

Semen Aleksandrovich Al'tshuler (Obituary)

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Soviet science has suffered a grievous loss. On January 24, 1983 Professor Semen Aleksandrovich Al'tshuler, a prominent Soviet physicist, an honored scientist of the RSFSR, a corresponding member of the Academy of Sciences of the USSR, Head of the Department of Radiospectroscopy and Quantum Electronics of the Kazan' State University passed away in his seventy-second year. Al'tshuler's name is inseparably linked with the discovery of magnetic resonance and with the development of a new direction in modern physics—magnetic radiospectroscopy. Perhaps the peak of his scientific creativity was the prediction in 1952 of acoustic paramagnetic resonance which soon after was discovered experimentally.

Al'tshuler was born on September 24, 1911 in Vitebsk. On graduating from school in 1928 he entered the physico-mathematical faculty of Kazan' University. He completed his first theoretical paper in 1933 in the Physics Institute of the Academy of Sciences of the USSR as a graduate student of Academician I. E. Tamm. Their paper in which the existence of the neutron magnetic moment was predicted became widely known. At that time the presence of a magnetic moment in the neutron which carries no electric charge appeared paradoxical. However their prediction received brilliant experimental confirmation.

Interest in magnetic properties of matter determined the whole scientific activity of S. A. Al'tshuler in subsequent years.

During 1934–1941 Al'tshuler worked energetically at Kazan' University together with E. K. Zavoiskii and B. M. Kozyrev. In 1941 they designed experiments to discover NMR in protons in water. According to records in the laboratory notebooks signals were observed in a number of cases corresponding to the NMR line. Lack of reproducibility of observations of this line prevented the authors from asserting the discovery of the NMR effect, although in their publication of 1944 there is a phrase that the method of network current to measure the absorption of radio waves in matter can be used for the determination of nuclear magnetic moments.

The war interrupted the scientific research of S. A. Al'tshuler. In the very first days of World War II the thirty-year old communist S. A. Al'tshuler enlisted as a volunteer in the Red Army. On completing a short course at the V. I. Lenin Military-Political Academy he served throughout the war in units of antitank artillery and in the rank of major greeted the day of victory.



SEMEN ALEKSANDROVICH
AL'TSHULER
(1911–1983)

After demobilization in 1946 Al'tshuler returned to Kazan' University and again began scientific research and pedagogical work. Following his proposal experiments were begun on detecting the hyperfine structure of EPR lines which led to a successful result in 1948. This work opened up new possibilities of EPR as a method for the investigation of electron-nuclear interactions in condensed media.

Al'tshuler became widely known for his theoretical investigations of spin-phonon interactions in solids. He was the first to treat acoustic oscillations as a dynamic coherent field that can be resonantly absorbed by matter and developed a theory of acoustic resonance (1952). This theory, which was soon confirmed experimentally, became the basis of a new direction in physics—quantum acoustics. Later this result was patented as a discovery.

In order to study nonequilibrium phonons emitted by a spin-system Al'tshuler proposed in 1965 to use the method of Mandel'shtam-Brillouin scattering of light. By this method he, together with collaborators, discovered the beautiful effect of avalanche emission of phonons. It turned out that the effective temperature of the resonance phonons at the peak of the avalanche attained millions of degrees while the sample temperature was only several degrees.

Al'tshuler and his pupils theoretically predicted and experimentally observed magnetic resonance in so called "Van Vleck paramagnetic materials". Al'tshuler proposed to utilize these unusual magnetic materials as working substances in the process of obtaining superlow temperatures by the method of adiabatic demagnetization. This idea made it possible to increase the cooling ability of magnetic methods of obtaining superlow temperatures by several orders of magnitude.

His extensive life experience and talent as a leader enabled him to create within Kazan' University a strong physics laboratory which became one of the leading centers of radiospectroscopic research. Among his pupils there are 10 doctors and many candidates of science.

S. A. Al'tshuler was not only a prominent physicist, but an outstanding and charming personality, a man who attracted to himself persons needing very different scientific and everyday life advice and aid. His invariable benevolence, intellect, and wisdom and a strict adherence to principle en-

abled him to find the optimum solutions in the most complicated and involved situations and have always benefited people. He had a deep knowledge and love of music, literature, history, and philosophy and had a lively response to all aspects of life.

Communication with him was always a joy.

S. A. Al'tshuler conducted extensive scientific-organizational work as the chairman of the Scientific Council of the Academy of Sciences of the USSR on the problem of "Radiospectroscopy of Condensed Media", as a member of the Presidium of the Committee on Physics of the Academy of Sciences of the USSR, a member of the editorial board of JETP and of many scientific councils.

The military and scientific attainments of S. A. Al'tshuler have been rewarded by three Orders of the Patriotic War, the Red Star, the Red Banner of Labor, "Badge of Honor" and medals.

For science, for his pupils and for all those who knew Semen Aleksandrovich Al'tshuler his death is a grievous loss.

Translated by G. M. Volkoff