

Mikhail Aleksandrovich Leontovich (Obituary)

A. P. Aleksandrov, E. P. Velikhov, V. L. Ginzburg, Ya. B. Zel'dovich, B. B. Kadomtsev, E. M. Lifshitz, A. M. Prokhorov, S. M. Rytov, R. Z. Sagdeev, and V. D. Shafranov

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Soviet science has suffered an irreparable loss. Academician M.A. Leontovich died on March 30, 1981 after a severe illness. We have lost a man of exceptional personal qualities, an outstanding theoretical physicist, and one of the founders of the Soviet schools of radio physics and plasma physics.

M. A. Leontovich was born in Moscow on March 7, 1903. His father, A. V. Leontovich, was a well-known physiologist and Member of the Academy of Sciences of the Ukrainian SSR. His maternal grandfather was V. L. Kirpichev, an eminent mechanical engineer. M. A. Leontovich graduated from the Moscow University in 1923. For five years after 1920, he was a member of the commission investigating the Kursk magnetic anomaly, gave lectures at Moscow University, and worked at the P. N. Lebedev Physics Institute of the USSR Academy of Sciences. His teacher, who influenced him profoundly, was the outstanding physicist L. I. Mandel'shtam.

M. A. Leontovich's range of scientific interests was always very wide. He carried out important researches in very different branches of physics: in physical optics, quantum mechanics, ultrasonics, theory of oscillations, electrodynamics, radio physics, and plasma physics.

These researches were distinguished by their fundamental character as well as their practical utility. For example, his work in the theory of molecular scattering (scattering by the surface of liquids, Raman scattering, polarization of scattered light, and so on) and on ultrasonic waves (theory of absorption in gases and liquids, and in electrolytes) was intimately connected with fundamental researches in statistical physics. His studies in the thermodynamics of nonequilibrium states and his work on the relationship between the kinetic theory of gases and the theory of random processes gained wide recognition. His generalization of Nyquist's theorem was essentially an anticipation of the fluctuation-dissipation theorem. In collaboration with L. I. Mandel'shtam and A. A. Andronov, he took part in the development of the theory of adiabatic invariants, self-oscillatory systems, and parametric resonance. The last two have, of course, played an important role in the development of radio physics and its many and varied applications. He was elected Corresponding Member of the USSR Academy of Sciences in 1939.



Mikhail Aleksandrovich
Leontovich
(1903-1981)

M. A. Leontovich made important contributions to electrodynamics. His approximate boundary conditions, now known as the *Leontovich boundary conditions*, are of major significance in the theory of propagation of electromagnetic waves near conducting surfaces. In a paper on the theory of radio-wave propagation around the Earth, written jointly with V. A. Fock, he first introduced the method of the parabolic equation, which was subsequently extensively used in nonlinear optics. During World War II, M. A. Leontovich was occupied with radar problems which were of great importance to the defense of our country. As a result of the work of our radio physicists, most of whom were students or collaborators of M. A. Leontovich, Soviet radio physics assumed a leading position in this field, and much of this success was due to Mikhail Aleksandrovich himself. He was elected full member of the USSR Academy of Sciences in 1946.

Since 1951, and until his death, M. A. Leontovich headed theoretical research into the physics of plasmas and controlled thermonuclear fusion at the I. V. Kurchatov Institute of Atomic Energy. He was responsible for a number of key physical ideas and researches in plasma physics. They included the theory of confinement and stabilization of the plasma column in tokamak-type systems by means of a conducting enclosure, the principle and the first investigation of a current-carrying plasma in a magnetic field, the dynamics of an inertial plasma column, and so on. However, M. A. Leontovich saw his role in a broader context. He clearly appreciated the scale of the effort that will have to be put into the practical realization of the idea of controlled thermonuclear fusion, and devoted much of his time to the training of young scientists. The fruits of this work are well known. Many of his students are now outstanding physicists, in charge of scientific teams and research programs.

M. A. Leontovich's influence extended far beyond the confines of his own laboratory. New work by theorists from other institutions was frequently reported at his seminars. Experimental physicists from many research centers in our country came to see him to discuss their problems and results. He attracted them by the breadth of his vision, his genuine interest in new results, and his friendly and helpful comments. His very exacting scientific standards and his total rejection of any kind of deception made him the ultimate arbiter in matters of dispute.

M. A. Leontovich was a remarkable teacher. For many years he gave outstanding lectures on theoretical physics at the Moscow State University and the Moscow

Engineering Physics Institute. All physicists will be well familiar with his *Statistical Physics* and *Thermodynamics*. He was the editor of the four-volume *Plasma Physics and the Problem of Controlled Thermonuclear Reactions*, published in 1958; and of the serial publication *Problems in the Theory of Plasmas*, which began in 1963 and provides the most complete review of work in the field of high-temperature plasmas. The latter volumes became the standard collections of papers for a whole generation of physicists working on controlled thermonuclear fusion.

M. A. Leontovich's exacting scientific standards and his great authority were always in evidence during his very active work as a member of the Executive of the Division of General Physics and Astronomy, and as the Deputy Editor of JETP. He was very interested in the publishing activities of the Academy. The life of the Academy, with all its nuances, was part of his own life, and this was clearly reflected in M. A. Leontovich's active interest in Soviet science generally.

His contributions were acknowledged by such important awards as the Order of Lenin (three times), the Order of Red Labor Banner in 1958 and the A. S. Popov Great Gold Medal in 1952.

The shining memory of Mikhail Aleksandrovich Leontovich—a wonderful, wise, utterly honest, and highly principled man—will always be with us, especially among his numerous students and all those who were lucky enough to work with him or come under his influence. His scientific legacy is certain to survive for many generations.

Translated by S. Chomet