PERSONALIA

Boris Mikhaĭlovich Kozyrev (on his seventieth birthday)

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Corresponding Member of the USSR Academy of Sciences Boris Mikhaĭlovich Kozyrev, a prominent investigator in the field of magnetic radiospectroscopy who is widely recognized for his work both in the Soviet Union and abroad, celebrated his seventieth birthday on May 4, 1975. He has been the author of over a hundred published scientific papers.

Kozyrev was born at Ashkhabad into the family of a lawyer. On completing his studies at Kazan' University in 1930 as a physical-chemistry major, he taught for several years at the University and at the Kazan' Pedagogical Institute, lecturing, among other things, on quantum chemistry and thermodynamics for physicists. This was the beginning of his association with the university physics department, in whose scientific work he began to participate actively in 1933.

In 1939–1941, Kozyrev collaborated with S. A. Al'tshuler and E. K. Zavoĭskiĭ in attempts to observe nuclear magnetic resonance. Resonance was observed on protons in aqueous solutions of copper sulfate, but the war made it impossible to complete and publish this study.

He defended his candidate's dissertation in 1945 and his doctorate dissertation in 1957; he was elected a Corresponding Member of the USSR Academy of Sciences for Physics in 1968.

Soon after Zavoĭskiĭ's discovery of paramagnetic resonance, Kozyrev used the highly sensitive method of measuring paramagnetic absorption that had been proposed by Zavoĭskiĭ to study paramagnetic resonance in parallel fields.

The many years of research done by Kozyrev, his coworkers, and his students, which resulted in the accumulation of a large amount of data on spin-lattice and spin-spin relaxation times, was a significant factor in forming our present-day conceptions of the kinetics of magnetization of paramagnetic media. While the group of Leiden scientists headed by C. Gorter must be credited with originating the first world center engaged in paramagnetic relaxation research, Kazan' became the second such center for study of paramagnetic absorption in parallel fields as a result of Kozyrev's efforts.

In 1948, Kozyrev (jointly with S. G. Salikhov) observed paramagnetic resonance in organic free radicals. This study launched a still-flowing stream of studies of electron paramagnetic resonance in these substances. As we know, EPR has now become the most effective method for the observation and study of free radicals.

Also in 1948, Kozyrev (working with S. A. Al'tshuler and S. G. Salikhov) became the first to detect the influence of the nuclear spin of Mn^{55} on the shape of electron paramagnetic resonance lines (the hyperfine structure of the paramagnetic resonance line) in solutions of manganese and copper salts. The present great importance of study of the hyperfine structure of paramagnetic resonance is a well-known fact. One of the important results in this area was the determination of the nuclear spin of the iron isotope Fe^{57} in 1957 by Kozyrev, N. S. Garif'yanov, and M. M. Zaripov. It was found that previous data on the nuclear spin of this isotope were in error and that this spin is in fact 1/2.

In the early 1950's, Kozyrev demonstrated for the first time how effectively electron paramagnetic resonance can be applied to organic chemistry. For example, he took note of the possibility of studying excited triplet states of molecules by the EPR method.

A major cycle of studies by Kozyrev and his coworkers was devoted to EPR and paramagnetic-relaxation studies of the structure of paramagnetic (including solvent-separated) complexes in liquid solutions. He showed with Garif'yanov that electron paramagnetic resonance yields a broad range of information on the nearest surroundings of paramagnetic ions in solutions and on the structure of the solutions as a whole: the symmetry of arrangement and lifetimes of ligands in a paramagnetic complex, the nature of the chemical bonds between the ligands and the central paramagnetic ion, the structure of microscopic inhomogeneities, etc. Recent years have also seen the first successful use of

EPR for these purposes under conditions of high hydrostatic pressure.

With G. P. Vishnevskaya, he used nonresonant-absorption methods to obtain data on the spin-lattice and spin-spin relaxation times in liquid and frozen solutions of compounds of transition ions and established the basic features of the relaxation mechanisms. With these studies of solutions, Kozyrev laid the foundations for detailed theoretical analysis of paramagnetic relaxation processes.

Kozyrev also studied solutions of paramagnetics by the proton magnetic relaxation method. With A. I. Rivkind, he showed in 1953 that highly useful characteristics of chemical-complexing processes in solutions of paramagnetic salts can be obtained by measuring the proton magnetic relaxation time.

EPR studies of short-range order in glasses and sitalls account for much of the work done by the scientific team that Kozyrev heads. With É. G. Kharakhash'yan, he is also engaged in study of frozen sodium-ammonia solutions, which exhibit anomalous conductivity. It was found that these solutions contain sodium in the form of colloidal metallic particles. Finally, research on the various forms of double resonance has been developing successfully under Kozyrev's direction. In particular, the Oberhauser effect has been investigated successfully for the first time in electrolyte solutions. The pulsed method of scanning for and detecting nuclear quadrupole resonance spectra that is now widely accepted worldwide was first proposed and developed in Kozyrev's department.

Kozyrev also devotes much attention to the practical acceptance of radiospectroscopic methods for solution of practical problems in the national economy; among other things, his department has developed a quick method for determination of vanadium in Tatar crude petroleums; processes of crystallization from solutions of paramagnetic salts, which are important for chemical engineering, have been studied. A number of instrumental innovations from the department are in use in the series production of scientific apparatus and in industry.

Kozyrev has written several reviews that have helped familiarize the community with paramagnetic resonance methods and contributed to their successful use in various branches of physics, chemistry, and biology. Jointly with Prof. S. A. Al'tshuler, he has written a major monograph on electron paramagnetic resonance that has been published not only in the Soviet Union, but also in the USA, Great Britain, the German Democratic Republic, and Poland. This book was the first generalizing work on EPR and was greeted with numerous good reviews in the Soviet and foreign literature. A substantially revised and expanded second edition of this fundamental monograph has recently been published.

Kozyrev is the founder of a radiospectroscopic school, one of the most important ones in the USSR. Over 15 candidate's dissertations have been written and successfully defended under his sponsorship. Four of his own students have defended doctorate dissertations. Practically all experimental methods of magnetic radiospectroscopy: EPR, NMR, NQR, and double magnetic resonance are now represented in the laboratories that he has organized at the Kazan' Physico-technical Institute of the Kazan' Branch of the USSR Academy of Sciences.

For a long time, Kozyrev's school remained the only experimental center for magnetic radiospectroscopy in the Soviet Union. It played a major role in the creation of other centers engaged in the study of paramagnetic resonance in our country.

Kozyrev is a very kindly man and is generous in sharing his knowledge with his numerous students and colleagues.

He has a broad range of interests. Many know him as a subtle critic of literature and poetry. He has written several studies of his favorite poet Tyutchev, one of which was published in a memorial collection for Academician N. I. Konrad.

We wish him further successful and productive scientific activity and continued good health.

Translated by R. W. Bowers