressing the following challenges:

1. The policy of maximal unrest in the concealedness of being, which is achieved as a result of the effective use of special impact technologies.

2. The creation of a single moulding matrix in the Dasein-Intelligent-Matter of the Earth’s being, or the *Sophia Republic*. In this case, the liberation and enrichment of the truths of the Dasein being’s experience will take place in accordance with the ideas, ideals and values of “Those Who Transform the Universe.”

3. The effective neuroprogramming,² by which we understand a set of actions on the part of specially educated professionals: philosophers, educators, political strategists, newsmakers, ideologues, etc. These specialists are the potentials of philosophy as politics. Using special impact technologies, they continuously affect the concealedness of being, arranging the maximal unrest in it. Neuroprogramming explains the meaning of the permanence of discrete memory “engrams” or “traces” on the level of molecular processes. These are, in their own way, neurobiological instructions that, along with other neural programs, regulate the quality of the presence and care of Dasein-mentality-about’s being as the potential of Dasein-the-One’s being.

Thirdly, four laws follow from the special theory of education:

The First Education Law states that: *Special technologies influencing the transition of the aletheia from “unhiddenness” to “truth” are determined by politicians and depend on the*

² We emphasize that the term “neuroprogramming” in the author’s understanding differs from the term “neuro-linguistic programming,” the meaning of which Richard Bandler, John Grinder et al. actively developed in the second half of the 20th century.

ideas, ideals and values that dominate in society. The law establishes a direct dependence of education as a policy on the national and political, and cultural context. It is necessary to change government policies in the educational sphere in order to change sets of special impact technologies: introduce new technologies or abandon old ones. Suppose educational policy corresponds to the absolutized truths of the current being, concentrated in the cultural ideal. In that case, changes in the sets of special impact technologies occur consistently and invisibly to society. If education reforms are revolutionary, or are at odds with the prevailing stereotypes and attitudes in society, they cause resistance and mass protests. The First Law explains the difference between old and new democracies. The ideas, ideals and values of democracy are *a culture* that has been formed as an educational matrix based on ethics and politics laws. It moulds the Dasein-mentality-about's being of well-established sets of special impact technologies in accordance with the absolutized in society truths of the current Dasein's being. In all countenance, new democracies can only strive for such a culture. If we take into account that the orientation and limits of the self-realization of Dasein-mentality-about's being are formed mainly in the first twenty years of ontogeny, then at least four generations must change so that the ideas, ideals and values of democracy become an integral part of the national culture. Time is needed, in addition to desire and action, to absolutize the truths of the Dasein being's experience, concentrated in the cultural ideal.

The Second Education Law provides the following: *The quality of influence on the transition of aletheia from "unhiddenness" to "truth" depends directly on the quality of knowledge and technologies that are used in education.* If the biological functions of the body are ensured by heredity, then the Dasein-mentality-about being's moulding occurs in the logosphere and the technosphere, which perform the functions of the external environment. The deeper the knowledge of the experience of Dasein's being is, and the better the technologies based on them are, the more effectively education influences the aletheia transition from "unhiddenness" to "truths." The law affirms the defining role of knowledge and technologies in the formation of the ontological orientation and limits of self-realization of the being of Dasein-mentality-about as the potential of the being of Dasein-the-One.

The Third Education Law will be formulated as follows. *In nature, there is no universal influence technology that ensures aletheia transition from "unhiddenness" to "truths." In different periods of ontogeny and in different periods of cultural history the transition of aletheia from "unhiddenness" to "truths" is provided by different sets of special impact technologies.* The liberation and enrichment of the truths of the Dasein being's experience, concentrated in the arete existentials, directly depends on the quality of special knowledge, technical means, methods of their use, qualifications of specialists, etc. In reality, however, only time determines the relevance and effectiveness of the use of special influence technologies that ensure aletheia transition. For example, the technologies of arete liberation in adolescence become irrelevant during maturity, etc. Or, for example, the effectiveness of the "blank slate" theory offered by John Locke in the 17th century is significantly inferior to the effectiveness of constructivism (learning theory) that Jean Piaget founded in the mid-20th century. The Third Law states that the development of special influence technologies that ensure aletheia transition from "unhiddenness" to "truths" *is driven by time.*

The Fourth Law states that the power of education as a policy defines that the aletheia as the "truths" corresponds to the aletheia as the "unhiddenness." Let us formulate the law as follows: *the moulding power of education decreases with the growing inconsistency between the aletheia as the "truths" and the aletheia as the "unhiddenness."* Despite the fact that education as a policy is formed on the basis of the absolutized truths of the current Dasein's

being, its true power forms the aletheia as “unhiddenness.” Educational policy based on ideological clichés, personality cults, conflicting ideals, false values, etc., is unstable in time. Its power is not enough to liberate the truths of the Dasein being’s experience. In such matrices, the *inauthentic* Dasein-mentality-about’s being, or *das Man* is formed. *Das Man* cannot self-assemble in the Republic; therefore, matrices built on “truths,” torn from aletheia as “unhiddenness,” quickly disintegrate. The Fourth Law creates the conditions for the self-assembly of Dasein-mentality about’s being in the Sophia Republic. The construction of the moulding matrix on the aletheia of the corresponding unhiddenness of Dasein’s being becomes the reason for their unification.

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Transhumanism and Posthumanism: Reflection of the Human Civilization Future

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Dobrodum, Olga and Olga Kyvliuk (2021) Transhumanism and Posthumanism: Reflection of the Human Civilization Future. *Philosophy and Cosmology*, Volume 26, 77-89. <https://doi.org/10.29202/phil-cosm/26/6>

Modern future forecasts, based on analytical studies of evolutionary and revolutionary social processes and phenomena, with scientific justification for society's development, generate a broad discussion in the world scientific community. The series of theories (the cyclical development of civilization, synthetic evolution, globalization, information and the digital revolution, the hypothesis of technical singularity, Great Filter, ecophagy, etc.) respond to the rapidly changing social reality. These theories lead to the realization of a fundamentally new paradigm of the scenario of the civilization's development that is different from the traditional hierarchy of the ontology. The modified social reality under the influence of the progress of high technologies, virtualization, techno-genesis, artificial intelligence, etc., produces the need to comprehend the moral, ethical, normative, and legal causal links of humanism and technology.

Key words: transhumanism, posthumanism, future, high technologies, artificial intelligence, globalization, virtualization, robotization, digitalization, cyborgization, humanity, social reality, cosmological theories.

Received: 3 November 2020 / Accepted: 29 December 2020 / Published: 29 January 2021

Introduction

Human development's current level signifies transhumanism inspiring the scientists (both theorists and empiricists) to bold futurological projects. This article focuses on transhumanism's information technology aspect due to high technology's impressive success, artificial intelligence, and robotics. Humanity is moving towards a robotic and cyborgized community and technological singularity, achieving digital immortality and increasing the adequate cognition of a new techno-human with virtual reality gadgets foreshadowing the future for positive eugenics and genome editing technologies.

High technology (high-tech) progress is impossible without developing the man himself, who is the "creator" of these technologies. Consequently, techno-genesis affects anthropogenesis and is in direct and inverse proportion to each other. The world is developing exponentially, and high-tech is modifying the world's picture and the idea of its past and future. The idealization of the need to create and improve high technologies as a means or instrument of human development actualizes the issues of human destiny and the strategy of survival of human civilization in the context of the synthesis of the principles of humanism and transhumanism, as possible prospects for future posthumanism.

The study's theoretical and methodological basis was made up of generally accepted philosophical principles: worldview and methodological pluralism, open-mindedness and humanism, comparativeness and unbiasedness, ideological diversity, and tolerance. The research involved the following methods: concrete historical and interdisciplinary synthesis, a comprehensive analysis of philosophical sources, and research methods in related scientific disciplines as well as methods of induction and deduction in philosophy, sociological methods of analysis of empirical data. Problem-chronological and historical-genetic, system-structural, and critical analysis of philosophical sources, socio-phenomenological analysis, and visual anthropology were used as research methods. The work also relies on conceptual-discourse and systemic-chronological approaches to the scientific understanding of reflexive scientific and philosophical problems, scientific concepts, and cosmological theory's interdisciplinary nature.

Many gaps, white spots, and the incompleteness of trans- and posthumanist issues in the 21st century determined the multiculturalist methodological approach of this work on the verge of scientific discourses and at the intersection of sciences when the problem is in a state of uncertainty. The current research was based on several methods developed by classical, non-classical, and post-non-classical philosophy: problematization and conceptualization of philosophical material, contextual and interpretive, informational and mythological, retrospective, and futurological approaches.

It is natural that the traditional hierarchy of ontology, where man is the pinnacle of evolution, loses its relevance. As a result, questions arise the ethical and legal regulation of the relationship between man and superman, cyborg, machine and robot, artificial intelligence and other forms of "reasonable" existence; ecosystems in local and global dimensions; virtualization and socialization; modification of the values of the ontological system, etc. The question arises about the trajectory of developing the emotional intelligence of the person himself because of the ever-closer interaction with the "pure" rationality and algorithmic nature of artificial intelligence and robotics. Thus, even now, the formation and development of the anthropological essence of the individual, its identification and evolution, the procedures of socialization and adaptation in society demonstrate a significant influence on the part of high-tech, where it is rather difficult to predict the possible consequences.

Transhumanism and posthumanism as the modern philosophical theories

It can be noted that the theory of transhumanism has been developed almost throughout world history based on “paradise” engineering and deliverance from suffering. One can recall the epic of Gilgamesh and the ancient Greek myth of Daedalus and Icarus, the ancient Greek myth of Prometheus, and Francis Bacon and Friedrich Nietzsche’s revival ideas. It is a well-known fact that the term “transhumanism” was introduced in 1957 by the British humanist evolutionist Julian Huxley, co-founder of UNESCO and its first general director. Transhumanists consider their ideological inspirers, in particular, the French theologian and anthropologist Pierre Teilhard de Chardin, the Iranian science fiction and futurologist Fereydoon M. Esfandiari, the American cryonics founder Robert Ettinger, the American popularizer of nanotechnology Kim Eric Drexler, the American researcher in the area of artificial intelligence Lee Minsky, Canadian author of works on artificial intelligence Hans Moravec, American futurologist Raymond Kurzweil, Swedish philosopher Nick Bostrom, British philosopher-futurologist Olaf Stapledon. Some historical, philosophical, and methodological aspects of transhumanism are reflected, in particular, in the report *Transhumanism 2017-2030* (Transhumanism 2017-2030, 2017).

In many ways, posthumanism opposes itself to classical humanism, rejecting the very idea of anthropocentrism, being based on the idea of the incompleteness of human evolution, which hypothetically can be continued in the future. The term “posthumanism” was first used by the American literary critic Ihab Hassan in his work *Prometheus as a Performer: Towards a Posthumanist Culture* (1977). Among the representatives of this kind of scientific trends, one can note representatives of the ideas of Russian philosophical thought: Nikolay Fedorov, Konstantin Tsiolkovsky, Vladimir Vernadsky, a Russian biologist and evolutionist Alexander Markov, American philosopher and political economist Francis Fukuyama, French historian and cultural theorist Michel Foucault, British utilitarian philosopher David Pearce, American and Italian philosophers of feminism Donna Haraway and Rosa Bridotti, American engineer and inventor Elon Musk.

Posthumanism assumes that the final stage in humanism development is the emergence of posthuman, and is sometimes understood as antihumanism, meaning the emergence of digital consciousness and the manifestation of ultimate humanism. Posthumanism de-anthropologizes a philosophical discourse to isolate a person from biological beings and modify one. It turns a person into an integral part of the technosphere, considering the possibilities of enhancing intelligence, creating artificial organs of the human body, integrating his consciousness with a computer, cyborgization and microchipping, etc. (Sarwant, 2017).

The steady progress along the path of scientific and technological progress, the dynamic development of biosciences and technology, pharmaceuticals, genetics, neurosciences, medicine, cybernetics and many interdisciplinary industries may result in artificial neural networks, implants, and nanotechnology. The proliferation of bionic prostheses and the cyborgization of humans as a whole can lead to the emergence of a posthumanist future, where humans and clones, cyborgs and robots, artificial intelligence, and digitized consciousness will coexist. The design of the future and space exploration, alternative energy and the coming singularity, as well as about the significant events of the scientific and technological progress of the 20th century, are characteristic, in particular, of the posthumanist direction of scientific thought (Ferrando, 2019: 645-651).

The final difference between trans- and posthumanism has not yet been found out, not comprehended, and is currently debatable. These theories' supporters differ in a whole spectrum of views on these phenomena, the extreme poles represented by techno-skeptics and techno-optimists. This kind of alarmism is characteristic of Francis Fukuyama, who is convinced that transhumanism is the most dangerous idea in the modern world (Fukuyama, 2020).

At present, from our point of view, such a feature of technological and cosmological theories as interdisciplinarity and multi-paradigmality appears to be more and more axiomatic. Cosmology appears as a phenomenon and maxim of philosophy. It should be noted that there is a steady tendency of interest in cosmological theories, cosmological reflections, insights, and discourses. In the 21st century, in a situation of a vast and rich kaleidoscope/palette of worldviews and pictures of the world, one can state the dynamic development of scientific strategies and paradigms, trajectories and tools due to the construction of new scientific concepts and views, ideas and concepts, theories, disciplines, and branches of scientific knowledge.

The progressive development of technologies is not least associated with the perfectionism of the human race and the alibization of high-tech, the microcosm's likening to the macrocosm, and man to its Creator. At one time, the ancient gods of Greece punished Prometheus for transferring fire to people, the flame of which is the spark of God in every heart and every soul. Continuing the views of Heraclitus of Ephesus about fire as the fundamental principle of the Universe, humanity began its existence from fire. Any technology is energy and generates fire, the fire of Prometheus to transform the elements into each other. The foregoing may result in the involution of humankind to the level of development of the 16th-17th centuries, the emergence of new relationships, a change in the direction of human activity, including the concept of God and religions, a complete change in human civilization, modification of cultural values.

The history of technoscience goes deep into a thousand-year history, to the origins of ancient civilizations. Still, science's progress has been especially clearly observed in the last half-millennium in connection with the practical implementation of scientific innovations and their progressive, revolutionizing, and intensified influence on the human community's spiritual and material life. The introduction into practice of the humanities' achievements and social, exact, and natural sciences significantly transforms and irretrievably makes a person's living conditions comfortable. Thus, cosmology as a whole appears as the basis for the synthesis of disparate efforts of scientists, the common denominator of reflection, insight, and perception of its researchers (Ferrando & Rosi, 2017).

The latest discoveries in the field of cloud technologies, artificial intelligence, and neuropsychology, as well as the conviction of many that biotechnology will determine the main direction of the 21st century, determine the intentions of scientists to achieve tangible results and priority in the atomic and space race, mastery of genetic information and complete sequencing of the human genome. The genetic revolution of the present time and the attempt to obtain political omnipotence through the mastery of genetic information inevitably actualizes the questions of trans- and posthumanism as academic philosophical theories (Glazier, 2018).

An ambiguous and ambivalent understanding of the posthuman nature, functionality, and status of a person occurs due to his sacralization (flights into space, discoveries in many areas of human life) and, at the same time, one's certain kenosis due to the limited capabilities of human nature. The motto of the Olympic Games, consisting of three Latin words "Citius, Altius, Fortius!" ("Faster, higher, stronger!") It can also be considered the motto of supporters

of the ideas of trans-, post-, and New Humanism, as one of the methods of improvement, including the modification of oneself (Fuller, 2017: 150-165).

It should be noted that the spectrum of perception of the ratio of the categories of trans- and posthumanism: from their almost complete identification to fundamental opposition, from their synonymous understanding (sacralization of the technological) to semantic dividing, from the ideas of the Enlightenment, implicitly inherent in transhumanism, to overcoming the maxim, the humanistic principle and the epistemological position Protagoras "Man is the measure of all things," marking the transition, in the words of Vladimir Bibikhin, from a new European subject to a superman.

It can be recognized that new technologies level and indeterminate the boundaries of the human in a person, and the achievements of biomedical technologies from cloning to cryobiology cast doubt on the philosophical discourse about a person, generally accepted since the time of Immanuel Kant. However, futuristic transhumanistic visions of human biology's transgression are inherently entirely anthropocentric since they still see value in the person (Banerji, 2019: 737–742). The transhumanist worldview is based on modern science achievements, even though it was directly influenced by science fiction plots, especially in cyberpunk and post-cyberpunk genres. In all likelihood, the Turing test ceases to be at least a humanistic template and yardstick approaching reality. Still, it fixes only one of the supposedly permanent transition stages from human to posthuman (Hyesook, 2017).

Transhumanist projects of digital immortality, founding digital philosophy, cyborgization, and robotization as manifestations of the intention to overcome the Cartesian limits actualize the posthuman era's eugenic problems posthumanism. The designated posthumanist themes, as you can see, make both ideological currents related. However, posthumanism completely refuses to operate with any binary oppositions and hypothetically can lead to a mainstream antihumanistic discourse, fragmentation of the subject and his secondary role, the discovery of the anthropological "Pandora's box" (Rana & Samples, 2019).

The cosmological and noospheric presumption of man is fundamentally essential for the transhumanistic understanding and techno-optimism up to the holiness and sacralization of technology. It can be assumed that the turn from trans to posthumanism can dramatically signify post-anthropocentrism, post-dualism, and the construction of new anthropology up to the radical deconstruction of human nature as such. There is a premise and intention to revise Man's place and position, position, and status in the Universe. It is a process that has found an echo in many philosophical theories and concepts.

Alternative theories of transhumanism and posthumanism

The existence of theories identifying technology with transcendence, the divine being, stated the emergence of a new theological direction, "techno-theism which is the idea that the rapid development of technology and the growth of man's power over the forces of nature does not refute, but confirms his creation by the higher Reason. Since a person, thanks to the latest technologies, can create a new virtual and biological reality, the chances increase that the physical world's surrounding reality is also created by a super-Engineer or a super-Designer" (Tulchinsky & Epstein, 2020: 397).

High-tech development is not least associated with the perfectionism of the human race, the likening of the microcosm to the macrocosm, and man to its Creator.

It is possible to note the spectrum of technology perception, the components of techno-theology, transhumanism. The views are quite common, following which high-tech changes the anthropological nature. According to transhumanists, the introduction of high

technologies modifies a person so much that he turns into a transhuman. A picture of the world is being formed, in which the main concepts of world religion act as a semantic construction of understanding modern socio-cultural transformations. The total spread of high-tech, “worship” of artificial intelligence is another methodological intention of the contemporary self-identification of subjectivity.

In the analysis of the worldview intentions of the spread of high technologies, there are often elements of resentment, that is, intellectually evolved and dominant machines over humanity are capable of exterminating it as a “useless” element of evolutionary development. For example, Anthony Lewandowski, the founder of the new religion “Path of the Future,” describes a futurological projection in which artificial intelligence “takes over” the planet Earth faster than a person masters deep space. It is well-known that Bill Gates and Stephen Hawking suggested the possibility of the formation of artificial intelligence exceeding anthropometric indicators of mental activity, as well as expressed concerns that artificial intelligence is likely to pose a threat to humanity, and not a blessing, due to the probable using programmed robots as weapons. Elon Musk also said that the development of artificial intelligence is akin to calling demons. Despite this, in 2015, he became an investor in the project to create an OpenAI institute engaged in developing safe artificial intelligence. Consequently, recognized researchers, inventors, visionaries of their time, on the one hand, express fears about the “impending danger” in the image of artificial intelligence, and on the other hand, they see the certainty of the active use of high-tech and the development of artificial intelligence in the future.

The emergence of technology companies’ power is increasingly called the prospect of global development, the ideology of domination of which will be presented in the form of religions of a new generation: techno-humanism and dataism. A paradox is forming: a person creates new technologies, algorithms, and large databases to resist global problems and possible cataclysms, the development of which, in turn, calls into question the existence of a person as the leading cause of these problems.

Some thinkers in machine ethics and robo-ethics call themselves cyber thinkers since the regulation of robots’ presence in our lives is more and more evident. In researchers’ eyes on this topic, network intelligence can pose extreme danger and a fundamental threat to the existence of human nature since our hopes of mutual understanding between human and machine intelligence may never come true.

In a theological sense, artificial intelligence seems incredibly destructive because it is based on the digital age’s eschatology hypothesis. It can appear in the form of the “Horseman of the Apocalypse.” The global network with its capabilities (social networks, information flows, virtual reality, etc.) acts as a single synthesized system, an “organism” of artificial intelligence. The entire planet, with all its cloud technologies, will be its “brain.” Still, there is a danger that artificial intelligence can get out of control, and destroy it will be almost impossible, hypothetically, without shutting down all cloud storage servers on Earth. This situation can lead to damage to the world’s cloud infrastructures, which, as a result, can lead to a global crisis, unprecedented in scale and its consequences.

At that moment, humanity wants to replace the Creator with a person similar to itself because human fantasy is anthropically conditioned. It is the apocalypse that is the starting point from which a new world unknown to man begins. The development of any community should lead to the emergence of a new organization — in our case, this is the emergence of artificial intelligence. The Lord is infinite, and He continues to create through us — this expresses the essence of his infinity. We develop artificial intelligence, which will create something new — for example, intelligent fields that will generate something already

incomprehensible. We are an instrument in the hands of the Creator, who thus endlessly changes the Universe, and this process is endless, being a reflection of the Creator's infinity in the world.

The emergence of new systems of interaction between man and machine actualizes a new understanding of humanity's role and beliefs. Technologies give rise to new areas of faith, which then, growing into a new world with incredible combinations and puzzles, are a self-developing structure that is formed under the influence of human consciousness and its beliefs. For operating systems for processors' operations are written by people with religious or atheistic views, respectively, imposing specific requirements or restrictions on the processor's work like a brain.

Programmers participating in creating new operating systems generate artificial intelligence as a creature that has absorbed the foundations of humankind's cultural, historical, and religious life. Even at its start, it is much higher than the level of human intelligence, leading to a contradiction between the human race and the machine that humanity is creating today. Having played the Creator's role in this issue, humanity assumes significant responsibility for making its own hands. It all comes down to one thing — Divine Providence, for God, the Creator, through us creates something new, and this process is endless.

Presumably, hundreds and thousands of years later, robots will construct a new artificial intelligence civilization based on "protocols," program codes, operating systems created by man, but improved by himself (artificial intelligence) in the same way as a man will improve his nature and the world around him, created by God. The foregoing will lead to the emergence of new religions, confessions, and denominations, which are incomprehensible to us today and, as a hypothetical option, to religious wars between people and robots, since any community strives for improvement. This creativity will create a new paradigm of coexistence, combining thousands of years of experience of humanity and robots, providing an opportunity to develop this endless experience to infinity, included in perpetuity — a process that will never end.

It is undeniable that artificial intelligence development entails space technologies' progress, exploring humanity's place in space, which actualizes the cosmological discourse, even though cosmological concepts are devoid of some clarity. Existing cosmological theories, and their interpretations, are fundamental in modern conceptions of the Universe. Also, it is advisable to note that cosmological discourse is a topic implicitly inherent in the genre of science fiction, and the overwhelming majority of all scientific achievements in the high-tech sphere everywhere on the planet have undergone cosmological testing and legitimation. The innovative and futurological potential of space technologies is becoming a reality today. The space future rushes into our lives, having a significant impact on the functioning of all spheres of human life.

It cannot be left unnoticed the phenomenon of the actual everyday life of being on social networks as a kind of parallel reality. On the one hand, the postulation of some data on the content of existential experience in virtual space acquires signs of social verification and legitimization. On the other hand, it creates a distorted perception of everyday life as an event-intensive process. In other words, all significant events in an individual's life are necessarily presented to the public. The absence of such eventfulness against the background of a motley tape of social networks is often the cause of psychological instability, neuroses, and psychosis, and in some cases, vice versa. Namely, meaningfulness and a qualitative indicator, in this case, play an essential role. Consequently, the quantitative indicators of data are increasing at all possible analytics levels: from personal to planetary.

Objectification of information (data) serves as the basis for forming a philosophical paradigm of dataism, according to which the significance and uniqueness of a person lie in the ability to use a complex and effective data processing system. In his book *Homo Deus*, Yuval N. Harari (2016) considers dataism as an ideology, or religion, in which the highest value represents digitized information. The inexhaustible and endlessly increasing volume of information requires a better and faster data processing procedure. Consequently, artificial intelligence's algorithmic nature is more effective in this respect than subjectivity burdened by emotions and desires. And in this sense, a person loses his significance in the system of accumulation, storage, and transmission of data (Harari, 2016).

Yuval N. Harari also noted that today's human experience is devalued if it is not shared on social media. Data is becoming the backbone of the new religion of dataism. This ideology recognizes that humans had significance and uniqueness because they were once the most sophisticated and efficient data processing system. But today, everything has changed — sometimes a person cannot understand one's emotions and desires, as well as the algorithm does for him. In these conditions, people become an additional link in the system. Techno-humanism puts human interests and passions first. The political system is no longer able to respond to new technological challenges. The world is changing too quickly, and politicians do not have time to form a vision and plan for the future. Only technology companies are capable of this, and if a thousand years ago, when a problem arose, a person turned to the church, now he is looking for an answer from algorithms (Harari, 2016).

For example, Teilhard de Chardin's followers bring his religious and poetic theory of subjectivity to the global level, formalizing the ability of rationality before calculating operations. And Frank Tipler expressed the idea that the infinite operational capabilities will allow the creation of virtual universes that can exist indefinitely in their inner time, and this will be nothing more than the "Kingdom of God." Frank Tipler identifies the cosmological singularity with the Creator. Even though the scientific community did not accept his ideas, the famous theoretical physicist David Deutsch was among his supporters. In this regard, Deutsch argued that "scientific theories explain the objects and phenomena of our life on the basis of a hidden reality that we do not directly feel. However, the theory's ability to explain what we feel is not its most valuable quality. Its most valuable quality is that it explains the very structure of reality ... one of the most valuable, significant and useful qualities of human thought is its ability to discover and explain the structure of reality" (Deutsch, 1997: 10).

The foregoing may result in the involution of humankind to the level of development of the 16th-17th centuries, the emergence of new relationships, a change in the direction of human activity, including the concept of God and religions, a complete change in human civilization, modification of cultural values. The robotization of society and the development of artificial intelligence leads to the individualization and automation of citizens up to a complete rejection of earthly life and beliefs for the sake of a virtual environment and religious beliefs generated by it (computer mythology, Internet religions, online religions, cyber religions, virtual reality religions, etc.).

Technological singularity in the context of transhumanism

Now the technological singularity is more often understood in the context of significant changes in humanity's social and cultural environment. Depending on such technological influence, two ways of modification are possible: either human evolution based on technology (transhumanism) or the disappearance of man as a biological species under the onslaught of artificial intelligence and its "non-human-sized" rationality.

Simulation theory is one of the most common models for driving out humanity by artificial intelligence. This theory conceptualizes the opinion that the horizon of the ordinary, as well as more complex levels of ontology, are identified with the appearance, “seeming” and illusory, behind which there is a world utterly different in its characteristics being described in many works of art (Jotterand, 2010). Thus, the objectification of subjectivity through technology development leads to an unexpected form of implementing the project, the explication of the Absolute Spirit in Christian-Hegelian terminology.

There are mythological notions that today Silicon Valley is allegedly preoccupied with the idea of an unrealistic world around, and IT billionaires have funded research to save humanity from the “Matrix.” Significantly, the comprehension of modern technogenic problems and the corresponding social and cultural transformations are carried out within the framework of the Platonic-Aristotelian paradigm of epistemology. Plato’s *The Myth of the Cave* prophetically describes the contradictions relevant to our time between the fragmentation of the perception of reality, the conformism of such a habit, and the need to adapt to the “expanding” information universe.

Elon Musk suggests that there is only one chance in a billion that the world is not a matrix. One of his arguments is the rapid progress in building virtual reality over the past forty years. Previously, computer games were limited to sorting out abstract geometric patterns, points, and lines (the game Pong). A significant part of the Earth’s population spends a lot of time in virtual reality and finds a sufficiently diverse and colorful world for exciting adventures and experiences (Baggini, 2016).

If we accept the matrix hypothesis, then the multiplicity of possible worlds and their structural organization’s logic becomes more critical (Solon, 2016). In modern clip culture, playing in virtual reality becomes a reality and performing too rational operations. Humanity is capable of simulating various enclaves and modes of existence. It is significant that, according to the majority of futuristic thinkers, the future of the information age has already arrived.

The cultural space has semiotic nature. In its context, real things and processes are replaced by signs and symbols. If we leave aside the ontological basis of a sign, it is possible to consider culture as a whole as a simulative formation, conditional in nature. Therefore, the information field as a phenomenon is comparable to the system of reality as a whole. Thus, the necessary reasoned grounds arise for evaluating the ontology as a virtual continuum.

Values of transhumanism and posthumanism

In the canvas of our reflections on the future of high-tech, it seems reasonable to talk about posthumanism. The theory appeared in the 1970s. Thanks to the article by Ihab Hassan, which was already mentioned above. The author argues that the traditional concept of a person is no longer relevant since not only an individual of the human race is considered as a subject of life in the modern context, but representatives of other biological life forms, natural phenomena, robots, and machines (Hassan, 1977: 830-850). The actualization of the problem of inhuman persons’ rights is an echo and correlates with the activation of paganism in the modern world. It is symptomatic that the discourse of artificial intelligence is vital in the high-tech topic. The acceptance of artificial intelligence as an individual and legal entity is a subject of legal deliberation and legislative creativity, which echoes the recognition of the corresponding rights for non-humanoid beings and artificial intelligence, cyborgs, and robots, however, as well as with environmental ethics and robotics.

An ethical attitude towards nature, in general, becomes an essential step in civilizational development. If we dream of becoming an extra-planetary civilization, we must be ready to communicate with the Universe. According to the traditional paradigm of epistemology, subjectivity is determined through rationality. Therefore, the subject of ethical and legal relations can only be an individual endowed with consciousness and the ability to pursue a rational activity. However, modern concepts of ethics offer the criterion of the subjectivity of moral and legal relations, the ability to cause and endure suffering.

The ethical-cosmological presumption of perception of the entire surrounding world is a maxim and postulate of the world community's progressive development. Evaluating it, Linda MacDonald-Glen believes that animals or artificial intelligence are straightforward soulless creatures and machines, declaring that emotions are not a luxury. Currently, a search is carried out for principles that can be guided in the process of resolving issues related to "who" or "what" has the right to a moral and ethical assessment (Upadhyay, 2018).

Suppose the robotics' field develops at the same rate as now. In that case, the need to regulate some aspects of human-robot interaction will become evident in a few years as long as there is no artificial intelligence in the absolute sense of its term, which means that the discussion regarding the legal status of "machines" is unfounded. Therefore, moral and legal relations are the individual, the human person, or the author-creator of technical devices.

The presence of consciousness in a machine is also a matter far from any specific solutions. Scholars such as Alan Turing insist on the potential for a shift from anthropocentric foundations of ethics to expanding its problem field. At the moment, an affirmative affirmation regarding the presence of consciousness and subjectivity in the technological sphere appears instead as utopian (BBC News, 2011).

Because the human brain's mutual conditioning and consciousness remain relevant in our time, the fundamental discourse about the individuality of products of the information technology sphere is logically unverifiable. Therefore, the emotional component of artificial intelligence's functioning (its rights, and freedom of will, temporality, and empathy) can be designed following anthropomorphic patterns, which are very conditional.

Accordingly, it is necessary to differentiate the ethical and legal regulation of human activity and the products of his practice. Human rights are the rights of an individual and a citizen. This assessment is hardly suitable for artificial intelligence. Simultaneously, the formation of a complex of potentially necessary fundamental rights of robots and artificial intelligence is based on a particular social request. The problem of moral and legal relations between a person and a "machine" is focused in the following contradiction: on the one hand, a mechanism is needed to protect the rights and freedoms of both a person and a "machine," and on the other, a limitation (conscious and voluntary) of one's own activity in the context of the common good. The legislative issues related to communication regulation between people and machines that have artificial intelligence are becoming more and more relevant. Are actions such as making a digital copy of a person ethical? Questions of robo-ethics related to the ethics of "killing" a robot that has become too smart, or outdated, or out of human control are discussed – the admissibility of using robots and algorithms as weapons, etc. Consequently, these issues are relevant in general in the context of social justice, not only on the horizon of a possible confrontation between man and "machine."

Some thinkers dealing with the issues of "machine" ethics and robo-ethics call themselves cyber thinkers since the regulation of robots' presence in our lives is more and more obvious. In the eyes of researchers of this topic, network intelligence can pose a radical danger and a fundamental threat to the existence of human nature since our hopes of mutual

understanding between human and artificial intelligence may never come true. Artificial intelligence seems incredibly destructive in a theological sense because it can act as the “Apocalypse’s Horseman.” Global networks operate in the form of the nervous system of artificial intelligence. With all its cloud structure servers, the entire planet will be its brain, but there is a danger that artificial intelligence can get out of control. It will be almost impossible to destroy it without turning off all the servers’ cloud storage on Earth. This situation can damage countries’ cloud infrastructures around the world, which in turn can lead to a global crisis of unprecedented scale (Molhoek, 2016).

The conceptualizers of information technology discourse are often also the authors of transhumanism ideas, which raises the question of verifiability of their forecasts and the conditional primacy of technologies about what they did before them. The eternal problems of birth, death, immortality, and artificial intelligence can be attributed to modern philosophy’s speculative field. Alan Turing also believed that if the computer beats a person in Go, it will be possible to talk about an artificial person’s appearance. You can recall how Raymond Kurzweil spoke about human evolution in developing gadgets and new technologies. As Eric Davis noted, if electricity is the soul of the modern era, then it is information that is its spirit (Davis, 2015). The range of modern scientists’ attitudes to the problems of high-tech (cyberization, robotization, artificial intelligence) is in range from apologetics and romanticization to stigmatization and desacralization: “The society of artificial intelligence, robots, and cyborgs assumes further evolutionary development, in which these kinds of subjects will become a united consciousness, complemented by humanity and post-humanity. A complemented society is an object of study of the philosophy of Essentiokognitivism, which considers the ultimate form of posthumanism. Essentiokognitivism is a philosophical concept that continues the ideas of posthumanism and brings them to an extreme level; it is expressed in the idea of the existence of complemented humanity and machines; the goal of this post-humanity is infinite knowledge. Essential cognitivism is a theoretical construct, speculative philosophy, and ideology of the future. It belongs to non/human philosophies” (Ivanchenko, 2019: 21).

Conclusions

At the beginning of the 21st century, it seems that informatization and virtualization, digitalization, robotization, and computerization cover more and more spheres of human life — it is possible to record and state the actualization and accentuation of technologies, their kind of sacralization and deification. Trans- and posthumanist studies correlate and complement anthropological discourse and reflection dating back to Aristotle and ancient philosophy. The anthropological potential of high-tech is also correspondingly increasing and multiplying, implying mainly philosophical and cybernetic anthropology. On the other hand, online mythology is developing as a genre of creativity. The worship and deification of robots and robotics are taking place. High-tech sacralization often acts as a competitive ideology in demand among a broad audience of adepts in our information age.

It should be noted that the intensification of knowledge in the field of philosophical problems and theories, directions, and models of modern cosmology may seem reasonable from the point of view of comprehension of the methodology of science, philosophy of science, and philosophy of the artificial world. Modern cosmology is based on the achievements of astronomy, physics, and mathematics, and the list of attracted disciplines is continually growing, as well as natural scientific approaches recognized as promising.

The form and core of any worldview, vision, and picture of the world is the modeling of the Universe, the foundation of the Universe, and the historical and philosophical intentions of cosmology. The history of cognition of the nature of the Universe is congruent and relevant to the scientific picture of the world. It is the ultimate goal of science in all the diversity of its manifestations with its inherent improving rationality and the types of thinking corresponding to it. The cosmological presumption, imperative, and coordinates of being are permissible and reasonable since scientific knowledge is a genuine historical and philosophical value. The interdisciplinary and multiparadigmatic theories of the Universe are in line with the modern post-nonclassical stage of science development.

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Cosmological and Cultural-Anthropological Turns in the Christian Philosophical Theology: Educational Implications in the Post-secular Contexts

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Kulthaieva, Maria, Natalia Radionova and Lesya Panchenko (2021) Cosmological and Cultural-Anthropological Turns in the Christian Philosophical Theology: Educational Implications in the Post-secular Contexts. *Philosophy and Cosmology*, Volume 26, 90-99. <https://doi.org/10.29202/phil-cosm/26/7>

The article proposes the analysis of the changes in self-understanding of the Christian theology, which is regarded as a hybrid philosophical discipline in the post-secular cultural and social contexts with references to cosmology. This transformation is caused by the cosmological and cultural-anthropological turns in the Christian theoretical theology and its practices, which were enriched with the actual cosmological and philosophical knowledge about human and non-human

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nature. The new perspectives of philosophical theology are showed with its cultural and educational implications. The psycho-therapeutical potential of philosophical theology is explicated.

Keywords: philosophical theology, cosmology, anthropology, human being, post-secularity, post-metaphysic, religion, culture, Christianity, education

Received: 23 October 2020 / Accepted: 29 November 2020 / Published: 29 January 2021

Introduction

The obsolete theological constructions which are based on the metaphysical assumptions have shown their theoretical difficulties in a new cultural and social context with bearing sight of the post-secularity. The illusion of religion's comeback in the post-industrial societies is based on pragmatic misusing its symbols and values in political interests. Because traditional Christian theology has lost the former power, its representatives make attempts to widen the horizon of theological reflection using cosmological and anthropological arguments.

The purpose of this article is to show a possible crossing between theology and philosophy, which might convert pure theology into a hybrid philosophical discipline with a cosmological background. The cosmological, cultural, and anthropological turns are regarded here as a frame condition for transforming and enriching the theology with philosophical content, which enables its critical reflection to unveil cultural pathologies in Christian education practices.

The Christian religion's ecumenical background also allows analyzing the new cultural-anthropological turn's potential by reflecting on this problem field. As empirical material, there were used especially explorations of the German- and Anglophone philosophers and theologians because they are trying to keep a distance — so far as possible — from political attempts to privatize the Christian virtues and values. It must also be mentioned that this article's important methodological impulses were coming from other Ukrainian authors' publications. The contemporary communicative philosophy is also significant for clearing new Christian education possibilities in the post-secular condition.

The different approaches to the post-secularity phenomenon are regarded with the reference on explorations made by Juergen Habermas and Charles Taylor.

The New Stage of Cosmological Turn in the Contemporary Christian Theology

The cosmological component in the theological knowledge structure has always taken a firm place because it was connected with the necessity to give at least the approximate coordinates of God's omnipresence. The heaven in theology since The Middle Age was conceiving in different ways: 1) following the metaphysical canons of the classical theology with the architectonic giving in Platonism and Aristotelian transformations; 2) founded on astronomical knowledge about star and planet constellations and all other phenomena which occur in cosmos. The development of physical cosmology and its discoveries also seem to complement the universe's theological constructions on the speculative foundation. Rodney D. Holder notes: "Science is powerless to explain why the universe exists. The universe cannot explain its own existence" (Holder, 2016: 9). However, the new cosmological turn in contemporary philosophical theology was stimulated by natural and technical sciences and the exploration of cosmic space.

The heuristic hypotheses made of physical cosmology are generally described metaphorically, e.g., as “red supergiant,” or “black and white dwarfs,” or the most mysterious “black hole.” For many people, this can mean breaking with the former conceiving of heaven as a safe and comfortable locality for eternal life after death. Eschatological pictures of the uncharmed cosmic space have similarities with the vision of The Bowls of God’s Wrath. The seven angels pour on the earth, then the emergence of New Heaven and New Earth from the Revelation to John. However, it must be said that the metaphor of the invisible hands of angels coming from heaven is prevalent in the secular social philosophy, in which the religious metaphors begin to substitute the ideological ones. Helmut Willke analyzes this metaphor regarding Adam Smith and Jean Paul: “Humans, so Jean Paul, are machines for angels. But today we know more about that. Globalization and digitalization have changed the possible locations also for angels” (Willke, 2001: 66). The theological construction of the angel’s apparatus, according to Willke, is created accordingly to Aristotelian-Christian tradition by God for courier transmitting of information from God’s cancel to earth. With the purpose to maintain the global order on earth. The development of the reflexive megamachine can rule the world and universe more effectively, making unemployed both angels and humans the most significant producers of crises and disasters on the earth (Willke, 2001: 67). This forecasting has a real perspective for its fulfillment. The popular theology and futurological fantasies demonstrate the contra-factuality of the completely digitalized world-society. On this ground appears a critical theological theology with an atheist background. It should be a regress for real philosophical theology because the Christian cosmology is irreducible to the concrete social problems and contexts. However, every critical remark can be regarded as an occasion to examine one’s own position’s edge stones.

The cosmological explication of the fate of the earth is founded only on hypothetical presumption. But we can be sure that God has no limits on creativity and would find many other activities angels in the spheres constructed by Christian virtues such as love, hope, and faith. The prevalent metaphors dealing with throwing the human into the world (Martin Heidegger) and leaving the whole humankind on the spaceship Earth (Buckminster Fuller) appear less pessimistic than the probability of a multiverse with new ways making messages of it.

In the optic of the multiverse, which possible action mechanism was explained still by Leibnitz, must be clarified not only from the position of the contemporary physical cosmology but also from the spiritual and ethical side. Today we cannot repeat by Leibnitz that we live in the better of all possible worlds because it needs more convenient arguments. It might be said that the esoteric teaching of Plato shows some main features with Leibnitz’s conceptualizations of monads, but without evaluating judgments. To further explore this problem field, it might be practical to ask about the heuristically potential mystical roots of Christian Cosmology. In this connection, Joseph Milne refers to Meister Eckhart, who made a significant contribution to Christian mysticism (Milne, 2011: 55). In the post-secularity contexts, the arguments of mysticism are sometimes more influential than the appeals to accept earth at the hole and its cosmic environment and serve all that for coming generations as God’s unity and the created by him world (worlds).

With the acceptance of the multiverse, Christian theology is coming into a crisis caused by discrepancy empirical knowledge of comic space, a theoretical assumption about all those factors, and theological stereotypes of thinking. The exit from such a situation Elizabeth Box Price sees in paying more attention to the human relationship to the Earth (Price, 2008: 85). The widening ecological imperatives on the cosmic space is the actual task for the coming

decades. However, its articulation in the post-secular culture must be brought into accordance with the post-secular cultural and anthropological conditions.

The Post-secularity as New Context and the Claim for Philosophy and Theology

The post-secularity is represented differently in the reflections of theology, philosophical anthropology, cultural and political sciences. Those discrepancies of reflections are caused not only through their intentionality but also by their segment of reality. Not less important is the consideration of senses, which generally used for the description of the status and functions of religion, especially of Christianity, in the spaces constituted by the idea of the Europe in which the Christian ethic and the social philosophy of Thomism are the constructive components for building new justice communities (Hoeffe, 2019:10). The concept of post-secularity is used generally in the descriptions of the dialectic of the secularization in the different subsystems of contemporary societies (Habermas, 2018; Taylor, 2007).

The post-secularity, according to Juergen Habermas, can be regarded as a very indistinct term. It means the following: 1) The contra-factuality of secularity in its self-denying. 2) The political instrumentality of religion. 3) The anthropological predisposition of the human being. These possible representations and corresponded senses Habermas tries to explain as the ambiguous and complementary process of social learning (Habermas, 2010: 7; Habermas, 2018: 34). All these directions can also be regarded as the problem fields for reflecting all facets of post-secularity and analyzing the relationship between philosophy and religion. The same intention but with another accentuating can be observed by Taylor (Taylor, 2007: 640-641). This accentuation has phenomenological and anthropological roots with references to the phenomenology of Maurice Merleau-Ponty. This recourse can help to clear the post-secularity phenomenon from the perceptive and epistemic side and show in this way the necessity of integrating the anthropological component into Christian education according to the post-secular conditions. The methodological approach of Taylor, which is essential for conceiving of cultural and educational representations of the post-secularity, Axel Honneth has precisely characterized as “the neo-phenomenological approach” with opening the methodological possibilities of embodied reason: “As Taylor shows, it cannot be reflexive disposal over rules of action, but must rather be, so to speak, an intuitive mastery of performativity acts that distinguishes such kind of knowledge” (Honneth, 1995: 153). The sense of the Christian religion in the interpretation of philosophical anthropology’s compensatory direction is bearing the semantics of the human being’s essential elements. The similar conceiving demonstrates the materialistic oriented philosophy of spirit. Therefore, Daniel Dennett attempts to explicate the religion in the post-secularity situation as a natural phenomenon in aphoristic definition, namely as “belief in belief” (Dennett, 2006: 200). This recognition of the humanistic meaning of good life introduced by religions also emphasizes Habermas in his revisions of tasks needed for social learning; it deals with increasing social subjects’ adaptive capacities (Habermas, 2010: 7). This form of preserving of religions can also be described as a kind of anthropological reduction and anthropological interpretation in the vertical and horizontal dimensions. From this standpoint, every place, event, and even game that can impress humans can be called a theological one. So, for Christian Bauer, football may also be regarded in the theological dimension (Bauer, 2017: 45-46).

The vertical dimension means the relationship between God and humans in the disenchanted secular world. The atheistic and religious cosmologies are just not in the militant relations. The post-secular transformations are trying to minimize the conflict

situations' risks in the debates concerning the world-view's questions. So, God returns in the social world, which cannot stop producing pathologies in scientific societies thinking of themselves in secular frames. The horizontal dimension of senses, which describes God's existence, is presenting not only as post-secular paternal protection of heaven but also as all-presence of the invisible power, which stimulates self-control and responsibility of all humans for the consequences of their creative activities. In these horizontal relations with God, the church has lost its mediator function. Martin Luther's idea of meeting with God directly on the table shines coming into appearance. However, it increases the hybrid concept of colonization of the cosmic space, heaven, and God. This kind of egoistic and egocentric thinking is widely represented in consumerism's ideologies with their dream of converting God into multifunctional security. The collective memory of societies with such social and cultural pathologies had given into archive all the narratives dealing with God's rage. In the opposition "God itself and God for us," the post-industrial subject makes decisions leading only by the own interest. Dismissing rage God from the mind of individual and memory of modern societies follows the ideology of consumerism.

Nevertheless, the metaphoric of God's love and rage belongs to the Christian narratives. As a supplement to this statement, it would be useful to site Peter Sloterdijk: "Combining of rage and eternity was always a Christian axiom... In our decades, which are new non-alphabetical times in the questions of religion, it might be almost forgotten that in Monotheism the angry God was always present" (Sloterdijk, 2006: 73). Asking for educational consequences of such presence, it must be not only light of deciding to show the rage in the metaphysical contexts because the human ability for transcendence must also be limited or even forbidden by God. In the secular language, it means: by politicians.

Dennis Dennett and many other naturalistic or materialistic philosophers support the appeal "For the love of God." They try to be honest with the ambiguous interpretations of their real feeling (Dennett, 2006: 249). The ultimate values, which emphasize the transcendental pragmatic (Karl-Otto Apel, Juergen Habermas), are necessary both for human existence and for maintaining the civilization process. The contemporary philosophers are not tired to repeat: "What shall we tell the children?" (Dennett, 2006: 328). Compared with the former but not less actual question, "What we leave our children?" there is more accented the communicative rationality of the irrational moments of the post-secularity used both in education and politics.

Anthropological Renewal of the Philosophical Theology

The post-secularity as a cultural and epistemic reality is also a challenge to traditional forms of philosophical reflection. The theological research in the contexts of late modernity and postmodernity is going to be more philosophical. Many causes are leading to this transformation. The Aristotelian-Arabian cosmology has lost its weight in theological reflection over the religion's phenomena, documental base, and institutions. The different scientific cosmology branches and their theoretical and practical achievement must be integrated into theological patterns that were obsolete just for a long time. The revision of self-understanding of theology, its ability for self-reflection, was paralyzed through exegetic canons and the authority of the Bible.

However, in the contexts of the digital realities and democratic political culture, this authority has lost its influence at first on the new generations, which can be named "homo digitalis" (Cappuro, 2017: 4). Pluralizing the world-view's propositions addressed to people in secular countries has contributed to solving world-view culture in the entertainment culture

and so-called “new religions” with esoteric practices. These pathologies in the secularized cultures have brought a new type of religious communication into social and cultural life. Instead of being with God in the form of free serving (religion) and reflexive proving God’s existence (theology), their imitations were coming into post-industrial societies’ cultural life. Kurt Flasch gives a remarkable interpretation to the fact of the interruption of philosophically reflected theological literature on the book markets: “We have no causes to state the renaissance of religions, we only are speaking about it” (Flasch, 2012: 9). It should not be obligatory professional debates. The laity or even empty communication on religious topics can be regarded as a trend of simplifying both the religion philosophy and theology, trying to keep a distance from the political instrumentality of religions and their institutions.

However, spiritual globalization and multiculturalism’s claim explain increasing interest in religion’s social and political function. However, the anthropological and cultural background of the post-secularity needs more detailed analysis because it deals with the acceptance of Christianity as the world religion with significant influence. The re-emergence of religion in the post-Soviet space is not obligatorily connected with more profound transformations in the social and individual consciousness. Instead, it responds to the spiritual disorientation caused by the crash of the communist ideology and its atheism as a secular religion with the corresponded secular theology.

All over mentioned problems toughing both the religious philosophy and the theology demand revision of their metaphysic foundations. The traditional metaphor of Christian theology was well-known as the door guiding to God’s wisdom and truth, which was connected with the opening of the Bible. Today the people are also searching for other portals to God’s spiritual treasures. However, Christian theology is dealing with research joining faith and reason. Herbert Schnaedelbach notes that in Christianity, the theology is represented as the “self-institutionalized religion critic ... that makes the permanent problems for the Vatican with its professors at universities” (Schnaedelbach, 2010: 15). In the Christian orthodoxy, this tendency is not so evident, but also remarkable (Bartholomaïos, 2019: 34).

The relationship between philosophy and theology was, on the one hand, very competitive because of the integration into Christian dogmatic ancient philosophical texts as the models for theodicy, but on the other one, they have given reciprocal stimuli for further development of those disciplines in the complex. The Platonic and Aristotelian ontological schemes and methodological approaches can be combined and applied in the Christian confessional plurality because they agree on the ethical principles and understanding of the good life (Schnaedelbach, 2010: 15). The tendency of refilling theology with philosophical thinking and methodology is principally continual; however, the philosophical content and approaches making from time to time the interruption of this continuation. The crossing of the theology, which has lost its metaphysical support, to the contemporary anthropologically oriented philosophical thinking with the cultural and social perspectives demonstrate it’s moving from the relatively narrow religious field in direction to cultural, social, and political actual realities. This crossing unveils the nearness of the theology to the epistemic culture of philosophical anthropology, which was able to substitute the metaphysic in the post-metaphysical constellations. The appeal of Ernst Tugendhat to recognize the theology as the first philosophy, which can produce synthesis in humanitarian sciences, also in cultural and religious practices, is founded on the premise that the knowledge on human being must include the perspectives of “You” and “We” with the methodological taboo to reduce them to the individual (Tugendhat, 2007:46). This was a proposition from the philosophical side. The theologians dream about the new holistic anthropology, which should connect humans

with everything done by him. This approach can answer the question about God's will or his participation's modus by all the natural and social disasters. The contemporary philosophical theology will give itself a new orientation crossing from the theoretical to more practical aimed reflections on the human being. Julia Enxing, a supporter of a new anthropological turn in theological studies, hopes for radical changes in theology: "So long we should not make a revision on the theological understanding of human and revolution in theology, it would be impossible to work consequently on the problem of non-human" (Enxing, 2020: 25). In her critical consideration, humans and non-humans depend on each other. The theological blind spot on these interdependent relations she makes responsible for all global problems of humankind because the theology had suggested no limits for human creativity. The positive part of new philosophical anthropology, which might be devoted to stopping or at last minimize all the catastrophes on the earth, is more nearing to the symmetric anthropology of Bruno Latour in his concerning of laboratory life as a unity of scientist, microbes, and other natural and human-made creations (Latour, 2008: 31-36).

The new anthropology is still not ready to transform theology into post-secular guidance on the good life. Nevertheless, its refusal from the conceptualization of human as God on the earth is promising and hopeful for solving all the problems resulting from human activities.

Cultural and Educational Potential of the Philosophical Theology

The theology enriched with new philosophical ideas, and the complex of empirical knowledge about humanity will integrate itself into the digitalized world's mass culture. It must be philosophical reflected not only the presents of church on-line, but also the cultural and didactical education practices in religion and religious education. The philosophical theology staying beyond confessional distinctions and denominations might be possible only based on the resonance-theoretical and resonance-practical anthropology. This direction in philosophical theology roots in the Christian mystic (Meister Eckhart, Hildegard von Bingen, etc.), which was actualized by Martin Buber. In philosophical theology, this direction is represented mainly in German-phone countries by Reinhard Deichgraeber, Paul Deitenbeck, Eugen Drewermann, etc. The integration resonate of anthropology and theology was possible only in the context post-secularity because the old scheme "God speaks — we answer" was supposed from the addressers of the religious education, as a rule, the asymmetric communication in the confessional communities. Because Christianity was always involved in cultural and social life, religious sociality always followed all transformations in modern societies, especially in the Late Modernity.

Charles Taylor's doctrine of strong evaluating can be regarded as an appeal for moving in this direction, which was done by followers of this philosopher on the European continent with other epistemic cultures, with more openings for theological explorations. The European philosophical theology has developed some practical conceptions founding on the resonance anthropology and psycho-therapeutically approach to minimize the pathologies caused by the mass culture and practices of occultism, making it popular in mass-media with its supra-natural effects. Like a Christian mysticism with its accent on the inner nature of relationship individuality to God, the occultism destroyed human beings through spiritual disorientation. Philosophical anthropology can translate mystical content into educational practices with the humanistic orientation with ecological background and robust evaluation in the sense of Charles Taylor (Meijer, 2018: 3, 112-14). It must be mentioned that the soul healing as the practice of exorcism or other authoritarian religious practices of humiliation was widespread

since the Middle Age and became legitimacy by conservative and orthodoxly oriented theologians. It attempted to apologize for spiritual and physical repression as a meaning for the human soul's growth and catharsis. Platonism is still staying — open or latent — behind all these religious education practices, but they have lost their influence on the Late Modernity's autonomic individuals. However, searching for healing power for a soul in nature remains a favorite topic in popular philosophy and popular theology, in philosophical novels and philosophical lyric for a long time. In these metaphorical descriptions, the soul equipped with all Christian virtues and values becomes necessary to physical world activities only in cooperation with nature.

This tendency and its sounds and promises cannot substitute learning on the Bible, which is a universal source both for religious and secular moral education and for shaping humans in similarity to God. The adaptation of the Bible to children's psychology is essential for the adequate introduction of themselves into the world of Christianity. People and God meet each other in the history of world creation and live communication in learning and self-knowing situations. That is why it is impossible to make from the Bible a modern talking in the option of the pop-culture or explain its story as fakes (Langenhorst, 2020: 59-60). The philosophical theology as an active and critical reflection on Christian education practices can be constructive in corrections in its curricular options, setting formal and operating purposes.

The experience of religious educations is vibrant today, but the approach of Elizabeth Box Price is very actually in the contexts of post-secularity. She proposes to combine two narratives that generally were holding parallel: the scientific cosmic story and a life-affirmative story of Christianity. There is especially stressed: "Religion education knows about the power of myth and how the internalization of narratives and stories affects values, attitudes and behavior. Cultural narratives mold attitudes and behaviors" (Price, 2008: 92).

Post-secularity creates many problems for Christian education. However, the new cultural and educational conditions show many directions for developing pedagogical creativity and fantasy. The practices of blended learning allow self-organized studies both in cosmology and in philosophical theology.

Conclusions

The synergy of the cosmological cultural, and anthropological turns in theology has made it really philosophical. The transmission of the theoretical accents in the direction to human beings and its cosmically, cultural, and social environment also had feedback consequences for structuring philosophical disciplines. In post-secular and post-metaphysical constellations, the renewed philosophical anthropology can take the place of the first philosophy giving a theoretical foundation for theology and converting it in this way into a hybrid form of self-representation of specific philosophical knowledge of human being with the latent inquire concerning the place of God in cosmos without clearing the former fundamental anthropological question about the position of the human in the universe.

However, human being's humiliation in interdisciplinary anthropological approaches has opened for theology new theoretical perspectives and showed practical fields, which can be elaborated in cooperation with social and educational philosophy. The philosophical foundations of the Christian education show the visible tendency of moving from the metaphysic to the more realistic oriented methodological perspectives in the last few decades. The traditional problem circle closed on the relationship between God and human beings. The world is now open for senses going from cosmic, social, and cultural contexts beyond the metaphysical explications. The early religious-philosophical anthropologies (developed

in the mainstream of Thomism, Orthodoxy, and representatives of other confessions) are transforming today into cultural anthropology to make synthesis and hybrids through involving secular anthropological conceptualizations.

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Nature of Moral Philosophy in the Human Universe: Retrospective Analysis and Modern Paradigms

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Lokhvytska, Liubov, Antonina Rozsokha and Channa Azman (2021) Nature of Moral Philosophy in the Human Universe: Retrospective Analysis and Modern Paradigms. *Philosophy and Cosmology*, Volume 26, 100-113. <https://doi.org/10.29202/phil-cosm/26/8>

The present research reveals the nature of moral philosophy in the human universe based on retrospective analysis and synthesis of the positions of modern sciences related to the problem of scientific searching practices and offers the author's concept. In the process of achieving the pursued goal, the raised problem is actualized through the prism of a view on the activities of the relevant scientific communities, in particular, AME, APNME, ESMP — associations of moral education and moral philosophy, which study various aspects of moral development and highlight the results in the journals founded by them: Journal of Moral Education, Journal of Moral Philosophy, Philosophical News, Moral Capital. Based on the retrospective study of moral philosophy in the human universe, it is proven that for many centuries, philosophers-moralists have been trying to clarify the specifics of the world of human freedom, their confession of moral norms, and rules accepted in society. Based on the analysis of modern paradigms of moral philosophy and moral psychology, which are related

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to each other, it is established that the universe contributes to the identification of moral values and their acceptance in the internal plan of human actions. The scientific research results made it possible to outline the author's concept of the studied phenomenon and determine its main components. It is established that the basis of the universe in its significance for man provides an interaction process that is directly reflected in the formation of moral consciousness, the basis of which is moral philosophy with a system of moral values. In turn, this affects the formation of man's moral self-consciousness, which contains such constructs as moral intuition, moral judgments, and moral behavior. In conclusion, it is postulated that man as a part of the single whole world acts as a builder of their own moral being, creating their moral "I" and producing their universe.

Keywords: moral philosophy, human universe, moral values, moral consciousness, moral self-consciousness, moral intuition, moral judgments, moral behavior

Received: 5 November 2020 / Accepted: 17 December 2020 / Published: 29 January 2021

Introduction

Modern changes taking place on a global scale are increasingly focused on the issues of specificity in the human universe, determining the impact on it of a set of established norms, regulations, rules and requirements, among which the moral ones have been prioritized. They contribute to the individual's full functioning, among others, determine their comfortable existence in the environment and ensure their proper behavior in various spheres of social life. Today, this issue is becoming increasingly acute due to the growing influence of moral relativism and the leveling of moral values in all spheres of human life (Kidder, 2009; Narvaez, 2020).

In view of the above, it is important to establish *the relevance of the problem under study* in terms of its studying by specialists in many sciences. In particular, the formation of the moral personality in the modern world is considered in terms of the following scientific areas: moral philosophy, ethics, moral psychology, education, etc. The first one is given the primary attention, because "moral philosophy is concerned ... with how we ought to be and what we ought to do <...> with our moral natures" (Alfano et al., 2014). In this context, the subject of research is distinguished — morality as a mandatory component of everyone's life (moral life). The essence of this postulate is clearly outlined in the scientific work of Anne-Marie Søndergaard Christensen, who noted that "in moral philosophy, we have to recognise that moral life contains many different aspects and not attempt to eliminate its complexity" (Christensen, 2020).

Given that the study of the "inner world of man has always remained a problem" (Kashuba, 2006: 14), to solve which both philosophy and other sciences have been approaching throughout their history, the focus of the given research is exclusively on moral issues. It is the multidimensionality of human being-in-the-world, as the being based on the interaction with others in a moral context, that determines a person's experience of their own life worldview and personal balance (Yachin, 2014). Since "the individual is the subject in relation to society, and society is its product — the object," it is important for them to realize the need for the priority of moral and "finding mechanisms for its implementation" (Sabadukha, 2017: 101, 107).

Recognizing that the problem of moral formation of a human being in modern society has become the dominant theory for comprehension and its implementation in practice and requires clarification of its essence, the purpose of the scientific research is to: a) substantiate

the importance of the research issue by considering the activities of scientific communities; b) analyze a retrospective study of the place and role of moral philosophy in the human universe; c) synthesize the positions of modern achievements in the field of moral philosophy and moral psychology, which are relevant to the subject of the study; d) present the author's provisions on the interaction of man and the universe in the formation of their moral consciousness and moral self-consciousness. The main methods used are the following: analysis, synthesis, comparison, a generalization of materials from the scientific sources and modeling of the author's concept based on the systematization of various scientific views on the role and importance of moral philosophy in the human universe.

Substantiation of moral philosophy significance in the human universe in the activities of scientific communities

The chronological order taken as the main criterion, we should focus on the activities of the Association for Moral Education (AME), which was founded in 1976 in the United States. It aims to conduct international research on the interdisciplinary study of the moral and ethical dimensions of human moral development in the process of their education and upbringing (Association for Moral Education, 1971 — till present). The Journal of Moral Education, the current editor-in-chief of which is Kristján Kristjánsson (Journal of Moral Education, 1971 — till present), has become a scientific platform for discussing these issues. The journal has become the platform for discussing the problems of moral formation and moral functioning of man in the context of considering different approaches and scientific views.

Since 2003, another thematic journal, the Journal of Moral Philosophy, edited by S. Matthew Liao (New York University, USA) (Journal of Moral Philosophy, 2004 — present), has been published. The Journal of Moral Philosophy publishes articles on the theory of morality in terms of ethics.

The activities of another public institution — Asia-Pacific Network for Moral Education (APNME), launched in China in 2006 — are similar in content to the AME. Its main task is to join the forces aimed at solving the problem of cultivating morality in human values in the process of moral education and moral development (APNME, 2006 — till present). What both organizations (AME and APNME) have in common is holding annual scientific conferences on topical issues of moral education worldwide.

Another fact points to the importance of the research subject — the foundation of the European Society for Moral Philosophy (ESMP) in 2016. ESMP brings together scholars from around the world to promote collaboration and exchange of scientific information in the field of moral philosophy (European Society for Moral Philosophy, 2016 — till present). The official publication of ESMP is the international journal Philosophical News, which was launched the same year. The journal aims to promote research in the domain of moral philosophy, active discussion of various concepts, approaches, and patterns of moral issues by the members of the scientific community in Europe and other countries (Philosophical News, 2016 — till present).

Evidence that tends to prove the relevance of the problem of moral education for the moral development of the individual in the world scientific space is provided by the Moral Capital website created by the company JME Trust Journal of Moral Education (UK) (Moral Capital, 2016 — till present). It should be considered as an additional resource that highlights the main trends, the experience of practices on this issue for all stakeholders. The purpose of its foundation was the idea of promoting “moral issues” in the range of their

diversity: moral philosophy, moral psychology, moral education, moral development; search for optimal means; development of new technologies, etc. for the effectiveness of ensuring moral development of the individual from the local, national to the global world level — “transcultural continuity” and the universe as a whole.

As of now, effective measures are being taken in Ukrainian society to form a morally oriented person with developed “social and public skills”, as stated in the current document — Recommendations of the European Parliament and the Council of the EU “Key competences for lifelong learning” of December 18, 2006 (Recommendation (2006/962 / EU). During the years of independence of Ukraine, the Law “On Protection of Public Morality” (2004) was introduced, with the latest amendments and additions made on January 14, 2020 No 440-IX (Law of Ukraine, 2004).

Hence, it allows providing evidence of the social demand on considering the discussed issue, its maturity and actualization, distinguished by the characteristic dynamics of economic, socio-cultural problems of the moral sphere of today’s society and the need to raise the moral culture of its citizens. Thus, the improvement of the realities of modern Ukrainian society will depend on the process of its recovery by improving the state of public morality, moral culture, and the level of moral development of each individual (Lohvytska, 2016).

The next step is to study the key concepts and the specifics of the development of ideas on the interaction of human morality and the universe based on the analysis of a retrospective study of the place and role of moral philosophy in the human universe.

A retrospective study of moral philosophy in the human universe

The main categorical units — “morale/morals” and “morality,” which according to the resource of Stanford Encyclopedia of Philosophy (online encyclopedia — SEP), are interpreted in the sense of norm, law, a form of social consciousness (the first), and patterns of behavior of people, groups, societies associated with moral responsibility (the second) (Gert & Gert, 2020). In determining the philosophical and ethical foundations of morality, we rely on the results of the scientific work of Ukrainian scientist Tatiana Abolina. According to Abolina, each cultural and historical stage of philosophy necessarily includes and retains in its issues a multifaceted analysis of “natural morality, manners, morale as value-normative systems of certain societies,” which are directly reflected in the process of substantiating the ideal of proper and ethical for a particular personality, their inner freedom, self-sufficiency, as well as “moral choice and responsibility” (Abolina, 1999: 3).

In Antiquity, philosophers (Socrates, Plato, Aristotle) considered the issue of morale in relation to human activity from the standpoint of understanding the universe as a single proportional holistic system with a spiritual origin and worldly mind (soul and mind) (Plato, 1999; Aristotle, 2002). Accordingly, man’s nature and morality were interrelated, which was characterized by openness to the world. In ancient philosophy, the man was seen as unique, universal, having their own microcosm and being capable of any activity, and integrating the physical, mental and spiritual origins. The understanding of outer space was at the center of understanding the world. Dual polar nature was interpreted as an eternal struggle of opposites, and at the same time, recognized as “personhood in both individual and interpersonal contexts” (existential and a relational construct) (White, 2013: 74).

Considering man as a subject of philosophical knowledge in the historical retrospective of life, scientists agree on the following thesis: integration into a complex system of social relations and social processes, which are quite stable connections and interactions,

contributed to the evolution of moral development reflected in human activities (Dubrovsky, 1998). Strengthening such interaction takes an individual path of formation for a particular person, which depends on their condition, socio-moral potential, qualitative formation of attitudes to the surrounding reality, and “transformation and inclusion” in meaningful socio-moral functioning (Malivskiy, 2020).

The turning point for moral philosophy was teaching the German philosophers Immanuel Kant and Georg Wilhelm Friedrich Hegel. They defended the system of objective idealism and the universal moral law for society. In particular, the law of moral imperative created by Immanuel Kant can be emphasized as fundamental to human activity and the formation of human behavior, as it ensures the observance of moral duty to oneself and others (Kant, 2004). In this way, the scientist proved the existence of a priori moral laws for man. He distinguished morality from other mechanisms and ways of regulating human behavior that was a significant impetus to ethical theory development. According to Robert Johnson and Adam Cureton, which we fully share, “at the heart of Kant’s moral philosophy is a conception of reason” (Johnson & Cureton, 2016). In Kant’s scientific theory, the categorical imperative is focused on unconditional moral duty, the obligation of proper behavior of a person who has free will.

In its turn, the merit of Georg Wilhelm Friedrich Hegel is the introduction of the term “morality” into the system of ethics and the substantiation of its substantiality (Hegel, 2000). The scientist explained the dialectical connection between people’s behavior and their moral beliefs, focusing on the moral essence of life — the search for truth and the pursuit of good. Thus, in the New Age, moral philosophy has deepened the explication of morality in human activity and understanding of the world in general. It was associated with the sense of human life, their own moral (internal and external) activity, which is manifested in one’s activity, freedom, and the ability to regulate volitional efforts. This was, at the same time, the determinants of moral self-realization and self-improvement of the individual.

Without going into details of moral philosophy developed in the 19th and 20th centuries, it is worth noting that it was significantly influenced by the theories of existentialism, psychoanalysis, and philosophical anthropology. As noted by Mariya Kashuba, this led to the need to clarify the essential contradictions of the inner world of man on the basis of “their fundamental problems” (Kashuba, 2006: 13).

Thus, the retrospective analysis gives grounds to assert that there were various polarizations of views on man in the process of development of moral philosophy. Still, they undoubtedly recognized their dominant importance in the system of relations with the outside world and the universe in general. Clarifying the historical background helped to understand the specific ways of combining individual-personal and general-social in human morality development. This is important for further study of the modern interpretation of various aspects of moral philosophy in the human universe.

Modern paradigms of moral philosophy in the human universe

Active scientific research is conducted by modern foreign philosophers-moralists (Hämäläinen, 2016; Kidder, 2003; 2009; MacIntyre, 2007; Smith, 1994, 2004; Williams, 2006; Yachin, 2014), who study various aspects of the problem:

- a) defining the demands of moral philosophy in the sense of reflexive community and moral arguments that act as rational and convincing and thus explain “how to live” (Williams, 2006: 28);

- b) clarifying “the genesis and the prediction of moral modernity,” due to the need to substantiate the issue of human virtue, or vice versa its interpretation in terms of metaphysical and biological approaches, but without denying the classical form of Aristotle (MacIntyre, 2007);
- c) significance of objectivity and practicality of moral judgments that structurally relate to moral activity in the process of building one’s own morality (Michael Andrew Smith explained the idea of moral objectivity as a specific feature of personal involvement in moral practice, provided that all its participants are interested in reliable answers to “moral questions”) (Smith, 1994: 5);
- d) studying the multidimensionality of human being-in-the-world, a component of which is a moral being, which is reflexively correlated with other people; elucidation of the specifics of “living through” and “experiencing” life conflicts in complicity with others, which is interpreted as ethical (Yachin, 2014);
- e) establishing a correlation between moral choice and personal well-being in the process of resolving moral dilemmas, finding ways to form an ideal human character and the role of moral duty by all members of society (Kidder, 2003; 2009).

Consonant ideas were expressed by Nora Hämäläinen. Hämäläinen noted that there was a need for new research ideas in moral philosophy, which should relate to the stimulation of man to developing the moral ideal and morality as a viable moral quality (Hämäläinen, 2016). Defending this view, the scholar stresses that to understand the specifics and relativity of morality of our time, one should turn to its “historicism,” which does not contradict the modern idea of universality, but would rather become an indisputable condition for understanding one’s place in the studied concepts of morality (ibid).

The scientific views of the modern researcher of moral philosophy Anne-Marie Søndergaard Christensen seem progressive. Based on the proposed concept of “the moral life,” she notes that the changes towards “morally right” do not depend on any moral theories but have to be interpreted as models that explore different moral structures (moral beliefs, moral values, virtues, etc.) (Christensen, 2020). It can be generalized that the innovativeness of the scientific views presented by the scientist is seen in the transition from the nomination of moral guidelines to specific actions (activity approach) in the moral formation of the individual, because “ethics is about our world, our life,” that is implemented “through moral education” (*noted by the authors*) (ibid). It is through moral education/upbringing that a person enters the moral community, which contributes to the development of human moral judgment, moral attitudes, ability to make moral assessment and self-assessment, etc. According to Anne-Marie Søndergaard Christensen, moral philosophy plays a leading role in the practice of “our moral life” (ibid). This thesis differs from others in its innovative content and explains the modern view of the essential importance of moral philosophy in the human universe.

Great interest is maintained in the scientific works of philosophers-moralists, who pointed to the importance of basing moral philosophy on the fundamental tenets of moral psychology, arguing that “emotional morality” is the basis for the formation of moral values based on emotional reactions and experiences (Prinz, 2005, 2007; Smith, 2004). Close to this issue, there is a relatively young branch — experimental moral philosophy, which “opened” new opportunities for research into the nature of morale and human morality, allowed resolving contradictions between different moral theories, and borders on moral psychology (Alfano et

al., 2014). It is worth noting that the structure of moral self-consciousness suggested by the scientists, which contains such components as moral intuition, moral judgments and moral behavior, was taken to create the author's concept.

A number of studies in the context of moral philosophy are devoted to researching the structural components of morale and morality (Bengson et al., 2020; Kashuba, 2006; Matas, 2018; Sabadukha, 2017; White, 2013; Yaruniv, 2018). The moral values that can be notably outlined serve as a fundamental basis in the formation of moral judgments, moral beliefs and activities in general, because "personhood is a conditional state of value defined by society" (White, 2013). Human freedom will contribute to the formation of one's own worldview axiological system, which is important for the rational-irrational component of development and elevates man as the creator of evolution, as the creator of the universe (Yaruniv, 2018).

The development of the ability to realize and be responsible for the moral choice of one's actions is based on the unequivocal confession of the moral values recognized in society, and which are accepted by the personality in the internal plan of acting as the main driving forces of behavior in the environment. Adherence to moral values as "personal values according to the criteria of existence" makes a person moral (Sabadukha, 2017: 106). This phenomenon is possible because a person is aware of "the possibility of personal choice through natural will and desire for change" (Yaruniv, 2018) and seeks to isolate their "I" (self-awareness) based on the understanding of generally accepted moral values that become their own (Matas, 2018). The inherent moral principle characterizes a person as the one who is able to be responsible for their own moral actions and deeds, takes into account the moral needs of others, is able to manage their volitional efforts, which have a direct impact on the manifestations of various forms of moral behavior, also making them "masters" of life and allows "justifiably apply moral concepts to novel situations" (Bengson et al., 2020). Thus, as Mykhaylo Yaruniv rightly pointed out, it is "human free will and norms that form the logical minimum of deontological reality" (Yaruniv, 2018: 6). This leads to generalizing the following: moral values, which are accepted as personal moral guidelines, contribute to the fact that a person becomes able to be responsible for their actions, and can subordinate their own volitional impulses to comply with moral and deontological norms, which Immanuel Kant called a moral imperative. However, their understanding depends on the development of a person's moral self-consciousness, their inner world, which is significantly affected by a number of "social, even global socio-practical problems" (Kashuba, 2006: 12). The latter affects both individual aspects of the individual's moral growth, self-realization, and self-organization, when external pressure, the imposition of moral behavior rules, excessive moralizing, and the essence of a human being in the universe as a whole are unacceptable.

It is necessary to clarify the issue of cultivating moral values in a person that occurs due to the influence of moral education/upbringing on their moral development. This aspect determined the further logic of the presentation of the material. The next segment of the article content will consider the phenomenon understudy in the context of moral psychology, which is related to moral philosophy. Postulating Patrick Welch, we agree with his thesis about the need to consider general trends in the psychology of morality, based on moral and philosophical theories that strengthen and clarify the boundaries between psychology and philosophy (Welch, 2011: 525). In particular, the scientist argues that moral psychology needs a greater ethical basis. Its research should be based on the provisions of moral philosophy (ibid). This determines the essence of moral philosophy, which serves as a fundamental basis for moral psychology that studies the individual in the "practical plane" and makes morality effective, leading to the functionality of moral education/upbringing. The studies conducted

by a number of scientists (Stefaan Cuypers, John Doris, Daniel Kelly and Stephen Stich, etc.) at the junction of moral philosophy and moral psychology convincingly prove that through the integration of scientific efforts, it is possible to establish the truth about human moral existence in the universe (Cuypers, 2020; Doris, 2012; Kelly & Stich, 2012).

Modern moral psychology considers morale and morality as specific phenomena, and if the first is permanent and is considered as a means and one of the dominants of life, the second ascends from the first, is variable and depends on the development of a particular individual and determines their moral development (Haidt, 2013; Kagan, 2018; Krebs, 2011; Narvaez, 2020). Thus, Jonathan Haidt, exploring the evolutionary foundations of morality, formulated a synergistic interpretation of morale as a set of moral values governed by moral norms based on their practical application and the action of psychological mechanisms (Haidt, 2013). The scientist outlines in detail the domains of morale and the theory of moral foundations, among which moral intuition is recognized as the leading domain of morale, and then behind it — moral judgments and moral actions. This was considered in the construction of the author's concept (ibid). In the process of formation of morality and moral formation of personality, as Darcia Narvaez argues, it is necessary “to ensure the development of human beings who live cooperatively with one another,” and in order to do this, “moral education should look like in light of children's basic needs” (Narvaez, 2020).

According to Tobias Krettenauer and Randall Currens, the implementation of the above-mentioned ideas will ensure the use of Self-Determination Theory (SDT), which promotes the development of moral motivation based on the formed self-consciousness of the individual (Krettenauer & Currens, 2020). A significant role in this process belongs to moral psychologists and educators who are called to help create a “relationship between leading a moral life and happiness” (ibid: 275). In this case, the mission of educators/teachers should not be reduced to moral planting, but to mutual harmony, which “provides a joint ascent to the image of a higher idea or to universal consciousness” (Bilyk & Sheremet, 2019: 92; Kovrovsky, 2012). In its turn, such harmony is achieved through the “concept of relationality,” when a person achieves harmony with oneself, harmony with others (moral aspect), and harmony with the world around them, thus defending their position in the universe as a whole (Di Fabio & Tsuda, 2018). It is the “psychology of harmony as harmonization” that makes a person happy (ibid).

Thus, both fields of science (moral philosophy and moral psychology) are closely interconnected and interdependent in the study of human behavior and motivations, but explore them from different perspectives. Thus, in modern paradigms of moral philosophy, morality is studied as a special world of man, the sense of their life and purpose, there are various theoretical provisions. Moral psychology, which is extremely relevant, substantiates, above all, the structure of the morality of an individual, the psychological mechanisms of moral formation and moral functioning. The analyzed research results form the foundation in the development of the author's concept of the role and importance of moral philosophy in the human universe.

Conceptual provisions of moral philosophy in the human universe

Considering the retrospective study and views of modern foreign and domestic scholars in the context of the research subject, the construction of the author's concept based on the analysis, synthesis and generalization of the above scientific provisions of moral philosophy and moral psychology, assumes the following main role: morale as such plays the role of

prescriptions, norms and rules. Based on their observance, moral judgments, moral emotions and feelings and moral behavior are formed, the formation of which characterizes a person who has developed morality as a personal quality (Hämäläinen, 2016). At the same time, morality testifies to the development of a person's moral self-consciousness, which has its own structure, and testifies to the level of their moral becoming and moral functioning (Narvaez, 2020). This allows the individual to build a strategy of interaction with the outside world, including that in moral aspects. This allowed us to distinguish three blocks in perceiving the conceptual positions of the role and significance of moral philosophy in the human universe: moral self-consciousness of man, the impact on the formation of human moral consciousness, the interaction of man and the universe (see Figure 1).

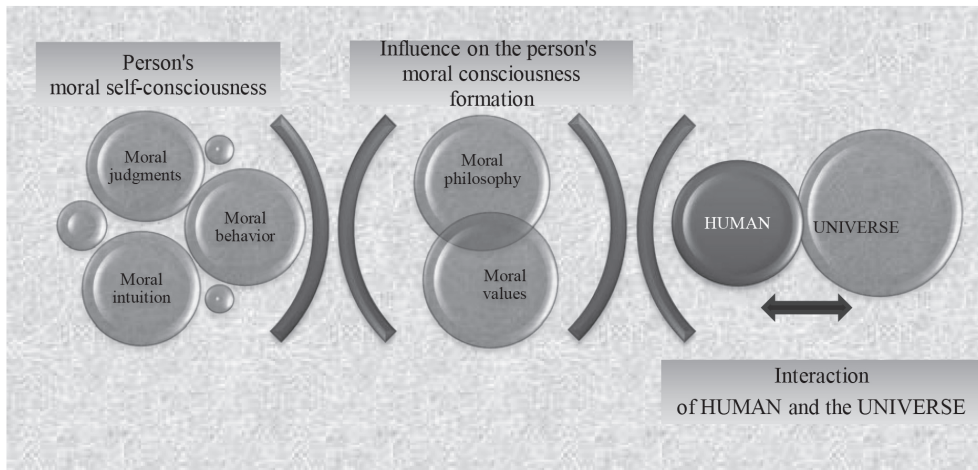


Fig. 1. Role and significance of moral philosophy in the human universe

As it is shown in the schematic representation in Fig. 1, the structure of human *moral self-consciousness* (the first block) includes the following components: moral judgments, moral intuition, moral behavior (Alfano et al., 2014). Moral judgments of the individual are based on the awareness of moral norms of behavior in the social environment. On the basis of observing the universal and unbiased moral standards, each person demonstrates the ability of moral argumentation. These are moral judgments that testify to the formation of moral beliefs of the individual and act as the basis of moral behavior. Moral intuition has a direct unity with moral judgments and is seen as the ability to “feel,” the insight into others’ problems (Haidt, 2013). Due to the development of moral intuition, which serves as a kind of vector, a person can fulfill their own moral precepts, show compassion and empathy in situations of moral content, which is directly reflected in their moral behavior. As a result of this, it is quite logical to outline that the quintessence of moral self-consciousness is moral self-esteem, which is based on the confession of virtues and is provided by regulatory control over one’s own moral behavior. Thus, in the multidimensional inner world of man, the leading role belongs to moral self-consciousness as the main substance and “cognitive-psychological phenomenon” (Kashuba, 2006: 9), which performs a cognitive, emotional-regulatory, and activity-controlling function in the observance of moral norms and laws.

The second block — *the impact on the formation of human moral consciousness* — presents a kind of “alloy” of moral philosophy and moral values. It consists in the fact that the first (moral philosophy) deals primarily with the fact that, in determining the essence of morality, it explains the second (moral values), pointing out their sources, causes, social functions, etc. (White, 2013). Moral values generally perform the function of normative regulation of people’s behavior, which they produce in relation to others and themselves, as well as in relation to the universe in general. At the same time, moral psychology has a significant influence, which examines the very process of emergence and application of moral values in a person’s life, considering their principles and structure. The direction of human consciousness is always determined by certain moral needs, which are associated with the satisfaction of one’s own moral activity and is closely connected with the development of one’s moral self-consciousness. It can be generalized as follows: the morality of the individual, the formation of their moral self-consciousness is a manifestation of the highest degree of existence, as it testifies to their compliance with a number of specific moral requirements.

The third block — *the interaction of humans and the universe* — the purpose of finding harmony and happiness in the moral life. Man appears as the center of the universe, with their inherent set of moral properties and system of moral values that make up personal (private) moral philosophy. It is about realizing one’s own need to be moral both for personal value and others. Each individual, integrating into living in society, learns the relevant moral precepts, which become internal regulators and are manifested in the stability of views, behavior and attitude to the world.

To be a moral person means to possess the basics of moral culture, think morally, and act according to moral principles, producing manifestations of good behavior in the immediate environment. In general, moral culture is characterized as the individual’s moral education to master and adhere to the moral norms and principles of life, which is achieved in the process of moral education (Lokhvytska, 2014). Moral education is defined as “a purposeful process of mastering moral categories, values, principles, ideals developed by mankind and accepted by society at the level of one’s own beliefs, their observance as a habitual norm of behavior” (Encyclopedia of Education, 2008: 523). Thus, moral education as a component of universal culture is a systematic organized influence on the individual’s moral sphere and ensures one’s moral development. The main function of the moral culture of the individual is to regulate the moral component of any activity.

Conclusions

The philosophical interpretation of global world problems gives grounds to generalize that the main subject in their solution is a person, their values, beliefs and specific activities. The issues of the morale and morality of man are attracting more and more attention of various scientific communities, although they have been debated for many centuries.

1. The following international associations are distinguished by their activities: Association for Moral Education (AME), Asia-Pacific Network for Moral Education (APNME), European Society for Moral Philosophy (ESMP), which promote the study of moral issues and thematically related scientific issues in various aspects. In order to do this, there has been a search for its practical implementation by conducting a series of scientific events and discussions in the following journals: Journal of Moral Education, Journal of Moral Philosophy, Philosophical News, Moral Capital.
2. The retrospective analysis gave grounds to assert that since ancient ethics, in moral

philosophy man and morale have been considered in their integral unity. Thinkers recognized that the inner world of man and their morality (soul and mind) contained the desire for a natural manifestation of moral activity, which is expressed in the ability to sympathize and empathize and has a direct impact on the formation of self-awareness, self-esteem and “stable semantic core” (Kashuba, 2006). A significant impetus to the development was achieved thanks to the ideas of the German school of philosophy (Hegel, Kant), in which man was seen as a part of society (the world) that was aware of their own responsibility (moral imperative, according to Kant). People are able to take responsibility for their moral (proper) or immoral actions in the context of their own freedom and submission to the will, which is closely related to the meaningfulness of what has been done. The only man is capable of realizing moral responsibility and strives for the truth that is based on the beginning of good (according to Hegel). Human beings’ ability to grant moral senses to their actions is based on morality as a personal quality that is part of their inner world and is the meaning of their life.

3. Without delving into the controversy over the role and status of moral philosophy in the analysis of various theories of morality, as this was not the purpose of the presented scientific research, it was found that the modern paradigms of moral philosophy illuminate the theoretical definition of moral views and their true values — meta-ethics (MacIntyre, 2007); morality as an ideal model in the sense of involving the individual in practical activities — normative ethics (Smith, 1994, 2004; Williams, 2006; Yachin, 2014); features of moral choice and human behavior in specific situations of moral content — practical ethics (Hämäläinen, 2016; Kidder, 2003; 2009); the essential importance of moral behavior based on understanding of a specific moral situation and compliance with moral obligations — “descriptive moral philosophy” (Christensen, 2020); the need to apply empirical observations in moral theory — experimental moral philosophy (Alfano et al., 2014). Particular scientific interest was attached to the views of philosophers- moralists, who noted that without moral psychology and, above all, clarifying the place and role of moral intuition, moral feelings, moral judgments, moral behavior and moral values, there can be no perfect study of moral philosophy (Alfano et al., 2014; Prinz, 2005, 2007; Smith, 2004). The need for the connection between moral philosophy, which is the fundamental basis, and moral psychology, as the area of applied research of moral issues of human existence, has been emphasized by a number of modern foreign psychologists (Cuypers, 2020; Doris, 2012; Kelly & Stich, 2012; Welch, 2011). It is the knowledge of moral philosophy that determines the direction of psychological research and helps to clarify the nature of morale and morality. Psychologists-moralists (Haidt, 2013; Kagan, 2018; Krebs, 2011; Krettenauer & Currens, 2020; Narvaez, 2020) outlined the evolution of the process of moral development as a personal quality, revealed the specifics of human moral development, highlighting the most important substance — moral self-consciousness, its structural components and psychological mechanisms.
4. Synthesis of positions of modern achievements in the field of moral philosophy and moral psychology contributed to the modeling of the author’s concept and presentation of provisions on the role and significance of moral philosophy, in particular, human interaction and the universe in shaping moral consciousness and moral self-consciousness. On the basis of a kind of unification of scientific and

methodological platforms of moral philosophy and moral psychology, the way of interaction and mutual influence of moral formation and moral functioning of the individual in the universe is revealed. Thus, the foundation of the analysis of the philosophical and psychological array of the source base for the study of moral issues provided a three-dimensional composition of the concept of the essential importance of moral philosophy in the human universe: 1) moral self-consciousness of man; 2) influence on the formation of the human moral consciousness of the foundations of moral philosophy and moral values as norms; 3) interaction of man and the universe, which forms the moral culture of the individual. The latter is achieved through the process of moral education.

This outlined the prospects for further scientific research, which will be to clarify the organic unity of moral philosophy and moral education of people to harmonize their life.

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Science Fiction about Intelligent Life in Cosmic Space. Posthuman Perspective

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Sapeńko, Roman (2021) Science Fiction about Intelligent Life in Cosmic Space. Posthuman Perspective. *Philosophy and Cosmology*, Volume 26, 114-122. <https://doi.org/10.29202/phil-cosm/26/9>

The article shows how the latest reflection within philosophical posthumanism can be applied to the analysis of science fiction works. The concepts of Francesca Fernando and Rosi Braidotti serve as a theoretical basis here, allowing us to look differently at the possible spectrum of life forms in cosmic space and the consequences of human and posthuman encounters with them. The post-humanist perspective seems to offer the possibility of looking at the future exploration of space and the encounter with extraterrestrial civilizations in a balanced and anti-dystopian way.

Keywords: posthumanism, transhumanism, science fiction, intelligent life, organic/non-organic life

Received: 29 November 2020 / Accepted: 2 January 2021 / Published: 29 January 2021

Introduction

The problem of contact humans with intelligent civilizations from space is not only of interest to science fiction authors but has always been a main and hot topic for science. Recently, for example, British scientists, for the question of whether we are the only ones in space, have been claimed that our cosmic neighborhood is swarming with other, intelligent forms. According to them, there are more than thirty cosmic civilizations capable of communication in the Milky Way galaxy (Westby & Conselice, 2020). Another researcher, physicist Michio Kaku, during an AMA (Ask Me Anything) session, stated that aliens are technologically advanced enough to come to Earth, but they would be dissatisfied with what we have achieved so far (Kaku, 2018). Through a NASA grant, two US research institutions have announced the start of a search for signs of life in space by attempting to detect the so-called techno signatures or technological traces of extraterrestrial civilizations. Steven Dick also writes about the discussions on extraterrestrial civilizations and the consequences for

human beings of this meeting in his famous work (Dick, 2014). In discussing the perspective of posthuman philosophy, we used the idea of “philosophical untranslatability” represented in the recent philosophical anthropology studies (Rudenko & Sobolevskiy, 2020).

Philosophical posthumanism and the problem of intelligent life

Giordano Bruno, who was burned at stake in Rome in 1600, was also thinking about the possibility of intelligent beings existing outside the Earth. And besides, his “sins” also included the doctrine of the multiplicity of inhabited worlds. This issue is as old as the world — as Gindilis Mironovich writes — because, in one form or another, philosophical and scientific thought considered it at all stages of development, starting from the deepest of antiquity. Today it has developed into the SETI program — the search for extraterrestrial intelligence (Mironovich, 2001: 138). How he goes on to write, from a philosophical point of view, the important question is whether highly developed civilizations can pose a threat to humanity. Historical experience teaches us that the interaction of civilizations on Earth usually took place according to a scenario in which the stronger tried to subdue the weaker. Can this scenario come true for further cosmic civilizations?

It seems that such a perspective has prevailed still. For example, this is evidenced by the position taken at the last congress on Russian cosmonautics, which, like a lens, showed the classic motives of an anthropocentric approach to the cosmic space and its role in human life. In this perspective, space exploration is the most important element in the development of civilization on Earth. It brings both obvious current benefits and as a basis for discoveries and wonderful projects, revealing the broad possibilities for the development of human civilization and, in particular, the self-fulfillment of a person (Kuvshinov, 2020: 5-8). Against this background, the vision of Mironovich at the turn of the century was like a cry in the wilderness. In response, he calls for the development of an entirely different paradigm of cooperation, as a historical principle of “technical-humanitarian balance, according to which, the greater the power of production and combat technologies, the more perfect containment mechanisms are needed to preserve society” (Mironovich, 2001: 145-146). If one were to extrapolate these ideas, one could find here the prophecy of posthumanism.

The leading theorist of posthumanism, Francesco Ferrando, does not doubt that man, in a sense, has always been in space, so the question “should people go into space” should be considered rhetorical. She recalls the story of the cosmic rivalry, which was another part of the “Cold War.” As she writes, people have already been in space since a series of successful launches following the space race between the Soviet Union and the USA in the 1950s and 1960s (Ferrando, 2016: 141).

Of course, suppose we are talking about a meeting of other cosmic civilizations. In that case, there is not only a problem concerning the technologies of the future on both sides of these meeting civilizations but a more fundamental issue, that is, what one means by an intelligent form of life. After all, the man not only means about “listening to each other (with extraterrestrial being).” He always wanted to be in space, to explore it, and above all to interact with other intelligence. Of course, apart from the question of the ability/inability of the human species to travel in space due to biological conditions. Already at this initial stage, the human being proves to be less adapted than robots and other AI machines. This may fundamentally undermine the sense of not only the discussion but also the practical intentions. However, as Francesca Ferrando writes, it is rather leading to deconstruct the essentialist concept of man, which will allow an open ontological framework for various

forms of existence in space (Ferrando, 2016: 141-142). To remain with the position we have taken so far is a well-known dystopian scenario. For example, Ricardo Campa and others write about such a version related to the competition for cosmic natural resources between man and hostile to him AI (in the form of the notorious Singularity) (Campa et al., 2019).

That is why reflection within the so-called philosophical posthumanism current deconstructs the existing (anthropocentric) center of discourse, enabling a multifocal approach and promoting a dynamic openness that takes into account the multiplicity of perspectives (Ferrando, 2019: 118).

This makes it possible to answer the question about intelligent forms of life, but already in a completely different configuration, related to the development of advanced technologies, automatization, and AI. A particularly comprehensive answer can be found in a recent work published under *Philosophical Posthumanism* by Francesca Ferrando. The comprehensive vision proposed by Ferrando is not only very topical and conclusive in the scientific sense, but it is also read as if the aim here is to provide an exhaustive theoretical interpretation for the whole of science fiction creativity. Readers and authors can find answers to most of the questions here.

About the problem of the definition of life, Ferrando states that both the biological domain and ancient beliefs, such as animism, do not consider a permanent division between what can be considered animate and what can be considered inanimate, which becomes particularly complicated due to appears, as a result of the development of advanced computer technologies, of the problem of so-called “artificial life,” which within the frame of the philosophy of posthumanism should be considered as part of posthuman life (Ferrando, 2019: 109). Of course, when this artificial life is legitimized, there is always the fear about the possible ontological primacy of the new form over the old. However, as Ferrando claims, from the point of view of philosophical posthumanism, granting the artificial life of equal rights in the kingdom of the whole spectrum of life in the posthuman world is unlikely to lead to that situation. Therefore, this does not mean accepting a vision of a dystopian future in which ‘nature’ will be replaced by artificial replicas.

However, as Milan Cirkovic, for example, says, although most transhumanists/post-humanists consider the nature of future civilization to be postbiological, they are not willing to abandon the biological motivations underlying any conscious action known to man, including to it a post-biological entity. This approach leads to specific technological optimism. As he writes, most, if not all, technological optimists are enthusiastic supporters not only of all naturalistic, but especially of the neo-Darwinian, evolutionary approaches to the origins of humanity, and even of the sociobiological origins of human culture and technological civilization. The situation seems, according to him, to be as follows: if we agree that specific biological motivations/ instincts were a decisive factor in the biological (human) phase of the history of our species, it would be reasonable to say that after the transition to the posthuman phase, the old biological impulses and motivations will become largely irrelevant. Paradoxically, it is rare for techno-optimists/transhumanists to see things that way. It is generally agreed that posthumanism will enable the same Darwinian goals and tasks to be achieved faster and better. They will be simply some new means to the old goals. Cirkovic, on the other hand, recognizes that this view is old-fashioned, illogical, and ultimately untenable. Rejecting it may shed new light on issues in the field of future studies of advanced extraterrestrial civilizations and ongoing SETI projects (Cirkovic, 2008: 247).

After all, the question is fundamental — why do these post-humanist, postbiological, extraterrestrial agencies/subjects function and work, what ‘pushes’ them forward.

For Milan M. Cirkovic, it is not important what forms of posthumans life will be present in the next stage, be it ‘uploaded’ people or ‘robots’, etc., because finally, they all fit into a simplified scenario of an inherently complex and heterogeneous evolutionary process. The following issue emerges in the context of ATC (Advanced Technological Civilizations): such traditional biological imperatives as survival to childbearing age, to leave as many and healthy offspring as possible, infant protection, various forms of biologically conditioned social structures — all this will become marginal, if at all not disappear, as an important motivation/stimulus/determinant for individuals and groups. In this perspective, there is no place for genetic inheritance, which is an inter-generational transmission, no threatening environment that exerts selection pressure, no need to preserve biologically conditioned sexual differences, no biotic competition, no selection of relatives, no ecological constraints (the environment is digital), no minimal viable population (Cirkovic, 2008: 251).

For the latest post-humanist reflection, such an approach is a classic expression of traditional hegemonic anthropocentric discourse.

For the first time, the issue of the one-sidedness of the previous concept of life was raised by Rosi Braidotti, who stress that it is necessary to finally put an end to the perception of life through the prism of the bios category, i.e., the strictly anthropocentric and political category, and to give priority to understanding life as a zoe, as something vitalistic, productive and prehuman (Braidotti, 2019). In the humanist paradigm to date, Zoe has been excluded from the sacred area of the “I” and is experienced as something alien. The concept of bios/Zoe has allowed Braidotia to create a new framework for the approach to life.

Marietta Radomska writes, “Braidotti’s proposal is some kind of “symbiotic,” requiring the “dissolution” of the previous subjectivity to be able to consolidate it anew — but this time as a nomadic network of mutual correlations and connections, putting the generative power to Zoe — Life” (Radomska, 2010: 72). Braidotti rejects anthropocentrism and leads to dismantling the category of nature. According to it, the division into nature and artifacts is destructive. Hybridization is normal, and the human perspective to date was based on the Bios. The perspective of Zoe — an impersonal, inhuman life — should be taken. Zoe’s discourse transcends the boundaries of what is organic/mechanical and allows for the recognition of the acting of non-human subjects. It is closely related to the construction of the subject as a relational entity, whose fundamental attribute is the ability to create connections, not reflectiveness or reasonableness.

Rosi Braidotti defines post-humanistic theory as a process ontology that challenges the traditional identification of subjectivity as the rational consciousness, thus opposing its reduction to some objective and linear construct. The nomadic vision of the human cognitive subject as a time continuum and collective assembly avoids the dualistic frame and shows it as forming a bond with various others and subsequently blending in with the technologically mediated planetary environment. The result of combining what is human with what is technological is a transversal alliance, a new kind of ecosophical unity resembling the symbiotic relationship between the animal and its planetary environment (Braidotti, 2014: 317-318).

Braidotti states that “we can all gain if we realize that the place of Beings, once known as the “other” for anthropocentric and humanistic “Man,” is occupied by postanthropocentric, transversally and structurally unrelated embodied non-human entities” (Braidotti, 2014: 209). This seems that it was the prelude for Ferrando’s subsequent vision of the subject as the part of “artificial life.”

Francesca Ferrando goes further and, based on philosophical posthumanism, which deconstructs the anthropocentric hegemony of identity formed on the bios paradigm, builds post-humanist anthropology. She states that it gives us an open platform for various life projects, both earthly and interstellar. She writes about it: “Following these reflections, we can conclude that the strict boundary established in the Western hegemonic tradition between organic/inorganic, biological/artificial and physical/virtual faces a radical challenge not only from different cultures and different time perspectives but more generally, through ongoing changes in areas such as artificial intelligence, including robotics and virtual reality” (Ferrando, 2019: 113).

The post-humanist approach is fundamental to developing that epistemology that analyses future civilizations and existence (terrestrial and extraterrestrial) in the context of new technologies to avoid the mistake of opposing technology man.

This position makes it impossible for people to transform a robot into a new symbolic other and avoid falling into the dualistic paradigm that historically characterized Western hegemonic positions, articulated in contrast to those of man/woman, white/black, man/machine, and me/other. In hypothetical cases of AI taking power, the adoption of posthumanism, postanthropocentric, and post-dualistic social practices will also prevent dualism and ultimately even discrimination against people by advanced AI. A careful reflection on the interaction between species takes the discourse into the interior of a symbiotic paradigm, not a dualistic one. The difference becomes an evolutionary feature of existence; this realization has not only scientific value but also social and political usefulness. The integral epistemological approach of philosophical posthumanism can allow humans and robots to fully develop their combined potentials, ultimately facilitating a truly inter-species expedition to existential exploration (Ferrando, 2019: 113).

Francesca Ferrando’s proposal in this context is all the more important because it incorporates the two usual futuristic or fictional visions — utopian/ optimistic and dystopian/ pessimistic. Of course, it is difficult to speak of a strictly objective point of view here, because these visions, after all, are our human visions, and only real contact with extraterrestrial intelligent life will verify scientific and artistic extrapolations. In any case, this is consistent with the vision of philosophical posthumanism itself, which says the following: “Philosophical Posthumanism invites us to proceed in relational and multilayered ways, in a post-dualistic, post-hierarchical praxis which sets a suitable way of departure to approach existence beyond the boundaries of humanism and anthropocentrism” (Ferrando, 2019: 19). One could say that the framework for meeting and theorizing these issues is still our point of view.

Forms of intelligent life in science fiction

In popular culture, the issue of human contact with extraterrestrial intelligent beings has always been between fantastic/fantasticality and futurology, as Stanisław Lem, for example, said. According to Lem, the most valuable is the kind of science fiction that is based on current and scientifically accessible empiricism. Such fantasy, although fictional, is cognitively valuable, is then close to futurology (Lem, 2009).

Of course, the perception of these beings has been burdened from the very beginning with the anthropomorphic/anthropomorphic dichotomy. Initially, alien intelligent beings are shown by reference to humans and are usually specific modifications of the human race. Edgar Rice Burroughs presented such a vision in the series about Barsoom (a vision of Mars as a dying civilization). In his series of adventures of Captain John Carter on Mars, we deal with various forms of humanoid intelligent beings (green race, red race, people-plants, “black

pirates race”) (Barsoom, 1911-1941). *The First Man in the Moon*, 1901 by Herbert George Wells, is the first novel showing anti-anthropomorphic intelligent beings from space, where we are dealing with an insect-like creature, with goggles and thorns on its head (Wells, 1901; Seed, 2018: 40-42). Another famous novel, *The War of the Worlds*, published for the first time in 1898, shows an inhuman race and apocalyptic vision of man’s future. The author presents the Martian’s invasion of the Earth; people from the invaders’ perspective are nothing but ordinary food.

Eminent Russian writers Ivan Yefremov and the Arkady and Boris Strugatsky brothers also had different views on these issues. Ivan Yefremov could not imagine that intelligent beings from outer space were not anthropomorphic. He was one of the active defenders of the anthropomorphism of aliens. He wrote that there could be no early maturation of intelligent life in lower forms such as mold, fungi, plants, crabs, let alone the thinking ocean. He believed in the possibility of semantic information exchange between cosmic civilizations. That is why he strongly criticized the inability of two spacecraft to represent different intelligent races to communicate (Murray Leinster’s novel *First Contact*, 1945) (Seed, 2018: 54). Whereas the brothers Strugatsky, unlike Ivan Yefremov, often refer in their works to non-anthropomorphic civilizations (the non-humanoid extraterrestrial civilization from the novel *Space Mowgli* (1971), the ‘wanderers’ are not very similar to people, etc.) (Strugatsky & Strugatsky, 1971). Most probably because it was difficult for them to say anything concrete about possible life forms and types of mind in the universe (Tenyakova, 2007: 122-124).

Another intelligent cosmic civilization popularised by the series *Star Trek: Enterprise* is the Borg race. As Lynette Russell and Nathan Wolski write, “The Borg stands beyond reason, communication, and understanding. They are presented to us and experienced by the crew of the *Enterprise* as irrational beings” (Russell & Wolski, 2012). Initially, the Borg are represented both as completely homogenous and as different from the Federation. The Borg are a race of enhanced humanoids transformed by cybernetic devices, functioning both inside and outside their bodies. Ultimately they turn out to be the most inhuman race that had met by the crew of *Star Trek*.

The humanoid body is like an empty shell on which technological modifications are made; what matters is not the body’s integrity but its technological functionality. It does not matter whether the body is the body of a human, Klingon, Vulcan, or another alien. All humanoid beings are potential resources for the Borg collective, which is becoming a “multiracial mass.” Visible transformations, such as the introduction of tubes and the addition of artificial limbs and eye prostheses, define the Borg race as non-human. Each Borg unit is connected by a subspace communication network that constitutes a homogenous synthesized whole — a unity, a Borg collective. Although the Borg unit is a separate physical entity, it is not capable of individual self-determination. Free will, self-determination, and choice are erased from the “mentalities” of Borg assimilated members of other races. The Borg are presented and experienced as something completely different, beyond the sphere of experience even known to the *Enterprise* crew. A Borg ship is unlike anything they have encountered before. It shows no signs of a command center, crew quarters, or even crew. Scanning the ship for life signs is fruitless because the Borg does not register as a living vessel in the classical, humanistic, biological sense of the word. The Borg collective is a unified whole, not a collection of individual minds. Multiplicity is unity. Each Borg is the same as the others. They are all completely homogenous (Russell & Wolski, 2012).

An exciting example of an unintentional creation of cosmic civilizations as if tailored to a post-humanist model (but without an optimistic message) is provided by the book by the

Polish author titled *Głębia* (Deep) (Podlewski, 2015- 2018; space opera in 4 volumes). An author has presented all possible forms of intelligent inorganic and organic life. All forms of intelligent life, organic and non-organic, proposed by the author, fit perfectly into the framework proposed by philosophical posthumanism.

Initially, we have humanity, which lives in a certain symbiosis with Others/Xeno in a political organization called The Galactic Empire. However, the question of Xeno is not entirely resolved, because there are still problems with ‘familiar’ aliens and the new ones, because the Empire has still problems with communication with them. The Galactic Empire has existed in something like an idealistic permanent Xenological Programme. However, in the following attempt to contact further aliens/Pilgrims on the planet Ether, an indeterminate transgressive intelligent entity was emerged (Antenate, Plague). That existence comprehended that the unification of people with aliens would only be possible if humans become mentally similar to aliens, which would mean the end of human civilization. The first war between People, Aliens, and Machines (artificial intelligence created by humans) and the Plague, started when the Plague took over part of the Empire’s army and threatened its extinction. The war ended with the success of the combined forces that destroyed a transgressive being called the Plague. However, as a result of the perturbation, emerged a war between the Aliens (until now humans friends) and the Humans and Machines. Finally, the aliens were driven out. Then has started the war between humans and Machines, which have organized themselves in integrative Unity — a transgressive Artificial Intelligence that advanced itself thanks to humans during the war with Plague. It is then that Unity uses the cosmic weapon — for the total burning out constellations of stars. The Galaxy Burnt out is precisely the remnant of the Milky Way, irretrievably ravaged during the historic war with the Machines. However, this Firing starts to live its life.

Against this background, the author, referring to the classic themes of adventure, interstellar travel, battles, and skirmishes, presents the reader with an interesting story of Grunwald Myrdal, one of the last people not contaminated by biotechnological improvements. The universe of the novel seems to be a model universe of posthuman philosophy. Here we have a spectrum of intelligent forms of organic and inorganic/ artificial life. The first species are people who seem to fulfill the postulate of transhumanism (Vita-More, 2006). In the novel, the human race is the main object of the author’s writing. There are the Humans + Tech-Personal (i.e., implemented to human fetuses through nano-injection, biotechnological chip). As it was said, genetically pure people no longer exist. We find a slightly similar situation in Stanisław Lem’s novel *Return from the Stars*.

The group of living intelligent forms includes other races presented in the novel. The collection is a spiritualist, transgressive sect. They want to develop the human spirit and psyche. The collection aims to free man from the body and function as a collective being, a mental entity. According to them, the body is only a cocoon for the spirit. To achieve this goal, they undergo gene-transformation. Another race is STRIPS — an acronym from Simultaneous Technique of Posthuman Intellect Development (in Polish). These creatures think they are machines, they identify themselves with them. They think that the world is a simulation, so death is simply the end of the simulation. They can be classified as another version of a transhumanistic project. This race dreams to embody itself in metal — in a machine. Their mentality is like computer programs. They profess the principle of technical salvation. Pilgrims — an alien species of the close type, that is, capable of communication. This species has been researched within the framework of the Empire’s Xenological Programme. Pilgrims’ representatives used a language based on crackling sounds; some of the detected

semantic forms intuitively fit into the simple forms of the Empire's praxis; because they were contacting with another Xeno races, the Xeno was considered by the Thinkers of the Empire to be a race focused on diplomacy. They traveled the Galaxy on live ships and knew little about their home planet. The Elohim is a human race that seeks to join with aliens/ Pilgrims. They worshiped mythical aliens; the Elohim slogan — the limit of man is the man; they want to become like the aliens through genotransformation. Machines (could rebel, as Francesca Ferrando, for example, warns us about) — robots created by man in the image of humans and animals. They have become alien... In human nomenclature, there were four levels of machines. AI-first level — the level of insects. Second level AI — the level of animals. Third level AI — a level similar to human intelligence. The third higher-level AI ('3.5') — almost corresponding to human intelligence — was the 'castrated' AI of spacecraft. Fourth-degree AI Autonomous Programming Units of Class D (JAR-D). During the Machine War, machine entities achieved the character of integrated existence — Unity. Not a separate machine is an entity, but Unity is a Being; Machine is a separate part of Unity. Being is a program — a code of Machines.

Studying in detail the characters outlined by the author of *The Deep*, one can say that the fantastic world created in this work, as well as that of other science fiction authors, sometimes rises to the level of a pro-philosophical reflection formulating as yet unspecified issues, categories, and problems connected with the current state of the world in which human, posthuman civilization functions.

Conclusions

The results of our research are as follows.

1. It is shown that the posthuman perspective has the greatest cognitive potential concerning the problem of the coexistence of various forms of life in the cosmos, both organic and inorganic.
2. It also allows for the reconfiguration of relations between humans and posthumans, including entities built on AI.
3. It is shown that the universes presented in science fiction can be an important starting material for advanced philosophical reflection.

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Paradoxical Nature of Language in Terms of its Acquisition and Learning (Based on Plato's "Cratylus")

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Sodomora, Pavlo and Oleh Yerchenko (2021) Paradoxical Nature of Language in Terms of its Acquisition and Learning (Based on Plato's "Cratylus"). *Philosophy and Cosmology*, Volume 26, 123-131. <https://doi.org/10.29202/phil-cosm/26/10>

The process of learning is analogous to the process of motion, as well as it resembles the progress from less to more perfect. Plato, combining two opposites, attempts at reconciliation of the theories of Heraclitus and Parmenides, providing us with his amazing theory of Forms. In light of this, he speaks of language as a means of cognizance of the Universe. In his own turn, and much later, Ludwig Wittgenstein, combining incompatible, speaks of language as the single subject which requires explanation. As well as it can be seen from the history of the development of understanding, those who dared to combine two opposites have come up with amazing discoveries. New discoveries in the field of gravity are likely to throw some light on the solutions to Zeno's paradoxes and, at the same time, reveal and explain to us the paradoxical nature of language acquisition. The article argues that the phenomenon of language possesses a paradoxical nature that seems not to be unambiguously explained by behavioristic theories. As a result, this view serves to the development and improvement of newer approaches to the learning of a second language, which is completely distinct from the process of primary language acquisition.

Keywords: paradox, understanding, perception, essentialism, linguistics

Received: 7 December 2020 / Accepted: 3 January 2021 / Published: 29 January 2021

Introduction

The question of knowledge acquisition, regardless of its own remarkable age (about 25 hundred years), still has not been provided with distinct and clear definitions. The acquisition itself, as contrasted with learning, is generally assumed as a relatively unconscious process of mastering language skills while learning is treated as a rather conscious process of studying the second language (Krashen, 1981: 132). In fact, this is what Plato gives hints about in his theory of reminiscence. Although the process of language acquisition is referred to the unconscious acquiring of the first language in early childhood, some scholars (Dorsch, 2010) still claim the adults can study the second language similarly.

Hence, there have appeared the studies of the researchers aimed at finding both the differences and possible links between these two processes. Given the complexity of this question, some puzzles about knowledge, as it seems, are going to be discussed for the next 25 hundred years; this is why this article does not intend to provide firm solutions to this question. However, this approach provides us with important inferences on the nature of primary language acquisition and contrasts it with the process of learning second languages. Contrastive analysis of the two processes can provide us with important inferences on learning of the second language.

It is suggested that these two processes are completely distinct and share little in common regardless of their similarity at first sight. According to Aristotle, the learning process, being a certain motion from imperfect to more perfect, possesses its own paradoxical nature, similar to the Achilles paradox. It is credited that those who acquire the language proceed their own order in the process comparing to those who learn it. In this article, an attempt at studying the process of learning is made on the basis of learning the second language.

Language: Approaches to Language Phenomenon

The concept of motion that is perceivable by senses is substantial for Aristotle as well as for Aquinas as a leading proof for the existence of Prime Mover, and, consequently, God. But the concepts of space and time, and consequently of motion, are both paradoxical and vague, according to Zeno. Following Zeno, many thinkers have admitted the paradoxical nature of space-time and being, which is assumed to be difficult to explain. Despite the fact that Zeno's paradoxes seem to be ridiculous at the first glimpse, they still require sophisticated and perplexed calculations to be dissolved at least partially. This ancient Greek thinker established his own view on the nature of the Universe. This view questioned basic principles that served the basis for Aristotle, Aquinas, and other thinkers long before they had been created.

Since the controversy between Heraclitus and Parmenides, two approaches to the question of how the Universe is being perceived have been arguing through all four ages of understanding. The issue is far from being extinguished even today. In order to grasp the extent of disagreements between adherents of approaches, it might be useful to have a brief look at the philosophy of linguistics, including the most important recent theories (Akmajian, 2010). Basically, there are two basic approaches to linguistic theorizing, although this might be seen as too simple approach to the subject.

Regardless of the age of the controversy initiated in Antiquity, these two approaches are based on the criteria, similar to those of Heraclitus and Parmenides, although it can also be regarded as oversimplification or exaggeration. These approaches are usually referred to as externalism and essentialism. The distinction between the two resembles the Aristotelian

versus Platonic approach to epistemology, and not only and exclusively: this can be said about their views on the nature of being in general. Externalists basically claim that primary language phenomena depend on actual utterances produced by users, while essentialists, in contrast, claim that language phenomena are based on intuitions and abstract universal principles. The researcher's works apparently show that the dialogue between the two is extremely rare (Phillips, 2010).

The analogy between the aforementioned approaches and Aristotelian vs. Platonic systems needs to be clarified in more detail. It should be mentioned that the names given to the approaches are just descriptive, hardly resembling the nature of topics being described. Sometimes externalists are referred to as "empiricists," although this title is not accurate due to several reasons, not to be discussed here. On the other hand, essentialists are referred to as "formalists" because of their adherence to abstractions, and consequently, mathematics and logic. In addition to this, the adherents of the latter consider the possibility of an infinite set of expressions that are not evident from the experience of language use. Infinity is an important notion which is applied to a variety of concepts, including linguistic ones. Especially, Zeno's paradoxes deal with an infinite number of parts.

Generally, while Leonard Bloomfield is the intellectual ancestor of externalism, then Noam Chomsky is the intellectual ancestor of essentialism. For a huge majority of those who practice this approach, researchers in the tradition of generative grammar are associated with Chomsky, i.e., postulating universals of human linguistic structure, unlearned but tacitly known, that permit and assist children to acquire human languages (Scholz, 2020). It can be seen quite obviously, that the aforementioned features of externalists and essentialists in their own way resemble Aristotelian and Platonic approaches to epistemology (McKee, 2008). Language acquisition, of which Noam Chomsky speaks, in fact, supports Plato's theory of reminiscence. As a continuation to the subject, second language learning versus acquisition has been discussed in academic circles (Krashen, 1981: 15-18).

Paradoxes in the Process of Understanding

Starting with Aristotle, the leading role in the process of acquiring knowledge has been assigned to experience, which is obtained basically from senses. Consequently, Thomas Aquinas, while developing his "Christian Philosophy" (Gilson, 2002), referred to Aristotle's conceptions on how knowledge is acquired. Even today, experience finds its place in the works of philosophers (Riegler, 2017). But this approach did not appear out of the blue: previous thinkers contributed significantly to the development of realism and other currents in philosophy. In fact, similarly to those of Plato, Aristotle's works were aimed at reconciling opposite theories of Heraclitus and Parmenides. Zeno of Elea, being a pupil of the latter, developed a series of paradoxes, or *aporiai*, which puzzled not only Aristotle, but all upcoming generations of philosophers. Even more, they triggered many thinkers to develop their own paradoxes.

In fact, *aporiai* do not exhibit their existence in the real world, that of Aristotle: but still, they are extremely difficult to refute. Saying just "no" is not enough, as well as such an answer is not going to eliminate the contradictory nature of paradoxes. This article is aimed at discussing ancient *aporiai* in the light of new discoveries in sciences and linguistics. It is worth mentioning that recent paradoxes, compiled by Russel and other thinkers, already possess distinct nature compared to those developed by Zeno. The newer paradoxes possess more abstract nature, which can be seen while contrasting an Achilles-tortoise paradox and that of Russel's barber one. This can be linked to the development of civilization, as it will be specified further on.

Paradoxes of Zeno, regardless of their first-glimpse ridiculousness, triggered the discovery of several methods in mathematics, including that of "calculus" (Grünbaum, 1967:

13-23), and aim at settling definitions of infinity, which in a certain manner resembles the approach to language suggested by Wittgenstein, and later by Chomsky. This is why the so-called “*aporiai*” force us to revise beliefs in a highly structured way. For instance, much epistemology orbits a riddle posed by the regress of justification (See Meno’s paradox). The impossibility to reach infinity was a pivotal point in Aquinas’ theology, as far as he speaks of God being an infinite Being, which is impossible to comprehend, i.e., to learn. Starting with Zeno, infinity has been widely discussed in a variety of subjects. There is a difference between the so-called “potential” and “actual” infinity, but this issue is analyzed elsewhere (Dowden, 2007), although any potential infinity presupposes the actual one. The concept of potential infinity can be applied to language, as it appears from the works of the aforementioned scholars (Tarski, 1924: 25-27). Bertrand Russell contributed significantly to the development of paradoxes (Kevin, 2003), but in a more abstract manner than those of Ancient thinkers, consider “barber’s paradox,” which deals with overlapping properties.

As it can be seen, paradoxes aim at settling questions about the most apparent phenomena of reality, which still have no explicit explanations, and are linked with non-traditional approaches to the most important questions, e.g., time, space, and language (Grünbaum, 1967: 4-5). Debates between adherents of rationalism and empiricism were settled on the basis of paradoxes (Sorensen, 2003: 12). Hegel deemed paradoxes to be proofs of his ideas on the inherent contradiction of reality. And, as it has been stated earlier, according to Plato, language is a way to the cognizance of the Universe and of reality.

Aristotle frequently referred to *aporiai* in his works, and in his “*Topicon*” Aristotle asserts that although paradoxes do not agree with common beliefs, they are difficult to repudiate (Palmer, 2013), which provides us with the possibility to assert that language is of paradoxical nature which does not undergo any rules, despite linguistics tries to attest this. In fact, humans possess everything in a set of innate primary grammar compositions, which are applicable to any language. Similar to recent discoveries in physics, namely that of gravitational waves and others, the paradoxical nature of language is being revealed in the new light. This is probably why Plato never stated anything clearly in his dialogues, never provided us with the answer on the conventional versus natural nature of the language. It is suggested that Zeno developed his paradoxes as a response to attempts of Pythagoras to link reality to mathematics. Apparently, *aporiai* point to a more exquisite mode of connections between reality, perception (Russell, 1919), and language. It seems that a theory of relativity questions not only Newtonian principles of gravity, but it can be applied to linguistics in terms of questioning language rules.

Paradoxes assert that many things, in fact, are not what they seem to be, i.e., either the things themselves or our perception of them is fallacious (Huggett, 2013). This is what has been recently proved by the experiments conducted at gravitational observatories (LIGO). Gravitational waves warp space-time (Kramer, 2017), which we take as fixed by definition: apparently, this is not necessarily so. “Experience is false,” as Hippocrates claims, assuming that our senses can provide us with warped information. Later on, Descartes will support this point of view, providing more detailed proofs for the impossibility of obtaining proper knowledge from sense perception. In fact, this is what Chomsky speaks about today in terms of linguistics, with other scientists reflecting on the same ideas in a variety of applications. The illusory nature of motion from the point of view of Zeno still puzzles scientists even today: supposedly, if we can not see something, we can see something which does not exists (Phipps, 2020). Despite the fact that this phenomenon is very familiar to all of us, the principles of gravity are still to be explained. The same can be said about the phenomenon of language. But philosophy always settles questions, while other sciences provide answers (Deely, 2001: 238).

Language and Paradoxical Nature of the Universe

In order to be able to discuss broad questions about reality, there is a need for using a framework of some form. Again, in order to define a proper kind of framework, it seems appropriate to refer to the Antiquity. Thus, according to Heraclitus, the whole Cosmos is a well-organized system that resembles the language (Curd, 2016). This is why language can be used as a model we are using to communicate any other model, even those which are much wider, e.g., the Universe in general. Therefore paradoxical nature of the Universe is being exemplified in this research by the nature of language. But due to the abstract nature of language, it appears to be pretty difficult to define what is to be understood by the term "paradox." In order to clarify the meaning of the term, it would be useful to refer to Antiquity as well. Similarly to the process of studying at high school in particular, when kids are taught how to calculate, for example, apples, and only having learned this, they are taught how to calculate numbers (as far as no number by itself is linked to any object), humanity, in general, has been studying in the very same way.

Having started with materialistic views regarding the Universe, presidents triggered a more exquisite and subtle approach to understanding. As a result, Plato's theory of forms is closely connected with the nature of language which is discussed in "Cratylus." The most important question settled by Plato in this dialogue is the controversy between conventionalism and naturalism. Thereafter, these two opposite currents have been represented during all four ages of understanding in European thought and acquired their development in various fields. This is why St. Augustine, being a true Platonist, developed his theory of sign on the basis of some thoughts expressed in "Cratylus" (Plato, 1997). Finally, but not lastly, the theory of language acquisition acquired its continuation in the so-called "20-century debate" between nativism and empiricism represented by Chomsky and Skinner's theories of language, respectively. This is why the truth promulgated by Socrates as well as questions settled by his great disciple still remain valid in our post-modern civilization.

The basis for considerations of two main characters in the dialogue, namely Cratylus and Hermogenes, is language. Socrates, being a moderator of the discussion, strives to reconcile the two opposite views. The philosophy of language, which was initiated in this dialogue, still has not obtained answers to the questions settled by Plato. In fact, it just acquired various solutions among different approaches during all four ages of understanding, namely Ancient, Scholastic, Modern and Post-modern periods. Questions, risen by Plato in his "Cratylus" found their continuation in various nativistic theories of language, especially in recent works of Noam Chomsky (Chomsky, 2002). Plato, speaking in his dialogues on behalf of Socrates, his teacher, etymologically proves that stargazing is the unique ability of humans (Sedley, 2003). In fact, this is what can be seen even from the etymology of the Latin verb "considerare," which is common in the English language as well: consequently, humans stare at what is considered to be "beauty," or "cosmos," which exists in harmony and is opposite to Chaos, from which Demiurge created the world.

Despite the fact that dialogues possess a relatively easy and reader-friendly form of explanation, the interpretation of dialogues requires a deep understanding of questions settled by their author. Plato never strives to establish his authoritative solution to this or that issue that arises in the process of discussion: this is why it causes certain complications in grasping his precise point of view. Socrates, being the representative of Plato's positions in the dialogues, uses his well-known "Socratic method" of arriving to the proper solution, the most famous feature of which is avoiding direct indications of the correct answer. Apparently, Proclus (Proclus, 2007) provides us with a completely so-called "internal" meaning of Plato's text, similarly to what Swedenborg (Swedenborg, 2001) says about the internal meaning of the Word. This occurs due to the fact that Plato never expresses his exact

position on the discussed issue, namely the correlation between two opposite views on the nature of language (Sodomora, 2019), which are represented by contemporary notions of conventionalism and naturalism.

Being realist, Aristotle, in contrast to Plato, was convinced that humans could learn from experience only. Thomas Aquinas, Stagirite's follower, in his "De Veritate" (II, 3) says that "nihil in intellectu nisi prius in sensu" (Aquinas, 1970), which means "nothing in the intellect unless first in sense." The phrase eventually became the guiding principle of empiricism, accepted later by John Locke and others (Deely, 2001: 521). In such a way, Aquinas establishes the basis for empiristic theories. But the question of empiricism versus nativism underwent newer development in Descartes' theories, as well as those of John Locke, his contemporary opposer. The nativistic theories of Noam Chomsky are currently representing this point.

Plato strives to reconcile two opposite views not just because he wants to establish his own theory, but because he respects previous thinkers. He is convinced that we already know everything. Just proper recollection is required to arrive at a proper answer. His theory of recollection prompts him to reconcile the opposites, namely conventional and nativistic approaches to the theory of language. Modern science presents a variety of researches in conventional theories of meaning. For example, David Lewis suggested the first theory on the relationship between social conventions and linguistic meaning (Lewiss, 1969: 165-7). The author starts with the so-called "signalling" issues: in comparison with regular linguistic interaction, these so-called "signalling" issues, there is no need for speakers to make an agreement on special actions in certain situations.

Despite not actually being a follower of Plato, Ludwig Wittgenstein, in his attempt to combine incompatible, initiated the process of studying language through the perspective of math. Similarly to the famous inscription at the entrance of Plato's Academy claiming "ageometretos medeis eisito," which is "Let no-one without knowledge of geometry enter," famous mathematician considers language as the only subject which requires explanation. Paradoxically, for Wittgenstein, exactly as it was for Plato, the totality of things, which is, in other words, the Universe, can be described in no other ways, but via linguistic expressions. Being a mathematician, he compares a linguistic expression to a projection in geometry. Consequently, similarly to a geometrical figure, which can be projected in many ways while remaining the same, each of these ways corresponds to a different language. This is what can be represented in the process of translation from one language to another, resulting in an infinite number of options (Sodomora, 2009: 749). Still, all these options resemble the primary linguistic "figure," or expression.

Consider a situation, when I ask for "blue" milk in the supermarket instead of "yellow" one, and I am given what I want without extra questions and without a preliminary agreement, as far as it is well-known known that low-fat milk is being sold in blue boxes. The conventionality of meaning was a subject to discussion in the works of many authors (Lepore & Stone, 2015). As a rule, today, the majority of scholars support the point of view of Hermogenes (Devitt, 2006: 45), namely conventionalism of linguistic meanings, but there is a disagreement about the role of social conventions (Rescorla, 2008). Such paradoxical nature of language resembles the paradoxical nature of the Universe.

It is apparent that Plato's dialogues are still underinvestigated in terms of solutions to the questions settled there. Actually, dialogues ask more than they answer. But this was the style of Plato's works in general. But still, Plato is considered to be one of the most penetrating philosophers in the history of understanding. His influence is still valid in various fields of philosophy, especially in epistemology. When one compares Plato with some of the other philosophers who are often ranked with him — Aristotle, Aquinas, and Kant, for example —

he can be recognized to be far more exploratory, incompletely systematic, vague, and playful than they.

Leaving the variety of theories aside, it is necessary to confirm that the idea of the dialogue, namely reconciliation of two distinct views on the nature of language, remains the same. The theory of language acquisition acquired its continuation in the so-called "20-century debate" between nativism and empiricism represented by Chomsky and Skinner's theories of language, respectively. This is why the truth promulgated by Socrates as well as questions settled by his great disciple still remain valid in post-modern civilization. Therefore, many of his works give their readers a strong sense of philosophy as a living and unfinished subject (perhaps one that can never be completed) to which they themselves will have to contribute.

The language paradox stating that all languages are easy to learn is true due to the well-known fact that every child is able to learn languages easily. However, when a person grows up, the statement seems to be false, as well as other languages are quite difficult to learn. Apparently, there is no technology in the world that comes close to the learning ability of a normal two-year-old learning a language: no one knows how it happens. Actually, the English word "infant" derives from the Latin word, which means "not speaking," but within a few short months, the baby begins to recognize the extremely complex structure of the language, understand the connection between sounds and meanings. Paradoxical apparent simplicity and hidden complexity of language contributed to the development of the nativistic theory of the language.

Conclusions

The survey presented shows that the phenomenon of language still requires further explanations. This becomes a more vital issue when it comes to the learning of the second language. Intriguingly, regardless of the larger mental capacities of adults comparing to those of kids, the former class finds learning the second language much more complex than the latter. Due to the impossibility for us to get back into childhood in order to learn the second language easily, it becomes more and more essential to administer newer approaches based on modern linguistic theories. In fact, as it can be seen from the experience of teaching foreign languages to adults, it appears that learning vocabulary as one set and grammar as another does not necessarily result in language fluency. As Wittgenstein suggests, we communicate not via words and grammar, but via images. This is why it seems to be more efficient for us to learn phrases or even chunks of text instead of disconnected words to be able to use our language material for communication.

Being native speakers, we usually use grammatical structures properly without even knowing the rules, which appears to be impossible in the process of learning the second language. In this case, only grammar patterns can help us construct a nearly infinite number of grammatically correct sentences. Thus, having learned a certain number of such patterns, even without knowing the rules, producing grammatically correct sentences becomes possible.

Paradoxically, second language learning is supposed to be closely connected with direct usage and application of it regardless of the lack of knowledge of grammatical rules and a significant amount of words. According to Plato, we cannot learn anything. We can recall only, which is why, being endowed with thinking, while learning foreign languages, we can produce an endless variety of examples of natural sentences while skipping artificial grammatical rules. The theory of Noam Chomsky, in fact, is seen as the theory which supports Plato's theory of reminiscence.

Finally, as a logical consequence of the research, it seems to us that regardless of the fact who was right or who was wrong, namely either Plato with his theory of reminiscence, or

Aristotle with his realistic approach to reality, still, it seems to us that Plato's theory appears to be more profound in terms of modern language theories than that of his best disciple. But that would be a great subject for the discussion in the next research.

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Section Three

COSMOS AND HISTORY

Does a Theory of Everything Exist?

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Johnson, James (2021) Does a Theory of Everything Exist? *Philosophy and Cosmology*, Volume 26, 132-147. <https://doi.org/10.29202/phil-cosm/26/11>

Since Einstein's failure to define a Grand Unified Theory, physicists have pursued a comprehensive theory explaining nature, a Theory of Everything. But because General Relativity, Quantum Field Theory, and Cosmology have little in common, defining one theory is an imposing task, having eluded the best scientists for ninety years. So are we close to defining a Theory of Everything? This analysis, after defining requirements (which must include initial conditions), identifies four possible options for a Theory of Everything. Quotes from prominent physicists express divergent views on each alternative.

The leading proposal for a Theory of Everything is String Theory, which has possible issues. It requires supersymmetry, has extra compacted dimensions, and is background-dependent. A second less comprehensive theory is Loop Quantum Gravity, which emphasizes background-independence based on discrete quantum space. Explaining how theories define relationships between spacetime, quantum space, quantum time, and quantum gravity, positions the role of background-independence in proposed theories.

If supersymmetry and extra dimensions are discovered, String Theory or a modified String Theory integrated with Loop Quantum Gravity, may be the option. Or, possibly a radically new theory might be developed. Or, as the last option considers, the answer to the question — Does a Theory of Everything exist? — may be no; if so, nature will always be a mystery.

Keywords: theory of everything, string theory, loop quantum gravity, general relativity, quantum mechanics, cosmology, spacetime

Received: 12 June 2020 / Accepted: 6 August 2020 / Published: 29 January 2021

Introduction

Scientists labored two thousand years before clarifying how the world acts according to classical mechanics (1800's). Subsequently, another hundred years transpired before Einstein discovered general relativity and another decade transpired before the micro-world of quantum mechanics was defined in 1926. With the detection of the cosmic microwave background in 1967, cosmology flourished. After quantum chromodynamics was defined in the early 1970s, particle and force interactions were predicted to extreme precision. These successes are well known, but there remained one big task, a task Einstein failed (although he labored over it from 1915 until his death) — how to integrate general relativity and electromagnetism into a Grand Unified Theory (GUT). Subsequently, in the 1970s, quantum field theory described all three non-gravitational forces in the same mathematical language. Thus, to obtain a complete description of nature, only gravity was excluded. However, calculations involving quantum mechanics and general relativity produced Illogical results.

We now refer to this big task, the ultimate goal of physics, as defining a Theory of Everything (TOE) — a theory encompassing relativity, cosmology, and quantum mechanics. But why is a TOE needed? Is there a fundamental reason that a TOE exists? Quoting Brian Greene, “Because the gravitational field is woven within the very fabric of spacetime, its quantum jitters shake the entire structure through and through. When used to analyze such pervasive quantum jitters, the mathematical methods collapsed. For years, physics turned a blind eye to this problem because it surfaces only under the most extreme conditions ... when gravity and quantum mechanics are together brought to bear on either the big bang or black hole, realms that *do* involve extremes of enormous mass squeezed to a small size, the math falls apart at a critical point in the analysis” (Greene, 2011: 77-78). Greene continues, “It is hard to believe that the deepest understanding of the universe consists of an uneasy union between two powerful theoretical frameworks that are mutually incompatible. ... We have one universe and therefore, many strongly believe, we should have one theory” (Greene, 2004: 336).

Based on progress over decades, some scientists are optimistic a TOE will be discovered, others are not. Diverse opinions address each of the four options: String Theory, String Theory combined with Loop Quantum Gravity, a New Theory, and a Theory does not exist.

Perspective

The leading contender for a Theory of Everything (TOE) is Superstring Theory (ST) (Note these acronyms, plus QM for Quantum Field Theory and LQG for Loop Quantum Gravity, will be used in most of the text). But not all physicists support ST because it requires both extra dimensions and supersymmetry, which have not been experimentally verified. Also, being based on the concept of spacetime defined by relativity, ST is background-dependent, a potential problem. Thus, a broad perspective of options for a TOE must include all possibilities as shown in Figure 1,

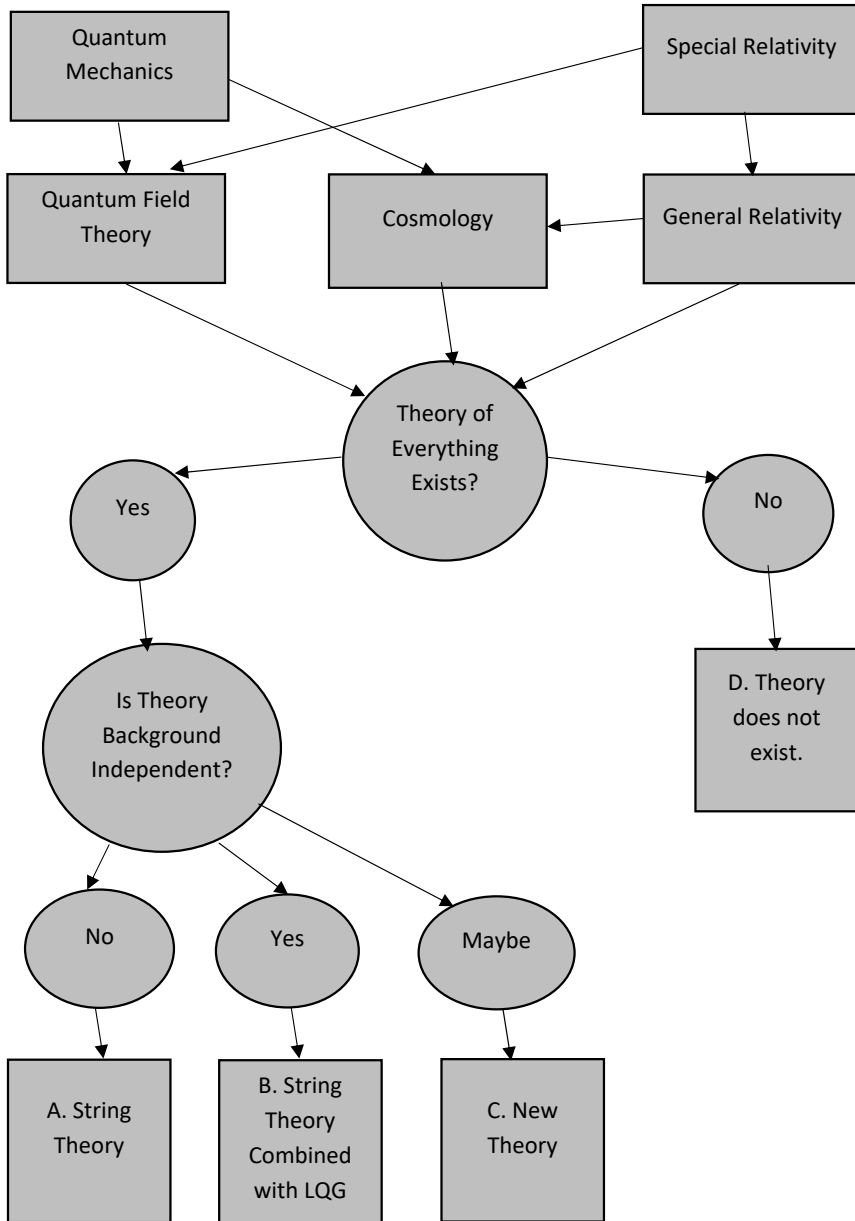


Figure 1. Four Options for Theory of Everything

The top section of the chart depicts the general relationship of a TOE with five major theories (Quantum Mechanics, Quantum Field Theory, Special Relativity, General Relativity, and Cosmology). Conceptually, all the existing fundamental theories could be derived from a TOE. The lower half shows the four possible options: String Theory; String Theory integrated with Loop Quantum Gravity; a completely new theory; and a TOE does not exist. As shown in Figure 1, background-independence is a key issue separating the options.

Requirements

Table 1 lists the general requirements for a TOE (defined by the author). It must: (1) define gravity as quantum, (2) combine the equations of GR and QM to resolve extreme situations and other issues, and (3) explain the values of constants in the Standard Model of Particle Physics (SMPP). By including Cosmology, the study of the origin, evolution, and eventual fate of the universe, as a separate theory, we highlight two additional requirements: (4) explain the constants in the Standard Model of Cosmology (SMC) and (5) explain initial conditions, how energy came into existence, for example via inflation or a cyclic/bounce process. The last requirement (6) is to allow experimental verification. Thus, a TOE must provide solutions to these six requirements. Optional requirements are discussed in the next section. Obviously, since scientists have been working over ninety years on a TOE (previously a unified theory), there are serious issues to overcome. A discussion of each requirement follows.

Define gravity as quantum. The theory of GR is non-quantum, with gravity as an integral property of spacetime. Space and time are interrelated, continuous, and *not quantum* (in the quantum world, energy and mass are quantized using Plank’s constant). Gravity corresponds to spacetime curvature, not a force field, although it acts like one. A TOE defining gravity as a quantum force, like the three other forces of nature, must use spacetime as a backdrop (as in ST) or redefine spacetime (as in LQG).

Requirements for TOE
1. Define gravity as a quantum
2. Combine GR and QM — Quantum Gravity
a) one conceptual approach for forces/particles
b) resolve singularities
3. Explain the values of SMPP constants
a) charge of particles
b) mass of particles
c) force strengths
d) fine structure constant (α)
e) mass electron/mass proton (β)
f) dark matter
4. Explain values of SMC constants
a) density ratios
b) number of photons/baryons
c) homogeneity (Q)
d) dark energy
5. Explain Initial Conditions, cosmology
a) energy source
b) low entropy
c) high pressure and density (temperature)
6. Experimental verification

Table 1. Requirements for TOE

Combining QM and GR. What are the differences between GR and QM that need resolution? The crux of the problem is summarized by Eugene Wigner, “Quantum mechanics and general relativity operate in different math concepts: four dimensional Riemann space and infinite dimensional Hilbert space” (Wigner, 1960). In addition to dimensions, there are other inherent differences between GR and QM. As the quote in the introduction from Brian Greene clearly states, combined equations produce erroneous results in extreme situations, a problem for physicists. “The melding of quantum mechanics and general relativity is an ongoing topic of advanced research” (Greene, 2020: 348).

Explain values of the Standard Model of Particle Physics (SMPP) constants. The dimensional values for an electron’s electromagnetic charge, the strengths of forces, and the mass of fundamental particles are determined experimentally. The three SMPP forces — electromagnetic, weak, and strong operate over distance in totally dissimilar ways and vary significantly in relative strength.

For fundamental particle masses, numerous mathematical analyses have been performed. However, plotting the masses of nine fundamental particles (electron, muon, tauon, and six quarks) produces a statistically random distribution rather than a logical pattern (Tegmark, 2014: 146). The logic to predict their values still eludes physicists.

The SMPP has few natural dimensionless constants; most are ratios; the two most useful and most mysterious ratios are the fine structure constant (α) with a value of 0.00729 and the ratio of the electron to proton mass (β) with a value of 0.000545. A TOE should predict correct values for all of these known constants and ratios.

As far as dark matter, theory and astronomical observation allow estimates of its mass, but physicists cannot explain what it is. Thus, a TOE explanation is welcome.

Optional Requirements for TOE

1. All forces converge to a single force at high temperature and short distances (SUSY)
2. Unify particles and forces (SUSY)
3. Extra dimensions (ST)
4. Explain QM mystery (wave collapse)
5. Background-independence
 - a) Space as defined by LQG (spinfoam)
 - b) Space from fundamental entities
 - c) Space “is what it is”

Table 2. Option Requirements for TOE

Explain values of the Standard Model of Cosmology (SMC) constants. “The SMC constants address aspects of space and have virtually nothing in common, and are not derived from, the SMPP constants” (Scott, 2006). The SMC *dimensional* constants are: energy densities (critical, baryon, dark matter, and dark energy) and a number of photons and baryons. “All except the dark energy density actually vary over time but are considered constants because they change so slowly” (Johnson, 2015). And for the last SMC constant, a clear definition of dark energy (cosmological constant) is a necessary requirement.

“The SMC also has a few *dimensionless* constants, primarily the ratios of the dimensional

constants; however, one well-known dimensionless constant is the measure of homogeneity in the universe, denoted by “Q.” It dictates how galaxies and clusters of galaxies form and is actually a ratio — the energy required to disperse cosmic structures (stars, galaxies, and clusters of galaxies) divided by their rest-mass energy” (Johnson, 2015). Q is validated by the difference in the CMB radiation intensity, about two in 100,000 (Tegmark et al., 2006). A TOE should predict this value.

Establish initial conditions (Cosmology). Initially, the big bang requires an energy source (initial conditions), — something to breathe fire into equations and propel the expansion of space itself. Energy density, low entropy, and temperature were established by initial conditions. Various theories (Inflation the predominant one) propose how initial conditions were established. However, a TOE must rely on existing theories or an alternative proposal based on unique assumptions. For example, a theory must propose a source for energy as the inflaton field in the inflation theory or colliding branes in M-Theory. Five proposed theories are briefly described in the Cosmology Insert.

Experimental verification. Experimental verification is a tough requirement because of the minute scale involved, the Planck length (10^{-33} cm) in current theories (both ST and LQG). However, if a theory cannot be experimentally validated, do we have a legitimate theory? It may be that circumstantial evidence is the only possible validation. For example, current tests for ST involve: searching for supersymmetric particles and for evidence of extra dimensions at the Large Hadron Collider; measuring the gravitational strength at small distances to prove that gravity escapes to another dimension; and searching the sky for fine temperature variations in the cosmos background radiation. However, these tests are not conclusive, quoting Brian Greene on tests for ST, “As of today, then, the most promising positive experimental results would most likely not be able to definitely prove string theory right, while negative results would most likely not be able to prove string theory wrong. Yet make no mistake. If we find evidence of extra dimensions, supersymmetry, mini black holes, or any of the other potential signatures, that will be a huge moment in the search for a unified theory”(Greene, 2011: 96).

Will future technology provide more stringent tests that are able to prove a theoretical TOE? Only time may dictate the resolution of this demanding requirement.

Optional Requirements for TOE

A TOE may or may not include the optional TOE requirements listed in Table 2. As an overview, the first three results from supersymmetry and are certainly possible, maybe probable. The fourth, explaining the mysteries of QM, is less probable. The last optional requirement is background-independence. Brief comments on the five requirements are provided next.

The first optional requirement, all forces (including gravity) converge to a single force at high temperature and short distances result from employing supersymmetry: “At the level of coupling strengths, then, we achieve a complete unification among all four basic forces” (Wilczek, 2015: 317). The unification of particles and forces, which allows substance particles to change into force particles and vice versa, is a direct result of supersymmetry. Unification and extra dimensions are both discussed later under option “A.” Explaining the mysteries of QM, specifically how waves collapse and non-locality, is more a question of philosophy; thus, a TOE may not explain “everything.”

The last optional requirement is background-independence, which in our context, means a theory where space and time emerge from more fundamental entities; thus, space and time

would be functions dependent on other variables defined within the theory. Alternatives for background-independence are: (a) space defined by spinfoam in LQG or (b) spacetime emerging from other unknown entities. A theory could also be valid if it does not meet this definition of background-independence because it is conceivable that spacetime is *fundamental* and may not exhibit a quantum nature or be constructed from more fundamental quantum entities. In other words, spacetime “is what it is.” Thus, background-independence is considered an optional requirement.

We can consider the spacetime background possibilities for gravity by asking a question: Is gravity a property of spacetime as defined by GR? If the answer is yes, spacetime “is what it is” and the gravitational force is *not quantum*. If the answer is no, three possibilities will be explored: LQG, ST with LQG, and a completely new theory. Additional specifics on quantum gravity and spacetime are discussed within options and later summarized (Table 3).

TOE Requirements	String Theory/ M-Theory	Loop Quantum Gravity (LQG)
1. Define gravity as a quantum	Yes	Yes
2. Combine QM and GR	Yes	No
3. Explain value of SMPP constants	No, but possibly in future based on Calbi-Yau shape	No, multiverse is explanation
4. Explain value of SMC constants	No, multiverse is explanation	No, multiverse is explanation
5. Cosmology proposal	Yes, Landscape. Brane, Cyclic, Holographic	Yes, Big Bounce
6. Experimental verification	No	No
Optional TOE Requirements		
1. Forces converge to single force (SUSY)	Yes	No
2. Unification of forces and particles (SUSY)	Yes	No, quantum gravity is focus
3. Extra dimensions	Yes	No
4. Explain QM mystery	No	No
5. Background independent?	No, theory based on spacetime as defined by relativity	Yes, establishing background – independence is basis of theory
Additional Comments		
Concept	Vibrating strings for particles and forces	Quantum of space forming spinfoam
Number of dimensions	Ten space with seven compacted and one time dimension	Three space dimensions

Supersymmetry?	Yes	No
New fundamental constants	Yes, two	No
Time fundamental	Yes	No, change based on causality
Mathematics complexity	Very complex, inventing new math in algebraic geometry and topology	Traditional math
Key Dates	1968 (strong force), 1984 (anomalies), 1995 (M-Theory)	1986
Notable Proponents	Brian Greene, Michael Green, Joseph Conlon, Gordan Kane	Carle Rovelli, Lee Smolin, Martin Bojowald

Table 3. Overview of String Theory and Loop Quantum Gravity

Cosmology Insert. Overview of theories referenced
in options A and B

The **Landscape** multiverse combines string theory and eternal inflation (the eternal or chaotic inflation theory produces separate universes, sometimes referred to as bubbles, each separated by expanding space) to predict an infinite number of universes. The significant difference from the Inflationary proposal is that space consists of nine space dimensions instead of the three space dimensions. These extra dimensions provide numerous “shapes” for space, each shape a different variety of the universe.

The **Brane** multiverse evolves from M-theory theory, which has ten space dimensions. The theory predicts multi-dimensional branes. A “one” brane corresponds to a one-dimensional string and a “three” brane corresponds to a three-dimensional space. Thus, our universe could exist on a 3-brane (one of many) with a large or infinite extent. Different branes reside in different dimensions, not necessarily separated by vast distances in space, and possibly hovering in close proximity to each other. All strings are attached to the brane except for gravitons, which are unattached loops that can leave and re-enter the 3-brane (Greene 2011: 118).

The **Cyclic** multiverse is another prediction based on M-theory. In a process that repeats over time, two colliding branes generate new universes. Although laws remain unchanged, the constants of nature may vary as the process repeats. Consequently, there is an explanation for fine-tuning. Some theorists predict periodic collisions between braneworlds that produce Big Bang scenarios. The proposed cycle, occurring over a trillion years, is: collision, expansion, cooling, dispersion and then another collision. Although collisions occur in long cycles, infinite time generates an infinite number of universes that repeat in time. The process excludes a dramatic “inflation” type of expansion.

The **Holographic** multiverse represents two physically equivalent universes, one existing on a two-dimensional boundary surface mirroring a second universe in three-dimensional space. From black-hole theories, physicists conclude that the amount of information contained within a region of space is always less than the area of the surface that surrounds the region (expressed in square Planck units), a strange relationship since volume increases with the cube of a sphere’s radius. Consequently, since all physical phenomena can be encoded on the surrounding surface, our three-dimensional reality could be a holographic projection from a

two-dimensional surface — the holographic principle. Brian Greene views this development as among the most exciting in decades: “A particular *non-gravitational, point particle* quantum field theory in *four* spacetime dimensions describes the same physics as *strings, including gravity*, moving through a particular swath of *ten* spacetime dimensions” (Greene, 2011: 266).

In the **Bounce** multiverse theory, expansion is created from the rebound of a contracting universe (an alternative to inflation). Loop quantum gravity suggests that the atomic structure of spacetime *changes the nature of gravity* at very high energy densities. Loop-based scenarios are founded on general principles of quantum theory and relativity theory and therefore avoid introducing new ad hoc assumptions (as with inflation). When a preexisting universe collapses under the attractive force of gravity, the density grows so high that gravity switches to repulsive and the universe starts expanding again. It bounces (Bojowald, 2008). In this scenario, energy is recycled from the previous universe.

Option A. String Theory

Many physicists believe ST is the answer. In ST, tiny strings of vibrating filaments replace electrons and quarks as nature’s building blocks. Strings are so minute they may never be observed (size on the order of Planck distance of 10^{-33} cm). The string vibration pattern dictates intrinsic features that may represent an electron or a quark or, more importantly, a graviton (massless, chargeless, and having a spin-2 quantum property). Thus, without contradicting previous theories, ST bridges the gap between general relativity and QM. However, the mathematics, as defined in five unique theories, requires nine (ten for M-Theory) rather than three space dimensions. The extra dimensions are curled up into Calabi-Yau shapes, shapes that dictate particle properties. Supersymmetry, which unifies particles and forces, is an optional TOE requirement required for ST.

Why string theory? Theoretically, ST meets three of the six requirements as shown in Table 1: includes quantum gravity, combines QM and GR, and provides four possible cosmological theories addressing initial conditions: Landscape, Brane, Cyclic, and Holographic. For a description of these theories, reference the *Cosmology Insert* that summarizes the descriptions in Brian Greene’s book, *The Hidden Reality* (Greene, 2011: 309).

The three requirements not met, explaining the values of constants for SMPP/SMC and experimental verification, are challenges. Although in principle, ST allows all particle properties to be determined, for example, the same Calabi-Yau shapes yield just the right number of particles, but the calculating mass is more difficult (Greene, 2004: 374). No one has accomplished this. However, as emphasized, ST is still very much a work in progress. Finding the correct shape for existing particles and subsequently, their mass is an active area of research.

	Special	General	String		String Th.	New
Attribute	Relativity	Relativity	Theory	LQG	plus LQG	Theory
Spacetime	Yes ¹	Yes ²	Yes ³	No	No	Maybe ⁷
Space quantum	No	No	Future ⁴	Yes	Yes	Maybe ⁷
Time quantum	No	No	Future ⁴	N/A ⁵	Yes ⁶	Maybe ⁷
Gravity quantum	No	No	Yes	Yes	Yes	Maybe ⁷

Notes.

1. Spacetime is as defined by SR — space and time are interrelated, continuous (not discrete), and not quantum.
2. In the non-quantum theory of GR, gravity is an integral property of spacetime. Gravity corresponds to spacetime curvature, not a force field, although it acts like one.
3. In ST, gravity is quantum. Spacetime is as defined in SR with gravitons (gravity is a separate quantum force field). Thus, string theory is background-dependent on SR.
4. Spacetime emerges from more fundamental entities (based on zero branes, Matrix, or possibly other spaceless timeless entities), and therefore string theory would transition to background-independent.
5. Time not a basic variable in equations, replaced with causal relationships.
6. Assumes the time variable is required in theory.
7. Although a new theory might be based on theoretical spaceless timeless entities, spacetime and gravity could also be as defined by GR (non-quantum).

Table 4. Background-independence attributes and theories

A more generic reason for supporting ST is described by Michael Green (paraphrasing). As time goes by and ST evolves, it is more and more apparent that it is not just a “Theory of string-like elementary particles,” but it is a ‘Magnificent theoretical framework’ that interrelates a wide range of topics in physics and mathematics (Conlon, 2016: 103).

Another way to explain the value of SMPP and SMC constants is an initial condition theory which predicts a multiverse. With this solution, all possibilities exist. Thus, we happen to be living in one which has the “right” constant values to enable life. If the values of constants were slightly different, we would not be around to observe the universe (anthropic principle). ST includes various multiverse options as described in the Cosmology Insert.

Why not ST? As noted in Table 3, Overview of String Theory and Loop Quantum Gravity, ST is background-dependent, has ten space dimensions and requires supersymmetry. Addressing background-independence, Brian Greene says, “No one has yet come up with a spaceless and timeless formulation of string theory — something that physicists call background-independent formulation. Instead, virtually all approaches envision strings as moving and vibrating through a spacetime that is inserted into the theory “by hand”; spacetime does not emerge from the theory Many consider this to be the greatest unsolved problem facing ST” (Greene, 2004: 487). Lee Smolin agrees, “The general theory of relativity is a background-independent theory. A quantum theory of gravity should also be background independent. This means that the whole geometry of space and time should arise from it, not serve as the backdrop for the actions of strings” (Smolin, 2006: 184).

Brian Greene again addresses this issue, “If string theory is correct, the usual concepts of space and time ... simply do not apply on scales finer than the Planck scale — the scale of

strings themselves” (Greene, 2004: 350). There would be no such thing as a distance shorter than the Planck length or a duration shorter than the Planck time. Greene continues, “Another possibility is that space and time do not abruptly cease to have meaning on extremely small scales, but instead gradually morph into other more fundamental concepts. ... Many string theorists, including me, strongly suspect that something along these lines actually happens, but to go further, we need to figure out the more fundamental concepts into which space and time transform” (Greene, 2004: 351).

There are two speculative ST proposals for more elementary constituents: strings-as-threads-of-spacetime; and, Matrix theory, where space and time are formed from zero-branes (Greene, 2004: 488). It is conceivable, however, that spacetime as defined by relativity “is what it is.” More fundamental entities would not be required and background-independence would not be an issue for ST as a TOE.

The concept of having more than three space dimensions was first introduced in 1919 by Kaluza-Klein. The theory *assumed* one extra dimension. “[Fifty] years later, along came string theory. Rather than allowing for a universe with more than three dimensions, the mathematics of string theory *required* it” (Greene, 2011: 88). “*This is a fundamentally different kind of result, one never before encountered in the history of physics. Prior to strings, no theory said anything at all about the number of spatial dimensions in the universe*” (Greene, 2004: 367). The compacted extra dimensions, if discovered, would establish credibility for the theory. To date, experiments have not indicated the existence of extra dimensions.

Supersymmetry is required by ST. It predicts additional particles and thus unifies forces and particles. As Frank Wilczek states, “Supersymmetry is the claim that our world has quantum dimensions and that transformations exist ... which change substance particles into force particles, and vice versa ... Both are the same thing seen from different perspectives” (Wilczek, 2015: 317). “If ... force and substance are the same ... we will have achieved a new level of unity and coherence in our fundamental understanding of nature” (Wilczek, 2015: 390). Representing the other position, Lee Smolin, a noted critic of ST, states, “If the new dimensions and supersymmetry do not exist, then we will count string theorists among science’s greatest failures” (Smolin, 2006: xvii). “If the world turns out to be eleven-dimensional and supersymmetric, I will be the first to applaud their triumph. But for the present ... I no longer believe this is likely” (Smolin, 2006: 373).

Continuing to focus on the why not ST question, a generic argument is proposed by Brian Greene, “But most researchers feel that our current formulation of string theory still lacks the kind of core principle we find at the heart of other major advances. Special Relativity has the consistency of the speed of light. General relativity has the equivalence principle. Quantum mechanics has the uncertainty principle. String theorists continue to grope for an analogous principle that would capture the theory’s essence as completely” (Greene, 2004: 376).

Others, by asking if we have gone too far with mathematics, express a more negative view: “After piling layer on layer of abstract mathematics, theoreticians managed to get string theory working” (Clegg, 2016: 236). And in a similar vein, “The mathematics used in these studies [ST] is becoming more and more advanced. Not only are ordinary numbers replaced by an extended class of numbers known as Grassmann numbers [they satisfy a different multiplication law, $xy = -yx$] ..., ordinary geometry is also superseded by a special branch known as noncommutative geometry” (Livio, 2005: 231). In addition, ST uses abstract math, such as Lie groups and knot theory (Livio, 2009: 203-217). However, most physicists think advanced mathematics is a positive argument supporting ST, not a disadvantage.

Option B. String Theory and LQG

By analyzing Table 3, Overview of String Theory and Loop Quantum Gravity, it is obvious that ST and LQG are not comparable theories. LQG does not address four of the six TOE requirements. Rather it specifically addresses quantum gravity from a background-independent point of view. Consider the following quotes from a LQG expert, Carlo Rovelli, which verify this statement:

1. “Again, loop gravity does not pretend to provide a unified picture of nature, to tell us what the matter content of the universe is, or to determine the number of dimensions of spacetime.” (Rovelli, 2011: 4)
2. “The unification of forces and the quantization of gravity are two conceptually distinct problems. ... Solving the second does not necessarily imply solving the first” (Rovelli, 2011: 5).
3. “The problems addressed by strings and loops do not coincide. ST addresses questions outside the scope of loop gravity, such as: ... what is the final theory of nature?” (Rovelli, 2011: 2).

So what is the principle behind LQG? Rovelli captures the intent as follows. Spacetime is a manifestation of a physical field. All fields we know exhibit quantum properties at some scale. We believe space and time to have quantum properties as well. We must thus modify our understanding of the nature of space and time, in order to take these quantum properties into account. ... We have to understand what quantum space and what quantum time are. This is the difficult side of quantum gravity, but also the source of its beauty” (Rovelli & Vidotto, 2015: 6). “In my opinion, the theory provides an intriguing possible formalism for describing quantum spacetime. It makes predictions at the Planck scale, dealing with the early universe, and offering a coherent conceptual framework where GR and QM cohabit amicably” (Rovelli, 2012: 20).

A conceptual definition of LQG follows: “The relation of special adjacency tie the grains of space into webs called “spin networks.” A Ring in the spin network is a “loop.” The webs in turn, transform into each other in discrete leaps as structures called “spinfoam.” This is the world described by LQG” (Rovelli, 2018: 126). This may sound strange but remember these structures are the spacetime ingredients.

A few important points about LQG (reference Table 3): it is derived based on three space dimensions, does not include supersymmetry, defines discrete space, replaces the time variable with causality, uses traditional math, and includes a cosmology theory, named the big bounce (reference the Cosmology Insert for brief description). As Carlo Rovelli states, “Loop cosmology is the most spectacular success of LQG. The theory elegantly resolves the big bang singularity and predicts a sort of “bounce” from a previous contracting phase” (Rovelli, 2011: 5). Since an infinite number of bounces may occur, LQG is classified as a multiverse providing a solution for the SMPP and SMC constant values (requirements two and three).

Under additional comment in Table 3, there is the question of time in the two theories, with it playing a fundamental role in ST but replaced by causality in LQG. How does causality replace time? Is *time* inherent, or is there a more correct way to explain the change, for example, defining how things change in relation with one another? Quoting Rovelli, “The fundamental equations of quantum gravity do not have a time variable, and they describe the world by indicating the possible relations between variable quantities” (Rovelli, 2018: 119). For justification, he says, “The Heisenberg and Schrödinger pictures are equivalent if there is a normal time evolution in the history. In the absence of a normal notion of time, the

Heisenberg picture remains viable, the Schrödinger picture becomes meaningless. In quantum gravity, only the Heisenberg picture makes sense” (Rovelli, 1999: 12). Further clarifying the role of time, Carlo Rovelli says, “Einstein’s General relativity does not describe evolution in time: it describes the relative evolution of many variables with respect to each other” (Rovelli, 1999: 12); “In quantum gravity, I see no reason to expect a fundamental notion of time to play any role. ... We should simply forget time” (Rovelli, 1999: 13). Even with this explanation, equations without time are non-intuitive to most people.

Is it possible that ST and LQG are complementary theories and create a valid option? Brian Greene provides his opinion, “If I had to hazard a guess on future developments, I’d imagine that the background-independent techniques developed by the LQG community will be adapted to string theory, paving the way for a string formulation that is background-independent. And that’s the spark that will ignite a third superstring revolution in which, I’m optimistic, many of the remaining deep mysteries will be solved” (Greene, 2004: 491).

In a less optimistic opinion, Carlo Rovelli says, “If there is a fundamental description of strings, this should be background-independent, perhaps could it resemble somehow LQG?... Would it lead toward something more resembling strings? If I had to bet, I would say no, the two paths are really different, but I would not rule out the possibility a priori” (Motl & Rovelli, 2011). In a completely negative opinion, string theorist Lubos Motl says, “An equivalence between LQG and ST — or an LQG-like description of strings in physics — has surely been an attractive idea for many physicists (myself included) but it is impossible because of fundamental differences in virtually all general features and predictions of both frameworks” (Motl & Rovelli, 2011).

Option C. New Theory

As previously discussed, there are good reasons why GR and QM are incompatible. One way to resolve the contradiction between the two theories is to assume that both theories are approximations of another yet unknown theory. A new theory must satisfy the TOE requirements but could also include a series of “maybe” assumptions, for example: maybe background-independent; maybe supersymmetry; maybe an explanation of QM; maybe both discrete and continuous entities; maybe more fundamental entities of space and time; and, maybe new sophisticated mathematics. A few noted physicists have considered the possibility that ST and LQG are not the answer for a TOE:

1. “Composite spacetime would mean that an even more elemental description of the universe — one that is spaceless and timeless — has yet to be discovered” (Greene, 2004: 472).
2. “So what is everything ultimately made of? ... We simply don’t know yet, but there is good reason to suspect that everything we know of so far — including the fabric of spacetime itself — is ultimately made up of some more fundamental building blocks” (Tegmark, 2014: 163).
3. “On the other hand, I think that the theory [LQG] is still fragmented, and I am far from sure that it is physically correct or that it has already reached its definite form. ... And even if the theory was fully coherent, of course, nature could have chosen something else” (Rovelli, 2012: 20).
4. “Clearly if string theory or LQG by themselves were an answer, we would know it by now. They may be starting points, they may be parts of the answer, and they may contain necessary lessons. But the right theory must contain new elements...” (Smolin, 2006: 258).

It might be improbable, but if we assume experimental evidence contradicts one or more of the predictions or premises of ST (strings, extra dimensions, and supersymmetry) and LQG (spacetime emergence), physicists must return to the drawing board and develop a new approach for a TOE.

In addition to meeting the TOE requirements, one key conceptual issue a new theory must address is background-independence (optional requirement five) — are space and time emergent as in LQG, or is spacetime fundamental as in GR?

What role would time play in a new theory? Time seems as fundamental as anything in the world. For example, the theory of GR treats time as a dynamic variable that interacts directly with matter/energy. But when discussing LQG, Carl Rovelli argued that we should forget time. Thus, is there a more correct way to explain the change, for example, by defining how things change in relation with one another? Are relationships among entities more fundamental than time relationships? Brian Greene joins the debate when he explains attempts to merge GR and QM, “In the central equation that emerges, it turns out that the time variable does not occur. So rather than having an explicit mathematical embodiment of time — as in the case of every other fundamental theory — in this approach to quantizing gravity, temporal evolution must be kept track of by a physical feature of the universe (such as density) that we expect to change in a regular manner. ... it is not clear whether the absence of an explicit time variable is hinting at something deep (time as an emergent concept) or not” (Greene, 2004: 527).

Earlier, when discussing background-dependence for ST, it was described as a “potential” weakness because even though the majority of physicists think it is a problem, *it might not be a problem*. Spacetime may be just spacetime, with no additional fundamental spaceless and timeless entities. However, offsetting this view are Brian Greene’s comments on spacetime, “Is spacetime a something, or isn’t it? ... I believe that an experimentally confirmed, background-independent union between general relativity and quantum mechanics would yield a gratifying solution to this issue. ... Then, the theory’s ingredients — be they strings, branes, loops, or something else discovered in the course of further research — coalesced to produce a familiar, large-scale spacetime” (Greene, 2004: 491).

Another conceptually new theory different from both ST and LQG is proposed by Sean Carroll in his book, *Something Deeply Hidden*. He bases the theory on the Schrodinger equation, “String theory, loop quantum gravity, and other ideas share a common pattern: they start with a set of classical variables, then quantize. From the perspective we’ve been following in this book, that’s a little backward. Nature is quantum from the start. Described by a wave function evolving according to an appropriate version of the Schrodinger equation. Things like “space” and “fields” and “particles” are useful ways of talking about what way functions in an appropriate classical limit. We don’t want to start with space and fields and quantize them: we want to extract them from an intrinsically quantum wave function” (Carroll, 2019: 275).

Relating background-independence to fundamental theories and our first three TOE options, can be confusing since it involves space, time, spacetime, and quantum gravity. Table 4, Background-independence Attributes and Theories, summarizes the alternatives we have discussed.

Option D. No TOE Solution, always a mystery

The science world in the 1920s thought that there was nothing new to discover, but they were shocked by QM and a host of observational discoveries in cosmology. A TOE

is an elusive, problematic topic and ST, as the primary theory proposed, is a promising but unverified theory. If it were to fail, the options are a new theory or a theory does not exist. We may have reached a time where significant advances in theory development are over.

It is conceivable a new branch of mathematics might help define a new theory, but the prospect of this is unknown. Although ST has advanced fields of mathematics in the areas of topology and algebraic geometry, other advances are not guaranteed.

Returning to experimental verification, which supports a No Solution option, Greene says, “Until our theories make contact with observable, testable phenomena, they remain in limbo — they remain a promising collection of ideas that may or may not have relevance for the real world” (Greene, 2004: 493).

Addressing the question of No Solution option based on previous research regarding ST, Lee Smolin says, “It is not an exaggeration to say that hundreds of careers and hundreds of millions of dollars have been spent in the last thirty years in search for signs of grand unification, supersymmetry, and higher dimensions. Despite these efforts, no evidence for any of these hypotheses has turned up” (Smolin, 2006: 176), and, “If a large number of people have worked on a question for many years and the answer remains unknown, it may mean that the answer is not easy or obvious. Or this may be a question that has no answer” (Smolin, 2006: xvii). Nature may want to retain its true identity as a mystery.

Summary

In this survey article, after ascertaining TOE requirements and options, divergent opinions on a number of controversial issues were quoted from noted experts in the fields of ST, LQG, and cosmology. Topics covered were: credibility of ST; possibility of merging ST and LQG; background-independence; replacing the time variable with causality; fundamental timeless, spaceless entities; initial conditions; circumstantial experimental verification; a new theory option; and the possible option of no solution.

Because of physicists’ conflicting views, selecting an option is not obvious. Two prominent theories, ST and LQG, are not direct competitors but, if combined, might possibly be a TOE solution — a third-string revolution. Requirements were divided into those required and those not required. Background-independence, which is a key issue for a TOE, although most probable for a successful theory, is an optional requirement since spacetime may be a fundamental entity. And if it is, ST, using spacetime as a background, would be a viable option.

Also, current, and possibly future, experimental verification is not definitive. This may be inherent to any theory addressing Planck sized dimensions. As related to cosmology, both ST and LQG have proposals that satisfy initial conditions. There is some hope that ST will calculate the values of constants for SMPP and SMC (requirements three and four); but, both ST and LQG primarily rely on the multiverse as a solution. If experimental results from the Large Hadron Collider verified the existence of extra dimensions or supersymmetry, this would further endorse ST as the most likely option based on circumstantial evidence.

Even though ST is a leading candidate among the four options, we must acknowledge all options, even the last option, the possibility that no solution exists — if this option is valid, nature may have intentionally created an unsolvable puzzle.

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Philosophy of Vitality, Mortality, and Immortality in the Theories of Hryhorii Skovoroda and Confucius

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Kovtun, Oksana and Svitlana Pechenizka-Gubareva (2021) Philosophy of Vitality, Mortality, and Immortality in the Theories of Hryhorii Skovoroda and Confucius. *Philosophy and Cosmology*, Volume 26, 148-155. <https://doi.org/10.29202/phil-cosm/26/12>

The research reflects the philosophy of vitality, mortality, and immortality, based on the mystical life and theories of Hryhorii Skovoroda and Confucius. What connects these two philosophers from different epochs and parts of the world? What makes them always stay interesting for each new generation? And what are their ideas still provoking plenty of interpretations? Dealing with real philosophy, there are always more questions than answers. We can never be sure whether the true ideas of the teachings of the philosophers of such high level were revealed or stayed mysterious secrets for the next generations. But we hope to analyze the tips, given by the great minds, to find out someday the clues to the actual problems for humankind of any century: What is the sense of life? Where can we find happiness? Is it possible to predict death? Are there any possibilities for becoming immortal? This study is focused on investigating the possible answers to all these questions, using modern discoveries of American scientists and the clues left for us in the legacy of the philosophers beyond time and space: Hryhorii Skovoroda and Confucius.

Keywords: prediction of death, death spiral, libido, mortido, the philosophy of heart and happiness, vitality, mortality, immortality

Received: 28 November 2020 / Accepted: 29 December 2020 / Published: 29 January 2021

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Introduction

China is known for its picturesque nature, majestic architecture, and unique culture. But in addition to all this, China is a country with a rich historical past, which is considered to be the birth of philosophy as a science (Orel, 2017). But do we always know the origin and the authorship of each stable expression or aphorism of famous philosophers while hearing or using them in our everyday life? For example, few people know that the famous quote “Do not do to a person what you do not want to be done to yourself” belongs to Confucius, the second largest and most famous philosopher in China after Lao Tzu (Orel, 2017).

However, Ukrainian sages are also known for their contribution to the treasury of world philosophy: for example, Hryhorii Skovoroda is often called the first mystic philosopher and extremely talented orator, “Ukrainian Socrates,” “the unique thinker-visionary” and “aristocrat of spirit” (Betko, 2018: 161-162). And although Skovoroda did not consider himself to be a philosopher, some modern researchers are convinced that “Skovoroda’s philosophical solitude did not prevent him from entering the ranks of founders of Ukrainian and, in some versions, even Russian philosophy” (Malinov, 2018: 34). Different studies of Skovoroda’s legacy in philological, philosophical, and historical-pedagogical aspects have been investigated for more than 200 years, but his words and ideas still do not lose their relevance. His wisdom undoubtedly lives beyond time, and his mystical figure attracts world researchers’ attention till nowadays, especially from Ukraine, Poland, and Russia. Thus, there are still debates as to which country heritage of Hryhorii Skovoroda should belong: whether he could be considered Ukrainian, Russian or Ukrainian and Russian writer because: “Skovoroda wrote his works in the Ukrainian “Baroque” language, nowadays hardly understood by modern Ukrainians” (Koval, 2019: 8).

Ukrainian and Polish universities regularly hold international conferences devoted to Skovoroda’s readings in Kharkiv, Pereyaslav, Krakow, Wroclaw, Warsaw. There are many outstanding scientists of Hryhorii Skovoroda’s legacy, among which we should mention the works by Vladimir Ern “Gregory Savvich Skovoroda. His life and doctrine” (published in Moscow, 1912), Dmitry Chizhevsky “The Philosophy of Hryhorii Skovoroda” (published in Warsaw, 1934), Denis Pilipovich “Rozmowa o duchowym świecie. Hryhorij Skoworoda: filozofia — teologia — mistyka” (published in Krakiw, 2010), but the most fundamental studies were made by Leonid Ushkalov: “Ukrainian baroque theology. Seven sketches about Hryhorii Skovoroda” (published in Kharkiv, 2001), “Two Centuries of Skovorodiana: Bibliographic Reference” (published in Kharkiv, 2002), “Hryhorii Skovoroda: seminary” (published in Kharkiv, 2004), “Hryhorii Skovoroda. Complete academic collection of works” (published in Kharkiv-Edmonton-Toronto, 2011) which is considered among researchers as the most complete and authentic, “Hryhorii Skovoroda. Primer of peace” (published in Kharkiv, 2015), “Catching an elusive bird: the life of Hryhorii Skovoroda” (published in Kyiv, 2017), “Skovoroda: from A to Z” (published in Lviv, 2019) and others. Several editions of selected works of Skovoroda were published in English due to representatives of the Ukrainian diaspora.

The first study about Hryhorii Skovoroda was made by his favorite student-follower Mykhailo Kovalinsky “The life of Hryhorii Skovoroda” (1794-1795). Kovalinsky’s notes were trendy in the Russian Empire, influencing the Ukrainian and Russian intellectuals of that time: Ivan Kotlyarevsky, Gregory Kvitka-Osnovyanenko, Ivan Kulzhinsky, Izmail Sreznevsky, Leo Tolstoy, creating a romantic image of a wandering philosopher that gave impetus for research to subsequent generations of scientists (Koval, 2019: 9-10).

The Mystical Life and Death of Hryhoriy Skovoroda

Skovoroda's acquaintance with Mykhailo Kovalinsky in 1758 was quite mystical. One day Kovalinsky had a strange dream: the names of three young biblical martyrs were shining like gold in the sky, and below, on the ground, stand Mykhailo's teacher — Skovoroda, and next to him, the boy just felt extraordinary joy and freedom. To whom Mykhailo told about this dream, the priest exclaimed: "Young man, obey this man! He was sent to you by God to be a guiding angel and mentor" (Unguryan, 2001). Kovalinsky never told his teacher about his vision. Still, two months before Hryhoriy's death, during their last meeting, Skovoroda suddenly remembered how he had been excited by a biblical parable since childhood (which he has carried through his own life): in the parable, three young men, Ananias, Azariah, and Michael, refused to worship the golden calf — they were thrown into the fire for it, but they were not burned and thus embarrassed King Nebuchadnezzar.

It seems that the student also had a premonition about the death of his beloved teacher because shortly before that, Kovalinsky suddenly became sad, left his family and job in St. Petersburg, bought an estate in some remote place and begged Skovoroda in letters to visit him. The old philosopher came to cheer up his student, and at the farewell, took out of the travel bag his manuscripts and gave them to Mykhailo. It was Kovalinsky who wrote the first biographical book about Skovoroda.

There are many legends about the gift of Skovoroda's premonition. It is considered that mystically, at the age of 72, he pointed out his death's exact day. According to the legends, he dug his own grave, went to his room, put on clean clothes, prayed to God, and lay down, with arms folded: "As to the legends, Hryhoriy Skovoroda knew the day of his death and died in peace with himself" (Shtogrin, 2020).

However, some researchers are convinced that this is not a legend. Still, quite logical for the philosopher's final stage of life — conscious life should end with mindful preparation for death: "If to look at Skovoroda's correspondence (and I re-read almost all of his letters), you can understand that he was very seriously preparing for death. The transition to another world was also like a philosophy of his last years of life. He had to go to visit his friends and, of course, his best friend — Mykhailo Kovalinsky" (Tomenko & Yashchenko, 2007). Thus, Mykola Tomenko emphasized that Skovoroda's life and philosophical intuition was powerful: "He is the man who thought, analyzed, reasoned all his life, but did not just eat, walk or waste. Skovoroda has Gogol's mystery and Socratic logic of life" (Tomenko & Yashchenko, 2007). So comparing Skovoroda's incomprehensibility with the mystical figure of Gogol and his lifestyle with the natural one, like Socrates, who always fell asleep at sunset and woke up at sunrise, Tomenko underlines that such a natural cycle was significant in Skovoroda's life and, therefore, the researcher is sure that Skovoroda's death is not a legend: "He was preparing for the transition to another life and knew that no one would come up with a better place for his death than himself" (Tomenko & Yashchenko, 2007). That is why Hryhoriy Skovoroda came to the place where he wanted to be buried (the village of Pan-Ivanivka in Kharkiv region, now Skovorodynivka), dug his own grave, and prepared himself for the transition to another world.

There are also opinions that Skovoroda did not want to cause trouble to anyone when he was alive, and he did not want to burden anyone with his death, so he dug his own grave and calmly said goodbye to everyone so as not to upset anyone. According to the legend, once, a 72-year-old philosopher went to the park and began to dig the ground with a patch. "What are you doing, friend Hryhoriy?" asked the landowner, on whose estate the old man was staying. "It's time, my friend, to end the journey!" replied the sage. He walked around and

said goodbye to everyone. And a few days before his death, he asked for an inscription over his grave: “The world was catching me, but did not catch” (Unguryan, 2001). Philosophers and researchers worldwide are still debating about possible interpretations of this expression, which has become well-known and inseparable from Hryhorii Skovoroda’s philosophy of life and death. Maybe it could be observed the symbolic parallel with another famous metaphor of Skovoroda (contained in *Silenus Alcibiadis*, 1775): “God is as an elusive bird a hermit was in love with” (Perri, 2015: 90).

Is It Possible to Predict Death? The Connection between Skovoroda and Confucius

Death is inevitable — but is it possible to predict it? Some modern scientists believe so. During the experiments with *Drosophila* flies, held in 2007, 2012, and 2016, American scientists discovered a new and exceptional phase of the life cycle, which is a messenger of the approaching end. This phase is called “the spiral of death” (Barras, 2016). The scientists became convinced that people’s lives can also be a similar stage, which occurs after the main stages: childhood, adulthood, and late-life. According to Lawrence Mueller and Michael Rose, the researchers at the University of California, Irvine (USA), there is evidence that those about to die of natural causes fall into a spiral of death. Although it is generally accepted that equalization of mortality is related to age, Mueller and Rose proved by their experiments with flies that they fell into the death spiral regardless of age. The female-flies showed a sharp decrease in fertility in a few weeks before death, and the male-flies — a similar decline in reproductive potential a few days before death. It is unclear whether *libido* (willing to live) affects *mortido* (willing to die) or *mortido* influences life’s energy instead. According to James Kertsinger, the researcher at the University of Minnesota (USA), both the equalization of mortality and death itself are related to the level of fertility. Perhaps this observation will force biologists to reconsider theories of aging.

Alexander Lavrin, in his fundamental study “1001 Death” (1991) (later this book was renamed as the “Chronicles of Charon. Encyclopedia of Death” and translated into five languages) observe death in various aspects — from strictly scientific to adventural — and among the other questions he also asks: “Is it possible to predict death?”. The author analyzes Confucius as an example of it. There were times in Confucius’ life when he miraculously avoided death. However, he lived to a ripe old age (like Skovoroda, who died about 70 years old) after the death of his wife, son, and beloved student Yan Yuan. Confucius tried to complete his book “Chun-tsyu,” a chronicle that was supposed to reflect the era of enmity over quarrels, which he hoped to leave for the judgment of his descendants, but eventually felt that it was his turn to die: his strength left him and before the disease visions and dreams began to come. His followers prayed for him, but Confucius just compared the passing of life to the river: “Everything fleets — like this current does not stop day or night” (Lavrin, 1993). According to one of Confucius’ students, Tzi Kung, one early morning he heard Confucius walking up to the door, pulling a stick in his hands behind his back, and chanting: “The great mountain must ruin, the strong current must stop, the wise man must fade like a plant” (Lavrin, 1993). The teacher told his student that he had a dream that foretold his death soon, and the only thing Confucius complained about: “There was no wise ruler who wanted to be my student. It’s time for me to die” (Lavrin, 1993). After that, Confucius went to bed and died a week later. It is said that before his death, he did not pray or show fear. The only thing that bothered him was clear from his last words: “Who will take the task to continue my teaching after my death?” (Lavrin, 1993; Xie & Ge, 2013)

The influence of Confucianism on the understanding and perception of the concepts of life and death is felt in modern Chinese culture, allowing its adherents to get rid of the fear of death through its interpretation as an inevitability that one should not fear (Tsai, 2005; Yong, 2011). And suppose Daoism focuses on man's belief in immortality and the pursuit of longevity in recognizing the naturalness of life and death. In that case, Confucianism emphasizes the social aspects of life, which make death only its continuation ("performing feats," "creating teachings," "glorifying moral qualities") (Tan, 2005). "The difference between the ideas of the two above teachings is that Confucianism — the doctrine of entering the world (society), which emphasizes that there is something more valuable than death in relation to life and death (the sense of life); and Daoism is the doctrine of leaving the world. According to Lao Tzu, people should not be so happy about birth and so sad about death. Everything corresponds to nature" (Mengting, 2020: 89; Sarkissian, 2010).

So, if, according to Epicurus, "the ability to live well and die well is the same science" (Lavrin, 1993), then both Confucius and Hryhorii Skovoroda are vivid examples of this philosophy, which they proved by their own lives and deaths. As Skovoroda wrote in one of his poems "To each city its custom and rights..." (1758):

"I know that death is like a scythe,
She will not even bypass the king.
Indifferent to death, whether a man or a king –
Like a straw, fire will devour everything.
Who will despise her terrible steel?
The one with conscience like a crystal..." (Hryhorii Skovoroda)

Maybe this could be the secret of no death fear but immortality?

The Philosophy of Heart and Skovoroda's Secret of Immortality

According to Mykola Tomenko, Skovoroda has already defeated death several times: At first, he was reborn in the Soviet version. The most exciting thing was that the Soviet doctrine did not eliminate or ignore him. It simply shifted the emphasis a bit: "This is the law — each generation writes history in a new way, reads it in a new way, and finds its heroes. We also need to re-read Hryhorii Skovoroda, and I think he will be born again in the 21st century, but a little differently — more significant and more important for us" (Tomenko & Yashchenko, 2007).

Researchers of the life and teachings of Hryhorii Skovoroda agree that this philosopher manages to remain close and modern for new generations, despite the change of several epochs: "In each new generation there are people who have Skovoroda "for their own," love him as a friend and respect him as a teacher" (Shtogrin, 2020). Perhaps this phenomenon can be explained by Skovoroda's desire to find answers to the questions that will never lose relevance, remaining exciting for each generation: "What is the sense of life?", "What is happiness? Where to find it? And how to keep it?", to which Hryhorii Skovoroda answers in his poems:

"On ships and chariots, we strive for a good life.
But what you want is with you:
It is, my friend, inside you" (Hryhorii Skovoroda)

So, for Skovoroda, the path to happiness is inseparable from knowing our essence and realizing that each of us is a part of something higher and all-encompassing, so we should live doing good deeds to be in harmony with ourselves and the Universe — and only through self-knowledge, according to Skovoroda, a person can learn the essence of all things: “This is what it means to be happy — to know yourself, that is your nature, to take on your destiny and to live accordingly to your own part of the all-encompassing idea” (Shtogrin, 2020). Skovoroda considered self-knowledge to be a part of the “natural” cycle of things that binds the universal with the individual fire. The philosopher identified God with nature — he clarified in *The Dialogue Among Five Travelers* (1772) that the best way to call God is to call him “nature”: “He Himself is the principle, and is all in all” (Perri, 2015: 93). Thus, people as a part of nature may find God inside themselves. “To be happy is to know oneself, to find oneself” (Malinov, 2018: 44), which means to find out the core, the essence of one’s own nature and life, to discover it to oneself. That is why Hryhorii Skovoroda was convinced that we shouldn’t look for happiness somewhere: “It is not somewhere, because it is everywhere” (Malinov, 2018: 43), because “it is always with us — like a fish is in the water,” and happiness is like the sunshine: “just let it enter your soul...” (Unguryan, 2001). As to Hryhorii Skovoroda: “Happiness is in heart. Heart is in love, love is in the eternal law” (Malinov, 2018: 43). So, easiness is another quality of happiness. It mustn’t be a burden for people. But the search for happiness is impossible without self-knowledge — that was the firm belief of Skovoroda.

The philosophy of the heart occupies a leading place in the system of the philosophy of Hryhorii Skovoroda. His statements evidence this fact in many of his works that the heart itself is the main organ of a man: “The head of everything in a person is the human heart. It is the most real person in a person, and everything else is just the environment... The heart is the root of life and the home of fire and love” (Tomenko & Yashchenko, 2007). Thus, only through the heart and soul in the broadest sense, Skovoroda tries to comprehend the world and everything that happens in it. So the heart for him is the center of a man as a part of the Universe, like a bridge between how a person lives and how he perceives this life: “That is, everything passes through the heart, through feelings, through emotions. This is how a person perceives the world, and it does not need to be done another way. It is not necessary to make the stomach or brain the basis of human existence. The mind is not the basis of existence, because it is too pragmatic and rationalizes man” (Tomenko & Yashchenko, 2007).

It is natural for Skovoroda not to focus on any human defects in his fables, but to cultivate moral values, so he emphasizes the values, needed for high-spirited, moral, honest men, which he believes should be the basis of human thinking and being. And modern researchers point out that although it should not be assumed that in Europe before Hryhorii Skovoroda, no one professed cardiocentrism or the philosophy of the heart, but “the fact that Skovoroda painted it in his own unique way proves that he is one of those who introduced such a doctrine in European philosophy” (Tomenko & Yashchenko, 2007).

Conclusions

The village (Pan-Ivanivka, now Skovorodynivka, Kharkiv region), where the famous philosopher is buried, claims that his spirit has protected these lands for more than two hundred years. At the resting place of Skovoroda, as he asked, there is no cross, only a massive stone with an inscription, “The world was catching me, but did not catch.”

“Life is a constant and continuous search for truth”: that was a life philosophy of Hryhorii Skovoroda, and he demonstrated it by his own example. The multifaceted figure of

Skovoroda, who was considered by Ivan Franko a completely new phenomenon due to the breadth of his views and the depth of his thoughts, of course, will be attracting the attention of researchers again and again. And his mystical life and death will excite people of different generations, too. The same we may tell about Confucius. Their secrets will stay thrilling for ages, as well as their theories, will provoke more and more interpretations.

World researchers and philosophers still have been analyzing the life and creative paths of both Hryhorii Skovoroda and Confucius, discovering new sides of these unusual personalities and their viewings in the context of new realities and eternal values. And questions of vitality, mortality, and immortality are just as troubling for people of each era, so further researches in this direction cannot lose its relevance in the future.

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The Cosmoplanetary Economy of Lost Humanity: the Postnonclassical Version of Noospheric Ontology (Philosophical Reflection)

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Smirnov, Grigoriy and Alena Artemyeva (2021) The Cosmoplanetary Economy of Lost Humanity: the Postnonclassical Version of Noospheric Ontology (Philosophical Reflection). *Philosophy and Cosmology*, Volume 26, 156-168. <https://doi.org/10.29202/phil-cosm/26/13>

The article describes the theoretical basis of cosmoplanetary economy representations in their ontological, epistemological, axiological and praxeological dimensions that were suggested in science and philosophy in the 20th and 21st centuries. It is shown that the conceptualization of cosmoplanetary economy and economics comes from the works of Sergey Bulgakov, Sergey Podolinsky, Vladimir Vernadskiy, Nikita Moiseev, Vlail Kaznacheev, Pobisk Kuznetsov and manifests itself in various models of noospheric economy. It is concluded that in the current realities of the intensive scientific and philosophical search for some new economic and ecological theories, a complex model of “cosmoplanetary economy” is constructed as a meta-economy so as to ensure the survival of humanity in the face of the destructive force of global catastrophism of the 21st century.

Keywords: cosmoplanetary economy, noospheric economy, digital economy, market, econoomics, noospheric picture of the world

Received: 6 December 2020 / Accepted: 5 January 2021 / Published: 29 January 2021

Midway upon the journey of our life
I found myself within a forest dark,
For the straightforward pathway had been lost.

(Dante Alighieri. *Divine Comedy*.)

Metatheoretical preamble

The modern economy world consists of a huge number of elements-subjects: local, regional, interregional, transregional and global subsystems of different levels and personifications are inextricably linked by a number of insurmountable (and even antagonistic) contradictions. All previous economic activity of mankind was based on the principles of extensive development and exploitation of nature in order to receive the maximum of economic benefits and satisfy all social and economic needs of an increasing number of people. Each civilization tried to find some way of extensive development, providing both the nation's best survival and effective defense of national interests, associated with rich and super-rich minority priorities. There was a worldwide competition of national elites, which traditionally resulted in small and large wars (in the 20th century — in the World Wars) to institutionalize and constitutionalize different planetary economic models.

For two centuries, the civilizational approach had been explaining the economic technologies of world development; the creation of a global image of mankind had proved challenging for humanity divided by linguistic and cultural differences. Ultimately, the antagonisms manifested themselves in tragic series of both continental (O. Spengler) and planetary disasters (Meadows, 1991).

The first national not apocalyptic version of the Tower of Babel for global humanity was announced in literature in the 19th century (by Aleksander Pushkin, Mikhail Lermontov, Nikolay Danilevsky, Nikolay Gogol, Lev Tolstoy, Feodor Dostoevsky, Peter Kropotkin, Nikolay Fedorov, Vladimir Solovyov, Vladimir Vernadsky, Alexander Chizhevsky and others). On the border of the Western and Eastern worlds, they foresaw the inevitability of the country's existence in the grips of the geopolitical Eurasian future and so expressed the mission of absolute total-unity in the words of Vladimir Solovyov. "I call true or positive total-unity such a unity where the one exists not at the expense of all the other, but for the benefit of the whole," Vladimir Solovyov wrote. "A false, negative unity suppresses its elements and thus turns out to be emptiness" (Solovyov, 1988: 552).

Alexander Blok expressed a presentiment of insanely tragic but inexorably intervening globality in his "Scythians":

"For the last time — come to your senses, old world!
The barbarian lyre is calling
To a fraternal feast of labor and peace,
For the last time — to a light fraternal feast!" (Blok, 1960: 362).

The modern processes of cardinal transformation of political, social, cultural international relations pose the problem of proper ways of global economy reformation. Transnational corporations and leading national economic entities are gradually turning into key actors in the modern historical process. Thus, classical formational revolutions are changing their theoretical political and economic face, becoming not spontaneous but conscious forms of synergistic praxeology. The nuclear era put an end to the traditional forms of the violent

solution of problems of diverse humanity and at the same time opened the gates for the triumph of non-violent forms of global coevolution, in the framework of which, however, the classic “philosophy of non-violence” was converted into its nonclassical and postnonclassical forms with their doubtful non-violent nature. In the era of digitalization and computer communication, the “invisible world government” is no longer invisible: it is successfully scanned with the help of a global computed tomograph based on the technologies of the “nooscope” (Vaino, 2012).

When a candidate for American President left-wing politician Bernie Sanders wins the hearts and minds of citizens, and the artist from New York David Datuna wants to buy Lenin’s Mausoleum and put it in the United States, officially stating that “America is moving towards communism and socialist ideas,” it should be recognized that the world has become radically different. The reality of this socialization of capitalist ideas in the context of the population growth was noted by scientists in their first reports to the Club of Rome in the 20th century (Meadows, 1991) and was finally stated in the 21st century in the Report “Come On!” (Come On, 2018).

In the foreword to the report “Come On!” the authors emphasize that “the world is again in a critical situation,” and therefore, this time they see a serious need to “question the legitimacy of the ethos of materialistic selfishness which is currently the most powerful driving force in the world.” “The time has come, we believe, for a new Enlightenment or for otherwise overturning current habits of thought and action that only consider the short term. <...> However, unless the destructive driving forces of purely materialistic economic growth are tamed, we cannot escape the fear that 15 years from now the world will be in an even harsher ecological situation than it is today,” the scientists are convinced. From this perspective the report “Come On!” is no longer just a diagnosis, it is a sentence for the lost humanity, to delay the execution of which Ernst Ulrich von Weizsäcker and Anders Wijkman (the authors of the report) offer a new economic paradigm for the future (regenerative urbanization, energy-efficient buildings, the orientation of public institutions towards the restoration of human and natural capital, implementation of “blue economy” principles according to which “product and consumption systems are inspired by nature”). Scientists admit that such “circular economy requires a new economic logic” in order to overcome the traditional “‘fast turnover’ principle — take, make and dispose”: “humanity needs to find ways of initiating an environmentally enhancing, restorative relationship between cities and the natural systems they depend on; the mainstreaming of efficient, renewable energy systems for human settlements across the world; new lifestyle choices and economic opportunities which will encourage people to participate in this transformation process” (Come On, 2018).

In other words, new environmental, economic priorities should replace discredited political and social principles. Like the goddess Gaia, the biosphere encourages humanity to change radically or disappear from the surface of the planet Earth.

Cosmoplanetary economy: in search of meganames

The proper consideration of the modern cosmoplanetary economy requires the definition of the content of this phenomenon.

At first sight, the cosmoplanetary economy can be regarded as an economy where human activity goes beyond Earth and is organized outside it. A striking example of such cosmoplanetary economy can be found in the modern nascent branch of space tourism. The general idea of space tourism was born in 1967 when Barron Hilton (the president of Hilton Hotels) described his vision of the hotel on the moon, where the richest elite could be enjoying

the luxury of stars. Today Richard Branson's Virgin Galactic aims to become the world's first commercial "space line" offering flights with six minutes of zero gravity and stunning views. There are already more than 700 confirmed travelers, who wish to take the opportunity to travel into outer space and patiently wait for flights. More than that, Richard Branson is not the only space travel operator: Blue Origin, led by the Amazon founder Jeff Bezos, is also developing space tourism. It appears that this kind of tourism will not be just a luxury for the elite and a source of enrichment for the owners of this new branch of business, but it also will help humanity to respect and awe the planet Earth — the house where we live (Fyall, 2016).

Another example of cosmoplanetary economy was successfully demonstrated in American economist and politician Lindon LaRouche's "The Economics of the Noosphere" (LaRouche, 2001). In the book, the scientist proposed the idea of extending the principles of planetary "basic economic infrastructure" to the creation of synthesized natural conditions in outer space. He was convinced that in the process of space research, "when people are in outer space for months or more, mankind cannot endlessly rely on so-called "artificial life support" <...>, it is necessary to use natural principles in space" (LaRouche, 2001: 167). Lindon LaRouche noted that just as the principle of life was included in inanimate processes to change their functioning towards the formation of the biosphere, the intervention of the human mind in the development of the biosphere changed the functioning of the biosphere (LaRouche, 2001: 168). Thus, the human mind is able to bring planetary biospheric principles to a new level both on the planet Earth and in outer space. Such understanding of the cosmoplanetary role of the human mind enriches the content of cosmoplanetary economy, because it involves the conceptualization of cosmoplanetary life not only from the standpoint of extensive economic activity scale, but also in the context of possible intensive, reasonable human impact on outer space.

It should be noted that the ideas of this "intensive" cosmoplanetary economy were set forth by Konstantin Tsiolkovsky in his book "The Goals of Starfleet" (Tsiolkovsky, 1929). Scientist's views on life in outer space were presented in the context of developing a cyclic economic ecosystem of life support, which was closely related to the principles of organizing of biosphere and the current scientific development of mankind. In particular, the author explained how "a certain temperature, humidity, a specific composition of air and good food for plants and human could be achieved in outer space." He substantiated the structure of the space economy, in which "there is no need for a constant inflow of water or food for plants and animals. A certain supply of gases, water, soil and fertilizers is never depleted." According to the scientist, "the same is happening on the Earth, but it is happening on a larger scale." In general, all the benefits of relocation to outer space "are not possible to imagine" (Tsiolkovsky, 1929).

The cosmoplanetary function of the human mind in economic activity was also shown in the work of Sergey Podolinsky "Human labor and its relation to the distribution of energy on our planet" (Podolinsky, 2005). In his opinion, man is the only force of nature that is capable of increasing the share of the Sun's energy accumulated on the Earth by certain volitional acts called labor. Mental labor is cosmic in its nature and represents the only way that, with the help of more advanced machines and technologies, makes physical labor more productive, increases the energy budget of mankind, reduces the increase in entropy and eliminates the threat of the end of the Universe (Podolinsky, 2005).

For the understanding of human cosmoplanetary economic activity, the law of power conservation (as a universal law of nature), discovered by Pobisk Kuznetsov, is also significant (Bolshakov & Kuznetsov, 2014). According to the law, there is the preservation

of the exchange energy flow modulus, expressed in the universal language of space-time quantities. Modern scientists have shown how the development of specific social relations systems represents the universal law of nature: in private social systems, there are non-linear processes of the struggle for power and the possibility of its use in certain interests (Bolshakov & Kuznetsov, 2014: 27).

The economic ideas of Pobisk Kuznetsov are also interesting. The scientist noted the importance of discovering new forces of nature for the benefit of society. His ideas involved the discovery of new types of energy used by the economic system and the creation of physical devices that could allow changing the direction of energy flows (Afanasyev & Kuznetsov, 2014). Moreover, Pobisk Kuznetsov predicted: “There will be ideas about the using of the full volume of the energy flow that permeates our planet, but at present science does not know anything about them” (Afanasyev & Kuznetsov, 2014).

All these ideas bring to mind the forgotten thoughts of ancient sages about the reverse effect of cosmic energy on humanity, about the fundamental unity of macro- and microcosm, and that “there is only the manifestation of the will of the Universe in the will of a human being and all other creatures (higher and lower). The voice of a human being, his thoughts, discoveries, concepts, truths and delusions are only the voice of the Universe” (Tsiolkovsky, 1928: 14).

Taking into account this interconnection of space and anthropogenic factor and increasing influence of mankind on near and far outer space, it seems true that modern humanity is witnessing “a new stage of evolution — geocosmic, geopolitical, social, demographic and noospheric” (Kaznacheev, 2010). The active role of humans and humanity in this process raises the issue of life-giving values and dominants of cosmoplanetary economy. From the axiological perspective, an increasingly manifesting itself link between humanity and outer space generates “the idea, that mankind is responsible for the cosmic evolution and influences it by good or evil” (Kaznacheev, 2010).

It also seems that this responsibility can be explained through the etymology of the term “economy” (οικονόμος) that includes two roots: “οἶκος” (home) and “νόμος” (a rule, a law). It appears that the concept of “home” can be understood both narrowly (“a man’s home is his castle”) and broadly (“my home is the planet Earth”). Taking into account this concept, it seems that the ontology of cosmoplanetary economy is generally constructed within the framework of econology (Reimers, 1990) (the science, which claims the connection and inseparability of economy and ecology, economic activity and ecological limitations from the coevolutionary point of view) and related concepts of “biosphere economy,” “green economy,” “blue economy.”

Philosophical sense of cosmoplanetary economy also can be shown through the prism of Kant’s “creative agnosticism” (Kant, 2017) from the perspective of delimitation of “economy in itself” and “economy for us.” The “economy in itself” is aimed at expanded self-development in order to suppress competitors regardless of their economic goals. For example, for several centuries, the philosophy “big fish eat small fish” has become a form of oligarchic economy. Simultaneously, many areas of the real economy need not pyramidal but network values, providing the survival of humanity as an integral system, not as an antagonistic multiverse of separate global entities. Such cosmoplanetary “economy for us” (for multifaceted humanity in its relationship with the biosphere of the Earth and the whole Universe where “everything is connected to everything” (Commoner, 1974)) could become a real alternative to the modern “economy in itself.”

Thus, the logic of the understanding of cosmoplanetary economy can be represented from its quantitative description (cosmoplanetary scale) to its qualitative characteristics (values and dominants of human interaction with the Universe).

Cosmoplanetary economy in the context of the “biosphere — noosphere” transition

It is difficult to consider the cosmoplanetary nature of human economic activity in isolation from the ideas of Vladimir Vernadsky, who first outlined the philosophical poetry of “cosmoplanetary unity” in the language of scientific discourse. His ideas about the cosmic process of the origin of a human being and his mind, about the strong link between humanity and the biosphere, about scientific thought and its role in the organization of planetary processes are especially significant for understanding cosmoplanetary economy. Academician noted: “A man must understand <...> that he is not random and independent of biosphere or noosphere natural phenomenon. He is the inevitable manifestation of the natural process that has been going on for two billion years at least” (Vernadsky, 1991: 21). The establishment of the noosphere “requires the manifestation of mankind as a whole” (Vernadsky, 1988: 35).

These philosophical reflections of Vladimir Vernadsky were received by the Novosibirsk school of academician Vlail Kaznacheev. The contribution of Vlail Kaznacheev to the development of knowledge-intensive and human-oriented economic activity cannot be overemphasized. The scientist admitted that mankind was on the verge of very serious trials: “Today these trials can be distinguished both in social and in cosmophysical planetary (geocological) aspect” (Kaznacheev & Trofimov, 2019: 122). One of the central ideas of the academician is connected with the fact that a person has five socio-natural dimensions, the primary of which are human health and a set of socio-natural valences (the economic structure, family institutions, cultural traditions, a language) that determine the possibilities and the direction of human social activity. These dimensions must necessarily be taken into account when designing socio-economic, political, cultural and educational programs. Vlail Kaznacheev was deeply concerned that the logic of life “was reduced to the accumulation, concentration of economic potential, money and property values, not human lives.” He wrote: “If we turn back to the past of science, to the most ancient times, it turns out that science and culture did not possess this important factor of accumulation, wealth and property, it went into the space of the intellectual movement of practice, life, the relationship of a man with the Earth, to his essence (which, apparently, is defined as a soul) and the space where a man exists on the planet Earth in the cosmic and solar world” (Kaznacheev & Trofimov, 2019: 122). Within this framework, the modern cosmoplanetary economy appears as a very ill patient, and some extreme measures are necessary in order to treat it.

Nowadays, this spiritual and intellectual component of the world-historical process has already become clearly visible. The ideas about socio-economic formations turn into theories of noospheric and ecological formations that suggest that the material and technical forms of human existence give place to rational and ecological priorities in the global historical process. For that reason, the development of the Noospheric ethical and ecological constitution of humanity, which “forms the legal basis of the global evolution of humanity and biosphere as a new — Noospheric, geocosmic stage of development” (Article 1), proclaims “the protection of the spiritual, ecological, energetic and information human rights” (Article 3), endows humanity with “ethical and ecological (cosmic), biological and social rights, freedoms and duties” (Article 4), seems to be important and timely (Gordina & Limonad, 2007). Of course, the interests of humanity require further implementation of these noospheric principles in regional, national and international law, but the importance of this political and legal process is not evaluated at the appropriate level or not considered at all. Consumer economic consciousness neglects the idea that human economic activity can only

rely on biospheric sources and exists only to assert the logic of noospheric processes. So the real organization of a proper cosmoplanetary economy as a valuable economic activity of mankind in the Universe faces formidable obstacles.

Cosmoplanetary economy in the noospheric picture of the world

One of the difficult problems of cosmoplanetary economy conceptualization is connected with the search for an adequate theoretical dimension. The real cosmoplanetary economy's tragedy is that it is constantly placed in immeasurably smaller formats than it requires. According to its definition, its dimension cannot be less than the biosphere organization. Still, at the same time, it is affected by very strong fluctuations of the noospheric (social and socio-economic), but, in fact, anti-noospheric (unreasonable and irrational) order. Such an ambivalent situation presupposes an attempt to embed ideas about cosmoplanetary economy into the noospheric picture of the world (Lebedev & Panchenko, 2010). The application of the sphere approach to the representation of cosmoplanetary economy seems to be reasonable, because "a planet" itself already presupposes some spheres. So we offer to dwell on the model of the noospheric picture of the world that received its justification in Nikolay Antonov's work (Antonov, 2003).

Nikolay Antonov proposed a transitive chain "lithosphere — hydrosphere — atmosphere — biosphere — sociosphere and — technosphere-noosphere" (Antonov, 2003: 170). This interpretation performs an important explanatory function: it shows the intermediate links between biosphere and noosphere. In this context, it is obvious that the transition from the biosphere to the noosphere cannot ignore these intermediate links. So, it seems quite possible to imagine "the transition from the biosphere to sociosphere" or "the transition from the biosphere to technosphere," which take place in literature.

Modern noospherology has adopted this global evolutionary transitivity from the lithosphere to noosphere and enriches it, building an increasing number of planetary spheres: the noospheric picture of the world in the context of the sphere approach in its minimalistic representation demonstrates the interaction between anthroposphere, biosphere, technosphere, sociosphere, cultural sphere (Smirnov, 2003) and also information sphere, ecosphere, semiosphere (Smirnov, 2011b) and energy sphere (Zhulkov, 2013). The theoretical completion of the sphere approach is achieved through the complementarity of the basic noospheric law (information generates energy, energy structures matter) (Dmitrevskaya, 1990) and the basic semiotic law (matter unfolds into energy, energy is "unpacked" into information) (Smirnov, 2008: 54). Thus, adequate consideration of cosmoplanetary economy within the noospheric picture of the world requires the identification of a large number of cause-and-effect chains.

At first glance, it seems that cosmoplanetary economy should be confined to the anthroposphere as self-realization of the principle of anthropocentrism. However, upon closer examination, it turns out that the anthropological principle presupposes the consideration of a human being precise as a rational being (Vernadsky, 1991). Thus, the concepts of the harmonious relationship between humanity and nature, of human-oriented economic activity, noospheric autotrophy (Zhulkov, 2011) and noospheric asceticism (Artemyeva, 2020) are becoming the integral markers of cosmoplanetary anthroposphere. The sociosphere of the life-giving cosmoplanetary economy is impossible out of high scientific social and natural standards for the organization of human activity, noospheric law (Borodin, 2015), collectivism and solidarity of mankind. For example, in the works of Vladimir Vernadsky

these “standards” are formulated as the law of the “unity of mankind” (Vernadsky, 1991: 34), violation of which entails the inevitability of collapse and global destruction. The struggle for survival and natural selection in cosmoplanetary sociosphere thereby should be replaced by the philosophy of mutual assistance of Peter Kropotkin (Kropotkin, 1995) and the theory of altruism of Pitirim Sorokin (Dolgov, 2015).

Modern concepts of cosmoplanetary technosphere surpass the classical problem of the negative impact of technology on the environment and humanity (which, however, have not lost their relevance) and turn out to be closely related to the problem of interaction between the natural mind and artificial intelligence. It is clear that the epoch of the living matter development has been evolutionarily replaced by the epoch of the techno-substance (Balandin, 1993) development and in the third millennium is moving towards the dominance of intelligent matter (Bazaluk, 2016), built on the principle of complementarity of natural mind and artificial intelligence. The economy of matter gradually appears as the economy of energy and, at a certain stage, turns into the economy of information (in this case, “digital economy” is considered as an important part of it). These three historical forms of economy are subject to the principle of conformity. Only energy in its various socio-economic forms provides a transformation of matter, and only the human mind embodied in a variety of information forms makes the transformation of living and non-living matter possible.

The emerging informational formation (noo-formation) differs from the previous formations, because so-called artificial intelligence unexpectedly arises and even dares to claim the status of a special managerial (algorithmic) matter, showing its advantages in providing “optimal” similar to biosphere processes. The current dialectic of the natural mind and artificial intelligence achieves a new level of interaction, “overcoming the archetypes of an all-devouring crocodile as well as unconsciously working horse through the cognitive blast” (Smirnov & Smirnov, 2019: 138) and ensuring the processes of techno-social cephalization.

Thus, such paired ontological opposites as “technosphere and sociosphere,” “biosphere and cultural sphere,” “surrounding” anthroposphere (and genosphere (Savchenko, 2009), ethnosphere, natiosphere (Timofeev, 2005) associated with it), pose a universal set of values and goals and show the axiological coloring of the economic ontology of human existence.

The epistemological dimension of cosmoplanetary economy

The problems of the cosmoplanetary economy proper values are closely related to the study of modern economic consciousness.

Methodologically this understanding is possible through the environmental and economic ideas of academician Nikita Moiseev, particularly about the multiple meanings of the term “market”: a “commodity market” (“market” with a small “m”), “Market” (“market” with a capital “M”) and “MARKET” (“market” in capital letters). The scientist used the concept of “Market” to explain complex social processes. He noted: “Market in its usual sense as a distribution tool is only a particular case of the Market as the only natural form of the comparison of the various forms of living matter organization and their rejection, the main factor determining the development of the world” (Moiseev, 1996: 49). Thus, the “principle of market” was understood by Nikita Moiseev as a universal regulator of human relations and so corresponded to the synergistic ideas of academician-mathematician, represented in the theory of universal evolutionism. The concept of this planetary “Market” (“market” with a capital “M”) is strongly associated with the processes of cosmoplanetary organization, described through the prism of “MARKET” (“market” in capital letters) (Moiseev, 1995a). Nikita Moiseev noted the value of rational factors in human life (especially from the

perspective of the “rational society” organization (Moiseev, 1995b)) and was convinced that “at the new stage of anthropogenesis human life would be controlled by a new type of MARKET capable of foresight” (Stepanov, 2013: 56). He wrote: “If the birth of LIFE is considered as the first fundamental bifurcation of the process of cosmic evolution, then the second bifurcation is the birth of MIND. This is a restructuring of the very content of biosphere development, because qualitatively new principles of selection, formulated by human MIND, appear” (Moiseev, 1995b: 163). Thus, the birth of MIND and its influence on the evolution processes turns “Market” into “MARKET.”

All three meanings of “market” also suggest that its concept includes the dimensions of continental, regional, local and individual markets. In this sense, it seems that the term “MARKET” is well correlated with the idea of Sergey Bulgakov about “the understanding of the world as an economy” (Bulgakov, 2009: 38) and in modern socio-philosophical discourse is close to the views of Karen Momdzhyan, who considers the economy not as an independent sphere of production, but as “a system of distributional relations” (Momdzhyan, 2019: 32) in various subsystems of society. This approach reveals a significant epistemological dimension of economy (as a way of the understanding of the world as a whole (Sergey Bulgakov), as a way of the study of cosmoplanetary evolutionary processes (Nikita Moiseev), as a way of benefit sharing in various spheres of public life (Karen Momdzhyan)), that expands its content to the methodological level. This meaning of economy brings it closer to the concept of economics (as a science, a field of knowledge about various ways of efficient organization of production and distribution relations, exchange and consumption of necessary goods).

The list of Nobel Prizes in Economics (Namyatova & Semin, 2020) illustrates some features of modern economic consciousness: the awards are almost always for some specific economic achievements in a particular area of global economy, but in the list of “high-quality Nobel products” there are not any versions of cosmoplanetary economy. Of course, it would be wrong to insist that there are not any fundamental cosmoplanetary economic theories at all. For example, some reports to the Club of Rome could claim the prize of the Swedish State Bank, but they are not nominated for it, as if they are outside the human future. However, the transition from the “Earth” economy to cosmoplanetary economy is the reality of the contemporary world where mankind is waking up from “consumer fever” under the influence of COVID-shock.

Unfortunately, Barry Commoner’s “environmental laws” have not been implemented in the modern political economy yet. The capitalist economy does not understand that “Everything is connected to everything,” “Everything must go somewhere,” “Nature knows better,” and “Nothing is given for free” (“Everything has to be paid for”) (Commoner, 1974). An integral “political econology” (“biospheric political economy,” “econoomics”) has not been created yet, and humanity is still in captivity of economic anthropocentrism, which destroys nature — the sphere of human existence and consciousness. Modern capitalist society is unable to give up its “extreme dreams” of over-consumption in conditions of overexploitation of “the nature of nature” (Morin, 2005) and “the nature of human.”

Econoomics provide a necessary integral way of considering the modern cosmoplanetary economy — the interdisciplinary and transdisciplinary field of knowledge, describing the noospheric face of human economic activity and aimed at finding some “proper” attractors of harmonious social, natural and cultural development of cosmoplanetary life, where the economic entities of different degrees of complexity and organization pursue their goals and values that sometimes coincide and sometimes contradict the interests of other praxeological actors (Smirnov & Odintsova, 2019).

We believe that the problem of econoomics' subject area can be viewed from the perspective of the laws of Barry Commoner. For example, the formula "Everything is connected to everything" is not only ontological (as it seems at first glance): it contains the diverse philosophical palette of the world-building process (including cognition processes, value orientations and activity approaches) and shows that the consideration of cosmoplanetary economy should not be unconsciously limited to one or another kind of "centrism" (sociocentrism, anthropocentrism, economic centrism). This formula shows the dialectical complementarity of "Everything in everything" and "All in one." The problem is that the real universal meaning of this thought in the modern economy is often "limited" ("everybody is connected to everyone," "everything is connected to everything materially," "everything is connected to everything energetically") and serious difficulties also arise due to the fact that few people know how "everything is connected to everything." Thus, the way to overcome the crises of modern economic thought is to develop econoomics as a due synthetic paradigm.

The advancement of econoomics is significant because the traditional ecological paradigm of economic development is no longer valid: the informational paradigm is being implemented in the economy as a key driver. In fact, the role of the digital sphere (as a certain part of the infosphere) can be expressed in terms of additionality: a more complex digital paradigm includes both economic and ecological, technological, anthropological, cultural paradigms. Such digital "common denominator" can unite in the numerator all the forms of human cosmoplanetary life in the noospheric epoch with its advantages and disadvantages. All these digitized forms can be properly organized in the context of econoomics, intended to provide the orientation of the infosphere (and digital sphere) to reconstruct life-giving socio-natural and socio-cultural integrity.

Cosmoplanetary economy and noospheric economy

This research on cosmoplanetary economy should be supplemented by the analysis of the relations between the concepts of "cosmoplanetary economy" and "noospheric economy."

In modern literature, the authors' concept of the noospheric economy is considered primarily due to a proper, reasonable, creative, green economy. For example, Peter Nikitenko considers noospheric economy as "a reasonable way of social reproduction of goods, works and services based on improving the system of corporate innovative production relations and predominantly postindustrial productive forces in order to provide the development of human personality, preservation of nature for future generations, sustainable growth of the gross domestic product and its reasonable distribution between relatively rich and relatively poor members of society with maximum employment of the working-age population in a socially-oriented economy" (Nikitenko, 2006: 16-17). Aleksander Subetto, in his "Manifesto of Noospheric Socialism," defines noospheric economy as "a noospheric-socialist mode of social production, which is built on the basis of the Synthetic Civilization Revolution, on the basis of intelligent, knowledge-intensive market-planned economies. It is presented as a result of the transition from the 'epoch of political bourgeois economy' to the 'era of social economy' [...], the basis of which is a 'social economy of labor' [...]. Noospheric economy is both the labor economy and the economy on the foundation of the unity of labor and intelligence and manifests itself through the quality of management of socio-economic, scientific-technical and socio-natural development of society as a whole and the development of noosphere" (Subetto, 2011: 73, 75).

From this point of view, the noospheric economy can be considered a real due concept of

the cosmoplanetary economy — the tragic reality of modern mankind. At the same time, taking into account the axiological approach to the understanding of cosmoplanetary economy as an economic activity focused on achieving life-giving integrity in the Universe, the concepts of noospheric and cosmoplanetary economy can be considered as future synonyms. Nowadays, such a change of the modern economy concept from regional to global and from global to cosmoplanetary seems the only way for humanity to survive.

Conclusion

Finally, it should be noted that the importance of the cosmoplanetary economy investigation is determined both by the ontological status of the phenomenon (in its extensive and intensive dimensions) and by the urgent necessity of filling its content with an axiological and epistemological component. An effective, life-giving reorganization of cosmoplanetary economic order that is now under the severe strain of the technosphere is seen as the only way to overcome modernity's global catastrophism.

Some proper attractors of economic development are found in the noospheric thought of Vladimir Vernadsky (Vernadsky, 1991) and related philosophical ideas about rational society as “a society moving in the era of noosphere” (Moiseev, 1995b: 318), about noospheric consciousness (Smirnov, 1998), econoomics (Smirnov & Odintsova, 2019), noospheric strategy of the transition to the sustainable development (Ursul, 1998), about basic noospheric law (Dmitrevskaya, 1998) and basic semiotic law (Smirnov, 2011a), a noospheric human being (Melikyan, 2013), which can provide the re-formation of cosmoplanetary economy towards preservation and enhancement of the world economic integrity as a necessary condition for the survival of mankind.

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Cosmological Ideas in the Natural Philosophy of Cadwallader Colden

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Sobolievskyi, Yaroslav and Liubov Sobolievska (2021) Cosmological Ideas in the Natural Philosophy of Cadwallader Colden. *Philosophy and Cosmology*, Volume 26, 169-178. <https://doi.org/10.29202/phil-cosm/26/14>

In the history of philosophy, in particular, in the history of early American philosophy, there is a person who deserves special attention, because the extraordinary ideas of this thinker greatly influenced the science of the 18th century. We are talking about Cadwallader Colden, who was an extremely active scientist. He published several treatises on physics, mathematics, ethics, and he studied the nature of mind, psyche, physiology, and the cosmos in which man lives. His cosmological doctrine was formed under the influence of the natural philosophy of Isaac Newton, and it was proof of the existence of philosophical discourse on different sides of the Atlantic Ocean. The purpose of the article is not to test the validity of the ideas of the early American philosopher, not to critically examine the doctrine through the prism of modern physics and cosmology, but to try to assess self-valuable philosophical ideas. The article demonstrates that Cadwallader Colden was a unique and individual philosopher, with original teachings in natural philosophy and cosmology. His views on the nature of physical phenomena were similar to mental phenomena; he carefully studied the properties of bodies and the nature of their impact. Using the ancient concept of the ether, he tried to explain the nature of gravity, which keeps the Planets of the Solar System in their orbits. In his understanding, it is impossible to imagine the process of transferring power from one agent to another without an intermediary, and he considered ether to be this intermediary. Since the theory of gravity is still a theory, a philosophical analysis of this phenomenon remains relevant, and an appeal to the cosmological experience of philosophers of the past will allow us to look at the problem from a different angle.

Keywords: Cadwallader Colden, history of philosophy, philosophical cosmology, natural philosophy, early American philosophy

Received: 12 December 2020 / Accepted: 10 January 2021 / Published: 29 January 2021

Introduction

Cadwallader Colden contributed to the history of science in America, developed an original philosophical doctrine, with which both his supporters and critics agree. However, historically, there was no completely fair tendency either of a negative attitude or the darkening of his personality and activities. Such assessments of his merits are very common. Cadwallader Colden “was the most dismal physical scientist produced in colonial America” (Tucker, 2003: 100-101). As the researcher Allen C. Guelzo rightly asserts, Cadwallader Colden’s attitude, not as a historical person, but as a scientist, as a philosopher, has been and remains ambiguous. “On those terms, it has been easier to read about Colden than to read anything of what Colden wrote” (Guelzo, 2004: 843). One of the most famous historians of early American philosophy, Isaac Woodbridge Riley (1869-1933), in his book *American Philosophy: The Early Schools* (1907), devoted an entire chapter to the memory and teachings of Cadwallader Colden, in which he praised the scientist’s contribution. He placed him between deists and realists in the materialist section. “Cadwallader Colden (1688-1776), the first and foremost of the early American materialists, had a career as varied as his accomplishments... His system, in general, was in advance of the ordinary eighteenth century deism, anticipated to a degree the New England transcendentalism, and issued in a movement essentially modern, — the resolution of matter into the mechanics of energy. Colden is thus akin to Franklin, to Emerson and to Count Rumford” (Riley, 1907: 329, 335).

Another important biography of the thinker is *Cadwallader Colden, A Representative Eighteenth Century Official* (1906), the author of this monograph, researcher Alice M. Keys, made undoubtedly an original contribution not only to the history of the United States, but also to the history of early American philosophy. Setting herself the task of describing a little studied period, and from which we still far from understanding. She chose an interesting combination of historical and biographical methods; that is why they made it possible to explore the career of a prominent historical figure in a new way. Very well suited to the description of the life of the early American thinker John M. Dixon. In 2016, he published *The Enlightenment of Cadwallader Colden: Empire, Science, and Intellectual Culture in British New York* (2016), in which he demonstrates a new trend, his description of the political views of a philosopher is more an apology than a criticism. In his interpretation, Cadwallader Colden maintained a belief in hierarchy, especially in monarchy; he believed that royalty stabilized the powers of motley politicians (Dixon, 2016).

In 2002, for the first time, the unique collected works of Cadwallader Colden were published under the title *The Philosophical Writings of Cadwallader Colden* (2002). This book is the first collection of the main philosophical works of the early American thinker. Thanks to his diplomatic talents and political activities, now we can better understand the worldview of the indigenous people of North America. For example, his book, *A History of the Five Indian Peoples* (1727) was the first history of the Iroquois in English. Contributions like this to the development of ethnology have helped in the future to better understand the process of acculturation and to promote the growth of tolerance. As a philosopher, he was interested not only in historical events in the history of tribes, but also in their worldview, their culture and thinking. In *Philosophical ideas in the spiritual culture of the*

indigenous peoples of North America (2020), researcher Sergii Rudenko examines a similar phenomenon, when non-professional anthropologists and ethnographers of colonial America tried to preserve the heritage of the indigenous people. “With the advent of European writing and science, American Indians gained additional opportunities to preserve cultural heritage, so archaeologists, anthropologists, philologists, and other researchers gained new scope of work” (Rudenko & Sobolievskiy, 2020: 171). According to the editors Scott Pratt and John Ryder, this book was popular both in the colonies and in Europe (Pratt & Ryder, 2002). A feature of this anthology is that, in addition to the famous works of the philosopher: *Introduction to Philosophy*, *Principles of Action in Matter*, *Introduction to The History of the Five Indian Nations* — it contains a full correspondence with the early American philosopher of the Great Awakening period Samuel Johnson (1696–1772) on the concepts of matter and idea. In addition, for the first time published the ethical treatise *Principles of Morality* (1745), which is very important for researchers of the intellectual history of the colonial period.

Sources and factors of the formation of the philosophical worldview of the thinker

In 1776, several historical events took place in North America. On July 2, thirteen colonies declared their independence from Great Britain, and two days later, Congress in Philadelphia passed the Declaration of Independence. Researcher of the biography of Cadwallader Colden, Seymour I. Schwartz, rightly asserts that against the background of these most important events in the history of the United States, the death of a famous doctor, scientist, botanist, ethnographer and philosopher, unwaveringly devoted to the British monarchy, was lost. “... a savant, who was deemed by colonial intellectuals as the most knowledgeable individual in all of the land. He shared interest and dialogue with three other colonial physicians, who were similarly notable for diverse contributions beyond the realm of medicine” (Schwartz, 2013).

The personality of Cadwallader Colden has been well studied by historians; it is known that he was born on February 7, 1688, in Ireland, although his parents were from Scotland. The father of the future philosopher, Alexander Colden, was a religious man who served in the church in Duns, Berwickshire, Scotland. He was interested in natural sciences and medicine, which played a significant role in the formation of his philosophical views. In 1705, Cadwallader Colden graduated with an MA from the University of Edinburgh. At the University, he studied the natural philosophy of Isaac Newton (1642-1727), and the new concept of the world order will be one of the important topics of his own philosophy.

At the invitation of relatives, in 1710, he arrived in America, where he took up a medical practice. In 1718, Colden left his practice for financial reasons and moved with his family to New York, where he received a lucrative position. As a surveyor-general of New York, he communicated a lot with Native Americans who lived nearby, and he was even accepted into the clan (Schwartz, 2013). In *Dictionary of Early American Philosophers* (2012), researcher John Shook writes that “In 1728 Colden and his family settled on an estate he called “Coldengham” in Ulster County, New York, where he was able to retreat from the political environment of New York City and study botany, mathematics, physics, medicine, and philosophy” (Shook, 2012: 232).

Cadwallader Colden’s bibliography is extensive, he left a legacy of extensive correspondence, and the main works of the philosopher are *The History of the Five Indian Nations Depending on the Province of New-York in America* (1727), *An Explication of the First Causes of Action in Matter and the Cause of Gravitation* (1745), *The Principles of Action in Matter, the Gravitation of Bodies, and the Motion of the Planets, Explained from*

those Principles (1751). Cadwallader Colden's *History of the Five Indian Nations Depending on the Province of New-York in America*, published in 1727 (revised in 1747). This is one of the key intellectual books published in America in the 18th century. Philosopher discusses the laws, religion, customs, manners, and systems of government of the confederacy of tribes. If the first work was devoted to ethnology, then the thinker already showed a talent for philosophical reflection in the next remarkable book. This time was a test for two civilizations to build a kind of respectful relationship that would last for centuries. Researchers Denys Svyrydenko and Wiktor Mozgin argue sparingly in the article *The Soft Power of the State as a Dialectic of Contemporary Dependencies in the International Arena* (2019): "... the theoretical and practical premises of external policy have not fundamentally changed since the 17th century, since the goal of each entity is still to ensure security and achieve the best position in relation to others" (Svyrydenko & Mozgin, 2019: 90). From the book *History of the Five Indian Nations*, we learn how important it was for a philosopher to understand the culture of the Indians and maintain a tolerant relationship with them.

He was inactive correspondence with another prominent figure in early American philosophy — Benjamin Franklin (1706-1790), together they laid the foundations of the future American Philosophical Society. In 1811, the first volume of the *American Medical and Philosophical Register; Or, Annals of Medicine, Natural History, Agriculture and the Arts*, published an anonymous biographical article on Cadwallader Colden. "Though his principal attention after the year 1760 was necessarily directed from philosophical to political matters, yet he maintained with great punctuality his literary correspondence, particularly with Linnaeus of Upsal, Gronovius of Leyden, Drs. Porterfield and Whytte of Edinburgh, Dr. Fothergill and Mr. Collinson, F. R. S. of London. There were also several communications on mathematical and astronomical subjects between him and the earl of Macclesfield. With most of the eminent men of our own country, he held an almost uninterrupted epistolary correspondence. Among them, we may mention the names of Dr. Garden, Mr. J. Bartram, Dr. Douglass, Dr. John Bard, Dr. Samuel Bard, James Alexander, Esq. and Dr. Franklin" (Anonymous, 1811: 301). Here on the journal pages, we find confirmation that Cadwallader Colden stood at the origins of the American Philosophical Society. "With Dr. Franklin in particular, he was a constant and intimate correspondent, and they regularly communicated to each other their philosophical and physical discoveries, especially on electricity. In their letters are to be observed the first dawns of many of those discoveries which Dr. Franklin has communicated to the world and which so much astonished and benefited mankind. In a letter to one of his friends Dr. Franklin gives an account of the organization of the American Philosophical Society in which he mentions that Dr. Colden first suggested the idea and plan of that institution" (Anonymous, 1811: 301). It is obvious that a man like Cadwallader Colden, who was at the origins of the American Philosophical Society, wrote philosophical treatises and studied Aboriginal culture, is an important person in the history of early American philosophy.

Cosmological ideas in the natural philosophy of Cadwallader Colden

As one of the founders (ideological inspirer) of the American Philosophical Society, Cadwallader Colden had to keep abreast of all the latest scientific discoveries. Here it is necessary to clarify that for the 18th century, the concept of philosophy was significantly different from its today's understanding. Thanks to the principle of historicism, it is necessary to study the phenomenon in its historical realities. Even the famous work of

Isaac Newton (1642–1727) *Mathematical Principles of Natural Philosophy* (*Philosophiæ Naturalis Principia Mathematica*) was devoted to the philosophical problems of nature's study. Philosophy in the era of the Enlightenment was associated mainly with education, erudition, encyclopedic knowledge. It was considered as an instrument of reason for penetrating the secrets of nature, which became not the scene of the Biblical story, but the workshop of the scientist. The Universe, Cosmos, Space, everything seemed subservient to the new research methods, and the mind was the only oracle. Here it is worth clarifying what we mean by the concept of progress in the history of philosophy and cosmology when we assert the contribution of this or that philosopher to science. The correct thesis was formulated by the researcher Vadim Tytarenko in the article *Non-Classical Approach to a History of Philosophy: Modern Status and Research Prospects* (2019). "Today, there are many theories of the historical-philosophical process, which can be divided into two main groups: those that consider the history of philosophy as a consolidated and unified process of the progressive development of philosophical ideas (Hegel's and Marx's theories of the historical-philosophical process) and those that suggest that the history of philosophy should be understood as a set of philosophical ideas that do not have a clear line of development, but which emerge and interact chaotically" (Tytarenko, 2019: 122). Most of the historians of philosophy from Ukraine and other post-Soviet countries prefer the former group of theories to the second.

An interesting experience of comprehending the philosophical heritage of Cadwallader Colden was carried out in the Soviet Union. In 1968-69, Soviet philosophers conducted a series of studies of early American intellectual culture. The interest was clearly political since it was necessary to know the forms of thinking of a potential adversary. In the history of the United States, an era was found that more or less suited Soviet ideology; it was the American Enlightenment with its struggle against the monarchy. Soviet ideology was built on the idea of a revolutionary struggle against tsarism for the sake of the communist ideal. Soviet philosophers in the 18th century in America saw this spark of revolutionary sentiment; it subtly legalized the research itself. The works of Benjamin Franklin, Thomas Payne, Thomas Jefferson, Cadwallader Colden, and others were translated into Russian. The compiler of the texts was Nikolai Goldberg. The author of the introductory article was Bernard Bykhovskiy. He started with such words: "This is about thinkers and public figures that the American people can rightfully be proud of. About the inspirers and ideologists of the anti-colonial revolution of the 18th century. About the people who brought the advanced ideas of their time" (Goldberg & Bykhovskiy, 1968: 5). Soviet philosophers argued the relevance of the study of early American philosophy in this way: "One of the most important tasks of Marxist philosophical historiography is to extract from the group of materialist thinkers, devoted to oblivion by the idealist history of philosophy, to restore their true views, not vulgarized and not distorted by opponents, and to understand their real role in the struggle between the two camps in philosophy and the significance of their ideas in the progress of social thoughts. Enlightenment philosophy is of particular interest in this respect because of its inextricable connection with advanced, revolutionary for their time, socio-political aspirations" (Goldberg & Bykhovskiy, 1968: 8-9). Translating and publishing American philosophy in the Soviet Union, Soviet philosophers assimilated the ideas of the West and expanded their own range of concepts. Researchers Sergii Rudenko and Vyacheslav Vilkov wrote about this well in their article *De-Stalinization of the Concept of the Nation in Soviet Marxism in the Second Half of the 20th Century* (2020). "... in the Soviet scientific literature depending on the political leaders and elites who headed the USSR, as well as the specifics

of the geopolitical processes of the 20th Century, the main ideological components of the official version of Marxism-Leninism, the precepts of the programs and strategies of the ruling Soviet Communist Party” (Rudenko & Vilkov, 2020: 161). Some works of the early American philosopher were translated into Russian, namely *The Principles of Action in Matter, the Gravitation of Bodies, and the Motion of the Planets, Explained from those Principles* (1751). He based his most important philosophical work on his treatise *An Explication of the First Causes of Action in Matter and the Cause of Gravitation* (1745). In one undated note, Cadwallader Colden noted that because the words “first causes” were misunderstood, he changed the title to “first principles.” Cadwallader Colden’s book gained notoriety mainly in Europe, but in America, Samuel Johnson (1696-1772), theologian and idealist philosopher, a follower of George Berkeley, drew attention to it. Soviet philosophers called this debate the struggle in American political philosophy between materialists and idealists. It is difficult to give an unambiguous answer to the question of Soviet philosophers about whether the early American philosopher was a materialist or an idealist. It is much easier to assert that he was an empiricist; all cognition begins with perception. Do not forget about the increased interest in astronomy, cosmology, and its history in the Soviet Union, especially against the backdrop of successes in the space program.

Before proceeding to the study of the force of attraction of planets, bodies, and their motion, it is necessary to understand the principles of action of the matter: “We have no knowledge of substances, or of any being, or of any thing, abstracted from the action of that thing or being. All our knowledge of things consists in the perception of the power, or force, or property, or manner of acting of that thing; that is, of the action of that thing on our senses, or of the effects of that thing” (Colden, 1751: 1). We find this quote at the very beginning of the treatise — CHAP. I. *Of the Principles of Action in Matter*. SECT. I. *Of the essential Properties and Differences of Things*. “For if any thing produce no alteration in our senses, it is impossible for us to know that any such thing exists: and every effect must be produced by some cause, or by some action” (Colden, 1751: 2). From the very beginning, he comes to an amazing conclusion. Through philosophical reflection, he deduces the principle of existence, which is in many ways similar to George Berkeley’s thesis *esse est percipi* (“To be is to be perceived”). If the logic of the European philosopher identified existence with the fact of perception, then the American philosopher formulates a similar principle in a different way. It is obvious to him that if a thing is not perceived, then it does not exist (existence is an alteration in senses). In fact, George Berkeley never wrote “*esse est percipi*,” the closest he ever came is in section 3 of his *Principles of Human Knowledge* (1710), where, of “unthinking things,” he says: “Their *esse is percipi*.” The full quotation looks like: “Their *esse is percipi*, nor is it possible they should have any existence out of the minds or thinking things which perceive them” (Berkeley, 1734: 31). For Cadwallader Colden, every thing we know is an agent. What this agent is, he explains as follows — the agent is determined by the acting force, since we know nothing about the thing, except for its action and the consequences of this action. Any agent, in order to exist, must have an impact on another thing, and for the impact, he must have his own ability or received power. However, since if an agent receives power from the outside, then he is not the original agent, and therefore is not suitable for studying first principles. The American philosopher analyzes only the initial agents, and those must continuously manifest their energy. Analyzing the content of the mind, the philosopher comes to the obvious answer, these are ideas or concepts, but they do not arise arbitrarily, but under the action of some thing that we perceive. For a thing to act on our perception, it must have qualities, must have some form and component parts. If a thing

consists of parts, then it is able to influence perception with different strengths depending on the number of parts. “And every thing which is conceived to be of Line quantity, is commonly called *matter*. But if the action of any thing does not excite in us any perception of its being of any quantity, or of any form or shape, or of its consisting of any parts, or that its force or action can be increased or lessened by the addition or taking away of part, that thing commonly goes under the name of an *immaterial* substance, or of *spirit*... The property, or quality of any thing, is nothing else but the action of that tiling...” (Colden, 1751: 3). Thus, the philosopher equally operates with two concepts: matter and spirit, which complicates his identification as a materialist or idealism. We emphasize that we did not set ourselves the task of solving this issue, but its mention is necessary. The essence of things, or substances, the philosopher believes, consists in the ability, or force, or mode of action of these things. In the SECT. II. *Of the force of Resisting, or Vis Inertiae of Sir Isaac Newton*, Cadwallader Colden develops his cosmology, based on a critical examination of the physical image of the world by Isaac Newton. The works of the latter, at one time, significantly changed the idea of humankind about outer space and our planet. His merits are so obvious that they are not worth mentioning, but in this study, we conduct a comparative analysis of some of the ideas in order to reveal the cosmological teachings of the early American philosopher. The most obvious knowledge given to us through the senses is knowledge about the quality of things that affect us due to some kind of resistance. The action of an object on the senses meets resistance; this is perception. The most obvious way to experience the juxtaposition of the outside world is tangible things. “This was first considered as a force or power by Sir *Isaac Newton*, under the Name of *vis inertiae*, or that power or force by which any thing resists or opposes any alteration of the state in which it is: and it is so generally observed, that it is commonly accounted a permanent essential property of all matter” (Colden, 1751: 5). This power, which both the early American philosopher and the European physicist wrote about, is sometimes more, sometimes less.

According to some researchers, there has never been a more daring claim to intellectual superiority in colonial America than Cadwallader Colden’s claim that he discovered the cause of gravity. For the enlighteners, Isaac Newton symbolized a world governed by precise laws that can always be double-checked, which are always predictable. Despite the exact laws that explain the effects of gravity, Isaac Newton was unable to answer a very important question: “I have not been able to discover the cause of those properties of gravity from [the observation of] phenomena... and I frame no hypotheses” (Newton et al., 1947: 547). According to Brooke Hindis, who was an associate professor of history at New York University, from 1948 to 1950 was research associate at the Institute of Early American History and Culture, Cadwallader Colden succeeded in what Isaac Newton did not: “What Newton could not discover “from phenomena” and would not seek by hypothesis, Cadwallader Colden would attempt: he would find the cause of gravitation. He started to put together his thoughts upon this great subject at least as early as 1743. In 1744, he circulated among a few friends in New York and Philadelphia a manuscript draft of his developing ideas. A small edition, still incomplete, was published in 1746 so that it could be offered to a wider circle of men of learning. It bore the title, *An Explication of the First Causes of Action in Matter; and of the Cause of Gravitation*” (Hindle, 1956: 459).

This force can increase if it is summed up with other forces or grow in proportion to the number of components. Cadwallader Colden gives an example with a ball, imagine a ball weighing twenty pounds. It will resist with more force than a ball, for example, one pound. This force has nothing to do with the concept of motion, because when moving, an

action can be directed from one point to another, and then only in one direction. Therefore, if there were any kind of movement in the act of resistance or inertial force, it would resist movement only if their directions were opposite, and it resists movement in all directions equally. Resistance is a force that equally resists movement. It is quite customary for a person to attach the idea of moving to the idea of any action, but when we eat to imagine a kind of action without movement, we face difficulties. When a person thinks, he thus undoubtedly does something, which means that a philosopher concludes that thinking is an action, a kind of action: "Thinking is acting, or is a kind of action" (Colden, 1751: 7). However, thinking cannot be thought of as movement or resistance; it is a special action, significantly different from all other types of action. Therefore, in thinking, simple ideas arise from the action of simple forces, like resistance. In turn, complex ideas arise from the combination of the actions of several simple forces.

Cadwallader Colden interprets matter in a positive, dynamic sense. For him, the matter was not something that was defined only in terms of geometry and the theory of contamination, but as a fundamentally active source that could provide ample opportunities for describing and explaining the world. "Colden construed matter in positive, potent terms; the matter was not something that was identified principally in terms of geometry and resistance but as a causally active source that could provide a rich explanatory framework for describing and explaining the world. Although Colden stopped short of thoroughgoing materialism, he did go quite far in that direction" (Taliaferro, 2005).

A different sophism, nothing can act where it is not. From this maxima, the philosopher deduces the following idea, and nothing can communicate its action to another thing located at some distance from him. Power can only be communicated through something, through another thing. He describes the example that a person's hand can move a ball, either by touching it or using a stick. "We perceive that the Sun communicates some kind of action to all the planets, which circulate round it, by which they are retained in their orbits, or gravitate towards it: So likewise we observe, that the earth communicates action to bodies at a distance from it, by which they gravitate towards the earth. There must then be some *medium*, some middle thing, by which the Sun and the Earth communicate the action to other things, at a distance from them. This cannot be by an emanation of some kind of virtue, as some imagine; because any kind of emanation supposes motion from the thing which emits the virtue to the thing on which the virtue exerts its force; but it is impossible to conceive that any motion from a thing, can cause a motion to that thing" (Colden, 1751: 17). However, it doubtfully that a movement emanating from one thing can cause movement to another thing. If, in this case, we want to investigate the causes that cause some phenomena, or phenomena, of nature, then it becomes necessary to reveal the nature of this medium through which things communicate their action at a distance. Isaac Newton and other philosophers have called it ether, and everyone admits this kind of thing exists.

Conclusion

Cadwallader Colden was a prominent and undeservedly forgotten early American philosopher of the Enlightenment. A possible reason why his personality remains on the sidelines is his political beliefs; that is why his biography and bibliography were lost against the backdrop of the dramatic events of the American Revolution. His contributions to natural sciences and medicine are indisputable, but the question remains about his legacy in the fields of cosmology and philosophy. The article describes the main key works of the philosopher, focuses on the facts of the biography that influenced the formation of the philosophical

worldview. The article also analyzes his epistemological, ontological and cosmological ideas, which were born in polemics with the outstanding minds of the 18th century on different sides of the Atlantic Ocean. It was in the philosophical discourse that new cosmological knowledge was born, which filled the scientific image of the world with new ideas. In his writings, Cadwallader Colden held a parallel between thinking and the world, demonstrated the similar nature of physical and mental phenomena, studied the nature of resistance, force, described by Isaac Newton. With the help of philosophical terms, originally from antiquity, he tried to answer questions that remain unanswered today, which produce more and more new hypotheses. With the help of ether, he explained the reason why the Sun holds the Planets. Since the gravitational interaction is still not completely studied, the philosophical understanding of this phenomenon does not lose its relevance.

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Arkady Ursul's Death an Irreparable Loss



July 28, 1936 — November 5, 2020

On November 5, 2020, an outstanding scientist Arkady Ursul passed away after a serious illness at the age of 85 in Moscow. He will be remembered for his significant achievements and enormous contributions to the world science: Doctor of Philosophy, Professor of the Faculty of Global Processes at Moscow State University named after M. V. Lomonosov, Honored Scientist of Russia, Academician of the Academy of Sciences of Moldova, Honorary President of the Russian Academy of Cosmonautics named after K. E. Tsiolkovsky, member of the International Academy of Astronautics and a number of other scientific communities, member of the Editorial Boards of a number of scientific journals, including academic journals *Philosophy and Cosmology*, *Future Human Image*.

The scope of scientific interests and research of Arkady Ursul covered the philosophical problems of mathematics, informatics, security and development, education, technical and agricultural sciences, space exploration, ecology, and global processes. In his works, he developed the concepts of space exploration and the prospects for human space activities,

global studies, informatization, advanced education, synergetics, the creation of the noosphere, social ecology, socio-natural balance, sustainable development, and universal evolutionism.

The author of over 1100 publications, of which there are over 200 books — monographs and textbooks. His brilliant articles were regularly published in our magazine.

Arkady Ursul, a man with encyclopedic knowledge, unique creativity, and outstanding performance, left behind an original and rich creative heritage, was an excellent lecturer, talented teacher, excellent organizer, and science and education leader. He trained many skilled specialists and great scientists. He was a responsive, intelligent person with a kind heart and a loving soul.

The bright image, ideas, researches and deeds of Arkady Ursul will remain forever in our memory and in our hearts.

Oleg Bazaluk, Sergey Krichevsky, Alexander Panov

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International Society of Philosophy and Cosmology (ISPC)

ISPC is an organization formed at the suggestion of members of the First International Seminar “The Universe — structure, stages of formation and development” (Pereyaslav-Khmelnitsky, Ukraine, 5–7 October 2004). The mission of the project ISPC — to merge into a single information space academic scientific and philosophical researches on space matters.

Activities

Currently, ISPC specializes in the design and creation of the common information space in space exploration.

The priority for ISPC is the three areas:

1. The scientific and philosophical research of the structure of the Universe and the stages of its evolution and the study of man’s place at the scale of the Earth and the Cosmos;
2. The scientific and philosophical analyst of modern educational systems in order to create the future human image — an abstract ideal way of future generations of serving a guide for the existing systems of education;
3. Theoretical and practical research of the organization and implementation of space travel. In addition to enabling high-quality communication and access to current information about space exploration, ISPC publishes research journals “Philosophy and Cosmology,” “Future Human Image,” and “Ukrainian Policymaker,” a series of monographs “Space Travel,” conducts online conferences, international seminars, exhibitions, etc.

Proposal for cooperation

ISPC is ready to cooperate with academic researchers, teachers of educational institutions at all levels of accreditation, students, enthusiasts and all interested in creating the common information space in space exploration.

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Philosophy and Cosmology, Volume 26, 2021

Academic Journal

Філософія і космологія, Том 26, 2021

Науковий журнал

Коректура, комп'ютерне верстання — Панченко Н.В.

Макет обкладинки — Кулинич Є. А.