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Natural Scientific Foundations of Historiometry of Chizhevsky

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***Abstract*—The first experimental and theoretical research of A.L. Chizhevsky opened a new page in the science of man in his connection with world history and space and physical factors influencing its course. In subsequent works on ionization in the gaseous medium (atmospheric air) and liquids (aqueous solutions of the body and blood plasma), the scientist showed that electromagnetic oscillations and corpuscular flows of the external environment interact by electrical exchange and quantum mechanical effects with the electronic structures of cells, tissues, organs, blood, and intercellular body liquid. The external environment, being under the influence of the Sun power and its periodic activity, is in direct communication with the internal environment of the body, and the Earth's psychosphere (collective humanity) and individuals are under the constant influence of these forces. For a scientist, the nature of the so-called Z-rays, which are responsible for translating the potential energy of the external environment into the kinetic energy of the mental-psychological structure of man, remained mysterious. He was convinced that they were connected by a single substrate, and monism was the principle of the evolution of nature and society. Based on the concepts of "historiometry" and "natural-historical knowledge", the scientist proposed an original periodization of the world-historical process and expressed confidence in their use for state-building and world politics.**

Keywords—Chizhevsky; synthesis of sciences; space and physical factors; historiometry; natural history knowledge; dynamics of social processes

I. INTRODUCTION

The undoubted literary and artistic talents of Chizhevsky from a young age were his guiding star. The second gift, which nature bestowed upon him, was the inclination to synthesize scientific knowledge, science, to which he devoted the best years of his life, despite all the trials and tests of fate that fell to his lot. The synthesis of the natural and human sciences was organic for him.

He simultaneously became a student of two Moscow institutes — Archaeological (later became part of Lomonosov Moscow State University), where, studying as a volunteer, he learned history and archeology, and Commercial (in the future, Institute of National Economy named after G.V. Plekhanov), mechanics, physics, philosophy, economics. Student Chizhevsky makes a report entitled "The Influence of Perturbations in the Electric Mode of the Sun on Biological Phenomena," the title of which indicates the focus of his interests. A huge array of historical and archaeological data testified that terrestrial phenomena are in correlation with the periodic activity of the Sun. To clarify the nature of these correlations, he began a systematic study of the influence of electric, magnetic and electromagnetic perturbations in the external physicochemical environment on the occurrence, distribution, and intensity of epidemics that had reliable statistics. In agreement with prominent historians & professors A.I. Uspensky and N.I. He starts writing a dissertation for the degree of Doctor of General History, which he successfully defended in March 1918. Attempts to publish the dissertation manuscript expanded to 900 pages were not successful due to the extreme novelty of the question. By 1922, he will prepare a reduced version of the manuscript, which will be published only in 1924 [1]. In parallel, he worked on the manuscript "Electronic Theory: The Genesis of Forms" (1922), which demanded that a scientist immerse himself in the natural sciences — physics, crystallography, biology, medicine, physiology, which he learned in two years as a volunteer at Moscow State University. Chizhevsky consults with prominent scientists; he closely follows the publications of theorists of quantum mechanics, conducts correspondence with foreign scientists, and conducts original research. From the ideas that emerged during these years, a research

program of solar-terrestrial relations is developed, including heliobiology, ionification, electrohemodynamics, fundamentals of electronic medicine, historiometry and the concept of heliotraxia [2]. In 1939, Chizhevsky received recognition from the world scientific community as the head of biophysicists in research on space biology (First International Congress on Biophysics and Space Biology, New York, 1939).

II. Natural Science Bases of Historiometry and the Object of Its Application

Modern science has concluded that all life on Earth, like herself, exist under the necessary condition of exposure to solar radiation [3]. Ionizing radiation (streams of particles and quanta of electromagnetic radiation, whose passage through matter leads to ionization and excitation of atoms and molecules) enters the Earth in the form of cosmic rays. Another type of solar or optical radiation — ultraviolet waves. Sources of ionizing radiation in terrestrial conditions include radioactive radiation and gamma radiation, or high-energy electromagnetic radiation, as well as artificial sources of ionization. Small doses of ionizing effects on biological objects stimulate their activity.

The leading scientists of Europe were actively engaged in research on the ionization of gases and liquids at the beginning of the 20th century. Svante Arrhenius (1859-1927) expressed the idea of extraterrestrial life origin, investigated the ionization of solar radiation, revived the ion theory of electrolysis, these studies were picked up by P. Debye (1884-1966), who used X-ray scattering methods to study the structure of liquids and individual molecules, which led to the development of theoretical and applied electrochemistry. Works by J.J. Thomson (1856-1940) and E. Rutherford (1871-1937) led to the discovery of the phenomenon of current saturation during gas ionization under the influence of X-rays, Paul Langevin (1872-1946) also participated in this work, which laid the theory of paramagnetism and diamagnetism. Arsen D' Arsonval (1851-1940) investigated the effects of high-frequency alternating current on biological objects, contributed to the development of biophysics, and developed methods of electrotherapy, named after him. Among Russian scholars, we single out the names of A.A. Eichenwald (1863-1944), who investigated including various characteristics of light waves, and P.P. Lazarev (1872-1951), who created the physicochemical theory of excitation (ionic theory of excitation) and derived the laws of the action of electric current on the nervous tissue. This period includes the original research of the famous N. Tesla (1856-1943) on the extraction of huge electrical energy enclosed in atmospheric air (he could create ball lightning artificially) for military purposes. He also studied the effect of alternating currents of different frequency and power on the human body, created electrical devices for medical research, which were widely distributed.

Chizhevsky was one of the first to focus on weak electromagnetic fields, believing that life could be formed and will last only in such an environment. Drawing analogies between the physiological mechanisms of a living creature and the physicochemical mechanisms of the solar system, he designed a microwave air ionizer (Chizhevsky chandelier), which in appearance resembled some variants of Tesla coil equipped with spikes that served as the output of electrons.

Chizhevsky wrote in the poem "To the Man": I took the lightning from the sky, took the storm clouds and brought them into the house, forced me to breathe in a man — they prolonged existence, man! The ionizer creates artificial fields that have a beneficial effect on it, and the Sun, directing radiation fluxes and corpuscles, has a beneficial effect on humanity and all life. Of exceptional importance is the rhythm and intensity of these influences.

The exceptional scientific integrity of Chizhevsky allows people to use the links of a scientist to present that circle of predecessors, the work of which he thoroughly studied when writing the work "Physical Factors of the Historical Process". However, intruding into the very essence of the so-called "dispute over methods", he bypasses the panelists, speaking rather like a natural scientist. He writes that man is given to perceive only a very insignificant part of what is happening in the outside world, and therefore he has no right to claim absolute knowledge of nature.

What needed to do is to strive to take a position of critical or scientific realism, that is, to approach the scientific comprehension of the "thing in itself". In addition, the task of philosophy would be solved in the perfect way if it's possible to express reality in its entirety and unite understanding into one logical whole. How should a scientist act if the object of his research is multidimensional? V.V. Kazyutinsky (1932-2012), astronomer and philosopher physicist, described the state of science at the turn of the XIX-XX centuries as follows [4]. The scientific picture of the world turned out to be "torn". On the one hand, it was a picture of the world of physicists and mechanics, it was an abstraction that enters the scientific worldview, but does not encompass it all, does not even penetrate into all areas of natural science. On the other hand, it was a picture of the world of natural philosophers, which covered biospheric phenomena containing a new element for science — life [5]. A.L. Chizhevsky overcomes this gap in the idea of the existence of a single law of all being, which is possible based on the following principles: monism biological objects, he used the pluralistic approach, energy, determinism and the theory of balance of forces, world harmony and cosmic rhythm, global evolutionism [6]. The scientist expanded the classical concept of "natural-historical knowledge," including the cosmophysical factor. He introduced the concept of "historiometry", which reflected the idea of a unit for measuring nature (society and the sun-biosphere) and social processes that are common to nature and society. Innovations stemmed from the original presentation about the nature of objects that simultaneously belong to two worlds, the earthly and the heavenly, and which he sought to present in its entirety as a logical whole. Chizhevsky thoroughly reworked the original research of the scientist of Kazan University N. A. Vasilyev (1880-1940) according to imaginary logic. If there exists a non-Euclidean geometry of Lobachevsky, which describes a curved space, considered Vasilev, then why cannot curved (non-Aristotelian) logic exist? As Lobachevsky rejected the fifth postulate of Euclid, so

Vasilev rejects the law of the excluded third Aristotle, assuming that there may be a law of the excluded fourth [7].

The logic of Aristotle is the logic of two dimensions, the logic of Vasiliev is the logic of three dimensions, which indicates that there is a contradiction in the subject itself (A is and is not B), and in general he says — there can be a lot of logic. As the logic of Aristotle is based on metalogics (philosophy), so the logic of Vasiliev contains metalogics [8]. Applying more flexible logic to such extremely complex objects of science as life, A.L. Chizhevsky began to consider them as components of the more general system "Cosmos-Sun and planets-Earth with its spheres, including the psychosphere-Man with his individual and world history". The concept of cosmic factors of biological and social processes developed by a scientist is one of the most grandiose and value-significant achievements of scientific thought, comparable to the creation of quantum mechanics or genetics. The concept is directed to the future, it is distinguished by a deep value-ecological sense [9] [10].

The world-historical process, according to A.L. Chizhevsky (1897-1964), is a social evolution in all human communities, the most important events of which occur simultaneously with any fluctuations or changes in the forces of the surrounding nature. To single out the parts simple and clear in this complex is the main task of natural-historical knowledge. The task is to apply the methods and principles of physics and mathematics to the historical process and social evolution. The greatest objection was caused by the intention of the scientist to show on the processes of the world-historical process that the essence of psychic life (and the psychosphere of the Earth) is closely connected with the life of the Earth as a whole organism, as well as the Solar system and space. The world will appear like a complex system of dependent variables. When these laws are established empirically, thoroughly tested and translated into causal ones, by introducing causal connections, humanity will acquire new knowledge — foreseeing the near future [11]. The scientist developed these ideas by exploring the gas and electrical exchange between the external environment and the human body, the electrical and magnetic properties of blood.

III. Modern Research of Solar and Earth Relations

The development of science and space technology contributes to the accumulation of new empirical facts and theoretical ideas about the role of solar activity and makes Chizhevsky's avant-garde work relevant. One of the side effects of the first flights of spacecraft to the Moon is the registration of electromagnetic disturbances in deep space, which was interpreted as the effect of solar activity (solar wind). The possibilities of studying the processes occurring in the depths of the Sun and on its surface have significantly expanded. They are developing the model of the mutual influence of the planets of the solar system (space weather). According to one of the models, global cooling is expected on Earth, the cause of which will be the "crushing" of the earth's crust under the influence of the giant planets (Jupiter and Saturn), as a result of which the angle of inclination of the sun's rays will change. Established is considered the existence of cycles of solar activity in the deep history of the Earth (more than 300 million years). The development of new medical technologies (MRI) contributes to the approval of the foundations of e-medicine, according to which the electronic base of cells, tissues, and organs should be dosed out before resorting to surgical or extreme chemical methods [12]. In the work of Yu.I. Gurfinkel (Ischemic Heart Disease and Solar Activity, 2004), who used the device to simulate solar flares, and other researchers obtained convincing results about the effect of solar activity on hemostasis and peripheral blood composition [13]. Practical medicine concludes that it is advisable to introduce a systematic approach to the study of variations in the parameters of the functional state of the body, the qualitative and quantitative characteristics of blood cells, depending on the fluctuations of the complex of ionospheric and cosmogeliogeophysical parameters for each patient [14]. The theoretical side of heliobiology and ionification is much slower developed. Back in the 1960s, an active supporter of the works of Chizhevsky, an Italian physicist and chemist J. Piccardi, showed that the solidification of molten naphthalene reveals a connection with the phases of the moon and correlates with solar activity. In the period from the 1950s to the 1990s, the biophysicist S.E. Shnoll studied the nature and mechanism of macro-fluctuations and showed that they have correlations with cosmophysical phenomena.

In a number of works astrophysicist BM. Vladimirsky [15] [16] traced the history of heliobiology and expressed the conviction that modern studies demonstrate not the biological, but the more fundamental, physical, essential nature of the agent that, according to Chizhevsky, provides the solar-terrestrial connections, including their effects. On the human psyche. E.N. Chirkov [17] holds the position that the 11-year cycle of solar activity is the result of the phase-amplitude interaction of several dozen heliorhythms, it determines the direction and intensity of biological processes at the molecular, cellular, systemic and population levels of living matter organization, participates in the regulation of gene activity, which has wave nature.

As for the participation of physical factors in the course of world history, nothing similar has appeared in the last 100 years, however, it is already impossible to ignore this work of a scientist. Mikrosdvigami can be called the transformation of the concept of "historiometry" in the concept of "cliometry" (Nobel laureates R. Vogel and D. North), which, while still controversial, has taken root in foreign literature, mainly in the United States. In the 1990s, it was replaced by the concept of "cliodynamics", which was introduced by Peter Turchin, our compatriot, who turned out to be in the USA. Researchers (among them Jack Goldstone and others) focused on the dynamics of historical and cultural phenomena, economic and mathematical models. In domestic science, attempts are also being made to make history a science, therefore the arguments of the history of the evolution of the biosphere, the facts explained by the laws of animate and inanimate nature, become the main ones. It calls to seek and describe the channels and mechanisms of the indirect influence of nature on society, and in

methodological terms to build a general theory of the influence of the natural factor [18]. At the same time, researchers realize that the "laws of history" are unlikely to reach the same level of accuracy as the laws of physics. Nevertheless, in the qualitative form, it is possible to formulate some general assumptions of a theory that has sufficient resources to rely on broad empirical support [19] [20].

IV. CONCLUSION

In the evaluation of researchers, A.L. Chizhevsky played a prominent role in the history of national science and culture: he was an encyclopedic scholar, the last of the great cosmic thinkers, occupying a special place in this series as the founder of cosmic natural science. He made a revolution in the worldview, similar to the thinkers of Axial time. Plato and his outstanding contemporaries tried on the geometry of the universe to earthly history, trying to direct its path to higher ideals. The Russian scientist applied natural science and mathematics to correlations in solar activity and periodic phenomena in the historical life of humanity, he introduced cosmophysical factors into the dynamics of social processes, proposed the first scientific tools for predicting social phenomena. Modern science shows that man is a kind of "photon machine"; he receives from outside the wave-particle energy, which he transforms into functions of vital activity and sense of activity. This flow of energy expires from the depths of the universe, intensifying the activity of the Sun to such an extent that it acquires the character of a decisive factor, acting as an incentive mover at the level of brain neurons, mental reactions, and emotions. All phenomena are turbulent. The interaction between the levels of turbulence occurs at the bifurcation points; in synergetics this is called phase transitions. Representatives of such a direction as modeling unstable historical processes by mathematical methods work in this direction, where we find useful analogies: phase transitions applicable to the World-System as a single developing completely can be considered different sides of a series of single, or hierarchical, phase transitions [21].

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