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ABSTRACT

To the 120th anniversary of birth of Alexander Chizhevsky – biophysics, founder of heliocosmic biology, aeroionification, electrogeomodynamics, associate of the father of astronautics Konstantin Tsiolkovsky, a member of nearly two dozen foreign academies and an honorary professor at several universities. At the first international congress on biophysics and space biology in New York in 1939, he was elected in absentia a president of scientific forum, nominated for the Nobel Prize, justly called «Leonardo da Vinci of XX century». He was, among other things, a talented poet, philosopher, artist and landscape painter.

Keywords: *cosmonautics, biophysics, aeroionification, cosmic philosophy, heliobiology, energy of space and terrestrial biological media.*

Background. Alexander Leonidovich Chizhevsky was born on February 7 (January 26 old style) in 1897 in Tsechanovets of Belsky county of Grodno province (now Podlasie region, Poland) in the family of an artillery officer of the Russian army [1–44]. Being 4 years old he read aloud, and knew by heart, Russian, French and German poems, and soon he began to write poems, since nine years he became interested in astronomy. For many years from 9 a.m. he carried out daily observation through a telescope and careful sketches of sunspots, and in the diary he recorded their changes.

Objective. The objective of the author is to consider work and life of a prominent Russian scientist A. L. Chizhevsky.

Methods. The author uses general scientific and historical methods.

Results.

Kaluga shoulder of Tsiolkovsky

The boy began to learn in 1907 in the gymnasium of the city of Belo of Siedlce province (now the province in Poland), but due to his father's transfer to Zegrze Fortress (the Kingdom of Poland, which was then part of the Russian Empire), he switched to home schooling. He studied foreign languages (French, German, English, Italian), history, studied painting and music. He read all the books about the Sun, which were in the home library. In the years 1908–1909 he wrote a treatise «The shortest astronomy of Dr. Chizhevsky, composed according to Flammarion, Klein et al.».

In 1913 his father was appointed a commander of an artillery unit stationed in Kaluga. The young man entered the 6th grade of the private secondary school of F. M. Shakhmagonov and in April 1915 he graduated from the 7th (optional) class. He studied again the books about the Sun, which he found in the Kaluga city library, ordered them from the stores of Petrograd, Moscow and other cities. He became acquainted with the fellow countryman – the founder of theoretical cosmonautics K. E. Tsiolkovsky, who on the assumption of the young men about the impact of galactic fields and solar activity on humans, animals and plants advised him to analyze statistical data. Alexander collected unique statistical data, covering centuries and affecting not only the biological aspect of the problem, but also showing the effects of extraterrestrial factors on social and political processes and events, on the whole course of the earth's evolution.

In summer 1915 Chizhevsky published his first book «Poems». In July, he was enrolled as a valid attendee in Moscow Commercial Institute (now the Russian Economic University of Plekhanov), and in September – non-matriculated student at the archeographical department of Archaeological Institute and Moscow University at Physics and

Mathematics Faculty (natural and mathematical department).

In October, a student at the Archaeological Institute made a report «Impact of perturbations in the electric mode of the Sun on biological phenomena», which presented the results of observations of the Sun and his considerations about the connection of solar activity and its periodicity and processes on Earth. The report aroused heated debate. Opinions of teachers and students were divided opposite, but then relevance and prospects of heliocosmic topic became clear.

In winter 1915–1916 he attended lectures at the People's University of A. L. Shanyavsky, literary evenings and clubs, where he met with many writers and poets. In the second half of 1916, he volunteered for the front of the First World War. He participated in battles in Galicia, was wounded and shell-shocked, he was awarded the George Cross of the fourth degree (soldiers) and discharged for health reasons.

In 1917 Chizhevsky, passing exams and defending his thesis «Russian poetry of the 18th century (M. V. Lomonosov)», graduated from Moscow Archaeological Institute, he became a senior researcher, and since 1921 – professor, taught courses «History of development of natural science in the ancient world», «The history of archaeological discoveries».

It is, however, not all. In December 1917, he presented a thesis «Evolution of Physics and Mathematics in the Ancient World» for the master's degree in general history. In 1918, he graduated from Commercial institute and he defended at the historical-philological faculty of Moscow University a thesis for a doctoral degree in universal history «Study of periodicity of the world historical process». His theory was expressed in the fact that solar activity cycles manifest themselves in the biosphere, changing all vital processes, ranging from productivity and ending with mental illness and mood of humanity. What is happening on the sun is reflected in the epidemic, epizootic, political and economic crises, wars, rebellions, revolutions, etc. Therefore, the revolutionary events of 1917 should be seen as a natural historical phenomenon.

Ionization effect

Since 1918 Chizhevsky participated in Kaluga «Society for the Study of Nature» and in his father's apartment for three years conducted experiments on white rats concerning biological effect of electric charges of air produced by a mounted installation for air ionization. The purpose of the experiments was to find out why after a thunderstorm accompanied by lightning strikes it is easier to breathe on the street than in the room. Being a non-matriculated student at the medical faculty of Moscow University, a young scientist first discovered that the negatively charged

air ions have a beneficial effect on living organisms, and the positively charged produce a negative impact. He received funds for the experiments, by the way, from the sale of more than 100 paintings, which he drew as a landscape painter. In addition, Alexander taught Russian language on the courses Red infantry commanders and in the 4th unified labor school. In connection with the transition of the country to the new spelling teacher himself made a textbook of the Russian language in accordance with the changed rules of grammar.

In 1919, in Kaluga, he published the second and last lifetime collection of poetry «Book of poems», which included about 300 poems written in 1914–1918. He was elected a chairman of the provincial union of poets. On the recommendation of the People's Commissar of Education A. V. Lunacharsky the biophysicist was appointed an instructor of the literary department of the People's Commissariat of Education.

In 1920, summarized by Chizhevsky results of a large experimental work with rats were multiplied on the rotator and sent to a number of eminent scientists, including in translation to the director of the Nobel Institute, the Swedish academician S. Arrhenius. He received from him with a positive feedback an invitation to work. But he, despite the support of Lunacharsky and Gorky, was denied a business trip.

From 1922 to 1923, Alexander Leonidovich was a nontenured research consultant of the Institute of Biophysics of the USSR Commissariat of Health, headed by Academician P. P. Lazarev, and then to 1926 – chief expert on medicine and biology and a member of the technical council of the Association of Inventors. In 1924, on the recommendation of Lunacharsky in the 1st Gostipolitografia of Kaluga was published a book «Physical factors of the historical process», in which in an accessible form his doctoral thesis was presented. Immediately again discussions began, there were articles against this paper, that then had a negative value in the future for the scientific and personal life of the scientist.

Chizhevsky developed an interest in astrology that fueled his scientific research with ideas. In 1926 in the magazine «Ogonyok» the scientist published an article «Modern astrology», in which he wrote that several prominent astronomers argued the periodicity of solar phenomena with the movement of the planets around the sun. Consequently, the earth phenomena, depending on the stain and prominences are dependent on them. Moreover, open in the upper atmosphere, rays of cosmic origin, make a very real assumption about impact on us of not only the sun, but also more distant stars. In this regard, he was later repeatedly blamed for trying to «bring pseudoscience» astrology in scientific knowledge system.

Worldwide recognition

From 1924 to 1931 Chizhevsky worked as a senior researcher (at the rank of professor) in the practical laboratory of animal psychology Glavnauka of People's Commissariat of Education of the RSFSR. Here he experimented on the biological and physiological effects of air ions on animals.

In 1927, there were tests of electroeffluvial chandeliers (generator of negative air ions), which consisted of a light metal rim with a diameter of 750–1000 mm. Bare copper wires with a thickness of 0,6–1,0 mm, forming a grid, sagging down, were stretched on the mutually perpendicular axes in increments of 35–45 mm. In the grid nodes were soldered vertically the needles with the points down



of not more than 50 mm and a thickness of 0,25–0,5 mm. To the rim of chandeliers in 120° three copper wires of 0,8–1 mm were attached, welded together over the center of the rim. For this point the chandelier using fishing line was suspended to the ceiling or the bracket at a distance of not less than 150 mm. To the same point negative polarity of DC voltage was applied. From sharpened needles flowed electrons that adhered to the molecules of atmospheric oxygen, which entered the lungs of a living organism.

The value of the minimum voltage, ensuring the vitality of negative air ions – from 25 kW was experimentally established. At excessively high voltage corona discharge arose, accompanied by the smell of ozone, which reduces the efficiency of the generator. For the sake of safety in the electrical circuit before chandelier was included resistance limiting the current to 30 mA. The scientific conducted experiments by counting the number of air ions generated. The inventor's certificate for aeroionizer for production of light air ions was issued.

When the chandeliers of Chizhevsky was on air ions, inhaled by a man, give their charges to erythrocytes, and with them – all the cells and tissues of the body, normalizing metabolism and quenching «electronic hunger». It helps with burns, wounds, urticaria, whooping cough, functional disorders of the nervous and circulatory systems, respiratory diseases (acute and chronic catarrh and bronchitis, vasomotor rhinitis, pharyngitis, laryngitis), allergies, stress, initial stage of pulmonary tuberculosis and other diseases. People and animals are electrical beings and all metabolic processes in the body are electrochemical. Electric air deficiency leads to hypoxia. However, he was against the use in medicine, hygiene and veterinary of hydroionizers and ions produced by the action of hazardous radioactive or ionizing radiation on air molecules.

In 1930–1936 Chizhevsky was the director of the Central Research Laboratory of ionification (CNIL) of Academy of Agricultural Sciences. He advanced





aeroionification problem – the electrical technical task of artificial creation of such a regime indoor, which has the air of the best places, famous for beneficial effects on human (alpine meadows, mountain and seaside resorts). The studies at CNILI involved 50 researchers. It was found that in the filtered (chemically sterile, clean) air in the absence of negative ions organisms will soon get sick and die. Confirmation of aeroionic starvation and its physiological consequences was one of the greatest achievements in the science of life and hygiene of housing and was reflected in medicine (aeroionotherapy) and agriculture (aeroionization of animals).

Based on the data of CNILI in 1931 Soyuzkinohronika made a film «Ionization: Discovery of professor A. L. Chizhevsky». Two resolutions of Narkozem and Sovnarkom of the USSR appeared, which supported the discovery and Narkomzdrav of the USSR the method of aeroionotherapy as a way of physiotherapy for a widespread introduction. The scientist received the award, emerged seven lab branches in Leningrad, Voronezh, and other cities of the country. Proceedings of CNILI (Volumes 1 and 3), published in 1933 and 1934 in Voronezh, were translated into several foreign languages.

In 1933 Chizhevsky determined experimentally that the directed flow of air ions precipitates dust and microorganisms from the air, purifying it. These studies have opened the opportunity to clean the air of working premises from harmful contaminants that has been used in industrial hygiene. A simple method for producing highly dispersed and ionized water vapors was found, medicinal solutions and fine particulate of solids, laid the foundations of electroaerosoltherapy and electron-ion technology (electro-coloring, electroapplication of corrosion-resistant coatings, etc.).

Together with Kazan microbiologist S. T. Velhover in 1935 the scientist discovered metachromasia (feature of cell and tissue painted in tone, different from the color of the dye) corynebacteria (effect of Chizhevsky-Velhover). On the basis of this effect, he made a conclusion about the possibility of solar activity prediction, dangerous to humans.

The scientist was invited to give lectures in Paris and New York, in 1929 he was elected a member of Toulon (France) academy and became an academician of 17 other academies of sciences of the world, an honorary professor at many universities in Europe, Asia and America. His works in the field and aeroionification and heliobiology (Space Biology)

were given a great importance. Aeroionotherapy method became widely used in the United States, France, Germany, Italy, Belgium and Japan. The researchers of these countries confirmed the effectiveness of this method in the treatment of many diseases and praised the discovery of Chizhevsky. There were offers to buy the patent for the works on aeroionification, which he refused, handing his invention at the disposal of the Soviet government.

Galileo of space biology

In the country, meanwhile, a strange situation evolved around the scientific theme. Experiments of ionification laboratory were criticized in «Pravda» newspaper in printed materials in which Chizhevsky was accused of ignorance, charlatanism. In the article «The enemy in the guise of a scientist», he attributed as much to the supporters of the counter-revolution, which is the mouthpiece of the anti-Soviet ideas. In 1935, banned the publication and distribution of printed works edited by him, Volume 2 and 4 of CNILI scientific papers that were in typesetting, were scattered, and in 1936 by order of the People's Commissariat of Agriculture of the USSR the professor was removed from work, laboratory and all branches were disbanded.

However, at the same time (1938) Chizhevsky was invited to the post of scientific adviser on aeroionification at the Administration of construction of the Palace of Soviets – no less, no more – of People's Commissars of the USSR!

In 1939, the first International Congress of Biological Physics and Space Biology took place in New York, on which the scientist was invited. Since he was denied a trip abroad, on the forum he was elected in absentia Honorary President, in the course of speeches we was called «Leonardo da Vinci of XX century», on behalf of the Congress the memorandum of his scientific writings was sent to the Nobel Committee. The attitude of political power in the country to him was such that he could not receive the Nobel Prize, and for ethical reasons he refused this variant.

In 1939–1941 Chizhevsky headed the laboratory of aeroionification in III Moscow State Medical Institute and Leningrad State Pedagogical Institute. With the onset of World War II he was evacuated to Chelyabinsk, where in the regional hospital became a consultant in the treatment of gunshot wounds, burns, ulcers and other diseases using ionotherapy.

Again, the vicissitudes of life: before the war, his scientific papers were presented at the competition of the Stalin Prize for Science – a clear recognition of merit. But then another stroke. Unexpected arrest prevented awarding. The Commission, headed by the Deputy Chairman of People's Commissars of the USSR A. Ya. Vyshinsky accused the professor in the non-proletarian origin, in writing a bad book «Physical factors of the historical process» and creation of a «bourgeois» theory of ionization.

Let's clarify about the origin, family roots.

Father, L. V. Chizhevsky, was a career officer and general since 1916; he invented and tested commander protractor for firing with cannons fanning (parallel) with fire on unseen targets from concealed positions and a device for the destruction of barbed wire; he made experiments and perfected the design of a rocket in 1855 of general K. I. Konstantinov, which were successfully applied in the years 1915–1916 in a combat situation. In the 1st world war he was in the army; in 1918 he served in the Red Army; in

1928 he was awarded the honorary title of Hero of Labor of the Workers' and Peasants' Red Army; he died in 1929.

When Sasha was not yet a year old, his mother died of tuberculosis. Education and versatile home training of boy was performed by his grandmother, E. S. Chizhevskaya (before marriage Oblachinskaya), who was a very educated woman, knew history well, several languages and was a greatness of the hero of the Crimean War of 1853–1856, Admiral P. S. Nakhimov. Naval commander, as known, defeated the Turkish fleet at the Battle of Sinop, heroically led the defense of Sevastopol, in 1855, he was mortally wounded in battle. In honor of him in 1943 in the USSR Nakhimov schools for young sailors began to be established, and on March 3, 1944 in the country the Order of Nakhimov of 1st and 2nd degree and medal of Nakhimov were established.

In 1942, after fast investigation (it was allowed to hold for 10 days) the biophysics Chizhevsky without participation and hearing of the parties was sentenced to 8 years. To not get the death penalty, and to save his life, he had to renounce the «false bourgeois and anti-Soviet» ionization theory. The Italian scientist Galileo, who defended the heliocentric system of the world, in 1633 was subjected to the Inquisition. He was forced to accept the fact that the Sun supposedly revolves around the Earth. D. Bruno, Galileo country fellow, did not give up his views and burned for heresy by inquisitors at the stake in Rome. By 1941, many of the technical issues of aeroionification have been resolved in the USSR. But this theme for many years afterwards a loud «medieval» trial of Chizhevsky was not mentioned and in fact was not investigated. Only in 1959 the Ministry of Health by the order № 1261 repeatedly recommended to use aeroionotherapy method for medicinal purposes.

In the meantime, while in prison, Alexander Chizhevsky in different camps on the location (Chelyabinsk, Sverdlovsk region, Kutchino–Moscow region, Karlag–Dolinskoe, Spasskoe, Steplag) sought refuge in poetry, painting and science. He wrote more than 100 poems, published after the death in three poetry collections. 300 of 2000 art works preserved, mainly landscape watercolors. In Karlag in 1945 when the prison hospital he was allowed to create a clinical laboratory and to engage in electrical problems of blood (structure and mechanism of its movement through the vessels and their relation to electricity of the body and the environment). Together with him on the mathematical calculations associated with the study of blood, worked G. N. Perlatov and other prominent scientists prisoners. It was possible to detect structural and systemic organization of moving blood. This was a fundamental discovery. The results of camp experiments were scientific books «Electric and magnetic properties of red blood cells», «Structural analysis of moving blood», a monograph «Biophysical mechanisms of erythrocyte sedimentation reaction».

The convict was in prison not only «from start to finish», but to finish the experiments in the blood, got out of jail a month after the end of the sentence. He was sent to exile in Kazakhstan. He worked as a consultant on aeroionotherapy issues and head of the laboratory of structural analysis of a blood and dynamic hematology in the Karaganda regional hospital, at blood transfusion station, until 1955 headed the clinical laboratory of oncology center, was a consultant at the Research coach institute. Sessions

of aeroionotherapy helped many patients of the regional clinical hospital in wound healing. It was established that air ions give the most stable therapeutic results in combination with drug therapy, UHF therapy, intramuscular injection of blood irradiated with ultraviolet rays. In a number of coal mines of the Karaganda basin aeroionization was successfully implemented.

Chizhevsky was released from the settlement in 1954, he returned to Moscow four years later and worked in «Soyuzsantekhnika», where he continued to study the Sun's influence on the physical and biological properties of blood and was engaged in the implementation of air ionization. In 1958–1960 he was a consultant on aeroionotherapy and scientific director of the laboratory of the State Technical Bureau of the Union. Then he was the deputy head of the research laboratory on the ionization and air conditioning. In 1962, he was partly rehabilitated, and in the future – posthumously completely. He managed to publish during his lifetime some of their works, on which he worked in the prison and in exile [11, 12]. In the last period he wrote the memories of twenty years of friendship with the founder of cosmonautics K. Tsiolkovsky.

Alexander Leonidovich Chizhevsky died on 20 December 1964 aged 67 years, he was buried in Moscow at Pyatnitskoe cemetery. In 1965, the USSR Academy of Sciences formed a commission, which took up the study of the scientist's archive. The papers, which were left unpublished in manuscripts, were published posthumously [13–20]. But much of what he knew or what he could assume, learn, explore, show was left with him and was carried to the grave.

Conclusion.

Chizhevsky formulated the dependence between cycles of solar activity and the various phenomena of the biosphere, highlighted the relationship of a living organism with the surrounding environment; he developed the theory of energy coupling of space and terrestrial phenomena; developed and approved the principles of regularity, uniformity and determinism, global evolutionism and cosmic rhythm principle [8]. He managed in a unified manner to see and appreciate the diverse phenomena of physical, biological and social nature: nine times in a century all the elements of the earth's mineral and organic nature become agitated (magnetic and electric storms, earthquakes, tornadoes, floods, forest fires, etc.), microbes and viruses are activated, on all continents there are epidemics, chronic diseases are aggravated, overall mortality increases in different countries. The human body resonates in accordance with the outer space environment due to increased load on the nervous system and affect social behavior.

For the development of these ideas, he belongs to the leading figures of Russian cosmism. He is one of the founders of biophysics, new directions in science: solar and cosmobiology, space epidemiology, explaining applied features of the Earth's biosphere, their indisputable link to the world of the Sun and the cosmos [7].

The scientist established for the first time the fact of the opposite physiological effect of positive and negative air ions on living organisms, pathology of desionized air and stimulating effect of negatively charged ions. He applied artificial air ionization (electroaerosoltherapy) in medicine, agriculture (livestock and crops), industry (electro-coloring and electrostimulation of chemical reactions) and other sectors of the economy [11, 12]. In some countries





hospital wards, sanatorium premises, assembly rooms, classrooms, auditorium, service rooms, offices, halls for physical education and sports, shops and factories, homes and apartments are air ionized. Painting of materials and surfaces (including subway cars, airplanes, ocean liners) is produced in the electric field by the method of Chizhevsky [12]. He discovered the spatial organization of the structural elements of moving blood and described the process of formation of certain radial-ring assemblies, the so-called «rouleaux» (Chizhevsky phenomenon) by red blood cells.

Chizhevsky was gifted with many facets: a great scientist, he wrote beautiful poetry, painted perfectly, played the violin, was a man of encyclopedic knowledge [3, 5, 16, 17, 20].

Film studio «Tsentrnauchfilm» in 1989 released a documentary «Prisoner of the Sun». In 1995 Laser Academy named after Chizhevsky was founded, which annually awards the prize of the same name and medals to scientists. In Tambov Museum of the History of Medicine there is a permanent exhibition works devoted to the prominent biophysics. In 2000, in Kaluga (Moscow street, house № 62 / 71) was opened a memorial scientific and cultural center of A. L. Chizhevsky. Ten years later, it was transformed into a house-museum of the scientist. In 2012, near the building of Kaluga State Pedagogical University named after K. E. Tsiolkovsky monument of A. L. Chizhevsky was erected.

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