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NOOSPHERE: Terra-Incognita (A New Territory to be Explored)

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I. INTRODUCTION

Noosphere represents the current phase of human development in Geological Time Scale.Just like various other realms of geographic study- as, e.g., lithosphere, atmosphere, hydrosphere, barysphere and so on, the concept of nooshpereis gaining momentum since the last few decades.The term frequently pops up in contemporary discussions about the present and future place of humans in planet Earth[1]. It constitutes the realm of interaction between nature and society, within whose boundaries human intellectual activity becomes the primary decisive factor in development (other parallel terms in use being the 'Anthroposphere', 'Technosphere' and 'Sociosphere').[2]The concept is supposed to yield a fresh outlook on the state of humanity merged with the technical and physical development in contemporarytimes, identified as Anthropocene.[3] The Anthropocene indicates a new era on the Time Scale in which humans have become a distinct global force of nature. Capitalist industrialization, large-scale agriculture and unwarranted consumerism have led to global pollution, exhaustion of natural resources, pandemic mass extinction, global warming, etc.In the last fifty years or so, all these effects show an exponential growth, passing beyond irreversible points of no return.[4]

The noosphere we live in is the sphere of human cognition.It is regarded as the sphere of human thought often used in connection with cyberspace and the internet, seen as its materialization.The noosphere is a geological phenomenon, taken on a planetary scale.The concept and study of Noosphere is related to that of technical and digital world of human beings. It represents a sphere dominated by flows of digital information surrounding the Earth.The study of Noosphere offers a new challenge for geographers in 21st century. The Noospheric paradigm deals with the issues of future development of the civilization within the Earth's biosphere and environment. In order to take into account ecological threats for citizens in different regions of the world, the noospheric approach to global challenges has been suggested.[5]The present paper examines the significance and emergence of Noosphere and the related conceptions to it, as the *terra-incognita*, a new territory to be explored by geographers.

Postulation

The term 'Noosphere' comes from French *noösphère*, based on Greek *nous*(mind, reason).It was first coined by the French mathematician and philosopher, Edouard Le Roy.Along with him, other early protagonists, namely Vladimir Vernadsky, Pierre Teilhard de Chardin, J. E. Lovelock and Edward Suess, worked out on distinct themes of the noosphere.[6]Although,stemming out from the writings of Le Roy,[7]as philosophical concept, the notion of Noosphere has been developed and popularized, particularly, by the Russian and Ukrainian biogeochemist Vernasdsky and the French philosopher Teilhard. Interestingly, Protagoras, the ancient Greek philosopher (490–420 B.C.), the founder of the Sophist school,had already claimed earlier than these writers about the supremacy of man on Earth, when he wrote and expressed that"Man is the measure of all things: of things which are, how they are, and of things which are not, how they are not. Many things prevent knowledge including the obscurity of the subject and thebrevity of human life".[8]

Vladimir Ivanovich Vernadsky (1863-1945) was one of the most prominent Soviet natural scientists of the early twentieth century. Vernadskydeveloped the concept of Noosphere out of his theory of biosphereand biogeochemicalstudies, combining with his own work in philosophy of science.[9]His was the first publication (1943)[10] about the revolutionary theory of the Biosphere and Noosphere in English. Today, Vernadsky's notion of Biosphere has gained widespread acceptance.However, the concept of Biosphere was derived from Austrian geologist, Eduard Suess who had discussed the various envelopes of the Earth with respect to the genesis of the Alps.Vernadsky was the one who elaborated on the concept of biosphere and who is now generally

acknowledged as the originator of a new paradigm of life studies[11], a principal architect of the contemporary ecological vision of the biosphere.[12] It is essentially Vernadsky's concept of biosphere that we accept today.[13]Today, the word 'Biosphere' is a common word in our language; it is widely used by academicians, mass media and by ordinary people.According to Vernadsky, the biosphereis a great geological and cosmic force, changing the face of the unique, living planet Earth through space and time.Vernadsky defined the future evolutionary state of the biosphere as the Noosphere, the sphere of reason. Vernadskywas an atheist and thus presented materialist vision of the Noosphere.He defined the noosphere as the new state of the biosphere[14] and described it as the planetary "sphere of reason".[15]Vernadsky expressed his idea of the noosphere as the synthesis of natural and historical process.[16]According to him, the future represents transition to the noosphere.Human cause is just and it spontaneously coincides with the advent of the noosphere – a new sphere of life, where the human mind turns into a powerful geological force.Vernadsky stated that the most profound manifestation of human consciousness happens when the thinking man tries to find his place not only on Earth, but in Space. In a scientific empirical way, he comes to understand the unity of all living things – from bacteria (and even viruses) to man. There is a tendency to the unification of mankind in history, to the noosphere – the unity of the human organization as a single planetary structure.Often Vernadsky is compared to his contemporary Albert Einstein(1879-1955), and his name is as inseparably linked with the biosphere as Albert Einstein's name is with relativity".[17]

Pierre Teilhard de Chardin,on the other hand, integrated science and religion in his vision of the humanity and Noosphere.Inheriting from the works of his contemporaries, Teilhard considered the noosphere as external to the biosphere, and saw its progression from biological to psychological and spiritual evolution. He based his conception on philosophical writings, and was completelyignorant of Vernadsky'sbiogeochemical approach.In the early 20th century,he introduced the concept of Noosphere as an ideal, 'thinking'membrane that envelops the earth and that takes shape with the rise and development of human consciousness.[18]He argued thatthe Noosphere would ultimately develop towards an "Omega Point", a kind of God-like state.Like a surgeon, Teilhard attempted to dissect the super-organism, and found that there are three essential parts. (1) First is the Culture,that transfers information quickly as new ideas and know-how are communicated within a given generation, via imitation, conversation, books, etc. With culture, accumulated information and knowledge can be transferred. (2) Second isthetechnology and machines thatcreate their own evolutionary path and dynamics, on top of biology.[19]According to Teilhard a process of mechanization "finally creates, on the periphery of the human race, an organism that is collective in its nature and amplitude." (3) Finally, Teilhard sees the importanceof computers and communication networks, forming the beginning of a global cerebral apparatus. He writes that "No one can deny that a world network of economic and psychic affiliations is being woven at an ever-accelerating speed which envelops and constantly penetrates more deeply within each of us."[20] These three parts areinter-dependent, and make up the whole.[21]

Edouard Le Roy, building on Vernadskyand Teilhard's ideas, came up with the term "Noosphere", which he introduced in his lectures at the College de France in 1927.[22] Le Roy understood the noosphere as a shell of the Earth or a "thinking stratum", including various components, such as industry, language, and other forms of rational human activity.[23]Further, in the early seventies, James Lovelock(English environmentalist) and Lynn Margulis (American theorist) formulated the *Gaia*hypothesis in an attempt to explain the role of biota (plant and animal life) in the evolution of atmosphere.[24]Since then, a systems perspective on biogeochemical cycles has been rediscovered as a result of attempts to explain chemical disequilibria of the Earth's atmosphere by Lovelock and Lynn Margulis. They proposed an explanation called the *Gaia Hypothesis* which postulated the Earth to be a self-regulating system made up ofbiota and their environment with the capacity to maintain the chemical composition of the atmosphere and hence keep the climate in a steady state favorable for life. [25]

The Concept

From the writings of all the above scholars, the following conceptions of Noosphere may be derived, in general:

(1) Noosphere *versus* Noosystem
(2) Noosphere constituting the Third Spherearound the Earth;
(3) Intrinsic connection of Noosphere to Biosphere;
(4) Noosphereand'Gaia'appearing as complementary Paradigms of environmental study in Geography;and
(5) The Noosphere being Anthropocentric.

Noosphere versus Noosystem

There are two possible interpretations of the Noosphere as described by Teilhard and Vernadsky. The first is that the Noosphere represents the total pattern of thinking organisms and their activity, including the patterns of their interrelations. The other is that of a special environment or medium for humanity, the systems of organized thought and its products in which humans move and have their being - as fish swim and reproduce

in rivers and the sea. The former has been referred as the 'Noosphere' and the latter as the 'Noosystem' in an attempt to draw distinction between the two.[26] To Teilhard the Noosphere is the planetary layer of consciousness and spirituality which was emerging from a biospheric mass of energized substance. To Vernadsky, the Noosphere is above all the medium within which humanity could find material (and so spiritual) fulfillment. He believed that humanity could achieve this through exercising deliberate and conscious control over its milieu. Despite his association with Teilhard, Vernadsky appears to have remained essentially technocratic and materialistic, as opposed to spiritual in his own ideas. Unlike Teilhard's conception of the Noosphere which tried to draw together material and spiritual interpretations of the development of the Universe, Vernadsky saw the Noosphere in strictly materialistic terms as an historically inevitable stage in the evolutionary development of the Biosphere.Vernadsky's notion of the Biosphere was that of a medium for living matter and proved to be the precursor of the modern conception of the Biosphere as an "integrated living and life-supporting system comprising the peripheral envelope of Planet Earth together with its surrounding atmosphere so far down, and up, as any form of life exists naturally".[27]However,for both Teilhard and Vernadsky, the Noosphere concept represented a deep-rooted conviction that the destiny of humanity lay within its own grasp.'Gaia', a systems perspective of planetary biogeochemical cycles, has been used to investigate the stability, robustness, and sustainability of biogeochemical cycles of this Biosphere.[28] Gaia hypothesis, as presented by Lovelock and Margulis, is an attempt to explain the role of biosphere life) in the evolution of Noosphere.

Noosphere constitutes the Third Sphere encircling the Earth

Noosphere has emerged as the Third Sphere encircling the Earth (Figure-1).This sphere denotes the "sphere of human thought"enveloping the Earth.It is the third stage of Earth's development, after the 'Geosphere' (inanimate matter- rocks, water, and air) and the 'Biosphere' (all the living things). The three spheres build on each other: For example, life in the biosphere needs the geosphere to survive(matter, water, and air), and thinking needs to be embodied in the biosphere, via the living brains of human beings and our technology. So, the Noosphere can be seen as the rise of a planetary superorganism integrating all geological, biological, human and technological activities into a new level of planetary functioning.

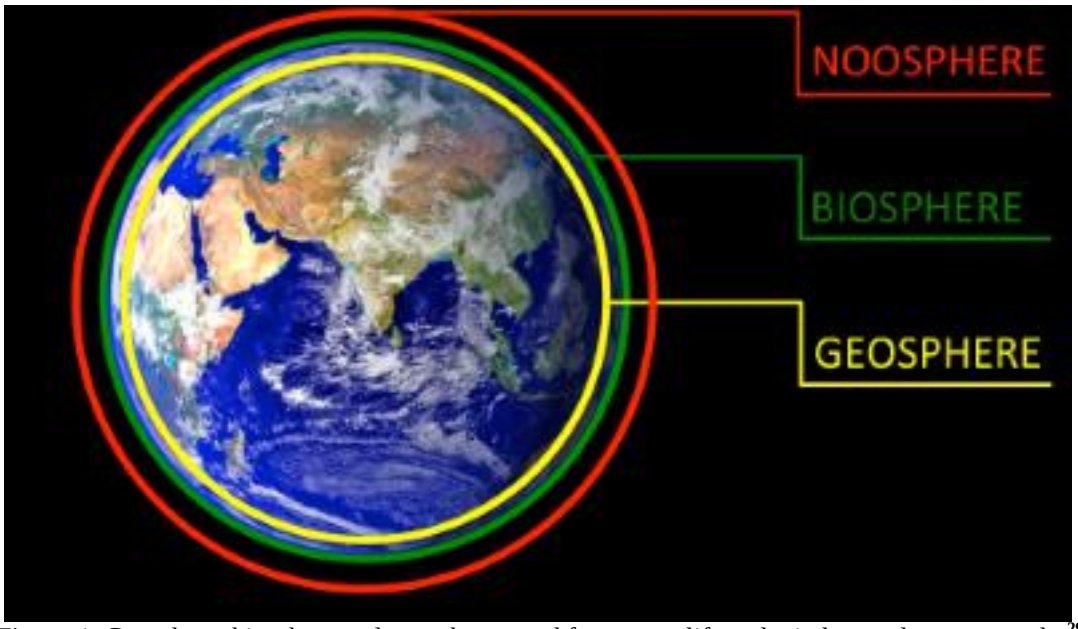

Figure-1: Geosphere, biosphere and noosphere stand for matter, life and mind on a planetary scale.[29]

Noosphere is considered as the synonym of environment.[30] It is the sphere we live in; the realm of human cognition. Simply stated, Noosphere is the part of the biosphere that is affected by human thought, culture, and knowledge. It represents the stage of evolutionary development dominated by human mind and reasoned thought. It is the sphere of human consciousness and mental activity especially in regard to its influence on the biosphere.The Noosphere we live in is the major result of our understanding the environment.Thus, noosphere is an empirical generalization.

Connection to Biosphere

The term *biosphere* was coined in 1875 by the famous Austrian geologist Eduard Suess (1831-1914). through his pioneering work on the genesis of the Alps.[31]In his interpretation, the "biosphere" is an

envelope of life, which "is limited to a determined zone at the surface of the lithosphere". The term was never given a definition or elaborated upon until Vernadsky developed a complete theory about the biosphere of the planet Earth in his two monographs and several dozens of papers. He specified boundaries (limits) of the biosphere, explicitly defined the difference, i.e., qualities, of living and non-living matter, determined the total mass of living matter, calculated the amount of cosmic energy that is absorbed by the biosphere, developed a mathematical method for determining the pressure of different types of living matter, determined cycles of chemical elements passing through living organisms of the biosphere, etc. Under Vernadsky's definition, the Biosphere is the single greatest geological force on Earth, moving, processing, and recycling several billion tons of mass a year.Accepting the concept of Biosphere, as derived from the works of Eduard Suess, Vernadsky added the now familiar notion of geochemical cycles of the Biosphere and discussed the energetics of life.[32]He proposed that life on Earth should not be considered as an accidental but rather as a geological and evolutionary phenomenon. He distinguished living matter from inert matter and emphasized their interdependence.Vernadsky's Biosphere has come to represent a powerful informing concept for humanity's relationship with Nature.[33] Its strength lies in its ability to embrace pragmatic and idealistic philosophies which guide human activities, together with the perspectives of science.Vernadsky argued that a close and cosmic connection exists between life on Earth and the geochemical processes taking place on the planet.The radiations that pour upon the Earth cause the biosphere to take on properties unknown to lifeless planetary surfaces, and thus transform the face of the Earth. In its life, its death, and its decomposition an organism circulates its atoms through the biosphere over and over again."[34]. Chemically, the face of our planet, the biosphere, is being sharply changed by man, consciously, and even more so, unconsciously. Besides this, new species and races of animals and plants are being created by man. Man is striving to emerge beyond the boundaries of his planet into cosmic space. According to Vernadsky, the whole history of mankind is proceeding in this direction.[35]The term Biosphere has taken on the connotation that to sustain its activities, humankind must learn to conduct them with increased appreciation and respect for other life forms as well as the life support capacity of our planet. Thus, we increasingly speak of humanity's relationship with the Biosphere, rather than with Nature.

Biosphere denotes the living and life support system of our planet.Living matter exists only in the biosphere. This includes the whole atmospheric troposphere, the oceans, and a thin layer in the continental regions, extending down three kilometres or more. Man tends to increase the size of the biosphere[36]not only because it (the Biosphere) is inhabited by living matter, which reveals itself as a geological force of immense proportions, completely remaking the Biosphere and changing its physical, chemical and mechanical properties, but also because the Biosphere is the only envelope of the planet into which energy permeates in a notable way, changing it even more than does living matter".[37]Living matter is the totality of all organisms present on the earth at any one time, and it is usually such a totality that is important in dealing with the effect of man on the processes of this planet. Living natural bodies exist only in the biosphere and only as discrete bodies.The chemical composition of living bodies is a function of their own properties. The processes in living matter tend to increase the free energy of the biosphere. Living natural bodies are always mesomorphous.The vast majority of living natural bodies change their forms in the process of evolution. The rates at which these changes occur are, however, widely divergent. The processes of living natural bodies are not reversible in time.In the course of geological time living matter morphologically changes according to the laws of nature. The history of living matter expresses itself as a slow modification of the forms of living organisms which genetically are uninterruptedly connected among themselves from generation to generation. This idea had been rising in scientific research through the ages, until, in 1859, it received a solid foundation in the great achievements of Charles Darwin (1809-1882). It was casted in the doctrine of the evolution of species of plants and animals, including man. The evolutionary process is a characteristic only of living matter. The change in the morphological structure of living matter observed in the process of evolution unavoidably leads to a change in its chemical composition.The noosphere is a new geological phenomenon on our planet. It is the last of many stages in the evolution of the biosphere in geological history. The course of this evolution only begins to become clear to us through a study of the biosphere's geological past. Now we live in the period of a new geological evolutionary change in the biosphere, i.e.,Noosphere.

Gaia and Noosphere: the Complementary Paradigms

The living organisms interact with their inorganic surroundingson Earth to form a synergistic and self-regulating, complex system that helps to maintain and perpetuate the conditions for life on the planet.The notion that the Biosphere (or Gaia[38]) has operated as does a living organism, modifying its own environment and so maintaining conditions suitable for its survival, has caught the attention of the scientific community.This view has been expressed as *Gaia philosophy*, also known as the*Gaia hypothesis*, *Gaia theory*, *Gaia paradigm*, or the *Gaia principle*[39]**.**The Gaian perspective of an interactive co-evolution of biological and abiological components of our planet has spawned new avenues of scientific inquiry aiming to understand biogeochemical cycles, especially in the atmospheric sciences.[40]For example, the importance of methane in climate change has

only come to be seriously explored with the recognition that biological organisms play a vital role in regulating the atmospheric environment.[41]In this sense, Noosphere and Gaia have come to represent potent symbols of human understanding of Nature.[42] As such, they constitute influential guides for making sense of the implications of large-scale human interference in planetary biogeochemical cycles. Today, transnational problems of planetary management which have resulted from human interference in planetary biogeochemical cycles such as the prospect of global warming, increasingly widespread soil erosion and the damage of acid deposition, are recognized to be in need of solutions as never before. The advances in our understanding of biogeochemical cycles and the Biosphere have given rise to the concepts of Noosphere and Gaia. A unified East-West perspective is emerging on dealing with common large-scale problems of planetary management. This perspective incorporates both Gaia and Noosphere as complementary parts of a unified whole.

Gaia and Noosphereseem to have appeared the Complementary Paradigms of environmental studies in geography. Within thisGaia has emerged as the guiding concept of Ecocentrism and Techno-centrism.[43]Ecocentrism is a nature centered view of the earth, grounded in a belief that humankind and its activities are subject to a natural order according to which the Universe operates.In contrast, techno centrism is a 'man-centered' view of the Earth, based on the belief that humanity can manage and control Nature.[44] If Gaia represents an ecocentric guiding concept of the Universe in such a schema, then Noosphere represents a technocentric one. Lovelock's Gaia encapsulates a conception of an evolving planetary entity which is fundamentally ecologically egalitarian with "man at the periphery". In contrast, Vernadsky's Noosphere is not only ecologically anthropocentric, "man-centered", but also "man in charge". Thus, Gaia and Noosphere appear to represent contradictory informing concepts about humanity's relationship with Nature, and so could be interpreted as the latest in the dialectic of technocentrism versus ecocentrism which has colored much of the thinking on environmentalism.

However, in conceptions of both Gaia and the Noosphere, Biosphere represents human understanding of the biogeochemical cycles taking place on our planet. Thus, the concepts of Gaia and Noosphere can be viewed as complementary as each is founded on an interpretation of Biosphere. The concept of Noosphere focusses on what we do know and understand about the workings and management of biogeochemical cycles, while the notion of Gaia emphasizes what we do not know and understand. They complement each other as guides to human living and understanding in terms of the constraints of the biogeochemical processes of the Biosphere. This is because taken together as parts of a unified perspective, Gaia and Noosphere can help distinguish what we do understand from what we do not about humanity's ability to conduct its activities on our planet so as to ensure the survival of our own species, as well as that of the Biosphere. Far from being contradictory guiding concepts for human action, Gaia and Noosphere represent a unified interpretation of humanity's relationship with Nature. Such concepts are likely to strengthen as useful guides to the design and evaluation of policies for dealing with global problems of Biosphere. It is the unified philosophical perspective of Gaia and Noosphere, firmly rooted in analytical understanding of the Biosphere, that is embodied in the emerging notion of joint East-West 'Sustainable Development of the Biosphere'.

Noosphere & Anthropocentricism

Man, in all kinds of manifestations, is an integral part of the Biospheric structure. For Vernadsky, the sphere of human mind coincides with the noosphere concept of living generations of Individuals, the Citizens in the planetary community. The thinking man is a measure of everything and he is a huge planetary phenomenon. Vernadsky discovered the scientific ternary of Space – Time – Life in the biosphere of mankind generations. It represents ethnoecological space-time of life, thoughts, deeds of Man, Personality and Citizen in a global society. Man, as observed by Vernadsky, like all living organisms, and like every living substance, is a 'function of the biosphere in specific space-time'. It means that the study of Noosphere is anthropocentric, in which man is considered as a measure of all, i.e., covering his thought (mind/Creativity), his tools (*Homo sapiens faber*) and his institutions and beliefs(*Homo sapiens institutius*).

The concept that human beings are able to control their fate and their environment as a result of the use of tools is expressed as *Homo sapiens (*or simply *Homo) faber* (Latin for "Man the Maker").[45]The environment of the social type of thinking man (*Homo sapiens*) in the nature has been identified as *Homo sapiens faber.* It is a rational factor of man in the noosphere of generations, *i.e.,* developed by science, education, culture and creativity in the global society. *Homo sapiens faber* is to transform into an institution, a tool, a mandatory mechanism taking into account biospheric laws in terms of ethno-ecological laws of life of the citizens of the Earth – into the noospheric function of *Homo sapiens institutius*.[46]

Vernadsky considers the life of *Homo sapiens faber* on Earth to be a biogeochemical function of the living matter in the biosphere of nature, cultural biogeochemical energy of the living matter: Man, Person, Citizen in the global existence of society. Therefore, thinking man is the subject of the noosphere in the Earth's biosphere, the subject of Big Science in generations (the source of developed and educated mind). Man in his individual and social aspect is closely connected,in a natural, material and energetic way with the biosphere.

This connection lasts as long as man exists and is no different from other biospheric phenomena. People, however, built their ideal world inevitably within the surrounding nature, the environment of life, the biosphere. For Vernadsky the sphere of thought, labor and the sphere of human mind coincide with the noosphere concept of living generations of Individuals, Citizens in the planetary community.

The Outbursts of scientific creativity of man, to a certain extent, provide transition from the biosphere to noosphere. Human scientific thought, creativity of nations, Academies of Sciences, education system, fields of knowledge, the culture of countries – all of these constitute the noosphere. Thinking man is the subject, factor, and participant in the evolution of the mind of ethnic groups in a global society, the attractor of the culture of geo-civilizational existence. A sense of belonging of ethnic groups to the institutions of social existence in the natural reality of the planet, *i.e.*, in the biosphere of the Earth, Space and Universe is expressed by a Scientific name of '*Homo sapiens institutius'* (the original name of the Man, Personality, Citizen as a reasonable being) by Vernadsky.In other words, noospheric metaphysics of the life of ethnic groups of mankind in the nature are represented in the nooname *Homo sapiens institutius* – scientific self, social identity, political self-identification of Citizens of the states in the regions of the Earth's biosphere. In particular, it represents human qualities, expressed as the measure of zoological, social, political, military, economic, geological, technical, informational, and other manifestations. Fundamentally, the nooname *Homo sapiens institutius* expresses: (1) the Ability of generations to conceive the noospheric nature of Man in the Earth's biosphere, (2) the Competence to take into account the noospheric nature of Man (adhering to the ethnoecological laws) in relation to the nature of the planet – the environment, thought, citizen activities of Yesterday – Today – Tomorrow; and (3) Mandatory compliance with the noospheric functions of science, knowledge, education, culture in life of all people of the Global Community. The nooname *Homo sapiens institutius* (Person-individual in the family, ethnic group, society) consolidates understanding of the basics (foundations) of the rational nature in the ecosystems of the biosphere of the planet. The term implies potential belonging of the Individual to the subjects of the realm of the mind (the subjects of the noosphere in humanity generations), able to recognize, develop, and implement individual noospheric status of a Citizen in the family, society, nations of the world.The nooname *Homo sapiens institutius* recognizes the presumption of environmental hazards, economic, and other types of human activity; its principle (measure) in the nature, country, states of the global society. The measure acts as the noospheric imperative of generations' viability. In philosophical, scientific and applied value, the scientific name *Homo sapiens institutius* recognizes the unity of the noospheric nature (starting point) of Man, the noospheric status (role) of Personality, the noospheric function (mission) of the Citizen in the Earth's biosphere, society (native land), which is implemented in the noospheric function of geocivilizational mankind. Belonging to *Homo sapiens institutius*, *one* can qualify for Surname (by family, generations), Name, Patronymic, which give the grounds for citizenship in the countries of the Earth's biosphere. Hence, the scientific name *Homo sapiens institutius* of the global society should be seen as a *means of recognizing* the functional unity of the noosphere of Human nature, the noospheric status of an Individual, the noospheric function of the Citizen. They are to be implemented in cooperation of the population of states with the nature of biospheric regions of the planet. In the era of globalization, the moral responsibility of the Individual and Citizen is the noospheric imperative of ethnoecological security of humanity in the biosphere of nature. It is the imperative of evolution, globalization and the Big History of the Earth, in which Man, educated by institutions of science, culture, and power, is a Measure of noospheric co-evolution of society and the biosphere, the planetary entity, factor, attractor of Universal History. Consequently,the history of scientific knowledge of generations is the history of forming the noosphere of mankind.

Theory: Geogenesis to Noogenesis

The theory of emergence of Noosphere is the theory of change and transformation. The theoretical versions of Vernadsky and Teilhard explain the change in the approach to the study of Universe from its simple description to its origin and evolution. The Noosphere is seen as a part of the cosmicevolution that stretches about 14 billion of years[47],involving the Matter, Life and Mind (both human and technological) as a coherent and evolving system, as a whole'.The processes of Geogenesis, Biogenesis, PsychogenesisPhylogenesis,Ontogenesis and Noogenesis are instrumental behind this evolution.The idea that humans can irreversibly change the planet's biosphere on a global scale was not alien to Ancient and Medieval thinking. According to Aristotle's cosmology and teleological view on nature, for instance, every organism strives for fulfilment of its form and essence within a static cosmos. Nature serves humanity while reason helps to pertain to nature in a sensible and harmonious way. Nevertheless, as early as in Plato's Critias[48] man is held responsible for small-scale local habitat destruction by deforestation and soil erosion. Likewise, in the Judaeo-Christian tradition, man, though part of God's creation, is assigned to take possession of the Earth in his role of steward and shepherd, thus placing man above nature.[49]In the early modern period, the geological representation of the Earth had shifted into a sequence of spherical layers, namely the atmosphere, hydrosphere, lithosphere and cryosphere, depicting a mechanical nature, operating according to knowable physical laws. After 1875,

when Eduard Suess coined of the term 'Biosphere' as the sum of all living creatures that permeate and interact with the layers within the geosphere,the planet Earth gradually became regarded as an integrated system. In this system, the evolution now is represented in terms of dynamical spheres that are related to the successive historical geological eras of our planet, the latest being that of Noosphere.[50]

The Cosmic Evolution

Representing an evolutionary theory, the Noosphere has been defined as the new state of the biosphere[51]. The noosphere represents the highest stage of biospheric development, its defining factor being the development of humankind's rational activities.[52]Both Teilhard and Vernadsky base their conceptions of the Noosphere on the existence ofBiosphere.Despite the differing backgrounds, approaches and focuses, they have a few fundamental themes in common. Both scientists overstepped the boundaries of natural science and attempted to create all-embracing theoretical constructions founded in philosophy, social sciences and authorized interpretations of the evolutionary theory. Moreover, both thinkers were convinced of the teleological character of evolution. They also argued that human activity becomes a geological power and that the manner by which it is directed can influence the environment.The founding authors developed two related but starkly different concepts, the former being grounded in the geological sciences and the latter, in theology.Both conceptions of the noosphere share the common thesis that together human reason and the scientific thought has created, and will continue to create, the next evolutionary geological layer as part of the evolutionary chain.[53]

Vernadsky

The most amazing point about Vernadsky is his approach to the Biosphere as a planetary and cosmic event - a new way of looking at the Earth - as if he observed the Earth from space, although the first satellite, *Sputnik* (USSR), was launched only half a century later, in 1957.[54]However, Vernadsky was not just an idealistic dreamer. His scientific theory of the Biosphere and Noosphere was built on a vast empirical basis and solid laws of nature.According to Vernadsky, the biosphere became a real geological force that is changing the face of the earth, and the biosphere is changing into the noosphere.Also, very much contrary to Teilhard's vitalistic ideas, Vernadsky adhered to the principle that life can only proceed from life, and refused to accept abiogenesis, the idea that life or living matter proceeded in some mysterious way from a combination of non-living, inorganic materials (oxygen, carbon). This could never be the case, since living tissue and inorganic matter had a different structure. As, according to Vernadsky, life might be brought to our planet from out of space, by cosmic particles and such, he was a strong adherent for extended research of the surrounding universe.[55]Vernadsky, being several generations ahead, pointed out that as long as citizens do not acknowledge the doctrine of the Earth's biosphere and the evolution of the biosphere into the noosphere, mankind has no future. If the 20th century was the age of the noosphere, the 21st century is to become the age of the noospheric forestalling of ethnoecological challenges of globalization to citizens, transition to sustainable development of civilization.

In the theory of Vernadsky, as stated earlier, the Noosphere is the third in a succession of phases of development of the Earth, after the geosphere (inanimate matter) and the biosphere (biological life). Just as the emergence of life fundamentally transformed the geosphere, the emergence of human cognition fundamentally transforms the biosphere. According to him, theNoosphere is the last of many stages in the evolution of the biosphere in geological history. As a consequence of this evolutionary change in the biosphere, the humans are entering the Noosphere[56]The formation of Noosphere is not a short-term and transient geological phenomenon. It is linked to the biosphere, processed by scientific thought and prepared by hundreds of millions of years (by the process creating *Homo sapiens faber).*Vernadsky was one of the first to recognize the essential role of the biosphere[57](as the total aggregate of living matter on Earth) in the development of the Earth's upper crust, atmosphere and stratosphere.Vernadsky, moreover, regards the biosphere as a cosmic phenomenon, surrounded by a cosmic milieu with celestial bodies, like the Sun, that permeate it with energy, creating life out of terrestrial matter and transforming and organizing the biosphere.[58]

Vernadskypointed out that the biosphere of 20th century is turning into the noosphere, created primarily by the growth of science, scientific understanding, and social labour of mankind that is based on it. There is an inextricable connection of its creation with the growth of scientific thought, which is the first prerequisite of the creation.[59]Vernadsky's Noosphere emerges at the point where humankind, through the mastery of nuclear processes, begins to create resources through the transmutation of elements.'An outburst' of scientific thought in the 20th century was stipulated by the history of the biosphere and has deep roots in its structure. This 'outburst' of scientific thought in 20th century is seen as the global geological force of mankind (natural phenomenon), a planetary phenomenon of scientific thought of man (Noospheric factor of the scholar in the Earth's biosphere) as a functional dependence on the environment, thoughts and deeds of generations.In Vernadsky's interpretation (1945), the noosphere, is a new evolutionary stage of the biosphere, when human reason will provide further sustainable development both of humanity and the global environment:

"*In our century the biosphere has acquired an entirely new meaning; it is being revealed as a planetary phenomenon of cosmic character... In the twentieth century, man, for the first time in the history of earth, knew and embraced the whole biosphere, completed the geographic map of the planet earth, and colonized its whole surface. Mankind became a single totality in the life on earth... The noosphere is the last of many stages in the evolution of the biosphere in geological history.*" [60]

From the standpoint of the theory of the Earth's biosphere, the concept of the biosphere – noosphere transition, global and planetary conditions of life, thoughts, deeds of the generations of mankind (aggregate *Homo sapiens institutius*) coincide.[61] Vernadsky pointed out, 'The biosphere of the 20th century is turning into the noosphere, created primarily by the growth of science, scientific understanding, and social labour of mankind that is based on it. There is an inextricable connection of its creation with the growth of scientific thought, which is the first prerequisite of the creation. The noosphere can be created only under this condition'.[62]But, apart from this, man in his individual and social aspect is closely connected (in a natural, material and energetic way) with the biosphere. This connection lasts as long as man exists and is no different from other biospheric phenomena."We undergo not only a historical, but a planetary change as well. We live in a transition to the noosphere." 'The noosphere represents a new geological evolutionary change in the biosphere and the humans are entering the noosphere.[63]

Ever since their first signs of civilization, Vernadsky argues, humans have been a dominant force in evolution, because they are incessantly changing the geochemical cycles on planet Earth through the cultural biogeochemical energy of agriculture and livestock, thus having impact on all other species in his habitat.[64]As knowledge and information started migrating over the globe within the last millennia, this continuous creation of the noosphere was speeded up simultaneously. The increase of cultural biogeochemical energy of mankind ultimately created the explosion of scientific thinking in the 20th century as an elemental geological process; and human scientific grasp of 'the biosphere' is an expression of that transition.[65]In his works, Vernadsky shows extreme optimism about science, because he is utterly convinced that the scientific human mind is able to control the complexity, multitude and variation in the planetary biogeochemical process of the transformation of the biosphere into a noosphere.[66]

Vernadky argues that increases and changes in the nature of "biogeophysical energy" — owing to a progression of inventions from fire-making, to agriculture, to modern communications technologies, etc. — explain the planetary spread of the biosphere and the emergence of a noosphere.[67] In his words, "This new form of biogeochemical energy, which might be called the energy of human culture or cultural biogeochemical energy, is that form of biogeochemical energy, which creates at the present time the noösphere."[68] This kind of energy, he wrote, lay behind the development of the human mind and reason itself; and it will lead "ultimately to the transformation of the biosphere into the noösphere, first and foremost, through the creation and growth of the scientific understanding of our surroundings."[69]

Vernadsky's work[70] proved to be an important step in the development of the modern view of the Biosphere as the integrated living and life-supporting system of Planet Earth. In it for the first time, Vernadsky drew attention to the increasing scale of human intervention into planetary biogeochemical cycles. This later led him to speculate that human activities were modifying biogeochemical cycles to such an extent that the Biosphere was undergoing transformation into a new configuration. To Vernadsky, the Biosphere was a stage in the evolutionary development of the Planet Earth. He hoped that emerging awareness of the nature and implications of human intervention into planetary biogeochemical cycles would lead to a new era of consciously directed human transformation of the Biosphere into Noosphere. Vernadsky reasoned that living matter actively regulates the geochemical migration of atoms and molecules between the hydrosphere. barysphere, lithosphere, atmosphere, and Biosphere through biogeochemical processes. This dynamic equilibrium of Biosphere and living matter has led the Biosphere to actively transform and accumulate energy on an ever-increasing scale, complicating biospheric organization and enriching the Biosphere with information.[71]This led Vernadsky to consider humankind as an increasingly dominant part of the planet's biogeochemical processes, and so an increasingly influential factor in the Biosphere's evolution. Further, he proposed that humankind's existence was not just modifiable, but in the process of being modified by human thought and effort. Consequently, he came to believe that the physical limits of the Biosphere were the only constraints to human development.Influenced also by Teilhard's ideas of human evolution, Vernadsky observed that the Biosphere was passing into a new condition, a new evolutionary stage, that of the nous or human reason, the Noosphere. He was convinced that this transition was taking place through the influence of scientific achievement.[72]

Thus, Vernadsky conceived the Noosphere as anthropogenic in the sense that he viewed it as both 'human creating" and "created by human". Thus, humanity could reach the apex of its existence through its own efforts. He predicted that technological development would accompany improved forms of human society and organization which together would allow the conscious and rational reshaping of the Biosphere into the Noosphere.

Teilhard

Teilhard, on the other hand, perceived a directionality in evolution along an axis of increasing Complexity/Consciousness.For him the noosphere is the sphere of thought encircling the earth that has emerged through evolution as a consequence of this growth in complexity/consciousness.Teilhard's vision of the Noosphere was that of an evolving collective human consciousness. reconciling the science of evolution with Christian teaching. To Teilhard, the transition to the Noosphere was a transcendence of biological to spiritual evolution.[74]According to Teilhard, human mental activity - ever expanding, multiplying - occupies the space above the biosphere, ultimately causing a thinking layer, the noosphere, which unfolds itself as an additive layer on the surface of the biosphere.Accordingly, he presents a teleological theory of both biological and spiritual cosmogenesis, with an evolutionary 'tree of life' that grows upward by an inner principle of movement along one single axis of evolution, which is showing an ascent of consciousness into a mass multitude of individual, disparate centres (or "points") of reflexive consciousness, that are leading up to and striving for, a spiritual and transcendent point of universal convergence: the point Omega.

In order to account for his view, Teilhard argues that the evolution of the Earth is based on the energy of a center-seeking mental 'inside', that is co-extensive with the visible, counterfeeding and complex 'outside' of matter. Consciousness is primordially enclosed as such in earth-matter from the very beginning, as two sides of the same phenomenon. In every next stage of evolution, matter wraps around itself in ever more complicated ways, through explosions of immanent 'psychic' energy. Therefore, although there is a closed quantum of energy, the universe is nevertheless not developing towards a homogenic balance and entropy, but towards 'unprobable' complexity.[73]One of the most salient features of Teilhard's theory is that the reflexive character of this spiritual cosmic convergence will lead to the end of the world, which designates a total absorption in an extremely concentrated and complex transcendental noosphere. This completely mental realm is freed from the matter, and is resting on the 'point Omega', which Teilhard ultimately equals with God. As such, evil will be conquered in an ultra-synthesis and 'unanimity of the masses' in a peaceful noosphere.[74]

In Teilhard'sview, as well, the world first evolved a global geosphere and next a biosphere.[75]Now that people are communicating on global scales, the world is starting to create a noosphere — what he variously describes as a globe-circling realm of "the mind," a "thinking circuit," "a new layer, the 'thinking layer'," a "stupendous thinking machine," a "thinking envelope" full of fibers and networks, indeed a "planetary mind" and a planetary "consciousness", where Earth "finds its soul."Teilhard's conceptthas been further defined as "web of living thought" and "a common pool of thought".[76] He advanced "a threefold synthesis — of the material and physical world with the world of mind and spirit; of the past with the future; and of variety with unity, the many with the one." And he clarifies that "we should consider inter-thinking humanity as a new type of organism, whose destiny it is to realize new possibilities for evolving life on this planet."Although Teilhard's concept is essentially spiritual, and far less technological than cyberspace or the infosphere, he identified increased communications as a cause. Teilhard thought in terms of thresholds of evolution which began with the appearance of elementary corpuscles (protons, neutrons, electrons, photons), led to the formation of molecules, then to cells, then to multi-cellular organisms and phyla, and to social groups. For Teilhard, the next evolutionary threshold was to be the rise of a collective human consciousness of the direction and purpose of evolution which would lead to deliberate human intervention in planetary evolution. He called this new evolutionary phase, the Noosphere.[77]

Teilhard conceived noosphere as much part of nature as the barysphere, lithosphere, hydrosphere, atmosphere, and biosphere. As a result, Teilhard sees the social phenomenon as the culmination of the biological phenomenon.[78]These social phenomena are part of the noosphere and include, for example, legal, educational, religious, research, industrial and technological systems. In this sense, the noosphere emerges through and is constituted by the interaction of human minds. The noosphere thus grows in step with the organization of the human mass in relation to itself as it populates the earth.[79]

Teilhard argued that the noosphere evolves towards ever greater personalization, individuation and unification of its elements. He saw the Christian notion of love as being the principal driver of "noogenesis", the evolution of mind. Evolution would culminate in the Omega Point—an apex of thought/consciousness—which he identified with the theological return of Christ.Teilhard tried to reconcile his religious faith with generally accepted novel insights of natural science of that time, by launching a coherent and complete interpretation of the evolution of earth and humanity in space-time.[80]Teilhard advances that there is a clear aim and vertical direction (a "deep, non-periodical process") in evolution, striving upwards from the *geogenesis* at the level of atoms in a crystallizing world, to the *biogenesis* of polymers of mega molecules and stable living cells, to the *psychogenesis* of larger vertebral animals and, finally, the *noogenesis* through humanity. This noogenesis represents the global groupwise passing of a threshold by acquiring reflexive capacity, which is more than just psychological consciousness (which many larger animals have), but also includes being aware of oneself and one's own evolution.[81]

From the Neolithic agriculture and ancient western civilization to the formation of the masses in the era of industrialization, for instance, our whole tradition of socio-cultural collective and reflexive memory and intelligence energetically was already stored forever in the noosphere, and added to thebiological human condition, so that their phylogenesis actively and freely coincides with the ontogenesis.[82]According to Teilhard, then, forces of the mind — first "psychogenesis' and then "noogenesis" — have gradually created pieces of the noosphere for ages, while increases in social complexity and human consciousness have laid further groundwork for the noosphere's emergence. Now it is finally achieving a global presence, and its varied "compartments" and "cultural units" are beginning to fuse. As he puts it, equating cultures with species, "cultural units are for the noosphere the mere equivalent and the true successors of zoological species in the biosphere." Eventually, a synthesis will occur in which peoples of different nations, races, and cultures will give rise to "unheard-of and unimaginable degrees of organized complexity and of reflexive consciousness" that is planetary in scope (a "mono-culturation"), without people losing their personal identity and individuality.Fully realized, the noosphere will raise mankind to a high new evolutionary plane, one shaped by a collective coordination of psychosocial and spiritual energies and by a devotion to moral, ethical, religious, juridical, and aesthetic principles.

Heargued that "biological change of state terminating in the awakening of thought does not represent merely a critical point that the individual or even the species must pass through. Vaster than that, it affects life itself in its organic totality, and consequently it marks a transformation affecting the state of our entire planet". He saw *Geo-genesis*promoted to *Bio-genesis.* which turned out in the end to be nothing else than *Psycho-genesis*... Psychogenesis has led to man. Now it effaces itself, relieved or absorbed by another and higher function - the engendering and subsequent development of the mind, in one-word *noogenesis*". For Teilhard, the Noosphere was the next evolutionary step towards the ramification and complexification of the Universe. By ramification, he meant the ordered, harmonious and systematized evolution of increasingly organized forms of life. Whereas, by complexification, Teilhard referred to the ever-increasing complexity of phenomena appearing in the Universe during the course of its history.

Comparative Views

Thus, the views of Teilhard and Vernadsky about causes and consequences differ enough to be worth comparing.Vernadsky's views were parallel to but also differ from Teilhard's. Vernadsky's are much more materialist, in spots more mystical, and always less spiritual (Vernadsky was an atheist).[83]Like Teilhard, he too held that Earth first evolved a geosphere, then a biosphere — and a noosphere is next. In his writings, Vernadsky treats the spread of life as an essentially geological force.[86]But, Teilhard's views were far more spiritually-grounded than Vernadsky's. In opposition to Teilhard, Vernadsky's noosphere denotes the transformed biosphere, structured by mental scientific activity and human agency, that changes the surface of the Earth and its geochemical cycles while the living as well as the non-living are influenced and recreated by consciously and unconsciously applied techniques.[84] Accordingly, scientific thought, developed throughout human generations, became a new geological force of its own in the geological history of the planet. The noosphere is the equivalent of the biosphere transformed by human thinking manifested in actions and organized human labour.Contrary to Teilhard, this does not completely depend upon the will of humans, but must be seen as an elementary natural process rooted in an evolutionary process of millions of years.[85] Accordingly, the biosphere and the noosphere are both planetary biogeochemical phenomena, and the noosphere isa creation of the inordinatelycomplex and intense biogeochemical energy of human culture. Hence, unlike Teilhard, Vernadsky's noosphere is not an extra envelope of thinking or spirit, but a historical phenomenon of transformation, and a new irreversible anthropic stadium in the evolution of the biosphere without any teleological (or religious) cause.[86]

Both Vernadsky and Teilhard viewed the noosphere optimistically as a realm of collective consciousness. And, seemingly contrary to Charles Darwin, both thought that evolution depended on cooperation as much as competition.Teilhard and Vernadsky both see the noosphere as evolving piecemeal around the planet, much as did the geosphere and biosphere, with some parts arising here and then spreading there, other parts elsewhere, with interconnections and interactions increasing over time, until the entire planet is caught up in webs of creation and fusion. Their conceptions of the noosphere share the common thesis that together human reason and the scientific thought has and will continue to create the next evolutionary geological layer. This geological layer is part of the evolutionary chain. It is argued that human activity becomes a geological power and that the manner by which it is directed can influence the environment. The noosphere is as much part of nature as the barysphere, lithosphere, hydrosphere, atmosphere, and biosphere. The complexification of human cultures, particularly language, facilitated a quickening of evolution in which cultural evolution occurs more rapidly than biological evolution. Recent understanding of human ecosystems and of human impact on the biosphere have led to a link between the notion of sustainability with the "co-evolution"[87] and harmonization of cultural and biological evolution. It is the imperative of evolution,

globalization and the Big History of the Earth, in which Man, educated by institutions of science, culture, and power, is a Measure of noospheric co-evolution of society and the biosphere, the planetary entity, factor, attractor of Universal History.Both Vernadsky's and Teilhard's concepts of a noosphere are sources of inspiration, and function as 'philosophical bridges' for the development of useful insights about the Anthropocene and its future. In their work, Aristotle's harmony and Plato's responsibility seem to be synthesized and transformed into a dynamical outlook. When elements of Teilhard and Vernadsky are combined, we can first of all conclude that Teilhard's noosphere is still viable as a symbolic promotion of unity and (scientific) collaboration, without individual or collective egoism, but with genuine communication and reflective openness to the future, which should converge without losing our deepest personalities. Likewise, desire and knowledge can have a shared projective character propelling the progress of humanity towards what not yet exists (the symbolic 'point Omega'). In addition, Vernadsky makes us aware that the noosphere is intrinsically linked to the bio-geochemically transformed biosphere, embedded in a universe we cannot escape. Scientific knowledge and the promotion of biodiversity were very important toboth Vernadsky and Teilhard.

Thus, the transformation of Biosphere through human interference in biogeochemical cycles is the process of Noogenesis - the creation of Noosphere. This Noosphere is believed to enhance human development through respect and management of biogeochemical cycles - the Limits of planetary Life support systems.Since its origin on the planet, the noosphere has shown a tendency toward constant expansion.It has become a special structural element of the cosmos distinguished by its social envelopment of nature. The concept of the Noosphere emphasizes the necessity for intelligent organization of the interaction between society and nature (that is, organization that meets the requirements of developing mankind). This is the opposite of an uncontrolled, rapacious attitude to this interaction, which leads to the deterioration of the environment. Formed on the basis of development the doctrine of the biosphere, evolution of the biosphere into the noosphere,*Noospherology* has emerged as an integral science studying the origins of the noosphere, the origins of nature in Man in the biosphere, the structure, characteristics of the noosphere status of an Individual, noospheric functions of the Citizen, forms of development, and implementation of citizenship mission for the generations of people in the countries of the world. Understanding the unity of the noosphere is expressed in noonames of Man, Person, Citizen and is the basis of the noosphere anthropology, the core of citizenship noospherology, noosphere futurology, and other sections of mankind noospherology.[88]

Significance

Present day world is stressed, hyperconnected and is drowning in a sea of information. The future often seems uncertain and unpredictable at best, and hopeless at worst. Most future visions are indeed scary as the artificial intelligence is taking over the Earth. The Noosphere vision provides direction and hope for the future, to tackle global challenges, whether they are environmental, social, economic, ecological, technological, or climatic. Most importantly, the Noosphere is a holistic idea that forces us to think of these global challenges together, as tightly interconnected. For instance, human activities induce fluxes of carbon, nitrogen, phosphorus and sulphur at magnitudes similar to those of natural cycles of these elements. The most important influences arise from fossil fuel burning which may double atmospheric carbon dioxide over the next century, and further increase emissions of nitrogen oxides and sulphur; expanding of agriculture and forestry with the widespread use of nitrogen and phosphorus fertilizers; and increased exploitation of freshwater for irrigation in agriculture and industry and waste disposal.[89]Recent insights gained from atmospheric chemistry have drawn attention to the intense chemical disequilibria of the Earth's atmosphere. Noospheric approach can help to address such issues.Vernadsky made an important contribution to science in general, and in ecology in particular. It is essentially Vernadsky's theory of the biosphere, expounded in his work "Biosfera" (1926) that is embodied in the global approach to ecological problems today. To solve global ecological problems that may endanger even the very existence of humanity in the future, a cultivation of a new worldview among people, and especially young generations, is absolutely needed.[90]There is an urgent necessity of a complex holistic conceptual approach to the problems of increasingly and rapidly deteriorating environment and impending global ecological crisis, and Vernadsky's work attracts appreciation in this direction.[91]

It's being argued that the relevance of the biospheric concept is increasing, as well as the biosphere-noosphere transition, thereby providing public safety and reaching sustainable development.[92]The issue of formation and development of the noosphere and its importance for the development of the civilization was addressed at different times by such prominent scholars as V.I. Vernadsky (1944),[93]A.D. Ursul (1993; 1994),[94]and N.N. Moiseev (1990)[95]. Their work has formed the foundation for the theoretical and the methodological basis of this study. One such attempt has been seen in the paper by Galina, et. al.[96] which justifies the noospheric pedagogy as an independent branch of the science of teaching that reflects both socio-natural and civilizational changes in the modern world. It has been accepted as a leading approach to the study of this problem through systematic analysis of theories and concepts dedicated to noospherogenesis, which

allows filling the teaching science and the educational practice with new constructs and meanings of noospheric content and expanding the humanitarian space by means of new areas of the science of teaching. The study has developed a model for the formation of a new teacher type in the noospheric pedagogy paradigm. Among other attempts, the following studies have been of importance: V.I. Subetto (2012)[97], which was dedicated to the formation of the noospherism and the educational society of the future and the need for the development of an anticipatory education system; and those by Z.I. Kolycheva (2007), S.A. Ivanov (2015), S.A. Vishnyakova (2012), E.M. Dorozhkin, E.V. Zaitseva & B.Y. Tatarskikh (2016)[98]which considered the noospheric education as a humanitarian phenomenon of the time and developed practice-oriented moral and ethical aspects of the noospheric education. Studies in the field of vocational and pedagogical education and professional pedagogy conducted by G.M. Romantsev et al. (2011)[99]have played a prominent role in solving the above issues.

The vision of the Noosphere is believed to tackle meaningfully the global challenges of today. It is being argued that despite the many perils on the road, the Noosphere has an immense potential, namely to develop pragmatic versions of divine attributes: omniscience (knowing everything needed to solve ourproblems), omnipresence (beingavailableanywhereanytime), andomnibenevolence (aiming at the greatest happiness for the greatest number). Viewed in this optimistic lens, the Noosphere may thus offer meaning and purpose, by guiding and inspiring us towards an amazing planetary transition.The Noosphere implies new ethics, new values. In human evolution, each time human groups have grown, from foraging groups, to villages, cities, nations, they had to transition to new ethical and governing structures to maintain high levels of cooperation. The fundamental challenge of ethics today is to find ways to understand, guide and steer the actions of some 8 billion people of today as well as the many more billions of technological artifacts that we design, build, interact with, and increasingly depend upon.

Humans are aware of past evolution, and our present predicament is that we are at a critical evolutionary threshold. This has major ethical implications because the successful unfolding of this evolutionary process towards the Noosphere relies on positive and conscious contributions from individuals, groups and governments.[100] An interdisciplinary and synergetic approach to finding scientific methods of 'softening' the growing threats, risks, challenges of civilization to the present and future generations of *Homo sapiens institutius* dominates in contemporary discussions. Vernadsky, being several generations ahead, pointed out that as long as citizens do not acknowledge the doctrine of the Earth's biosphere and the evolution of the biosphere into the noosphere, mankind has no future. In his diary dating back to 1940 he identified an alternative to social Darwinism in geopolitics, 'the 20th century is the age of the noosphere'[101]. The motto 'Noospheric Thinking – the 21st Century Thinking' is considered to be ideological, conceptual, institutional recognition of the doctrine of the biosphere, evolution of the biosphere into the noosphere, relevant to human nature. If the 20th century was the age of the noosphere, the 21st century is to become the age of the noospheric forestalling of ethnoecological challenges of globalization to citizens, transition to sustainable development of civilization.

II. CONCLUSION

The concept of noosphere is gaining impetus since the last few decades. Just like various other realms of geographic study, it represents the current sphere of human development in Geological Time Scale. It is the sphere of human thought, particularly related to the technical and digital world of mankind. The study of Noosphere offers a new challenge in 21st century, as the *terra-incognita*, a new territory to be explored by geographers. As a philosophical concept, the notion of Noosphere has been developed and popularized, especially, by Vladimir Ivanovich Vernadsky and Pierre Teilhard de Chardin, the Russian and French philosophers respectively. The view has been, further, substituted by James Lovelock (English environmentalist) and Lynn Margulis (American theorist) who formulated the 'Gaia hypothesis' in an attempt to explain the role of biota (plant and animal life) in the evolution of Noosphere.Vernadskywas an atheist and thus presented materialist vision of the Noosphere. He developed the concept of Noosphere out of his theory of biosphere and biogeochemical studies; and defined the future evolutionary state of the biosphere as the Noosphere. According to him, the future represents transition to the noosphere. Teilhard, on the other hand, integrated science and religion in his vision of the humanity and Noosphere. Heconsidered the noosphere as external to the biosphere - a progression from biological to psychological and spiritual evolution. The ultimate state of this evolution, he identified as an "Omega Point", a kind of God-like state or Super-organism. The human culture, technology and computers (communication) constitute three essential parts of this Super-organism.

Among the various conceptions related to Noosphere the important ones include, for instance, Noosphere being distinguished from Noosystem; Noosphere constituting Third Sphere around the Earth; Intrinsic connection of Noosphere to Biosphere; Noosphere and'Gaia*'* appearing as complementary Paradigms of geographic study; and the Noosphere being Anthropocentric. In an attempt to draw distinction between the concepts of Noosphere and Noosystem, the former has been related to the total pattern of thinking organisms and their activity, including the patterns of their interrelations; and the latter to the environment or medium of human activity, the system of organized thought and its products in which humans move and have their being.

Noosphere represents the third stage of Earth's development, after the 'Geosphere' and the 'Biosphere'; the three spheres building on each other. Noosphere is considered as the synonym of environment. Under Vernadsky's definition, the Biosphere is the single greatest geological force on Earth, moving, processing, and recycling several billion tons of mass a year. As a consequence of this, the face of our planet, the biosphere, is being sharply changed by man, consciously or unconsciously.A close and cosmic connection exists between life on Earth and the geochemical processes taking place on the planet. Biosphere has come to represent a powerful informing concept for humanity's relationship with Nature. Therefore, we increasingly speak of humanity's relationship with the Biosphere, rather than with Nature.The living organisms interact with their inorganic surroundings on Earth to form a self-regulating system that helps to maintain and perpetuate the conditions for life on the planet. This system has been equated with 'Gaia' as a living organism, modifying its own environment and so maintaining conditions suitable for its survival. The Gaian perspective suggests an interactive co-evolution of biological and abiological components of our planet and opens new avenues of scientific inquiry aiming to understand its biogeochemical cycles. This perspective incorporates both Gaia and Noosphere as the complementary paradigms of environmental studies in geography. Gaia and Noosphere represent a unified interpretation of humanity's relationship with Nature. Man, in all kinds of manifestations, is an integral part of the Biospheric structure. The thinking man is a huge planetary phenomenon, functioning within the ternary of Space – Time – Life in the biosphere of mankind generations. Man, as observed by Vernadsky, like all living organisms, and like every living substance, is a function of the biosphere in specific space-time. It means that the study of Noosphere is anthropocentric, in which man is considered as a measure of all, i.e., covering his thought (mind/Creativity), his tools (*Homo sapiens faber*) and his institutions and beliefs(*Homo sapiens institutius*).

The Noosphere is seen as a part of the cosmicevolution, involving the Matter, Life and human Mind, as a whole and coherent evolving system. The processes of Geogenesis, Biogenesis, Psychogenesis Phylogenesis, Ontogenesis and Noogenesis are instrumental behind this evolution.Noospherology has emerged as an integral science studying the origins of the noosphere.The Noosphere vision provides direction and hope for the future, to tackle global challenges, whether they are environmental, social, economic, ecological, technological, or climatic. Because the Noosphere is a holistic idea that forces to think of these global challenges together, as tightly interconnected. The Noosphere has an immense potential to tackle meaningfully the global challenges of today; as the vision promotes omniscience (knowing everything needed to solve our problems), omnipresence (being available anywhere any time), and omnibenevolence (aiming at the greatest happiness for the greatest number). The 21st century has become the Age of Noosphere. The noospheric approach should be trusted for meeting the ethnoecological challenges of globalization and paving way for sustainable development of civilization.

Notes

1. Jong, Thecla de (2019),
2. *The Great Soviet Encyclopedia*, 3rd Edition (1970-1979).
3. Samson, Paul R. & Pitt, David (eds.) (1999),
4. Hamilton, Clive (2017), Chapter-1
5. Vasilenko, Vasily N. (2015).
6. Vernadsky (1863-1945) was a prominent Russian mineralogist, geochemist and natural philosopher who incited the field of bio-geochemistry. While lecturing about the biosphere and geochemistry in Paris in 1922-25, Vernadsky met French Jesuit paleontologist Teilhard de Chardin (1881-1955) and philosopher and mathematician LeRoy. While discussing their perceptions of the biosphere LeRoy coined the term 'noosphere' in 1924.
7. Serafin, R. (1987),
8. http://www.brainyquote.com/quotes/quotes/p/protagoras2055402.html
9. Grinevald, (1998), p. 24-25
10. Trubetskova, Irina: "Vladimir Ivanovich Vernadsky and his Revolutionary Theory of the Biosphere and the Noosphere"
11. Smil, (2002), p. 2.
12. Engel, J. Ronald (1990),p:6.
13. Hutchinson G.I., (1970),
14. Yanshin, A. L.; Yanshina, F.T. (1997)
15. Vernadsky, V.I.(1945),
16. Vernadsky V. I. (1987), 141
17. Kauffman G.B., (1991),
18. Arbatov A. and Bolshakov B, (1987),

19. This theme has been explored in depth by Kevin Kelly in his book, *What Technology Wants*, (2010),
20. Vernadsky, V.I. (1944),
21. Teilhard de Chardin, (1959) "The Formation of the Noosphere,"
22. Le Roy E., (1927),
23. Arbatov A. and Bolshakov B, (1987),
24. Teilhard, 1958; 1959; Grenet, 1965
25. The Gaia hypothesis (or Gaia theory, Gaia paradigm, the Gaia principle) proposes that living organisms interact with their inorganic surroundings on Earth to form a synergistic and self-regulating, complex system that helps to maintain and perpetuate the conditions for life on the planet. The hypothesis was formulated by James Lovelock and co-developed by the Lynn Margulis in the 1970s. James Ephraim Lovelock (born 1919) is an English independent scientist, environmentalist and futurist, best known for proposing the Gaia hypothesis, which postulates that the Earth functions as a self-regulating system. Lovelock named the idea after *Gaia*, the primordial goddess who personified the Earth in Greek mythology. Lynn Margulis (1938–2011) , the American microbiologist,was the co-developer of the Gaia hypothesis with Lovelock.
26. Huxley, J. (1958),
27. Trubetskova, Irina L. (2010),
28. Pitt, David; Samson, Paul R. (2012).
29. Teilhard de Chardin, Pierre, (1959),
30. Suess E., (1875),
31. Smil V., (2002), *op.cit.*,
32. Polunin, (1984),
33. Vladimir Vernadsky, *Biosfera*, 1926.
34. Vernadsky, V.I. (1945)
35. Vernadsky, V.I. (1945)
36. Vernadsky, (1945),
37. Levit, Georgy S. (2000),
38. The idea of the Earth as an integrated whole, a living being, has a long tradition. The mythical 'Gaia' was the primal Greek goddess personifying the Earth; the Greek version of "Mother Nature" or the 'Earth Mother'.
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74. Federau, 2016, 74.
75. Federau 2016, 80-81.
76. Vernadsky 1938/2012, 27-28.
77. Vernadsky, V. I. (1929),
78. Mochalov, I.I (1985),232; With 'exteriorized works of consciousness' Teilhard de Chardin is referring to the dissemination of higher education, inventions, technical devises, and such.
79. Teilhard de Chardin (1956),
80. *Ibid*., 256-258.
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