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LEV ANDREEVICH ARTSIMOVICH

(On his sixtieth birthday)

A. P. ALEKSANDROV, A. I. ALIKHAN'YAN, B. B. KADOMTSEV and M. A. LEONTOVICH

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THE 25th of February 1969 is the sixtieth birthday of the prominent Soviet physicist, Academician Lev Andreevich Artsimovich.

Artsimovich was born in Moscow in the family of a professor of statistics. After his schooling, he entered the Belorussian State University in Minsk. His brilliant talents made it possible for him to finish earlier the University, and already in 1939 he began working at the Leningrad Physico-technical Institute.

The Physico-technical Institute, headed by Academician A. F. Ioffe, held at that time a prominent place among physics institutes of this country. The atmosphere of devotion to science and the scientific enthusiasm characteristic of the scientists at the institute played a very important role in the formation of Artsimovich's scientific views.

His first work, carried out in the P. I. Lukirskiĭ's laboratory, was in the field of x-ray optics; in particular, he investigated the question of total internal reflection in the x-ray spectral band.

Soon, however, his interests shifted to nuclear physics, a most intriguing and important field that attracted physicists throughout the world. The neutron was discovered in 1932, and the investigation of its properties was begun intensively in many laboratories throughout the world, including the Leningrad Institute. In 1935 Artsimovich, together with I. V. Kurchatov, G. D. Latyshev, and V. A. Khramov, studied one of the simplest nuclear reactions, that of the capture of a neutron by a proton. In this investigation, it was shown for the first time that the probability of capture of slow neutrons by protons is relatively large.

In 1936 Artsimovich, together with A. I. Alikhanov and A. I. Alikhan'yan, proved experimentally the validity of the laws of conservation of energy and momentum during annihilation of positrons. This work was the first direct experimental verification of the validity of energy-momentum conservation in an elementary interaction, which at the time was questioned, for example, even by N. Bohr.

However, the central theme of Artsimovich's investigations at the Leningrad Institute, in which were manifested fully his outstanding capabilities as an experimental physicist—the clarity of his analysis and the high reliability of the results—was the investigation of interaction processes between fast electrons and matter. It must be remembered that at that time our knowledge in this field was quite scanty. It is sufficient to say that the experimental data related to processes of bremsstrahlung and the angular distribution of scattered electrons were considered to differ from theoretical data by two orders of magnitude. The extensive and quite accurate data obtained by Artsimovich in 1935–1940 on the dependence of the intensity of bremsstrahlung and the total energy losses on the energy of fast electrons demonstrated complete agreement between the predictions of quantum mechanics and the experimental data. This important result, which eliminated all doubts about the validity of the basic tenets of the theory, opened at the same time the path for further precision experiments.

During the World War, Artsimovich was occupied with investigations in electron optics, and in particular worked on the theory of chromatic aberration of electron-optical systems.

In 1945, in a study carried out with I. Ya. Pomeranchuk, Artsimovich investigated in detail synchrotron radiation of electrons, which was of importance in the determination of the limiting energy of particles in the betatron.

After the war, the stormy progress in nuclear physics as a result of the solution of defense problems of this country and of the development of nuclear energetics changed completely the scale and character of investigations in physics. Under these new conditions, which forced the rapid solution of a number of difficult scientific and technical problems, Artsimovich headed an important applications effort, the electromagnetic separation of isotopes. The point was to construct with the aid of a simple physical apparatus—a mass spectrometer—a reliable technical installation millions of times more productive. As always in physics, the transition to new scales meant the birth of new physical phenomena, and with them of new difficulties. The physicists headed by Artsimovich solved successfully this problem, and presently isotopes separated by the electromagnetic method are ever in greater and more diversified applications in science and the national economy.

At the end of 1950, Artsimovich headed the solution of a new fundamental scientific problem, that of controlled thermonuclear reactions. Basing himself on the idea of magnetic thermal isolation of a hot plasma, enunciated by A. D. Sakharov and I. E. Tamm, Artsimovich and his co-workers began investigations in high-energy pulsed discharges in deuterium in a relatively modest-scale laboratory. Penetrating an unexplored field of physics phenomena, the group headed by him reached its first success already in 1952 by producing neutrons in a gas discharge. It was precisely the critical analysis performed by Artsimovich which made it possible to avoid the tempting but incorrect conclusion about the thermonuclear origin of these neutrons. Thus began the lengthy period of investigations in physics of hot plasmas and the very difficult problem of their stable containment. All this work was performed under his leadership and the direct participation.

After the 1958 Geneva conference, new scientific groups began working in this field of physics. Artsimovich became the acknowledged leader of the task of controlled nuclear fusion in the USSR. His monograph "Controlled Thermonuclear Reactions," published in 1961 and 1963, played an important role in the development of investigations in the physics of hot plasmas.

Alongside the general leadership of the task, Artsimovich participates directly in experimental investigations on "Tokamaks"—toroidal installations for the containment of hot plasmas. In the last few years, a long duration and stable plasma with a density up to 10^{14} ions/cm^3 and temperature up to 5,000,000 degrees was obtained in such installations—a significant step towards the final goal of a thermonuclear reactor.

Artsimovich's fame is very great in our country as well as abroad. His work has been translated into many foreign languages. His reports at international conferences on plasma physics are met with unchanging attention. At the invitation of scientists in France and England, he gave lectures in these countries on the results and future possibilities of thermonuclear investigations.

Artsimovich devotes a great deal of attention to the organization of scientific investigations in physics and astronomy in the USSR. He has been for several years the Academician-secretary of the Physics and Astronomy Section of the Academy of Sciences of the USSR, and has devoted much effort in scientific and organizational work.

He is also a leading public figure. An active participant of the Pugwash movement, he has done much towards the improvement of relations between scientists of various countries as a way of strengthening peace.

Artsimovich began his pedagogical activities early, and devotes much effort in training and educating young physicists. Presently, he is head of the department at the Moscow State University.

His scientific achievements are held in high esteem by the scientific community. In 1946, he was elected corresponding member of the Academy of Sciences of the USSR, and in 1953 he became full member. Artsimovich has been awarded a number of decorations from the Soviet Union, and is a Lenin and State laureate.

L. A. Artsimovich celebrates his sixtieth birthday in the full bloom of his activities, full of scientific ideas. Along with the extensive scientific, organizational and public activities, he participates as always directly in scientific investigations, and heads an experiment in one of the most promising fields of the thermonuclear problem.

Let us wish with all our heart good health, unending energy and new creative success to the hero of the anniversary.

Translated by L. C. Garder