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The Tchizhevsky's Copernican Revolution in Biology and Sociology (on the 50th death-day anniversary of the scientist)

The message is denoted memories of the professor Alexander Leonidovich Tchizhevsky (1897–1964), founder to cosmic ecology and heliobiology, initiator of the row of the important directions in the field of sciences and technology. His name stands in one row with names Konstantin Eduardovich Tsiolkovsky and Vladimir Ivanovich Vernadsky, which symbolize shaping the cosmic direction in of natural science. They have removed the area of the theoretical thinking and practical activity of the person for limits of the usual terrestrial measurements and geocentric restrictions, and have returned due respect solar-terrestrial factor, process and phenomenas.

Key words: space ecology, the solar activity, blood biophysics, superoxide anion radical, scientific biography of A.L.Tchizhevsky.

Introduction

This report is devoted to professor Alexander Leonidovich Tchizhevsky (1897–1964), the founding father of space ecology and heliobiology and the initiator of several important streams in science and technology. His name stands together with the World famed names, especially of Konstantin E. Tsiolkovsky and Vladimir I. Vernadsky which signify the formation of cosmic dimension in natural science including the modern world perception and man's practical attitude to the world. They have lead the theoretical thinking and human activity beyond the conventional terrestrial dimensions, geocentric criteria and other limits and have given the due regard for extra-terrestrial factors of Earth's processes and phenomena [1].

1. The fundamental change of the scientific background at the beginning of XX fundamental change of the scientific background at the beginning of XX century

A.L.Tchizhevsky suggested the wider meaning of the environment which embraces not only the habitats of all Earth's biological systems including *Homo Sapience*, but the off-planet space as well. He demonstrated the fact (and proved it by his versatile activity) that cosmic factors do interfere with the dynamics of the formation, development and functioning of self-organising systems of any nature and of any level of substance motion. The boldness of his scientific thinking and the actual achievements are comparable only with the exploit of Nicolaus Copernicus [2, 3].

The birthday anniversary of the scientist was marked in the 1997 by the special scientific seminar-symposium 'Space-Biosphere-Man' organised by the Russian Academy of Public Administration under the President of the Russian Federation (RAPA), the highest research and teaching establishment in the country [4].

The Russian Geographical Society and the Moscow Society of Nature Explorers (both reputable Russian scientific societies) held meetings addressed to the anniversary. The Russian Academy of Natural Sciences held the special session within the precincts of Moscow State University. Celebratory events took place in Kaluga, Tver and other cities. The Mayakovsky Museum in Moscow organised the evening 'Muses in the Temple of Science' addressed to the poetic heritage of A.L.Tchizhevsky which, according to some Arts experts, is worthy of attention irrespective of the scientific achievements of the scientist.

The beginning of our century, when A.L.Tchizhevsky was only entering the science, was marked by numerous advances on the front of natural science and technology which were drastically changing the human perception of the matter, the structure and functions of various phenomena of organic and inorganic nature. This was the time when the cornerstones of new methodologies of cognition and practice were being laid.

At that very time, the great thinker K.E.Tsiolkovsky who was a modest teacher in Kaluga and a Tchizhevsky's fellow-townsman, had already revealed the necessity of establishing 'a cosmic view of things' [5].

It was the qualitatively new world perception and outlook confronting the existing ones. Such views usually received ironic reception and was hardly shared even by those sympathising with the innovator.

A.L.Tchizhevsky became friends with K.E.Tsiolkovsky in the summer of 1930 being a student, and they had regular talks until 1930. Then they stayed in touch mostly by mail. The age difference did not present an obstacle to their close communication. They often discussed the vital problems of the contemporary natural science giving special consideration to the magnificent picture of the Universe opening before their eyes: its counterparts were connected with each other by powerful bonds the obscure vision of which was produced by the great philosophers of the past.

2. The milestones of biography

A.L.Tchizhevsky was born on 26 January (7 February according to the new style) 1897 in Tsekhanovets suburb of the Grodno province (now the Polish territory) in the family of a regular artillery officer. The scientist-to-be grew in a cultural noble environment with strong traditions. He received good education: firstly at home and then in gymnasia in Bela town of Sedlets province (Poland) and Warsaw. In 1913, his father was transferred to Kaluga to command a battery. In this city Tchizhevsky finished a private secondary school. Then he was a lecture-goer at the Moscow Architecture Institute and a full student at the Moscow Commercial Institute from which he graduated in 1918. He also studied at Moscow State University in the Department of Mathematics and Physics (1915–1919) and in the Department of Medicine (1919–1922). After he had defended his Master's thesis 'The Russian Poetry of the XVIII century', A.L.Tchizhevsky began teaching physical methods in archaeology at the Moscow Archaeology University which was shut down in 1922. He taught the same course at Moscow University (1917–1922).

In his autobiographical sketches [6] Tchizhevsky wrote how being a humanities student and dealing with historical and philological problems he took an interest in natural science. His attention was mostly drawn by atmospheric electricity, his biological function and the issue of artificial air ionisation as a means of creating biologically complete -' live '- air. Tsiolkovsky sympathised with the project. With the support of his parents he conducted experiments on 'live' and 'dead' air in his home laboratory in Kaluga. Having learned about these experiments, Svante Arrenius, the renowned Swedish chemist, extended his helping hand. He morally supported the pioneer with letters and started to help him materially (there was the post-war devastation and hunger in the 20s in Russia).

By building up a house the man deprived himself of fresh air — distorted the environment and thus got into conflict with his nature. The treated air is stripped off his electric charges which constitute its original quality while the presence in it of negative charges, air-ions, makes it biogenic, i.e. life-giving and wholesome. The long series of specifically designed experiments convinced Tchizhevsky that negatively ionised air multiplies the living forces of any organism and can be an efficient remedy. Deficit of air-ions is extremely harmful.

The discovery by Tchizhevsky of biological and physiological effects of air-ions is 'one of the fundamental achievements of therapeutic medicine of our century'. Their efficiency was proved by scientists of different countries for many diseases. This discovery is important for the prevention of premature ageing, life extension, improvement of the urbanised and industrialised atmosphere from a health point of view, anti-gas protection, etc.

Tchizhevsky invented a device for making 'live' air (air-ionisator, i.e. the generator of air-ions). The acknowledgement that the ionisation level is the indicator of its biological full value is a fundamental scientific achievement which has a major significance for understanding the conditions of the conception and existence of live matter on our planet. The presence of electric charges in the air is one the necessary conditions of normal development of highly organised life without which there would be no prospects for sustainable development of the civilisation.

In the spring of 1918, A.L.Tchizhevsky submitted a doctorate thesis 'On the Periodicity of the World Historical Process'. His examiners were eminent Russian Periodicity of the World Historical Process'. His examiners were eminent Russian historians N.N.Kareev, a Corresponding Member (since 1929 — an Honourable Academician) of the Russian Academy of Sciences (RAS) and S.F.Platonov, a Corresponding Member of RAS.

The contents of the thesis was sensational. The study based on extensive factual and statistical data demonstrated that the historical process on the Earth is characterised by periodicity correlating with the peri-

odicity (cycles) of the solar activity. Although the thesis did not receive a common consent of the Academic Council of the Moscow Archaeology University and the participating three representatives of History and Philology Department of Moscow University, the degree sought was awarded after a brief discussion.

3. The Periodicity of the World Historical Process and its Dependence on the Solar Activity

The systematic study of the influence of solar activity outbreaks on mass events in the human society was started by Tchizhevsky in 1915–16 when he took a great interest in astronomic observations and, in particular, in flashes of the Sun and sun-spots. Following the events on the Russian-German front where his father commanded an artillery battery, he noticed the coincidence of the increased activity on the battlefields and the intensification of physical processes on the Sun surface (the occurrence of flashes and spots).

At the same time Tchizhevsky conducted a statistical research among his relatives and friends in order to catch a similar relationship between the state of human health and the behaviour of the Sun. The participants were asked to register various individual nervous, psychic and physiological reactions and especially all anomalous incidents. Mathematical data processing resulted in a curious picture: the curves coincided again revealing the synchronism of some completely different phenomena. The following hypothesis was bom: sun-storms change the functioning of the human body, particularly the receptiveness of the nervous system, which must develop into mass social process according to the big numbers statistics.

The hypothesis received the reserved reaction of K.E.Tsiolkovsky who then recommended to carry on the collection of data and be careful with making generalisations as the scientific community would not forgive premature or hasty conclusions. Trying to prove his findings Tchizhevsky turned for support to the works of his contemporaries as well as to the evidence of the past. It was this search that developed into his doctorate thesis. The methodology of the study presented the major difficulties: it required the elaboration of a single method of statistical calculation of quantitatively and qualitatively different events which would allow to classify and analyse them on one scale. The commencement dates and culmination of relatively important mass events, e.g. mass movements towards some set goals, were taken as basic zero points.

A.L.Tchizhevsky conducted a detailed statistical analysis of the history of nearly all known states and peoples existed on all five continents of the Earth from VI B.C. until 1914, i.e. during 2414 years.

This tremendous amount of work which looks impracticable was carried out on the basis of all available sources on dead and modem languages, empirical data processing being limited (almost primitive) at the time. It became obvious as a result that the main historical events involving masses of people on all continents in all countries, often not connected with each other either politically, economically or geographically, coincide ('tend to be simultaneous' as he himself wrote). Moreover, the number of historical events taking place at the same time in different places gradually increases when the solar activity approaches its maximum, and this number decreases when the solar activity is on the way to its minimum.

It appeared that each of such cycles of the world-wide historical process equals approximately 11 years. Likewise, the average cycle of the solar activity is 11 years: each century sees its 9 rises and falls. The epochs of the highest concentration of the most historically significant events match the periods of maximal solar activity. The epochs of calm coincide with the minimums.

Using the comparative method for history Tchizhevsky analised some mass psycological and sociological manifestations in the cycle in order to understand the objective invariable connections controlling the occurrence of events within it. This subject (the new branch of knowledge) he called historiometrics.

Therefore, the global historical process goes in accordance with the undulating physical changes on the Sun. What is the average statistical rhythm of this process? A.L.Tchizhevsky calculated it for half a millenium (from XV until XX A.D.). Three years of the sun minimum receive only 5 per cent of historically significant events of the 11-year cycle. When the solar activity is on the rise (two years on average) 20 per cent of the events occur; during the maximum (three years) — 60 per cent, and on the fall (three years) — 15 percent Such a general 11-year 4 phase cycle was taken by Tchizhevsky as a unit of historical time (the inner structure of all cycles is the same) and called it 'a historiometric cycles'.

What was the bottom line of the study? The scientist gave it a rank of the basic law of morphology' of the science he founded. The gist of the law is that the intensity of the forward movement of the world history is irregular and has cycles, these cycles being synchronous to the 11-year (on average) periodicity of sunspot activity of the Sun. Each phase of such a cycle has its 'historical and psychological features' (according to Tchizhevsky): «in the middle part of the cycle (maximum of the solar activity. — authors), the mass movement on the whole surface of the Earth gets its maximal strength in the presence in human communities of some economic, political or military stimulating factors (emphasis added). This is manifested in such psy-

chomotor pandemia as revolutions, uprisings, wars, campaigns, migrations — all creating new formations within the life cycle of some states and the new historical eras in the human development and followed by the integration of the masses, manifestation of their activity and the rule of the majority [7; 51]. Here A.L.Tchizhevsky not only anticipated the ideas of L.N.Gumilev, but pointed out (in contrast with him) to the moving force behind these mass movements.

And what about the initial and final phases of the cycle starting and ending with the minimum activity on the Earth and in the heaven? '. The strain of the human activity either of military or political nature eases and falls down to the minimum giving way to some creative activity, peace and tranquil undertakings in the area of state structure, international relations, science and arts, while the absolutist tendencies of power increase following the depression of mass movements' (as above, p.52).

This conclusion as well as the previous one suggest that it makes sense if This conclusion as well as the previous one suggest that it makes sense if there are purely earthly factors ready available (social, economic and political). Social substance and its specific qualities are presented by people, their conscience and will, actual peculiarities of culture and history, traditions, material and spiritual interests, purposes, etc. They are all the subject of system organisation on big and small scale.

A.L.Tchizhevsky did not go into these details. He was interested in the more general picture of the sociosphere and its functioning in the global dimension. The idea was to fully understand the law first, and then to study its specific manifestations from the point of view of geography and substance.

'It would be totally wrong to presume that the cyclic activity of the Sun is a basic cause of these or those historical events' — the scientist wrote (as above, p. 60). The Sun does not decide for people what they should do, but setting their mass 'psycho-physical' (or it would be better to say socio-psychological) state (their so to say sub-social state which does not embrace their substance) it compels them to perform some actions. The kind of actions depend on specific individuals and concrete circumstances. 'All possible deviations from the basic law are caused by the factors other than cosmic ones and are only consequences of the main events occurred during the maximal tension and not ended for some reasons within their cycle' (as above).

A.L.Tchizhevsky never intended to ignore or underestimate the role of (speaking the modem language) the 'subjective factor', i.e. the importance of economic and political pre-requisites and conditions. Contrary to what his ill-disposed critics ascribed to him he specifically pointed out (to prevent the allegation of this kind) that the social science well before him 'carefully considered the detailed economic and political laws' [7, p. 4]. He saw his role in' revealing the role of some natural factors in social movements of human groups' and clarifying the issue of ' the influence of such a powerful cosmic factor as the cyclic sun-spot formation on the behaviour of organised groups and on the flow of the world historical process' (as above). The study of social phenomena in relation to geophysical and cosmic phenomena (in this he was supported by Academician P.P.Lazarev, the biophysicist) allowed him to firmly state that the predisposition to outbursts of mas-movements on the Earth is the function of the Sun activity.

Tchizhevsky never claimed that his findings are the truth at the highest instance; he just raised the issue of the relation between two phenomena which were until then considered unrelated.

4. Life electricity as a link between the Sun and the biosphere

What is the exact physical meaning of the sociogenic cosmic factor? The level of science at the time put considerable constraints on any attempts to answer this question. The only option open was to make hypotheses (the train of scientific though would not be possible without them). So, A.L.Tchizhevsky postulated that 'the electric energy of the Sun acts as that natural external factor which exert influence on the course of the historical process' (as above, p. 52, emphasis added). The wording seems quite abstract. Even now we are far away from the adequate understanding of such a phenomena as 'electricity'. Its essence is still not perfectly clear, and in those times science was even further behind. However, the general direction of the Tchizhevsky's idea seems right. It lead Tchizhevsky towards research of biophysics and physiology of individual and small group behaviour of both humans and the live substance in general. Human and animal bodies (which then had become a subject of biophysics, the newly bom branch of science) was seen by scientists as a 'colloidal system' having electric properties and receptive to all external impacts and fluctuations. Constantly undergoing changes and disruptions of inner balance due to various disturbances in the environment they 'always have to spend some energy on regaining this balance' (as above, p. 52).

At that point the phenomenon of air ionisation became helpful. We all (as well as the animal world) are 'electric' beings (the cell plasma is electrocolloid, nervous network are electrolytic 'rivers of life', and me-

tabolism is all about electrochemistry) and need supply of energy (electricity) not only from inside, but also from the atmosphere. Anyway, the sustainable balance of biosystems and their safety margin depend first of all on their 'electric' stock. Where it is in deficit the Tchizhevsky air ionisator can be of assistance as was already mentioned above.

When some somatic departures from the norms take place they lead to psychic changes which may result in abnormal behaviour. Then, the individual abnormalities of the second signal system can influence one another in a number of ways: they can be summed up, multiplied, they can resonate or suppress one another. Here we face a complex picture with a tangle of direct and indirect, i.e. mediated, influences and impacts.

In the report 'The Impact of the Cyclic Sun Activity on the Outbreaks and Expansion of Epidemics' (Kaluga, 1922), Tchizhevsky was the first to state that electric, magnetic and electromagnetic perturbations of the physical and chemical environment do influence the occurrence, expansion and intensity of epidemics, and to express some new theoretical thoughts on the subject.

Unfortunately, these findings were left unpublished, but in two years A.L.Tchizhevsky presented to the wide scientific community a book 'The PhysicalFactors of the Historical Process', which was his first research on the statistics of Asian cholera, and where he made the following major point: 'Cholera never dies, it just fades away in some comers in order to conquer vast spaces one day with the renewed force. These quiet periods happen to be in a striking coincidence with the sun-spot-making activity of the Sun, and vibe versa, when the luminary activity increases cholera epidemics may sometimes take a disastrous shape' (as above, p. 47).

Thus, the general statement was first made: outbreaks of mass infectious diseases come back in accordance with the cycles of perennial fluctuation of the sun activity. The publication of the book caused a lot of hostile criticism while K.E.Tsiolkovsky openly spoke in support of the Tchizhevsky's original and promising ideas. The scientist himself did not rest on his laurels and went forward in his quest. He became convinced that there should be the general causal link of physical nature behind the synchronism of the earthly and sun activities. 'To find it!' — that was the reason for Tchizhevsky, already a professor and doctor of sciences, to go 'back to school', start studying science and undertake new research. This step was also induced by his early days experiments with ionised air which he started in 1918.

5. General biological aspects of sun and atmospheric electricity. Z-rays and metahromazy effect

Electricity of life was looked at by Tchizhevsky as a link between the earthly Electricity of life was looked at by Tchizhevsky as a link between the earthly and the cosmic. This is clear from his theoretical investigations published later in one of scientific books he edited where he wrote about the relation between the variations in concentrations of air-ions and the development of some epidemics.

In the on-going process of investigation of sun activity and its influence on the earthly life Tchizhevsky paid much attention to the statistics of mass diseases: infectious, cardio-vascular, nervous and mental diseases as well as suicides and socially unacceptable behaviour. Surely, he did not consider a certain state of sun activity to be in itself the cause of outbreaks and expansion of any diseases. 'The sun activity, obviously, only assists their development and intensity' — he wrote [7; 162]. This means that some diseases may take place without the solar factor, but due to a range of natural factors. However, without the solar factor the scale and course of its development could be different: 'the role of the periodic activity of the Sun should be understood as the epidemics regulation in time and, quite possibly, the determination of their strength' (as above).

The Tchizhevsky's work carried out on his own accord and on pure enthusiasm attracted the sympathy of N.A.Semashko, the people's commissar (minister!) of health care. He thoroughly discussed the Tchizhevsky's extraordinary conclusions and was brave enough to publish them in «The Russian-German Medical Science Journal' he edited, in 1927 and 1928. This caused the displeasure of the authorities which were ill-advised on the matter. However, after the private meeting between N.A.Semashko and J.V.Stalin the case was dropped [8; 491–543].

In December 1926 in Philadelphia, just before the annual Congress of the American Association for the Support of Science Progress, Professor Vladimir de Smitte presented the research of the Russian Scientist (the presentation was repeated in 1927 in New-York at the US Academy of Sciences). Many scientific and public organsations of the US and on other continents awarded Tchizhevsky their full or honourable membership.

To this time Tchizhevsky became completely sure that the fluctuation of living functions of humans, animals and plants occur in close relationship with disturbances in their cosmo-physical environment, and that the virulence of pathogenic micro-organisms is a function of these disturbances.

The Tchizhevsky's field presented a bunch of tightly interwoven subjects: general biology, physiology and medicine on one side, and geophysics, meteorology and astronomy on another. He made the life science to go along the stars science. 'Due to the fact that astronomy possesses some means to forecast daily and monthly fluctuations of sun activity, he declared, presents possibilities to undertake in advance certain measures when the health risk or death incidents are at their highest (as above). It goes without saying that this is extremely important for social policies. This issue was given special attention at the RAPA symposium mentioned in the Introduction. This fact should be taken into account in the practice of economic prognostication which precedes economic decision-making on the national level.

The revelation of the relationship between the dynamism of spontaneous random processes in the biosphere and the dynamic influence of cosmic factors (the sun activity first of all), together with the development of new scientific ideas in this connection and numerous experimental research in medicine and biology, have led to the establishment of a special discipline — helio-biology [9, 10].

Tchizhevsky kept filling out his thesis with new facts, calculations and generalisations until 1930. Fortunately, this work despite all the complications of the Tchizhevsky's life, was not lost. However, it came to light only 30 years after his death, in 1995 [11; 29–696].

At the end of the 30s, A.L.Tchizhevsky, together with S.T.Velhover, the doctor, discovered the metachromasia — the phenomenon caused by the rises of the solar activity (as above, p. 708–716). The essence of this phenomenon is in the following: micro-organisms coloured for visibility purposes (in microscope) change their colour a week before spots appear on the Sun. In other words, apart from the well-known types of the sun rays (electro-magnetic and corpuscular) there must be some obscure, undiscovered so far, Z-rays which influence pathogenic micro-flora. This micro-flora responds to these rays, thus predicting a sun-storm while astrophysicists know nothing about it yet. This has a major bearing upon medicine, health care and, particularly, for the science of piloted space travel. This discovery became of a special importance for the preparation of people for space travelling as a means of forecasting unfavourable space 'weather'. A quarter of a century later (in 1963), Tchizhevsky presented a special report on the subject at the First AH-Union Conference on Aviation and Space Medicine. This issue will, obviously, grow in importance with the further expansion of the man into the outer space. However, under the earthly conditions this phenomenon should be taken into consideration by specialists in the area of biochemistry and biotechnology.

This discovery, therefore, completed the collapse of geocentricism within its last refuges — sciences about life and social sciences. The scientific cognition thus made a qualitative leap by tying up its creative 'orbit' with the laws of the Universe. If Nicolaus Copernicus recreated the scientific view of the world by 'making' the Earth rotate around the Sun as a common heavenly body, then A.L.Tchizhevsky made life and society dependent on the solar rhythm and brought together the fates of the socium and the Universe. The genius of Tchizhevsky also manifested itself particularly in realising the inadequacy of not only geocentricism, but heliocentricism as well.

At the beginning of this century he declared that the periodicity of mass biological processes on the Earth and the eruptive activity of the Sun are in essence co-effects of one single cause — the great life of the Universe. The creative functioning of this life led to the formation of biological life forever bound to its creator.

In August 1939, at the International Congress of Biophysics and Biological Space Science, Tchizhevsky was elected (in his absence) the Honourable President. In the Congress Memorandum signed by many eminent scientists all Tchizhevsky's multi-faceted work was addressed in a very complimentary way and he himself compared with the Renaissance heros.

6. Electromagnetic blood properties. Scientific work in prison

The second world war undermined the whole way of life in Russia and, thus, created new obstacles for Tchizhevsky's creative activity. Unluckily, in January 1942 he was arrested for absurd reason and had to spend 10 years in prison. Interestingly enough, in the tragic days of investigation within the walls of the Chelyabinsk prison he composed... a hymn to the Egyptian Sun god which says at the end:

Oh, Aton, I am your dear son raising the sacred name high
To the ultimate reaches of the Universe, where you are endlessly glorified;
Oh, Aton, give me strength, together with your good sons
To carry on striving for your always exulting radiance!

Was it a tribute to the reflections of his youth related going back to his student years when he was only entering science and studying Egyptian and other sources? Or did his desire to be free need some way of ex-

pression? Certainly, it did. However, he also remained faithful to the 'sun science' he founded and to his optimism of the fighter for the integrity of scientific cognition.

Tchizhevsky proved to able to carry on his scientific research under the exteremely unfavourable conditions of Stalin's camps. He elaborated the method of controlling chemical reactions of substances in a disperse state and made some new discoveries in the area of 'electricity of life' [12].

He found that the structural-system organization of the moving blood (in vivo) is conditioned by electricity [13, 14]; he also revealed some specific reactions of erythrocytes precipitation [15].

Thus, the foundation of electro-haemo-dynamics, the new branch of blood physiology was laid. It deals with electric and magnetic properties of erythrocytes. This is crucial for the understanding of blood physiology and early diagnostics of a number of pathological phenomena.

The new chapter in haematology was so opened. According to some experts, this is the second capital achievement in haematology after the discovery of blood circulation itself in the beginning of XVII by William Harvey [16].

According to science sociologists that was a heroic exploit, and if Tchizhevsky did not leave anything else to us, his name anyway would have been written down with golden letters into the history of natural science and medicine.

Conclusion

The wide spectrum of scientific interests of Tchizhevsky might give an impression that he dissipated his energies in conflicting directions. In reality, all his interests were linked by the single main aim of the scientist (sociologist and naturalist): to find the relationship between the microcosm and macrocosm.

Universe (or cosmical) ecology became the major 'axis' on which all the Tchizhevsky's aspirations revolved. His achievements and ideas were running ahead of his time. This, to some extent, created one of the antagonisms which followed him all his life as well as cost him some tragic collisions. At the same time he possessed a very integral personality capable of confronting any adversities of the fate and 'remaining at his post until his death-hour' as he wrote in one of his poems. After his return to Moscow in 1958 he established an air-ionisation laboratory at the 'Soyuzsantechnica' trust under the USSR Gosplan. Unfortunately, this activity ended in 1962, and in 1964 Tchizhevsky died of mouth cavity cancer. Until his last day he carried on his creative activity.

In Februaryl968, the Moscow Society of Nature Testers (still headed by Academician A.L.Yanshin) held the first Readings in the name of the scientist which laid the foundation for the regular lectures on the classic of the world naturalism [17].

In 1970, the Bureau of the Department of General Physics and Astronomy of the USSR Academy of Science, at its special meeting, discussed the issue of 'research on heliobiological links' once raised by Tchizhevsky (as early as in 1915). The meeting decided on the advisability of its future investigation in scientific institutions. In 1973, the Tchizhevsky's monography in Russian commissioned by the Paris publishing house 'Hippocrates' first came to light. It was published under the title 'The Earth Echo of Sun Storms' and welcomed by the adherents of many scientific orientations and was considered the 'manifesto of space ecology'. Then some other works were published and admired by experts. The name of Tchizhevsky eventually found his way into encyclopedias and reference books (for example 1,14) as well as did the science he founded [18].

Albert Einstein called science 'the War of ideas', but it also is a drama of people whose formulas, equations, conclusions, etc. are only the formal expressions of the thinking substance which leave the tears and sorrows behind them unseen to the world. Whatever happens, but the Truth always reveals itself!

The Tchizhevsky's life and creative work present a very educating example and is worthy of careful examination by the future generations.

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Биология мен әлеуметтанудағы А.Л.Чижевскийдің коперниктік революциясы (қайтыс болғанына 50 жыл толуына орай)

Мақала профессор Александр Леонидович Чижевскийдің (1897–1964) қайтыс болғанына 50 жыл толуына орай жазылды. А.Л.Чижевский космостық экология мен гелиобиологияның негізін қалаушы ғалым және ғылым мен техникада маңызды бағыттардың бастаушысы болып табылады. Оның есімі жаратылыстануда космостық бағытты қалыптастырған Константин Эдуардович Циолковский және Владимир Иванович Вернадскийлермен қатар тұр. Олар адамның теориялық ойлауы мен практикалық әрекеттерін Жер аясындағы бағамдау шеңберінен, геоцентрлік өлшемдер шегінен шығара алған және Жерден тыс факторлар, үдерістер мен құбыластардың шынын мойындаған.

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Коперниканская революция А.Л.Чижевского в биологии и социологии (к 50-летию дня памяти)

Статья посвящена памяти профессора Александра Леонидовича Чижевского (1897–1964) — основоположника космической экологии и гелиобиологии, инициатора ряда важных направлений в области науки и техники. Отмечено, что его имя стоит в одном ряду с именами Константина Эдуардовича Циолковского и Владимира Ивановича Вернадского, которые символизируют формирование космического направления в естествознании. Доказано, что они вывели область теоретического мышления и практической деятельности человека за пределы обычных земных измерений и геоцентрических ограничений и отдали дань должного уважения внеземным факторам, процессам и явлениям.

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