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Kev Minullinovich Salikhov (on his seventieth birthday)

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Kev Minullinovich Salikhov, corresponding member of the Russian Academy of Sciences (RAS), director of the Zavoisky Kazan Physical-Technical Institute (KFTI) of the Kazan Research Center, and a well-known expert in chemical physics, had his 70th birthday on November 3, 2006.

Salikhov graduated from the Physics & Mathematics Department of Kazan State University (KGU) and during his postgraduate years at KGU he was assigned as apprentice to the Institute of Macromolecular Compounds (IVS) of the USSR Academy of Sciences in Leningrad. In 1963 at IVS, he defended his PhD thesis on some aspects of the molecular theory of dielectric and mechanical relaxation properties of polymers (under the guidance of M V Volkenshtein and Yu Ya Gotlib). By the end of 1963, he transferred to Novosibirsk Academgorodok and started working in V V Voevodsky's laboratory of the Institute of Chemical Kinetics and Combustion of the Siberian Branch of the USSR Academy of Sciences. In 1988, Salikhov was elected to the directorship of KFTI of the Kazan Research Center of the RAS. In 1997, he was elected corresponding member of the Russian Academy of Sciences (to the Division of Physical Sciences).

Salikhov has made significant contributions to the study of spin exchange, to electron paramagnetic resonance (EPR), to the creation of spin chemistry and its progress, and to the investigation of the primary stages of assimilation of solar energy in photosynthesis.

He made a seminal contribution to the theory of the Heisenberg spin exchange in diluted paramagnets. He proposed kinetic equations for describing the spin exchange in collisions of paramagnetic particles in solutions and on this basis calculated the spin exchange cross sections involving free radicals, paramagnetic complexes, triplet excitons, and the cross section of exchange conversion of positronium by paramagnetic particles; and predicted a new mechanism for the shifting of EPR lines caused by exchange interaction. These results were mostly presented in the monograph *Spin Exchange* (in Russian) (Moscow: Nauka, 1977) by K I Zamaraev, Yu N Molin, and K M Salikhov, which was soon translated and published in English under the title *Spin Exchange. Principles and Applications in Chemistry and Biology* (Heidelberg, Berlin: Springer-Verlag, 1980).

Salikhov built the foundation of the theory of pulse EPR methods. He showed theoretically that it was possible to observe the modulation of the electron spin echo signal in amorphous and polycrystalline materials. He was the first to investigate the role of selectivity in the excitation of the spin system by microwave field pulses that shape the signals of the electron spin echo. He developed the theory of phase relaxation of electron spins in solid paramagnets via the dipole – dipole interaction between paramagnetic centers.

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He established the asymptotic laws for echo signal decay via the mechanism of spectral diffusion and developed the theory of decay of echo signals by the mechanism of so-called instantaneous diffusion. This body of research was summed up in the monograph *Electron Spin Echo and Its Applications* written with his co-authors A G Semenov and Yu D Tsvetkov (Moscow: Nauka, 1976).

Salikhov provided an interpretation of the first experimental observations of the effect of an external magnetic field on reactions involving radicals and of the magnetic isotopic effect in radical reactions. He formulated the general formalism of the theory of magnetic-spin effects in radical reactions and, using it, developed theories of the effect of external magnetic fields on radical reactions, of the magnetic isotopic effect, and of chemical polarization of nuclear and electron spin in the course of chemical reactions; he theoretically predicted certain extreme behavior in the dependence of the recombination probability on field strength for radical and electron – hole pairs in weak magnetic fields of strength comparable to local fields generated by hyperfine interactions with magnetic nuclei; he predicted unusual features in the recombination probability of radical pairs at the crossing points of their diabatic terms; he found the main features of the chemical polarization of

nuclear spins in weak magnetic fields; he theoretically predicted the effect of mutual influence of nuclei on their polarization; and he gave a theoretical estimate of the maximum possible contribution of the hyperfine interaction to the recombination probability of radical pairs. He calculated the recombination probability of radical pairs with an arbitrary number of magnetic nuclei in the Earth's magnetic field and obtained important results in the theory of optically detected EPR spectra of spin-correlated radical pairs. He suggested a novel theoretical mechanism for polarization of electron spins of triplet states due to the spin-selective annihilation of excited triplet states. The topics listed above were presented in the following publications: *Magnetic and Spin Effects in Chemical Reactions* by A L Buchachenko, R Z Sagdeev, and K M Salikhov (Moscow: Nauka, 1978); *Spin Polarization and Magnetic Effects in Radical Reactions* by K M Salikhov, Yu N Molin, R Z Sagdeev, and A L Buchachenko (Budapest: Academic Kiado, 1984; Amsterdam: Elsevier, 1984); *Magnetic Isotope Effect in Radical Reactions* by K M Salikhov (Wien, New York: Springer-Verlag, 1996); and *Ten Lectures on Spin Chemistry* by K M Salikhov (Kazan, Kazan University Publishing House, 2000).

Salikhov developed the theory of time-resolved EPR spectra and the theory of the electron spin echo of electron – hole pairs that are formed in the singlet state at a photosynthesis center. For this situation, he was able to predict quantum beats of the EPR line intensity and the anomalous phase of the primary spin echo signal.

As the director of KFTI, Salikhov exercised his talent in science administration. It was through his inexhaustible energy and devotion to science that today, despite the years that were so hard on Russian science, the institute not only held on to its position as one of the leading centers in radiospectroscopy but also strengthened it considerably. On Salikhov's initiative and with his active participation, the research programs in spin-dependent photochemical and photophysical processes, atomic force microscopy, EPR tomography, and femtosecond laser spectroscopy at KFTI continue to be successfully pursued.

Salikhov supervises a program of development in magnetic resonance tomography. Pilot models of the tomograph have been assigned certificates by the Health Ministry of the Russian Federation and are used in medical establishments in Tatarstan.

Salikhov has always paid great attention to training new specialists. In 1989 he created the chemical physics chair at Kazan State University. He has supervised the preparation of 19 PhD theses, and eight of his students have received the DSc degree.

Salikhov is Editor-in-Chief of the international journal *Applied Magnetic Resonance*, which he created, and is on the editorial board of the international journal *Molecular Physics Reports*.

A salient feature of Salikhov's creative work is his close collaboration with experimenters. The results he has obtained have often provided the stimulus for setting up new experiments.

The monographs that he co-authored became desktop features for many an expert in this country and abroad. In 1986, as a member of a group of co-authors including Yu N Molin, R Z Sagdeev, A L Buchachenko, and E L Frankevich, K M Salikhov was awarded the Lenin Prize for work on magnetic-spin effects. In 1991, he was elected full member of the Academy of Sciences of Tatarstan. In 1992, he was elected fellow of the Institute for Advanced Study in Berlin (Wissenschaftskolleg zu Berlin). In 1996, he received the Gold Medal of the International EPR (ESR) Society, and had the distinction of Famous Scientist conferred on him at the State Research Center RIKEN in Japan. In 1998, he received the State Prize in Science and Technology of the Republic of Tatarstan and in 2000 the Award of the Australian and New Zealand Society for Magnetic Resonance for that year. In 2001, he won the Award of the Alexander von Humboldt Foundation (Germany). He was also awarded the International Zavoisky Award for 2004 for work in electron paramagnetic resonance.

Salikhov plays an active role in the research life in Tatarstan. He is Deputy Chairman of the Kazan Science Center of the RAS, Vice-President of the Tatarstan Academy of Sciences, and Chairman of the physics section of the editorial board of the Tatar Encyclopedia.

Kev Minullinovich Salikhov's colleagues and friends salute him on his jubilee and wish him good health and further success in his activities.

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Yu N Molin, I V Ovchinnikov, R Z Sagdeev,
V F Tarasov, I B Khaibullin, Yu D Tsvetkov