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# LIFE AND WORK OF ACADEMICIAN L. V. PISARZHEVSKII* (ON THE 120TH ANNIVERSARY OF HIS BIRTH)

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*The life and work of the founder of the L. V. Pisarzhevskii Institute of Physical Chemistry, National Academy of Sciences of Ukraine, Academician Lev Vladimirovich Pisarzhevskii, are examined.*

The first child, Lev Vladimirovich, who subsequently become one of the greatest chemists of the 20th century, was born on February 1 (13), 1874, in the family of the Kishinev notary public, Vladimir Ignat'evich Pisarzhevskii and his wife, Ol'ga Lukinichna (neé Ozmidova).

When he was four years old, Lev Vladimirovich lost his father, who died of galloping consumption. This sad event significantly worsened the family's material conditions and forced his mother and her four children (in addition to L.V., his sisters Sof'ya, Mariya, and Nadezhda) to move to Odessa in 1883, where her brother, the architect M. L. Ozmidov, lived.

Beginning his education in April 1881 at the Kishinev Boys' Gymnasium, L. V. Pisarzhevskii continued it in Odessa within the walls of the Rishel'evsk Gymnasium. The family's material situation was very difficult, forcing L.V. to begin giving lessons for pay, and after he was 18, he was forced to live on his own earnings.

The young Pisarzhevskii read a great deal, and under the influence of the books he read, the sixth-form student at the Rishel'evsk Gymnasium became an active Tolstoyan — he denied the need for education and art, and since he was a logical and persistent young man in these years, he had to repeat his class as a result of his enthusiasm.

The Rishel'evsk Gymnasium provided a broad classical education in his senior classes, as L.V. had forgotten his attraction to Tolstoyism and dipped into the world of philosophy and Greek and Roman poetry. On his final examination, he freely read *à livre ouvert* Virgil and Ovid; his stated desire to become a physician surprised and displeased his philologist-teacher. L.V. wanted to become a country doctor to serve the people.

After graduating from the gymnasium in 1892, L.V. entered the Novorossiisk University in the Natural Sciences (Physics-Mathematics) Faculty, intending to enter the Faculty of Medicine after graduation.

However, it was not these youthful aspirations, but instead D. I. Mendeleev's book *Principles of Chemistry*, which played the decisive role in L.V.'s entire subsequent life and activity; having read the book in his first year, the young student decided to devote himself to chemistry. At this time, he began his constant — from morning until late at night — work in chemical laboratories. Professor Petr Grigor'evich Melikishvili (Melikov) turned his attention to the enthusiastic second-year student and suggested that he begin to do scientific research; his first subject was a detailed chemical study of a meteorite. After concluding this project, Prof. Melikishvili proposed that L.V. assist him in his studies of the composition, structure, and properties of peroxides and per acids. The cycle of research in this area continued for several years: with Prof. Melikishvili until 1898, and L.V. continued this work independently from 1899 to 1903.

The most important result of this research was the explanation of the structure of peroxides and per acids and the establishment of an analogy between the salts formed by compounds of metal peroxides with per acids and hydrogen peroxide. L.V. considered metal peroxides to be salts of hydrogen peroxide in which hydrogen peroxide plays the role of mono- or dibasic acids. Per acids would be mixed anhydrous acids of hydrogen peroxide and ordinary acids.

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L. V. Pisarzhevskii's work with peroxides was very important for confirming the characteristics of the periodic system of elements, as D. I. Mendeleev himself indicated in his last editions of *Principles of Chemistry*.

The extensive cycle of studies on peroxides and per acids was initially published together with P. G. Melikishvili and then independently in approximately 40 printed works; the most important ones were *Studies of Peroxides* (104 pp.) with P. G. Melikishvili, placed in the Proceedings of the Imperial Academy of Sciences, awarded the Lomonosov Prize of the Academy of Sciences in 1899, and L.V.'s *Peroxides and Per Acids* (204 pp.), which he defended as his master's dissertation in 1902 and which was highly esteemed by D. I. Mendeleev.

On graduating from the Physical-Mathematics Faculty of Novorossiisk University in 1896, L.V. remained at the university to train to become a professor. Six months later, he was selected as a junior member of the teaching staff, and after his master's examination, he was accepted as an assistant professor.

According to the rules at this time, a two-year scientific mission to the leading world scientific centers was granted to recipients of the Academy of Sciences' prize. Under this rule, on January 1, 1900, L.V. was sent on a mission to W. Ostwald's Institute of Physical Chemistry in Leipzig to finish working on his master's dissertation on peroxides and per acids and to study instruction in a new branch of chemistry — physical chemistry — to initiate practical work in this area of science at Novorossiisk University.

Ostwald's institute was the acknowledged center of the new chemistry in these years, where chemists from all over the world wanted to go and from which the founders and prominent researchers in physical chemistry came. At this institute, L.V. was able to hear reports and personally speak with such eminent physical chemists as S. Arrhenius, J. H. van't Hoff, W. Nernst, M. Bodenstein, and others; this undoubtedly had an important effect on the outlook and knowledge of the talented young (26 years old), but already known scientist, and strengthened his desire to comprehensively study chemical processes and apply the achievements of physics to the study of chemical problems. From this time on, modern physicochemical methods of investigation were constantly used in all of L. V. Pisarzhevskii's research.

In 1902, he completed his foreign mission and returned to Odessa where, as noted, he defended his dissertation for the master's degree in chemistry, gave a course in analytical chemistry to medical students and a course in general chemistry to mathematicians, and directed extensive practical work in physical chemistry. However, L. V. Pisarzhevskii did not stay in Odessa very long. In 1904, he was offered a chair at Yur'ev (Derpt) University (now Tartu University).

Due to the failures in the Russo-Japanese War in 1904 and the events of January 9, 1905, student uprisings occurred in Yur'ev, resulting in a rift in the professorship. L. V. Pisarzhevskii moved toward its left wing, which expressed its solidarity with the progressive student body, which was fighting autocracy. These events negatively affected L. V. Pisarzhevskii's nervous system, and he went to Odessa for treatment.

In 1908, L. V. Pisarzhevskii headed the inorganic chemistry chair at Kiev Polytechnical Institute, where he continued the extensive cycle of research on one of the central problems of physical chemistry which he began in 1903: the study of the effect of the solvent on the mechanism and free energy of a reaction in solutions. These studies constituted the second period of his scientific activity, begun immediately after the research cycle on peroxides and per acids ended.

It should be noted that the physical theory based on van t'Hoff's theory of solutions and Arrhenius' theory of electrolytic dissociation almost totally held sway in the chemistry of solutions at this time; the solvent was merely considered a medium in which the reaction takes place, while the reaction of the solvent with the dissolved substance was assigned an insignificant role. Only a few chemists, primarily D. I. Mendeleev, disputed the solvate theory in which the chemical reaction of the solvent with the dissolved substance is an important aspect of dissolution. The gradual accumulation of experimental data from the chemistry of solutions (primarily nonaqueous) which did not fit into the physical theory drew L. V. Pisarzhevskii's attention and induced him to conduct a detailed study of the most important problem in chemistry — the problem of reaction of solvent with dissolved substance. This cycle of studies, which continued from 1903 to 1913, produced extensive experimental data (107 equilibrium constants were determined for 8 reactions in 47 solvents and the internal friction was determined for 38 solvents) and extremely important conclusions. In particular, this concerns Walden's rule, advanced in 1906, which postulates the constancy of the product of the maximum equivalent conductivity and the viscosity of the solvent. As a basic conclusion of his research, L. V. Pisarzhevskii indicated that this rule is not universal, and he defined the limits of its applicability. The limitation of Walden's rule is now undisputed. However, the main conclusion of this cycle was the recognition, together with the correctness of the van t'Hoff and Arrhenius theories, of the extreme importance of the chemical reaction between solvent and dissolved substance, i.e., the necessity of supplementing the physical theory by considering solvation processes. The correct theory of solutions should be the synthesis of physical and chemical concepts. The subsequent evolution of science totally supported this conclusion and eliminated the opposition of the physical theory to the solvate theory.

L. V. Pisarzhevskii was thus the first to clearly formulate the problem, and this had a great effect on the evolution of the theory of solutions.

This fruitful scientific activity at the Kiev Polytechnical Institute was interrupted by circumstances far removed from science. In January 1911, the government issued a circular which totally eliminated the remaining autonomy of higher educational institutions. This caused a wave of protests in many higher educational institutions in the country, including Kiev Polytechnical Institute, where a student strike supported by the progressive wing of the professorship began on January 28. A telegram was sent in the name of the institute's scientific council to the Minister of National Education, L. Kasso, very sharply requesting that the circular be revoked. In response to this, the administration sacked the three deans who voted for the text of the telegram. Then seven professors, including L. V. Pisarzhevskii, resigned for effect. At the same time, prominent professors at Moscow University — K. A. Timiryazev, P. M. Lebedev, V. I. Vernadskii, N. D. Zelinskii, and others — resigned in protest.

After L. V. Pisarzhevskii's resignation, he had no laboratory for the next two years and was unable to continue his experimental research.

He moved to Moscow and together with Prof. V. A. Vagner actively participated in organizing and then in editing the popular-science journal "Priroda," which subsequently became an organ of the Academy of Sciences. L. V. Pisarzhevskii simultaneously gave a series of lectures on inorganic and analytical chemistry at the Bestuzhev Female Courses and at the Psychoneurological Institute. In 1913, he defended his doctoral dissertation entitled *Free Energy of the Chemical Reaction and the Solvent* at the meeting of the Scientific Council of St. Petersburg University, which generalized the results of the second cycle of his scientific research mentioned above.

However, his inability to conduct research in Petersburg and Moscow forced L. V. Pisarzhevskii to take up the offer of the Ekaterinoslav (Dnepropetrovsk) Mining Institute, where he was named an ordinary professor of general and physical chemistry in 1913. All of his subsequent life and scientific activity were connected with Dnepropetrovsk, and it was there that he reached his creative summit, which rightfully placed his name among the other eminent chemists of the 20th century.

L. V. Pisarzhevskii's talent as an organizer of science and high school was clearly manifested from the very first years in Dnepropetrovsk. He was the initiator and organizer of Higher Women's Courses (1916) which in time served as the basis for creation of a medical institute and university, and the Ekaterinoslav Jewish Polytechnical Institute (1917). In consideration of the needs of the warring Russian army, in 1915 L. V. Pisarzhevskii developed a method for obtaining iodine from ashes of the marine algae "red phillophora," which grew in the Black Sea. The process consisted of extracting iodine from ash with alcohol with subsequent catalytic separation of solid molecular iodine from the solution. The experimental station he created implemented this method on industrial scales, producing up to 4 kg of iodine a day and sending it to military hospitals. L. V. Pisarzhevskii was awarded the second-degree order of Ste. Anna for this work.

However, his basic occupation in those years, the same as the main goal of his life, became the introduction of an elementary particle into chemistry: the electron. I. V. himself answered the question of how he arrived at this third cycle of his research: "In 1912, I completed the cycle of studies to measure the forces of chemical affinity, devoted to the study of the effect of the solvent on the free energy of a chemical reaction. In the course of this research, I repeatedly came up against the transformation of chemical energy into electrical energy and I thought about the essence of this transformation. The indivisible atom did not answer this question... Arrhenius' ions, which appeared in the chemical arena, are electrically charged atoms and thus still indivisible, did not help" [7, p 18]. In considering the operation of a Daniell cell, L. V. Pisarzhevskii noted: "This is unclear..., extremely unclear. At this most important point of chemical science, the old atomic chemistry with its indivisible atom has entered ablind alley. The contradiction was resolved by the discovery that the atom is a complex body" [7, p. 18].

At the beginning of 1914, L. V. Pisarzhevskii gave a course of lectures called "Physical Chemistry and One of Its Next Problems" to a group of engineers at the Mining Institute; he laid out a number of premises in the new language of the chemistry of the electron: the theory of the appearance of current in a galvanic cell, redox processes, etc. In 1938, one of his closest students, Prof. B. Ya. Dain, wrote: "It was necessary to have the great daring and foresight of a brilliant scientist to be able to embrace new positions in 1914. Even the revolution in physics had then only just begun. Rutherford proposed his planetary model of the atom for the first time only in 1911. Nils Bohr opened a new page in the history of science in 1913 by proposing his first version of the theory of the structure of the hydrogen atom based on quantum theory. Nothing indicated that this upheaval would affect chemistry and could affect it... In 1914 in Ekaterinoslav, far from the large scientific centers, chemistry began to be reorganized on new principles — based on the science of the structure of atoms and molecules" [7, pp. 34-35].

L. V. Pisarzhevskii actually very deeply understood the new physics of the electron and first assessed its great importance for characterizing chemical processes. He was essentially the first to use synthesis of physics of the electron and chemistry of the ion for theoretical substantiation of the mechanism of chemical reactions. In the 1914 course of lectures for engineers mentioned above, L. V. Pisarzhevskii set out the theory of the ion based on the concepts of ions as atoms or groups of atoms which had lost some of their electrons or acquired new electrons, giving the first interpretation of redox reactions as electron transfer processes and thus introducing new electronic–ionic concepts in chemistry.

It is interesting that L. V. Pisarzhevskii himself characterized this period only as a "sketch of the electrical aspect of the life of chemical processes" [7, p. 19].

In the foreground: the enormous work in writing the broad artistic canvas called "Chemistry of the Electron."

The studies in chemistry of the electron required concentration of all forces, and in 1920 L. V. Pisarzhevskii decided to switch all personnel in his laboratory to the new subject. This was done very decisively. One morning an announcement appeared on the doors of the laboratory stating that work on the old topic would stop and only those who wanted to dedicate themselves to the chemistry of the electron could work in the laboratory. L. V. Pisarzhevskii subsequently wrote about this: "I remember the day when after our preliminary studies, I announced to the laboratory that chemistry of the electron and studies in this area alone would henceforth predominate here. This was in 1920. In the one room with a small stove where I lived and slept, 17 people worked from 9 in the morning to 6 in the evening" [7, p. 19].

His broad knowledge of chemistry allowed L. V. Pisarzhevskii to extrapolate electronic concepts to almost all basic divisions of physical chemistry: theory of the chemical bond, chemical thermodynamics, kinetics, catalysis, electrochemistry, radiochemistry, etc. In 1917, L. V. Pisarzhevskii was one of the first in international science to study radiolysis of aqueous solutions and he showed that radium $\alpha$- and $\beta$-particles induce redox processes: $\alpha$-particles act as an oxidant by knocking electrons out of atoms or ions, and $\beta$-particles (electrons) act as a reducing agent by joining to atoms or ions. L. V. Pisarzhevskii Thus first proved the electronic nature of radiochemical reactions and in this way laid the scientific bases of radiochemistry.

The concepts elaborated based on a study of electrochemical phenomena concerning the existence of free electrons in metals served as a starting point for L. V. Pisarzhevskii in his work in heterogeneous catalysis begun in the 1920s. In examining the catalytic properties of metals, L. V. Pisarzhevskii assumed that the existence of free electrons in the metal should play an important role in the mechanism of catalysis, and the activity of solid catalysts would be determined by the reaction of the electrons in the crystal lattice with sorbed participants in the reaction. These concepts were subsequently elaborated by L. V. Pisarzhevskii's students V. A. Roiter, S. Z. Roginskii, M. V. Polyakov, and others.

The story of L. V. Pisarzhevskii's life and work would not be complete if his pedagogical, organizational, and social activities were not briefly listed. A very prominent scientist, he was at the same time a brilliant teacher, and his attempt to introduce the latest scientific concepts into teaching, to critically interpret them, and to point out subsequent paths of development was characteristic of his pedagogical creativity, continuously bound with his scientific creativity. The elevated theoretical level of instruction and attempt to introduce new information in his courses are characteristic of L. V. Pisarzhevskii's entire long teaching career. This is indicated by the enormous work he did to popularize electronic–ionic concepts and the reorganization of all instruction on a principally new basis, the electronic theory. His courses in chemistry, the first and only ones at that time to apply electronic concepts to different problems in chemistry based on order and coherence of example, are indicative of this. To confirm this statement, we would like to quote an excerpt from the foreword to the third edition of L. V. Pisarzhevskii's book, written with a friend, his wife, and closest comrade-in-arms Mal'vina Assirovna Rozenberg, entitled *Inorganic Chemistry*: "Our book is on inorganic chemistry based on modern theories, inorganic chemistry in the electronic–ionic stage of its development. The first edition of the first part of our book *Introduction to Chemistry (Based on the Structure of the Atom and the Electronic–Ionic Structure of Molecules)* was published in 1926 and the second edition was published in 1928. The first edition (lithographed) of the second part of *Inorganic Chemistry* was published in 1927, and the second was published in 1930. Until recently, no other similar book existed. The first part of a similar (insofar as we can judge by the advertisement) book by Henrich Remy on organic chemistry was only published in German in 1931" [4, p. 130].

L. V. Pisarzhevskii's textbooks on inorganic chemistry played a large role in the dissemination of new views on the nature of chemical reactions and the formation of a new world view among inorganic chemists which converted inorganic chemistry from a descriptive science into a science constructed on theoretical premises. The electronic–ionic theory made it possible to give a comprehensively defined meaning to such fundamental concepts as the degree of oxidation, oxidation, and reduction. We would like to note something else connected with this. Academician N. N. Semenov, in the editors' comments

to J. Eggert's book on physical chemistry, noted that the basic concept in chemistry concerning oxidation and reduction was first given by L. V. Pisarzhevskii in the main form generally accepted in science: oxidation is loss of electrons, reduction is gain of electrons.

In expanding the range of scientific thought, L. V. Pisarzhevskii's constant struggle to strike out along new paths in science and his enormous personal charm led to the wide dissemination of his ideas and the creation of a large school of scientists and teachers. L. V. Pisarzhevskii delivered himself with great love to training young scientists.

His closest student, V. A. Roiter, remarked: "I had the great fortune of working directly under the scientific director L. V. Pisarzhevskii for several years. He was involved in all of the details of the research he directed, frequently sat before the instruments and worked enthusiastically. L. V. Pisarzhevskii taught and especially valued initiative and independence in his students, and he not only knew how to give instructions to but also to stimulate ideas in the student andd listen to his opinion, even when it differed from his own. It is not accidental that the majority of colleagues who worked directly under his direction rapidly changed to independent subjects; the wealth of ideas that L. V. Pisarzhevskii scattered around himself was an inexhaustible source of these subjects" [7, pp. 19-20].

The note written by L. V. Pisarzhevskii in the account book of the Institute of Physical Chemistry is a characteristic example of his thoughtful attitude toward his students and his very elevated humanistic qualities: "I will pay the 800 rubles promised to me to the Institute for improving the living conditions of post-graduate students. 10.10.35. Pisarzhevskii." A copy of this note is still preserved in the Institute's museum.

In addition to his scientific and pedagogical activities, L. V. Pisarzhevskii was also conducting active scientific organizational work in the same years.

On December 2, 1921, the Resolution of the Ukrainian Sovnarkom "On Establishment of Scientific Research Departments in the Major Centers of Ukraine," directed toward the development of scientific research and training of specialists, was issued in December 2, 1921. One of these departments, opened in Ekaterinoslav at the Mining Institute, was the Scientific-Research Department of Chemistry of the Electron, established on January 1, 1922 under the direction of L.V. and including a staff of three at the time of creation: L. V. Pisarzhevskii, M. A. Rozenberg, and E. I. Shul'ts. Many studies in the department were at the junction of chemistry and physics so that the creation of a physics section in the department (1923) was totally logical; it was directed by A. E. Malinovskii from Kamenets-Podol'sk University, an eminent specialist in the field of electron theory who studied with such prominent physicists as A. Sommerfeld, P. Langevin, and W. Roentgen. Such a specialist naturally had to be noticed by L. V. Pisarzhevskii, since the subject matter of his department, based on the fundamental concept of the electron, covered Malinovskii's scientific interests related to the electron theory of conductivity. L. V. Pisarzhevskii's department was renamed the Department of Physical Chemistry in time due to directions not related to chemistry of the electron.

At the same time, from December 1924 to December 1926, L. V. Pisarzhevskii was the rector of the Dnepropetrovsk Mining Institute where he organized the faculty of chemistry, later transformed into the Institute of Chemical Technology. L. V. Pisarzhevskii was forced to resign his post of rector and teaching activities due to illness.

Then 1927 arrived, the year related to probably the main event in his entire enormous scientific and scientific-organizational activity. The Scientific-Research Department of Physical Chemistry established by Sovnarkom was transformed into the Ukrainian Scientific-Research Institute of Physical Chemistry, the first scientific-research institute of chemistry in Ukraine and the first institute of physical chemistry in the USSR. L. V. Pisarzhevskii was appointed director of the institute. The grand opening of the new institute was on November 9, 1927.

The creation of four departments was provided for in the organization of the institute: chemistry of the electron (L. V. Pisarzhevskii), chemical thermodynamics and physicochemical measurements (A. I. Brodskii), physical chemistry of carbon derivatives and applied physical chemistry (Yu. V. Korshun), and physical measurements (V. I. Danilov).

The Institute of Physical Chemistry became and was subsequently L. V. Pisarzhevskii's dearest, most cherished personal project; he could have repeated D. I. Mendeleev's words about it: "The Institute is my beloved child, my image, my experience as a teacher, all of my scientific thoughts are invested in it" [7, p. 22]. L. V. Pisarzhevskii always said: "my institute." He had every right to speak in this way, since he gave all of himself, his intelligence, heart, and strength to the institute.

In 1929, L. V. Pisarzhevskii was invited by the Georgian Education Narkom to organize a scientific-research institute in Tbilisi and to head instruction in chemistry at the Polytechnical Institute. L. V. Pisarzhevskii burned with ideas for creating another center of chemistry and training national teams of specialists for Georgia. The fact that P. G. Melikishvili, who moved from Odessa to Georgia in 1917, was L. V. Pisarzhevskii's first student probably played an important role in this choice. After

two years in Tbilisi, L. V. Pisarzhevskii had accomplished a great deal: he had trained teams of chemists who disseminated his ideas in scientific research and education and also created the P. G. Melikishvili Scientific-Research Institute of Chemistry, part of the Transcaucasian Branch of the Academy of Sciences of the USSR. In addition to directing the entire institute, L. V. Pisarzhevskii also headed the Department of Chemistry of the Electron where he conducted research in catalysis and also research related to Chiatursk manganese ore and application of the advances in physical chemistry to chemical technology. When L. V. Pisarzhevskii returned to Dnepropetrovsk in the autumn of 1931, he retained the directorship of this institute, which continued until 1935, and he lived in Tbilisi for part of the year (at his physicians' recommendation).

In November 1934, the Institute of Physical Chemistry in Dnepropetrovsk was transferred from the Narkomat Education System to the Ukrainian Academy of Sciences. In the mid-1930s, the Institute was a large scientific center whose 6 departments employed more than 60 scientists, 8 of them professors, and approximately 30 candidates of sciences. This event was recognition of the great services of the personnel of the Institute and primarily its founder and director, Lev Vladimirovich Pisarzhevskii, before international chemical science. The personal scientific services of L. V. Pisarzhevskii himself were also highly esteemed by the scientific community. As noted above, he and P. G. Melikishvili were awarded the Lomonosov Academy of Sciences Prize in 1899. In 1930, he was awarded the Lenin Prize for scientific labor. This was the country's highest scientific award. Established by the USSR Sovnarkom in 1926, this prize had only been awarded to three distinguished chemists before L. V. Pisarzhevskii: A. E. Chichibabin, N. S. Kurnakov, and V. I. Ipat'ev. In January, 1925, he was named professor emeritus of the Ukrainian SSR, and in June of the same year, he was elected a full member (Academician) of the Academy of Sciences of the Ukrainian SSR. In 1928, he was elected a corresponding member and in 1930 a full member (Academician) of the Academy of Sciences of the USSR. L. V. Pisarzhevskii was also a member of French and German chemical societies.

A special Resolution of the UkrSSR Sovnarkom dedicated to 40 years of scientific and educational work by Academician L. V. Pisarzhevskii was issued on February 27, 1936. Noting his distinguished service to Soviet science, Sovnarkom in particular resolved: 1) to name Academician L. V. Pisarzhevskii an Honored Scientist; 2) to give the Institute of Physical Chemistry in Dnepropetrovsk Pisarzhevskii's name; 3) to give Academician L. V. Pisarzhevskii an automobile. L. V. Pisarzhevskii was awarded the Order of Lenin by Resolution of the Central Executive Committee of the USSR for his distinguished services in the scientific elaboration of major problems in chemistry and training of new teams of scientists and young specialists.

L. V. Pisarzhevskii's entire life was distinguished by his active social position, manifested in the early years of his activities (we recall the events of 1905 in Yur'ev and 1911 in Kiev). After the February revolution, in the spring of 1917 he was a member of a faction of the Socialist Revolutionary Party in the Ekaterinoslav Municipal Duma. However, in November 1917, due to disagreement with the program and tactics of the Socialist Revolutionary Party, L. V. Pisarzhevskii quit the faction and then the party. In 1930, he joined the VKP(b) (All-Union Communist (Bolshevik) Party).

As an active public figure, he was elected a member of the Dnepropetrovsk Gorsovet for many years, and was a member of its presidium from 1935. In 1928, he was elected a candidate-member of the Central Executive Committee (CEC) of the USSR, a candidate-member of the Georgian Central executive Committee in 1930 and 1935, and a member of the Ukrainian CEC.

L. V. Pisarzhevskii's characteristic traits were his exceptional humaneness and readiness to help anyone needing assistance. He was a multifaceted personality and highly gifted man who knew a great deal and generously shared his knowledge with the people around him. L. V. Pisarzhevskii retained a love of nature, steppe and especially marine landscapes, which he so loved to draw, from the gymnasium years in Odessa and throughout his entire life. He loved poetry very much and wrote verses himself.

L. V. Pisarzhevskii's closest colleagues know him in both anger and joy, but never viewed him indifferently. The oldest of his colleagues, he was very young in disclosing and sensing thoughts and feelings. L. V. Pisarzhevskii was a dreamer and a romantic, an optimist who ardently believed in the all-conquering life force.

The serious wasting disease he suffered from in his last years deprived L. V. Pisarzhevskii of the ability to work as he intended. However, up to the last days of his life, he was thinking about future research directions, did not stop working, and directed the activities of the Institute.

On March 23, 1938, Lev Vladimirovich Pisarzhevskii died.

His death was an enormous loss for international and domestic science and caused deep pain in the hearts of his many colleagues, students, and friends.

In the foreword to the book *Introduction to Chemistry* published in Ekaterinoslav in 1926, L. V. Pisarzhevskii wrote: "The electron in chemistry is now no less real than in physics...". And further: "We now have the right to assume that the molecules of inorganic compounds are constructed of ions. With respect to carbon compounds, most now assume a homopolar structure for their molecules, believing that there are no ions in them. However, the homopolar structure actually does not exclude the existence of ions. Only their effect here cannot be pronounced" [3]. An important foresight of an eminent scientist. Several decades of intense work by many scientists were required for such concepts as carbocations, carbanions, radical anions and cations to enter science, and one-electron, i.e., redox mechanisms, were justifiably hypothesized for the occurrence of many reactions of organic compounds, including reactions of free radicals and radical ions. It will not be superfluous to note that L. V. Pisarzhevskii's "scientific grandchildren," if we may so speak, colleagues at the Institute bearing his name, made their own contribution to solving this problem.

One more quotation: "In 1914," wrote Academician A. I. Brodskii, "L. V. Pisarzhevskii turned to a new, very difficult problem — the creation of chemistry of the electron. This did not concern solving an isolated problem, but re-examining the very principles of chemistry. L. V. Pisarzhevskii was a pioneer in this area and now ... his work, initially met by many scientists with disbelief, has become indisputable and so ordinary that the young generation of chemists cannot even adequately grasp how difficult these stages were" [7, p. 23].

Learning about the surrounding world and explaining not only its external, but also deep inner phenomena is most interesting and noble, but also the most difficult aspect of human activity. The life and activities of Lev Vladimirovich Pisarzhevskii, totally dedicated to these lofty goals, always served and will still serve for a long time as a brilliant instructive example for many generations of chemists. And this is why his image is so dear and close to us.

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