

## Mikhail Aleksandrovich Leontovich (on his 70th birthday)

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On March 7, 1973, Mikhail Aleksandrovich Leontovich, one of our most outstanding theoretical physicists, celebrates his 70th birthday.

Leontovich is a representative of the first generation of Soviet scientists. His turning to science (he was graduated from the Moscow University in 1932) and the beginning of his scientific activity occurred during the years of the establishment of our young government. The country and science needed talented, educated youth, whose active participation in the establishment of the new society was vitally necessary. And Leontovich's scientific activity began not at the writing table, not in a university laboratory, but in the fields of the Kursk Province—he began in 1920 as a student and for the next five years continued to work for the Commission for the Study of the Kursk Magnetic Anomaly; and he walked many hundreds of kilometers with a sextant and magnetometer in his hands.

His work with physics problems probably influenced the selection of his further activity, but it did not determine his path to science. He acquired his love of science, unsatiable curiosity, and inquisitiveness, qualities so absolutely necessary for a researcher, in his own family. Leontovich can be called a scientist by inheritance; his father, A. V. Leontovich, was a famous physiologist, and a full member of the Ukrainian Academy of Sciences, while his maternal grandfather was the distinguished Russian mechanics expert V. L. Kirpichev. Conversations in the family circle and the example of the elder members awakened in M. A. Leontovich at an early age a lively interest in science and a thirst for knowledge. A major role in the formation of his personality was also played by family traditions of democracy, respect for the individual, and dislike of the bureaucratic-clerical hierarchy which was so much in effect in old Russia. The roots of these traditions, according to family recollections, go back to distant generations.

Leontovich's circle of interests has always been exceptionally wide; he knows biology and chemistry to a professional degree; he has an excellent knowledge of French and German, and as he himself joked, he communicates very freely in English with Germans and Frenchmen. But, his "main love" is, after all, theoretical physics, and it was to it that he devoted his creative activities.

After he was graduated from the university, Leontovich worked at first at Moscow University and then in the Physics Institute of the Academy of Sciences. A. A. Andronov and he were the first students of L. I. Mandel'shtam, with M. A. Leontovich occupying precisely the central spot in the "theoretical-physics wing" of Mandel'shtam's school.

It can be said that whenever a need arose for a good detailed theory, Mandel'shtam would enlist Leontovich's services and this always led to effective results. Man-



del'shtam greatly valued Leontovich's versatility—his ability to approach each new task from the greatest variety of angles and thus reveal that which is most basic and essential. "He has a grasp, and that is an exceptionally important quality for a theoretician," Mandel'shtam used to say afterward about Leontovich.

Leontovich's sphere of scientific activity is quite vast; he authored more than 100 scientific papers in the most diverse areas of physics: physical optics, statistical physics, ultrasonics, oscillation theory, electrodynamics, radiophysics, and plasma physics.

His work in physical optics and statistical physics comprise a widely ramified but at the same time a unified body of research in the theory of macroscopic phenomena in matter. His famous papers on the theory of molecular scattering of light (scattering by a liquid surface, Raman scattering, polarization of scattered light, etc.) and ultrasonics (the theory of absorption of ultrasound in gases and liquids, the theory of the absorption of sound in electrolytes) are therefore organically related to his fundamental research in statistical physics. His research on the thermodynamics of nonequilibrium states and on the connection between the theory of gases and the theory of random processes received universal recognition. In the theory of fluctuation formulated by him, his generalization of Nyquist's formula anticipated in essence the fundamental fluctuation-dissipation theorem.

Together with L. I. Mandel'shtam and A. A. Andronov, he made an appreciable contribution to the theory of oscillation, which later provided the basis for radiophysics with its numerous radiotechnical applications. Works on self-oscillating systems, on parametric resonance, adiabatic invariants, etc., belong to this period.

An unceasing interest in wave processes led him to highly timely research on electrodynamics and radiophysics. Exceptionally important for practical applications were the relationships established by him in 1940 between the components of an electromagnetic field on the surface of a conducting medium, which are known as "Leontovich's boundary conditions." The theory of the propagation of radio waves around the earth was developed in joint papers by Leontovich and V. A. Fock. In his investigation of diffraction problems, Leontovich introduced the approximate so-called parabolic equation, which was later widely used.

During the second world war Leontovich concentrated his efforts entirely on special problems in radiophysics and its practical applications which were of great importance in the defense of our country.

As a result of the work of our radiophysicists, most of whom were Leontovich's students or co-workers, Soviet radiophysics rose to one of the foremost places in the world—a great personal accomplishment.

In 1951, Leontovich embarked on a new phase of his scientific activity; he became head of theoretical research on plasma physics and the problem of controlled thermonuclear reactions at the I. V. Kurchatov Atomic Energy Institute. He organized and educated a friendly group of young theoretical physicists. He became the inspirer, active participant, and severe critic of many highly important and interesting theoretical works which received wide international recognition. Leontovich can be credited with a whole group of key physics ideas and researches in plasma dynamics: the theory of containment and stabilization of plasma pinches by eddy currents induced in the conducting jacket, the ideas and initial researches on the stability of a current-carrying plasma in a magnetic field, the dynamics of an inertial plasma pinch, etc. "Problems of Plasma Theory," a collection of papers edited by Leontovich, embraces a wide area of physics problems and is a generally recognized handbook on the theory of high-temperature plasma. Leontovich exerted a great influence not only on the theoretical research but also on many experimental investigations of plasma physics.

The role of a scientist, as is known, is measured not only by his personal contribution to science, but also by his scientific and personal influence. In that respect, Leontovich has few equals. He is an excellent pedagogue who expended much energy in the education of youth and in lecturing at the Moscow State University and the Moscow Engineering-Physics Institute. His original monographs on thermodynamics and statistical physics are widely known. He is not only the author of dozens of first-rate works, but also the teacher and educator of a great number of students—the flower of Soviet physics. Among them are academicians, corresponding members of the USSR Academy of Sciences, and many doctors of science. This aspect of Leontovich's scientific activity makes up an organic and to a higher degree noble part of all his life. Leontovich is equally accessible to all—from the academician to the student. He is ready to

converse for hours with a young physicist, critically evaluating his results. "Our responsibility is to help those passing through"—this Gogolian aphorism is not only his favorite humorous phrase, but he reads into it a fully serious meaning. His warmth and eagerness to lend support (and not only moral) were felt by hundreds of people.

Leontovich is exceptionally demanding as to the level of scientific work, both from others and from himself. This trait is so strong in him that it repeatedly led to long halts in his work or even to an absence of publications by him. The exactingness toward himself is essentially tied to his exceptional scientific and personal modesty. He would sooner sacrifice his well-deserved authorship in a work in which he collaborated with a student or co-worker than put his name to an article in the writing of which he did not personally participate. It is hard to point out a man who would be as nonchalant toward advancement in ranks and titles as Leontovich. In this respect, a very telling episode is one dating back to 1946 when he, having been elected full member of the Academy, decisively rejected the honor (in favor of I. E. Tamm), and had to be specially prevailed upon. It is possible that the reason for this attitude toward ranks and titles is not only his modesty. While weighing very clearly and objectively the scientific merits of others as well as his own, he considers that "official eminence" has no direct relationship to science. In response to a questionnaire in The Literary Gazette as to whether the attention of the community interferes with scientific work, he answered, "yes, it interferes because such attention is usually connected with the giving out of "awards," and in science only the "bottom line" has meaning."

Leontovich's exceptional scientific and moral authority makes him a sought-after "supreme arbiter" in scientific (and sometimes also in everyday) disputes among physicists. His mere presence is an ennobling influence on scientific staffs and prevents petty squabbles and subjective passions from arising. This prestige rests also on Leontovich's high sense of civic duty—his uncompromising adherence to principles and his irreconcilability to many manifestations of pseudoscience, be it either in physics or biology.

Leontovich's scientific research and pedagogical activity received universal recognition. In 1939 he was elected a corresponding member and in 1946 a full member of the USSR Academy of Science. He has high state awards—three Orders of Lenin and four Orders of the Red Banner of Labor. For his work in radiophysics and radio engineering the Academy of Science awarded him in 1952 the Popov golden medal, and for his participation in the research on high-temperature plasma in high-power discharges, he received the Lenin Prize in 1958.

To many people, Leontovich is not only a model scientist but also a picture of cheer and health. This is expressed in the many-kilometer-long hiking and skiing trips he takes on Sundays and the touring trips he takes during holidays, all of which show that he can keep up with youth.

We hope that he stays athletically fit for many, many years and can successfully work with his former energy and enthusiasm in his favorite area of interest, theoretical physics.

Translated by J. G. Adashko