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## Theoretical and methodological essence of noospheric geography of the 21<sup>st</sup> century

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**Abstract.** In modern conditions of globalization of society development and fleeting transformations of natural processes, when the development of science, including geographical, is extremely accelerated, there is a rapid complication of forms and methods of theoretical and methodological knowledge, which makes it necessary to conduct logical

and methodological analysis of geography in modern conditions. It turned out that a hundred years ago, says Edwin Toffler, Thomas Mann put forward a formula that expressed the feeling of death of a certain era. Today, humanity has approached an invisible boundary that separates one era from another. It is established that the world is on the threshold of grand social changes, technical and cultural innovations. In these conditions, when the world has become completely different, it is important for geographers to understand the consequences of the ongoing transformation processes. All this requires a new understanding from the standpoint of a globalized society, to find out what fundamental consequences for geography brought the information technology revolution, which will result in new paradigms for the development of our science. A. Toffler argued in «The Third Wave» that humanity was approaching a new technological revolution, that is, the First Wave (agrarian civilization and the Second (industrial civilization)) was replaced by a new wave that led to the creation of a supra-industrial civilization almost twenty years ago. If the concept of «living matter» (as a natural planetary body) underlies the doctrine of the biosphere, then the selection of such a natural phenomenon on a planetary scale as «scientific thought», becomes the most important naturalistic generalization in the theory of the noosphere. Nowadays, the idea of the coherence of the most progressive social laws and the achievements of scientific knowledge acquires a special meaning, becomes the most important problem of the very existence of human civilization. Based on the above, according to M. V. Bahrov, L. H. Rudenko and I. H. Chervaniov, we argue that «there was a need to create new scientific products that reflect the state and problems of the current stage of development of society», i. e., noosphere geography. The refore, the realization of the purpose of the study is to identify scientific sources about the change of the theoretical essence of modern geography, substantiation of the theoretical and methodological essence of the «new» noosphere geography in the transition of information society to noosphere and clarify the place of noosphere geography in general scientific classification.

*Ключові слова:* *globalization processes, information world, changing the essence of modern geography, substantiation of noosphere geography.*

## Теоретико-методологічна сутність ноосферної географії XXI ст.

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**Анотація.** В сучасних умовах глобалізації розвитку суспільства і швидкоплинних трансформацій природних процесів, коли надзвичайно прискорюється розвиток науки, зокрема й географічної, відбувається швидке ускладнення форм і методів теоретико-методологічного пізнання, що робить необхідним проведення логіко-методологічного аналізу стану географії в сучасних умовах. Виявлено, що сто років тому, відзначає Едвін Тоффлер, Томас Манн навів формулу, яка виражала почуття загибелі певної епохи. Нині людство підійшло до небачимої межі, яка відділяє одну епоху від іншої. Встановлено, що світ стоїть на порозі грандіозних соціальних перемін, технічних і культурних нововведень. В цих умовах, коли світ став зовсім іншим, географам важливо зрозуміти, до яких наслідків можуть призвести трансформаційні процеси, що відбуваються. Усе це вимагає нового осмислення з позицій глобалізованого суспільства, з'ясувати які фундаментальні наслідки для географії принесла інформаційно-технологічна революція, які внаслідок цього виникнуть нові парадигми розвитку нашої науки. Е. Тоффлер у праці «Третя хвиля» стверджував, що людство підходить до нової технологічної революції, тобто на зміну Першій хвилі (аграрної цивілізації і Другої (індустріальної цивілізації)) прийшла нова хвиля, яка вела до створення надіндустріальної цивілізації. Це було майже двадцять років тому. Сьогодні з'ясовано, що інформаційна цивілізація створила фундамент для народження Четвертої без абзаців хвилі – сучасної ноосферної цивілізації. Якщо поняття «жива речовина» (як природне планетарне тіло) лежить в основі вчення про біосферу, то виділення такого природного явища планетарного масштабу, як «наукова думка», стає найважливішим природничо-науковим узагальненням в теорії ноосфери. Сьогодні ідея узгодженості найбільш прогресивних соціальних законів і досягнень наукового знання набуває особливий смисл, стає найважливішою проблемою самого існування людської цивілізації. Виходячи

із вище сказаного за М.В. Багровим, Л. Г. Руденком і І. Г. Черваньовим стверджуємо, що «Виникла потреба у створенні нової наукової продукції, яка відображає стан і проблеми сучасного етапу розвитку суспільства», тобто ноосферної географії. Тому реалізацією **мети** дослідження є виявлення наукових джерел про зміну теоретичної сутності сучасної географії, здійснення обґрунтування теоретико-методологічної сутності «нової» ноосферної географії в умовах переходу інформаційного суспільства в ноосферне та з'ясування місця ноосферної географії в загальнонауковій класифікації наук.

*Ключові слова: глобалізаційні процеси, інформаційний світ, зміна сутності сучасної географії, обґрунтування ноосферної географії.*

## Introduction.

It is established that the contradictions between the new facts in the observations of nature and the properties of a man by special studies and the modern generally accepted picture of the world and its fundamental laws are constantly growing. V. P. Kaznacheiev (1993) clarified that the global desire for unification and convergence of world national technical and religious cultures continues to take shape more and more clearly. In their historical movement, the globe and humanity are entering a new band – the existence of a noosphere society, in which through economic tools will rapidly unite peoples, countries, continents, humanity of the Earth into a single, indivisible, interdependent, cosmic mechanism.

At the same time, according to V. P. Kaznacheiev (1993), the planet Earth, from space view, is like an apple, which is peeled off with a powerful hand, pierced on all sides, eaten by an ugly force, peeled surfaces slowly heal, but not all. Moreover, technical innovations accumulate huge capital, which in the world of privatization, property at any cost trying to buy, to win regional and even global power. In these systems, modern political and state institutions, in fact, no longer play a deterrent role. A new parasitic, socio-political mechanism is also rapidly forming on the planet, which is already confronting and coming into conflict with the existing system of the United Nations of the Planet. State borders retain their own political, in fact, national-political significance. For natural processes (atmospheric, biological, energy, etc.) these boundaries are of no importance, global natural processes have turned out to be uncontrollable. The element of dismemberment and pragmatism leads the Planet, as a cosmic formation, to inevitable chaos. This is the scale of a new psychosocial historical phenomenon of the planet.

Today the main issue of globalization according to M. Senchenko, O. Senchenko and V. Hostynshchykov (2016, p. 55) is to answer the question: who is superfluous on this Earth? To avoid global crises, experts of the Club of Rome proposed to develop a new algorithm (management rules) for the interaction of subsystems (politicians call it a new world order) and to create a central body that regulates their functioning for the benefit of the whole system (World Government). Naturally, the authors continue, in such a situation,

nation-states must lose economic and socio-political independence (i. e. lose their subjectivity).

According to their scheme, the development or even the very existence of a number of industries or agriculture in some countries will become impossible, as it will disrupt the optimal functioning of the entire metasystem. In such a situation, the World Government will have to eliminate these industries (and, if necessary, the national economies themselves) to keep the new world order in a stable state. Naturally, these radical measures will primarily affect non-Western countries, whose level of development is disproportionate to Western ones, and therefore will be less valuable for the metasystem (and the authors warn: here is the answer to the question: why Ukrainian industry is destroyed?). It is worth adding another question: why did the Ukrainian government decide to sell the land to foreigners?

Based on the analysis of the current state and opportunities for the development of the INTERNET, INTRANET and EXRANET in foreign sources (Chen, Finin, and Joshi, 2013; ETSI TS, 2013; Gaia, 2014; Gu, Pung, and Zhang, 2004), Lishchytovych, 2019) found out that among a number of powerful global telecommunication networks, in particular reconnaissance and defense, the most widespread is the civil INTERNET, which already performs a number of internet functions in the future Noosphere. Internet users are already accustomed to the appropriate media environment, to audio, video and online games with high resolution, personalization tools for pattern recognition, non-locally tied software, even to security-critical tools such as e-commerce, e-Health, first responders etc. Over the past decade, the number of Internet users has increased thousands of times, for example, in 2017, in just one hour, about 41 million DVDs were sent over the Internet, and video calls accounted for about 85 % of the total Internet schedule. Now almost everything around us is found in the Internet, even the concept of the Internet of Things (LoT). For example, Machine-to-Machine communications (M2M) has already received its own driver to speed up traffic. Also, Voice over IP (VOIP) tools require just over 150 ms for latency, 30 ms for vibration, and about 1 % of packets are lost to maintain optimal Quality of Experience (QoE). Today, the development of Internet technologies is aimed at comprehensively providing people with services packed in the interfaces of the Internet for home life and work, as well as study, recreation, just communication and

more. The author is convinced – this is how the future Noosphere is born.

All this would be wonderful, if there were no thieving actions of the Western authorities. Therefore, Lishchytovych L. I. (2019) notes that already widespread at the beginning of the 21<sup>st</sup> century, conversations and discussions at scientific conferences on the so-called «sustainable development» of mankind are gradually subsiding due to the falsity of this idea in the agony of world capitalism. Many scientists no longer see a way out, investigating the facts of the rapid death of the basic elements of the Biosphere, which can not recover under the influence of an insane thirst for enrichment of individual rulers. Honest experts, especially ecologists and biologists, have begun to warn of the end of our civilization, along with the destroyed Biosphere.

Other scientists also cite disturbing facts. Thus, Mezhzherin V. A. (1996) found that modern civilization, as a game of chance and law, manifests itself in the form of a disease similar to alcoholism or drug addiction: it gives the illusion of happiness and brings doom to the humanity that has chosen it. Death is determined by many causes, among which two are decisive: reducing the effectiveness of social progress and criminalizing society. The first has the effect of replacing the accumulation of wealth by eating it. The second is the formation of criminal forms of its distribution. Then a period of total lawlessness comes there.

In addition, I. R. Oleksienko and L. V. Keisevych (1997, p. 19, 24) say, an impressive «achievement» is that in the process of civilization, the Earth is transformed into a giant landfill not only simple but also radioactive, saturated with highly chemically aggressive substances. In fact, the nearby space, the atmosphere, inland bodies of water and rivers, soil, seas and oceans, and the ocean floor have become a «starting point». Every year, about 150 billion tons of liquid, solid and gaseous household and industrial wastes enters this landfill. At least 5 billion tons of human excrements are added to them annually from the six billion population of the Earth, which even existing treatment facilities cannot cope with neutralization, not to mention natural detoxification systems. It should be supplemented with the annual movement for the extraction of minerals using up to 15 km<sup>3</sup> of soil, of which only 7% is used for the manufacture of the final product. As a result, we have a clear and undisputed conflict in the relationship between man and nature.

Oleksienko I. R. and Keisevych L. V. are convinced of this: only a small part of the most obvious tasks that humanity needs to solve without denial in the 21<sup>st</sup> century, if, of course, it wishes and, most importantly, has time to do so until power over the world is passed completely into the hands of organized crime, and the octopus of civilization is generated by mankind with its

tentacles did not suffocate in the arms of the biosphere and man-made.

Kaznacheiev V. P. (1993) stated that in these conditions, the very forces of the scientific and technical global process in the late twentieth century were in the hands of a new, far from humane, system of power. It is necessary to ask, who investigates all this new historical dynamism of mankind of the planet? What is a scientific organization or association of scientists and practitioners? Real experience suggests nothing.

Today, the idea of the coherence of the most progressive social laws and the achievements of scientific knowledge acquires a special meaning, becomes the most important problem of the very existence of human civilization. The authors agree with the opinion of scientists – M. V. Bahrov, L. H. Rudenko and I. H. Chervaniov (2010, a), who found that there was a need to create new scientific products that reflect the state and problems of the present stage. Development of society is the transition of the Biosphere to the Noosphere and the creation of noosphere geography. In the transition of the Biosphere to the Noosphere, the problem of new knowledge – noosphere geography is exacerbated as a practical and social problem. Philosophical understanding of the results of modern development of noosphere-geographical ideas is a necessary condition for a correct understanding of the laws of science in the modern world, its place in social progress. Science and education will play a fundamental priority role in the process of transition from the biosphere to the noosphere.

### Research methods.

The authors conducted research in accordance with philosophical principles: objectivity of content, historicism, the contradiction of the process of cognition. Disclosure of the full depth and richness of the content of the principle of development is possible only on the basis of consistent implementation of the dialectical approach, which contributes to the general generalization embodied in specific forms, interconnected in accordance with the structure of interaction of categories «general», «special» and «separate». The methodological essence of the study is based on the philosophical and concrete-philosophical levels. It is applied: *the method of inference knowledge*, which is due to the process of obtaining *review information as inference knowledge*, which is derived by purposeful logical justification; *ascending method* from abstract to concrete; a *systematic approach* in considering a single system of forms of motion of matter in conjunction with the theoretical and methodological justification of noosphere geography; *literary source, historical and classification method*. The general procedures of regularities of cognition are

also taken into account: *predication* – a logical act of establishing the properties of the object under study; *constructivization* – a way to include the studied position in the system of the whole in the form of a meaningful system of obtaining new consequences; *application and interpretation* as ways to reveal the new in knowledge through its addition to new areas of activity.

### Materials.

Nowadays, there are more and more calls from humanity and scientists to develop theoretical and methodological issues for the development of the Noosphere and justify the mechanisms of transition to the Noosphere – the realm of reason and justice. These appeals compel us to trace first of all the history of the very notion of the «noosphere».

Summarizing the accumulated knowledge about the shell («spherical») structure of the planet Earth, the Austrian geologist Eduard Süsses (1909) in a three-volume work «Face of the Earth» outlined the «synthetic concept of geospheres», identifying three material shells: solid (top is sedimentary) – stratisphere, water and air. From the 17–18 centuries there were known the ideas about the relationship of inanimate and animate nature. For example, the British scientist John Woodward in his work on natural history wrote about the role of living organisms in geological processes, and the philosopher Jean-Batiste Pirre Antoine de Monet, Chevalier de Lamarck (1802) expressed the idea of the planetary role of life, noting the significant role of living organisms in changing the Earth's crust. V. M. Corsunov and E. N. Krasekha (2010, p.13) note: Lamarck emphasized: «Complex minerals of all kinds, which form the outer crust of the Globe and occur there in the form of individual clusters, bodies, parallel layers that form lowlands, hills, mountains, are exclusively the product of animals and plants that existed in these parts of the Globe».

The famous German naturalist Baron Friedrich Wilhelm Heinrich Alexander Freiherr von Humboldt (1862) in the fifth volume of the «Cosmos – Entwurf einer physischen Weltbeschreibung. E. I. Kolchynskyi» (1990, p. 7), emphasizes that O. Humboldt in this work already characterizes a certain sphere of life, which he called «life sphere» as a regular in the form of a specific Earth's shell and an inseparable part of the Earth's surface, where a single integral system of atmospheric, marine and continental processes, as well as wildlife phenomena.

In *The Origin of the Alps (Die Entstehung der Alpen)*, E. Süss (1875) singled out of all the Earth's crust, a special living shell, the biosphere, which stretched in the surface geospheres and was formed by the living inhabitants who inhabited it. Under the biosphere E. Süss understood the Earth's shell

(geosphere), inhabited by living beings, and not the totality of living beings.

In 1922–1923, while V. I. Vernadskyi was lecturing at the Sorbonne in Paris, he adopted biogeochemical phenomena as the basis of the biosphere. Some of these lectures were published in «Sketches of Geochemistry», which was first published in French in 1924, and in 1926 – in Russian. In 1927, E. Le Roy (1927), a French mathematician and philosopher – Bergsonian, adopted the biogeochemical basis of the biosphere established by Vernadskyi V. I. as the source and in his lectures at the Collège de France in Paris he identified the «intellectual and spiritual layer», where his opinion, correlated with the evolution of the brain and received a special impetus to expansion in the biosphere with the advent of man in it. He substantiated the formation of the «spiritual layer of life», which was defined by E. Le Roy as the «noosphere» (the first use of this term).

In turn, Marie-Joseph Pierre de Chardin (1987, pp. 148, 150) investigated that under geochemical, geotectonic, geobiological pulsations there is a deep process – the one that materialized in the first cells, continues in the creation of nervous systems. He proved that geogenesis transitions to biogenesis, which ultimately is nothing more than the psychogenesis that led us to man. Now, he notes, psychogenesis changes and is absorbed by a higher function – first by origin, then by the development of the spirit – noogenesis. To the four overlapping shells of the Earth since the time of E. Süss, science adds a living film formed by the plant and animal surface of the globe – a universal shell – the Biosphere. Around the spark of the first reflective consciousness, according to Pierre de Chardin, a fire began to ignite. The flames eventually engulfed the entire planet. Only one name has the ability to express this great phenomenon – the Noosphere. Just as extensive and much more complete than all the other previous covers, it is really a new cover, the «thinking layer» that emerged at the end of the Tertiary period (during the Paleogene and Neogene – B. C., I.D.), has been unfolding ever since over the world of plants and animals – outside the biosphere and above it. A new era begins, the Earth «changes the skin». Moreover, it receives the soul. The most careful researcher of our modern science can find here that everything is valuable, everything is progressive, from the beginning present in the cosmic rag from which our world came, is now concentrated in the «crown» of the Noosphere.

Already in our time, Paul R. Samson and David Pitt (2002), based on numerous sources of Western scientists, analyzed the development of the concept of «noosphere» from its origins to the present and suggested that the two concepts – biosphere and noosphere are interdependent. Early promoters, they note, of the concept of the noosphere – Teilhard de

Chardin, E. Leroy and V. Vernadskyi considered the noosphere, albeit in different forms, but as a natural extension of the physical nature of the biosphere. It is important to recognize that they define and develop the role of human society in the biosphere, which has an extraordinary planetary role of consequences. The concept of the noosphere is clearly based on the classical geology of the representation of the Earth as a sequence of concentric spherical shells: barisphere, lithosphere and biosphere, first described in the work «Face of the Earth» (Das Antlitz der Erde) by Austrian scientist Eduard Süss (1875; 1909). The noosphere as a higher sphere subordinates other spheres, but develops together with other spheres.

During the first decade of the 20th century, the authors continue, they began to clearly define the role of humanity as the dominant geological force on the planet. J. Parkins Marsh, Edward Suess and others. began to view humanity as the potential to change the face of the Earth on a global scale. J. P. Marsh argued that man is a new telluric force, which in strength and universality can be compared with the great forces of the Earth (Cited by: Clark and Munn, 1986. 10). Paul R. Samson and David Pitt (2002) note that it is important to note the key differences between the conceptualization of Teilhard de Chardin, E. Leroy and V. Vernadskyi. For the first two, the noosphere is seen as an irreversible phase of biosphere development – a predetermined process driven by the phenomenon of a man with the noosphere as a kind of evolution of the stage outside the biosphere. In essence, they viewed the biosphere as an intermediate step leading to the higher plane of the noosphere present in their work at an early stage. For V. Vernadskyi, the biosphere was the basic principle of life, and the noosphere was rather a part of human potential and a stage of its development. For V. Vernadskyi, the biosphere and noosphere are interconnected in the framework of the coevolutionary development of the process. In any case, without the biosphere there could be no noosphere, no matter how one defines last one. Teilhard de Chardin created a comprehensive scientific and pantheistic concept of Noogenesis (1987, pp. 24–35).

Paul R. Samson and David Pitt (2002) emphasize that at the United Nations Conference on the Environment in Stockholm in 1972, many reports stated that the biosphere should be seen as a fundamental concept of life on Earth, covering the development of people to the environment. The authors note that the development of biogeochemistry has its roots in the work of V. Vernadsky and today the study of «Biogeochemical cycles» has become an active field of science that promotes research by a group of scientists from the Scientific Committee on Environment (Bolin and Cook, 1983) and ask: «Why this concept and the

reference to the idea of the noosphere has received so little attention and even recognition until the mid-1980s?»

Hilarov (1995, p. 193) notes: «Probably not by accident with the approach by the end of the 20<sup>th</sup> century the work of the scientific community of scientists such as Polunin (1982), Clark and Mann (1986), Grinewald (1987; 1988) and Haggett (1995) was particularly useful in popularizing the idea of the noosphere. Works such as «What is life?» (Margulis and Sagan, 1995) and «Cycles and Life: Civilization and the Biosphere» (Smil, 1997) have paid considerable attention to these same issues. Moreover, this probably indicates the changing times, which were influenced by the main contribution of V. Vernadskyi – the work «Biosphere» – was first published without abbreviations in 1988 with a foreword by prominent scientists presented by microbiologist Lynn Margulis. According to Lynn Margulis and Dorion Sagan, V. Vernadskyi showed that all life lived materially in a single place – the biosphere. V. Vernadskyi portrayed life as a global phenomenon in which solar energy was transformed (1995, p. 47).

Paul R. Samson and David Pitt (2002) found that during the Cold War, Vernadskyi's work was occasionally distorted by jealousy and competition, as Soviets often outnumbered Americans in space. The French natural philosopher Jacques Grinewald (1998) compared Vernadskyi's slow recognition of Thomas Kuhn's notion of the «invisible» scientific revolution. This analogy seems particularly relevant as the concept of the biosphere is increasingly recognized as the most important idea in thinking about global environmental change.

Paul R. Samson and David Pitt (2002) found that regardless of worldview, the noosphere is an important phase in the history of our planet. Importantly, the noosphere is an unprecedented event: Earth and society seem to be entering a critical period at this stage. In many ways, the Earth has become a single system intertwined with the interconnections of global reason and global action. Again, we were faced with two questions: what direction does public opinion want to move into the noosphere, and in what directions can the noosphere go? In practice, and in today's world, this means asking how the noosphere can be used to address issues such as the environment, health, poverty, violence and inequality.

Before moving on to these issues, Paul R. Samson and David Pitt (2002) offer several basic views on the noosphere:

1) an optimistic view of the noosphere is essentially related to concepts irreversibility and inevitability. It is believed that humanity is moving to a higher level of existence and this progress does not stop;

2) it would seem that the second optimistic view will support the same concepts or at least not deny them, although the driving force is not the spiritual energy, but there is human creativity in the form of technology;

3) shares a positive view of science, technology and human potential, but remains fundamentally tied to the constant physical limitations of the biosphere. From this point of view, humanity needs to design appropriate ways to govern the world, and all will be well;

4) provides for the possibility of balance between the biosphere and noosphere, but draws attention to the inherent unpredictability, which is manifested in human progress.

V. Vernadskyi's concept of the joint evolution of the biosphere and noosphere and his opinion that people are free to develop their future, albeit unpredictable. According to Eccles and Popper (1990) the idea of the noosphere needs good news as well as the fundamental role of intelligent matter, or perhaps another quantum process (Penrose, 1995). In particular, there are many opportunities in living matter to capture and justify the patterns of development of Nature in interaction with the development of society. As Lynn Margulis and Dorion Sagan point out (1995, p. 138): «The noosphere is still in its infancy», but «perhaps now at the most impressive stage». Indeed, it seems that this is the time of the most important decisions for our future. The authors believe that this time has come.

It was at the beginning of the twentieth century. V. I. Vernadskyi (1988) noted: two great facts, before which all others seem almost smoothed, prevail in the history of the Earth's past: the revival of matter and the humanization of life. Within living matter in the last decade, a new form free energy – biogeochemical energy, which covers the entire biosphere and determines mainly its history. This new form of biogeochemical energy, which can be called the energy of human culture, is the form of biogeochemical form that creates the noosphere in our time. We are just experiencing its bright entry into the geological history of the planet. Under the influence of scientific thought and human labor, the biosphere passes into a new evolutionary state – the Noosphere. **The creation of the biosphere and noosphere is a natural phenomenon, deeper and more powerful at its core than human history. It requires the manifestation of humanity as a whole** (highlighted – B. C., I. D.). This is its inevitable precondition and a new stage in the history of the planet, which essentially creates something new in the history of the Earth. Scientific thought as a manifestation of living matter carries the possibility of unlimited development over time perhaps billions of years, the process of creating *Homo sapiens* Faber is *not a short-lived and fleeting geological phenomenon*. Processes that have been prepared for many billions of years

cannot be fleeting, they cannot be stopped. It follows that the biosphere will inevitably pass one way or another, sooner or later into the noosphere. Forming the noosphere, the biosphere has all its roots in the earth's crust, something that has never been seen before in human history. The main geological force that creates the noosphere is the growth of scientific knowledge. Scientists face for the near future an unprecedented task for them to consciously direct the organization of the noosphere, from which they can not move, because it directs their spontaneous growth of scientific knowledge (Vernadskyi V. I., 1988). Under these conditions, as V. I. Vernadskyi noted, «The biosphere of the 21<sup>st</sup> century is transformed into a noosphere, which is created primarily by the growth of science, scientific understanding and social work of mankind based on it» (Vernadskyi, 1977). Vernadskyi V. I. in his work «Scientific Thought as a Planetary Phenomenon» noted: «It is now necessary to take into account circumstances that have never existed in human history to such an extent. Everything that is experienced cannot be long and lasting, and the transition of the biosphere to the noosphere that we are experiencing cannot disappear». He continued: «In the noosphere, the spiritual life of the human person is strong and decisive, in its social manifestation» (Vernadskyi V. I., 1988). These considerations of V. I. Vernadskyi was inspired by Academician I. P. Herasymov at the coordinatory meeting of geographers to call one of the main tasks of constructive geography the development of an extensive interdisciplinary program for the transformation of the Earth's biosphere in the twentieth century into the noosphere of the 21<sup>st</sup> century, outlining 12 points of the program (Herasymov, 1986).

It was found that V. I. Vernadskyi, observing the beginning of the scientific and technological revolution, believed in the human mind and its unlimited possibilities, and therefore was confident in a fairly rapid transition of the biosphere to the noosphere. V. I. Vernadskyi (1977, p. 133) in the early twentieth century confidently wrote: «I look forward very optimistically. I think that we are experiencing not only a historical, but also a planetary break. We come to the conclusion about the transition to a new social order, a new era in human life and life on our planet in general, when accurate scientific thought as a planetary force comes to the fore and changing the whole spiritual environment of human societies, when it embraces and changes the technique of life, artistic creativity, philosophical thought, religious thought. I am deeply convinced, and I am increasingly convinced that the only way to make social culture strong is to raise the masses, to make for them, culture (especially science) is vital... We live in the transition to the Noosphere».

However, according to Abramov L. S. (1988), for many years the name of V. I. Vernadskyi was not mentioned in the press or in university courses. He was not properly assessed by some compatriots (for example, A. I. Oparin). Moreover, whole generations of scientists – biologists, chemists, geographers worked in the fields close to the work of V. I. Vernadskyi, not knowing the basic works of his great compatriot.

V. I. Vernadskyi (1988) at this time was convinced that all mankind was taken together, but with his brain. In the geological history of the biosphere, a man has a great future, if he understands this and will not use his mind to self-destruction. The historical process is radically changing in front of our eyes. For the first time in the history of mankind, the interests of the masses, on the one hand, and the free thought of the individual, on the other, determine the life of mankind, are the measure of justive ideas. Humanity as a whole is becoming a powerful geological force. And before him, before his thought and work, is the question of *restructuring the biosphere in the interests of free-thinking humanity as a whole*. This new state of the biosphere, which we are approaching without noticing it, is the *noosphere*.

His general works have been published relatively recently. Even the «Chemical Structure of the Earth's Biosphere and its Environment» (the main book of life, according to the scientist himself) was published only in 1965–20 years after his death. The publication of other works, starting with the «Notes of a Naturalist» was delayed for another 10 years. Many scientists, realizing the process of transition from the biosphere to the noosphere, began to study actively his works and develop new ideas in the last quarter of the 20<sup>th</sup> century.

Having established the patterns of development of society and science in the late twentieth century, M. V. Bahrov (Bahrov M. V., 2005) specified that a shock more cardinal because of the speed of its origin, was the information age. The concept of information space also appeared. A total corporate-network market was formed, which covers all forms of socio-economic, spiritual and other spheres of life. The network in the information society has become the circulatory system of the world economic organism. Thus, for the first time in human history, we are dealing with a purely noosphere process, which determines the basis of human existence, because information and communication are intangible substances of the new world. Informatization and globalization have turned most of the world into a single system and set science the task – to formulate such system-wide laws that would reveal a number of patterns of formation of a new world order. Alvin Toffler (Toffler, 2004) described the patterns of global change: **the world is on the threshold of great social change, technical and cultural innovations**. The profound and impressive development of the potential of technology

will have an impact on all aspects of social life. Microelectronic evolution increases the power of human intelligence. Technological innovations will have an impact on the social structure of society. In fact, a new way of civilization is born, in which the sphere of work, management, and recreation will be fundamentally different. Mankind is entering a new era – the era of existence of man and society in a fully **technical and informatized world of the noosphere**. The conflict between the groups associated with the Second and Third Waves of Science is in fact the central axis of political tension along which our society is divided today. **The sooner humanity realizes the need to move to a new third wave, the less there will be threats of violence, dictatorship and other troubles** (highlighted by the author). Korchak K. (2008) found that with the transition of society to the noosphere environment of the XXI century society will not be informational with the mass spread of personal computers and the Internet, but a society of **nano-, pico- and frame technologies** that will replace all sectors of employment and will require for its emergence and use significant changes in education systems, including the transition from elite university to general and multisectoral higher education.

The influence of modern development of society on geography, which appeared at the beginning of the «revolution in the system of scientific worldview as a search for a noosphere model of future humanity in the 21<sup>st</sup> century, which covers *all sciences and all spheres of continuing education, as a leading problem of noospherogenesis*» (Subetto, 2009).

### Results and their analysis.

The regularities of geography development in the conditions of mad influence of informatization of society are characterized, although geographers in the last quarter of the 20<sup>th</sup> century believed that the «filled» territory is our object of study, – M. V. Bahrov (2008) said, – and approached its analysis as a geosystem, where real material and energy flows functioned, materialized energy production cycles. Now a new world has opened in front of us, built on a qualitatively new information basis to understand and know the global world is possible only by studying its various dimensions. The author is convinced that this dictates the emergence and development of the latest branches of knowledge – **geo-economics, geo-finance, geo-informatics, geo-ecology, geo-culture**. The information age began to influence geography, forcing it to delve into the object of knowledge with a different, more modern measure, with a deeper understanding of geospace, its immanent properties, with knowledge not so much real as a virtual network, a different assessment of resources when material values are replaced emerging intangibles. After all, today's production system of

the world seems to «breathe», flows from one region to another, the world of industry is largely becoming virtual and managed by managers. Based on the fact that the immediate and most important task of geography will be to identify virtual dynamic forms of information as an object, object and means of production, it can be argued that this will deal with **information geography** (Bahrov, 2008; Rudenko, 2006).

Bahrov N. V., 2008 and Rudenko L. H., 2006 found that the global development of society and science shows – the era of civilization «Third Wave» A. Toffler – the era of «information society» is coming to an end, preparing a strong foundation of the «Fourth Wave» – «noosphere society» with the newborn «noosphere geography». There are all grounds for this in Ukraine: in the last decade the works of M. V. Bahrov, L. H. Rudenko and I. H. Chervaniov have been published, which are a guide for substantiating the future development of geographical science in modern conditions of the beginning of noospherogenesis (Bahrov, Rudenko, Chervaniov, 2010; Bahrov, Rudenko, Chervaniov, 2010; Bahrov, 2011). The right opinion of M. V. Bahrov about the movement of modern geography to the socioospheric direction of development was also expressed. It is revealed that the first characteristic of «noosphere geography» at the end of the 20<sup>th</sup> – the beginning of the 21<sup>st</sup> century in Ukraine is associated with the names of the famous geographers: Bahrov N. V., Rudenko L. H., Chervaniov I. H. They found that in the 21<sup>st</sup> century «there is a powerful, irresistible process of informatization of society in front of our eyes, the world is rapidly becoming different. Already today, a third of humanity communicates via the Internet, the virtual world has become for many people a kind of «second entity». Since we are all also in this stream of transformational changes of the «third wave» of world civilization, we do not even realize that each of us, without noticing it, already lives in the informational world. World business is moving in the stream of information technology and rushing in it, accelerating the pace by tens of percent per year. M. V. Bahrov and co-authors emphasize: «The current production system of the world seems to «breathe», flowing from one region to another, the world of industry largely becomes virtual and managed by managers – this is **information geography**» (Bahrov, 2008; Bahrov, Rudenko, Chervaniov, 2010; Bahrov, Rudenko, Chervaniov, 2010). Today there is an urgent need for a positive perception of the need facing geography: **to intensify their participation in business, creating business geography** (Chervaniov, Ihnatiev, 2008).

M. V. Bahrov found out that geography today faces a fateful question: will it agree with the secondary role as a science and school discipline or can become an equal member of the scientific community on the highways

of scientific and technological progress and fit into the evolutionary process of the information society? We must be prepared for the fact that the geographical space, which is the object-subject foundation of geography, will be gradually replaced by the information space. Based on the above, he stated: «Information about the environment of mankind – the process of noospherogenesis, requires multidisciplinary scientific support. It becomes clear that we are on the verge of the emergence of a new branch of our science – socioospheric geography» (Bahrov, 2011). And immediately cited the scientific «attributes of socioospheric geography». All this suggests that geography is becoming different in its object-subject essence. But will it happen?

The regularities of the development of noospherogenesis and the formation of noosphere geography are characterized, which will unite the emerging information and socioospheric geography, and need to determine its place in the system of natural and social sciences. The authors of noosphere geography M. V. Bahrov, L. H. Rudenko and I. H. Chervaniov outlined a preliminary way to solve this problem, but it remained incomplete (due to the premature transition of the genius geographer M. V. Bahrov – in another world) and therefore the continued existence of noosphere geography was open for a long time. It is believed that the solution to this question should begin with the main thing – with the classification of natural sciences, which will determine the place of noosphere geography in the system of these sciences.

It is found that today the objectively fundamental basis for the classification of sciences is the classification of forms of motion of matter, substantiated by F. Engels: «Classification of sciences, each of which analyzes a separate form of motion or a number of combined, which each pass into another form of motion, is at the same time a classification, location, according to their inherent sequence, it is these forms of motion, and this is its significance. Transitions must be carried out by themselves and be natural. Just as one form of movement develops from another, so the reflection of these forms, the various sciences, must necessarily flow from each other» (Engels, 1982). F. Engels compiled the following hierarchical series of forms of motion of matter: **mechanical, physical, chemical, biological and social**. Today, as (Bazaluk, 2014) notes, scientifically proven legitimacy of the transition of some forms of motion to other more perfect forms of the structure of matter, types of interaction (relationships) between the structures of matter and habitats. It is established that evolution is not just a complication of the material world, but a complication of the named structures, that it is a continuous process of *self-complication* caused by derivative activity, which is the basis of evolution as its cause. The regularity of evolution is



characterized – there is *not a linear complication, but a branched process* and complication of the structure of matter, types of interaction and habitats, in which each element is part of the previous element and simultaneously includes all subsequent elements. Such a nonlinear hierarchical complication of the structure of matter, types of interaction and habitats is a *directed evolutionary process*. The development of the complication of the structure of matter, types of interaction and habitats according to the law of dialectics is estimated: «Movement and development in nature, society and thinking are due to the bifurcation of the one into interpenetrating opposites».

It is established that the classification of sciences by forms of motion of matter is fundamental for the current stage of the development of science, which allowed B. M. Kedrov to substantiate the idea of divergence in the development of nature into inorganic and organic (Kedrov, 1962; Kedrov, 1985). As it turns out today, the divergence of natural development began with the emergence of life on the Earth planet, «i.e. 4.252 billion years ago» (Nemchin, Whitehouse, Menneken, Geisler, Pidgeon, Wilde, 2008). Two branches diverge from the chemistry: «the branch of organic chemistry leading through biochemistry to biological beings, and the branch of inorganic chemistry leading through crystallography to mineral formations». (Kedrov, 1961; Vasilieva, Orlov, 1983). It has been established that such branching was prepared at the atomic level of the structural organization of matter» (Kedrov, 1972). These branches after the divergence of the chemical form of motion of matter correspond to the geological and biological forms of motion of matter. In this case, «geological form of matter motion acts as a necessary condition for the active evolution of matter – the formation of life (living matter)» (Moroz, Onopriienko, Bortnyk, 1997; Zubkov, 1979). Thus, the classification of forms of motion of matter has become nonlinear, but which more adequately reflects the ratio of forms of motion of matter in nature.

It was found out that the development of inanimate nature (inert matter) at the *stage of the geological form of motion of matter is not completed*. This was noted by F. Engels in the section «*Physiography*»: «After the transition from chemistry to life, we must first consider the conditions in which life arose and exists – hence, first of all, geology, meteorology and the rest. And then the various forms of life, which without this can not be understood» (Engels, 1982). Liamin V. S. notes that the idea of the existence of an independent geographical form of motion of matter belongs to A. A. Hryhoriiv. He considered it a way of existence of the geographical shell as a special material system on which there was no life from the beginning. According to him, the geographical form of motion of matter is

a dialectical unity of interconnected and transitional climatic, hydrological and geomorphological processes. In the future, they are connected to the biological form of motion of matter. A. A. Hryhoriiv developed the idea of a unique global process, which covered the near-surface layers of the planet, as a special form of motion of matter – geographical. This was a fundamental natural-historical generalization. But this problem at that time (1932) was not the focus of philosophy, and A. A. Hryhoriiv failed to avoid some methodological errors that called into question the validity of the very concept of the geographical form of motion of matter (Liamin, 1984). Based on dialectical criteria for the selection of forms of motion of matter, the data of in-depth analysis of the concept of geographical form of motion of matter V. S. Liamin clarified the selection of forms of motion of matter on the basis of such criteria, «as the presence of self-developing system laws and science, the presence of genetic and structural links with the lower form of motion of matter, the presence of specific forms of space and time and a specific form of reflection» and concluded that «the development of inanimate nature on the Earth does not end at the level of geological organization of matter higher for inorganic nature is the geographical form of motion of matter» (Liamin, 1978; Liamin, 1984). This means that, starting with the chemical form of motion of matter, the development of inanimate nature on Earth after divergence is two consecutive series: in the first, each form of motion of matter «naturally generates a higher form: **physical – chemical – geological – geographical**. In this series, the geographical form of matter motion follows the geological one, as the highest of the known forms of motion of matter in inorganic nature» (Liamin, 1978). The second series has the following successive changes in the forms of motion of matter: **physical – chemical – biological – social**. It is proved that the appearance of man meant the emergence of a special, qualitatively new in comparison with all previous types of movement and development of matter – the social form of movement (Belyk, 1982). Describing political economy, F. Engels in his work «*Anti-Dühring*» described the economic form of motion of matter. Marakhov V. H. argues that society, the system of subjects and the individual are defined as a system of relations that express the qualitative specificity of the social form of motion of matter (Marakhov, 1984). This was confirmed by other scientists, which gave reason to talk about the socio-economic form of motion of matter (Syrotenko, Chernov, 1991).

In significantly changed conditions in society, new learning conditions are needed. This was eloquently stated by Toffler A. (1997), who using a huge social prognostic resource based on interpolation and prediction came to the conclusion that what

was studied in schools and universities called «a hopeless anachronism». All educational institutions, in his opinion, are moving with their heels forward to a system that is already completely obsolete. Their energy is focused on training Industrial People, people committed to surviving in a system that will cease to exist before they do. The challenges of tomorrow require not millions of superficial people, not people who follow instructions without batting an eye, but people who can find their way in a new environment, who will quickly adapt to new relationships in a total market. The people of the future will need *new skills in three critical areas – lifelong learning, productive connections and choice*.

Based on the expected significant changes in the content and position of geography in the future noosphere society, the authors previously substantiated the noosphere form of motion of matter as the highest form of motion, which unites all other forms of motion into a single whole, which will explore noosphere geography. The classification of forms of motion of matter is, according to F. Engels, the basis for the classification of natural and social sciences (Fig. 1), where the noosphere form of motion corresponds to noosphere geography with developed by M. V. Bahrov attributes that correspond to the modern global information society became a fundamental concept of geographical space, replaced by network space and territorial organization.

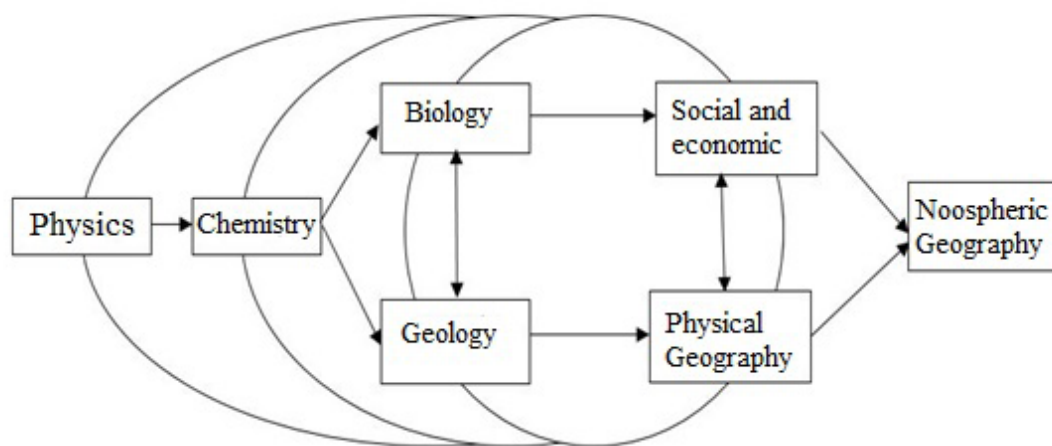


Fig.1. General classification of sciences

Intangible lies in the basis of the functioning of world networks, but all the more impressive in its power process of information exchange; pushing material values into the background and reducing to absolute intellectual and innovative «breakthroughs» the hitherto unknown «players» of the world intellectual market. All this should form the concept of noosphere geography, which radically changes its content along the entire vertical of its internal structure – from object and subject to place among the social sciences and place in the modern world» (Bahrov, Rudenko, Chervanov, 2010). Information about the living environment of mankind – the process of noospherogenesis requires multidisciplinary scientific support. The above gives rise to the idea that humanity is at the beginning of the emergence of a new science – *noospheric geography*, which agrees with the three challenges of humanity – the process of noospherogenesis requires multidisciplinary scientific support. The above gives rise to the idea that humanity is at the beginning of the emergence of a new

science – *noospheric geography*, which agrees with the three challenges to humanity justified by Bahrov M. V.:

1) with the extraordinary ecological transformation of the Planet; 2) with threatening tendencies of moral birth; 3) with the growth of the population of the planet and the deepening of the social polar polarization between the adapted (prosperous) and unadapted parts of humanity. Today, we are on the verge of losing a single universal perspective, splitting the world into a «golden billion» and the rest of the world's impoverished population. Today, as never before, the question is acute – what ways can lead us to a qualitatively new society. Participation in this noosphere geography can not be overestimated.

It was found that the formation of the noosphere, according to V. I. Vernadskyi, is a new postbiosphere reality. According to M. V. Bahrov, L. H. Rudenko, I.H Chervaniov, the object of noosphere geography should be an integrated resource for the development of society (society), which is the territory in a comprehensive global scientific vision and pragmatic perception of

humanity, which is aware own goals and opportunities for development. Forms of organization will be: cores, servers, information networks and the conscious attitude of people. Territories are characterized by natural and socio-economic properties, which together and in a systemic combination are natural-socio-economic capital, constituting the *integral potential of the territory*. Then the goal of noosphere geography will be to form a noosphere of a new postbiosphere reality with the study, inventory, ensuring the rational use and conservation of geosystems and natural and social capital, because this is the only prerequisite for self-sustaining human development in terms of conservation and rational use (Bahrov, Rudenko, Chervaniyov, 2010). The objective component of noosphere geography is information and socio-spheric geography. It should be emphasized that the implementation of all the proposed ideas will depend on the level of development of the content of noosphere geography and the formed consciousness of people. It was found that it is necessary to set in motion the intellectual forces of the geographical community, which would be ready to accept the challenge of time with giving a real constructive meaning to the noosphere geography.

### Conclusions.

It is established: in the conditions of transition of information society to noospheric the regularities of substantiation of theoretical and methodological essence of noosphere geography of the 21<sup>st</sup> century in terms of formation of noosphere society are characterized and its place in the system of natural and social sciences is clarified. It was found that the theoretical and methodological substantiation of noosphere geography is the awareness of the noosphere as a new geological phenomenon on our planet, which noosphere geography will study. This uses a deductive research strategy, in which the analysis of the scientific literature and their own understanding that the *noosphere* (according to V. I. Vernadskyi) – is the last of many states of evolution of the biosphere in geological history – it is the state of our time. Not only the development of the transformation of human society, but also a conscious, systematic re-transformation of nature and the geographical environment as a whole is rational for noosphere. Noosphere geography, really reflecting the real world, scientifically accurately analyzing the interaction of nature and society will accurately predict the development of the geographical environment under the influence of intelligent society.

In significantly changed conditions in society, new learning conditions are needed. It is found out: Toffler A. (1997), using a huge social predictive resource based on interpolation and prediction. He concluded that what was studied in schools and universities he called

«a hopeless anachronism». All educational institutions, in his opinion, are on the heels of a system that has already become obsolete. Their energy is focused on training Industrial People, people committed to surviving in a system that will cease to exist before they do. The challenges of tomorrow require not millions of superficial people, not people who follow instructions without batting an eye, but people who can find their way in a new environment, who will quickly adapt to new relationships in a total market. The people of the future will *need new skills in three critical areas – lifelong learning, productive connections and right for choice*.

With a scientifically sound organization of the educational process, «Noospheric Geography» becomes an advanced system of education for future citizens of the country and desirable for adult citizens, ahead of other areas of social activity, as information processes will be ahead of material and energy. Noospheric geography in the formation of noospheric society to preserve the aspirations and traditions of the national high school. According to Ursul A. D. (2014), the process of futurization of education will develop to form a leading human consciousness, able to both predict the future and put into practice the most desirable models. Today it has become clear that the transition of the Biosphere to the Noosphere and the formation of the realm of the mind is a historical process in material and spiritual aspects. The emergence of the noosphere quality of the sociosphere will occur when the basic forms of collective and individual consciousness acquire the properties of anticipation of being. It is about the formation of noosphere intelligence as a certain collective mind of the whole civilization, uniting the intellects of individuals and the means of informatization and mediatization, including artificial intelligence and the Internet.

Among the educational structures of the new society, a special place will be occupied by basic education, the main purpose of which is to train the knowledge elite. Training, knowledge and information make a person competent in their own field of activity. Ukraine's entry into the noosphere process together with the world community requires future teachers of noosphere geography to master the system of noosphere competencies. Under these conditions, the priority of the future teacher is to master the ability to learn to receive new information – that is, to develop the ability to lifelong learning. Avsheniuk N. M. with co-authors (2014) note: A special actualization of the globalization of all spheres of life of the individual and society in the general civilizational tendencies of the modern world, which requires higher education to provide young people with basic opportunities to integrate into different

societies, self-determination, active, competitive in the world labor market.

The authors hope that the content of Noosphere geography, which will be the leading system of education, will be directed to fundamental education. Ursul A. D. (2009) also hopes for this, noting that it will be ahead of other spheres of social activity, as information processes will be ahead of material and energy ones. The process of futurization of education must be developed for the formation of a leading human consciousness, given both to anticipate the future and to put into practice the most desirable models.

With a well-thought-out and scientifically sound organization of the educational process, this will be realized in the development of the sphere of the mind. UNESCO experts believe that noosphere education is a long process that should take place at all educational levels and include many different educational projects in which the entire knowledge system is involved. In addition, says Lishchytovych L. I. (2019, pp. 211–212) UNESCO experts identify the following possible types of training:

- **transmissive learning**, learning includes the active provision of information from both the teacher and additional learning materials;

- **discovery learning**, learning includes elements of mystery and encourages curiosity and research (in Ukraine, educational research has been conducted since 1996 according to the manual of Chernov B. O. and Korneeva V. P.);

- **participatory / collaborative learning**, learning includes active joint solution of related tasks and problems;

- **problem-based learning**, learning requires students to solve educational problems of a global nature (in Ukraine published in 2007 a work on problem-based learning of geography at school Topuzov O. M.);

- **disciplinary learning**, teaching fixed in a certain field of knowledge (Chernov B. O. and Topuzov O. M. issued for secondary school each more than 10 textbooks in geography);

- **critical thinking-based learning**, which seeks to explore the views of stakeholders when they are in conflict;

- **systems thinking-based learning**, learning focused on relationships to explore and learn about system integrity.

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Lishchytovych L. I. adds:

- **training to work with noosphere databases and knowledge**, where a person gets the opportunity to immediately find a scientifically sound solution based on a proven mathematical model;

- **the study of noosphere morality**, where man must undergo a reset of his individual, social and planetary consciousness;

- **training in the basics of noosphere justice**, which studies the procedure for standardizing the use of natural resources and the right of everyone to employment at any age and who will be interested in obtaining basic knowledge.

The authors are convinced that there are especially many opportunities for intelligent matter to capture and substantiate the patterns of development of Nature in relation to the development of society. This is possible in a complex science – Noospheric geography, which is based on the forms of matter motion of.

Based on the analysis of the general growth of intellectual technologies, Senchenko M., Senchenko O. and Hastynshchykov V. (2016) came to the conclusion that there is a feature in the Ukrainian mentality, which in some cases manifests itself as a «promoter of innovation». We do not have a firmly formalized view of the state of affairs. We see better the variability of spaces and structures, their inconsistency with formal patterns, and therefore, we catch the invisible possibilities that «have no name», i. e. innovation. This allows us to think about the Ukrainian project not just as a project to create an innovative economy, but rather as a formula for building a national innovation culture.

It was found that Ukraine with its high spirituality, science and culture can act as an organizer of the development of the idea of the noosphere and noosphere geography. The authors hope that research in this field will be continued by domestic geographers, as it is extremely important for geography and geographers themselves. M. V. Bagrov eloquently and convincingly noted this: «We are pleased to note that geography is not yet ready for such changes in its own vectors of development. In the information environment, she is still like Cinderella, but if we miss the chance to open up and declare ourselves, we can become the «Baba Yaga». Unfortunately, such an undesirable transformation is possible» (Bahrov M. V. 2008).

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