

## Boris Mikhaïlovich Kozyrev (Obituary)

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Boris Mikhaïlovich Kozyrev, a prominent Soviet physicist, Corresponding Member of the USSR Academy of Sciences, and head of the Radiospectroscopy Section of the Kazan' Physicotechnical Institute of the USSR Academy of Sciences Kazan' Branch, died at the age of 75 on October 21, 1979.

Kozyrev's scientific and scientific-organizational activity was associated with the emergence and development of an important field of physics—magnetic radiospectroscopy, which appeared after E.K. Zavoïskii's 1944 discovery of electron paramagnetic resonance.

Beginning in 1937, Kozyrev participated in Zavoïskii's experiments to investigate radiofrequency absorption and dispersion in matter, which were a prerequisite to the discovery. Immediately after the discovery of paramagnetic resonance, Kozyrev proceeded with a variety of studies that contributed to a thorough understanding of the set of associated phenomena and to the transformation of PR into a potent technique for appreciation of the nature of matter, the use of which has determined the development of many branches of science.

Kozyrev used a highly sensitive method of measuring paramagnetic absorption to study paramagnetic relaxation in parallel fields. Investigation of the variation of relaxation times in various substances played a significant role in establishing present-day concepts of the magnetization kinetics of paramagnetic media.

In 1947, he became the first to observe paramagnetic resonance in organic free radicals, thus opening a still unfinished flood of studies in this area. In 1948, with co-authors, he observed the effects of nuclear spin on the shapes of EPR lines in solutions of manganese and copper salts—the so-called hyperfine structure of the EPR lines. An important advance in this field was the establishment by Kozyrev and his co-workers of the nuclear spin of an iron isotope.

An important research trend developed by Kozyrev in the late 1940's was concerned with EPR and paramagnetic-relaxation methods for the study of solutions of paramagnetic ions and their complexes. Proving the existence of dynamically stable shells (solvates) around ions in solutions and demonstrating the capabilities of EPR in acquiring information on the structure and symmetry of complexes, on the lifetimes of ligands in the composition of the paramagnetic complex, and on relaxation-mechanism features in liquid solutions of paramagnetics—this was the area in which Kozyrev pioneered. His results stimulated intensive development of similar studies in many laboratories, in our country and abroad.



Boris Mikhaïlovich Kozyrev (1905-1979)

Kozyrev's great erudition, combined with his excellent physical intuition and his ability to focus his interest on the most important and promising problems of PR application were also evident in other research fields. These include study of short-range order in glasses, which yields information on color centers and makes it possible to control siallization processes; study of chemical complexing in solutions of paramagnetic salts by measuring the magnetic-relaxation times of protons; work on various types of double resonances and the first studies of the Oberhauser effect in solutions of electrolytes; research on compounds whose molecules incorporate several paramagnetic ions, which made it possible to obtain important information on the exchange interactions that determine the properties of magnetic materials. Note should also be taken of two other fields in which the Institute began work at the initiative of Kozyrev and with his support: nuclear quadrupole resonance study of organic and inorganic compounds and EPR in metals. In recent years, Kozyrev had attached much importance to investigation of coordination compounds of transition elements in liquid crystals and synthetic resins, and also to study of these matrices.

For his outstanding scientific achievements, Kozyrev was elected a Corresponding Member of the USSR Academy of Sciences in 1968.

Kozyrev worked vigorously to popularize the PR

method, authoring a whole series of review papers. Jointly with S.A. Al'tshuler, he wrote the first generalizing fundamental monograph on EPR, and then one of the later ones. Both were published not only in the Soviet Union, but also in many other countries.

Kozyrev was the founder of a major radiospectroscopy school and one of the organizers of the Kazan' Branch of the USSR Academy of Sciences. His former students include more than a score of Doctors and Candidates of Sciences. Kozyrev's school played a major role in the creation of other centers for the use of PR in our country. He was a member of the Scientific Councils of the USSR Academy of Sciences on the radiospectroscopy of condensed systems, on low-temperature physics, and on the structure of inorganic compounds, and represented the USSR Academy of Sciences on the Council of the European Physical Society.

The breadth of Kozyrev's scientific interests was combined with unusual charity, willingness to listen, and support for new ideas in physics. All of the physi-

cal interests and divisions of the Kazan' Physicotechnical Institute owe much of their development to his efforts.

The Soviet Government has granted high recognition to Kozyrev's work, awarding him two Orders of the Red Banner of Labor and medals.

Kozyrev's authority was due in part also to his outstanding personality: he was a man of high culture and uncommon modesty. He also had an unusually strong interest in literature and art and appreciated them deeply. Everyone who was fortunate enough to associate with Kozyrev can attest first-hand to his enormous charm.

The glowing memory of Boris Mikhailovich Kozyrev, a remarkable scientist and human being, will remain forever in our hearts.

Translated by R. W. Bowers

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