

In memory of Yurii Nikolaevich Demkov

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Yurii Nikolaevich Demkov, an outstanding theoretician in the field of atomic physics, one of the creators of the modern theory of atomic collisions, Honored Scientist of Russia, Professor Emeritus at St. Petersburg University, died on 15 November 2010.

Yu N Demkov was born on 12 April 1926 in Leningrad into the family of engineer-architects designing many public buildings in Leningrad and other cities in the USSR. He graduated magna cum laude from high school in 1942 in the city of Yaroslavl' during the evacuation and entered the Moscow Institute of Steel in 1943. In 1944, when he was 18 years old, Y N Demkov was drafted into the acting army and served as a soldier in the First Ukrainian Front during World War II. In September 1945 he was demobilized, went back to Leningrad, and joined the sophomore class of the Department of Physics at Leningrad State University, where he worked all his life.

After graduating with *summa cum laude* from Leningrad State University in 1949, Yu N Demkov joined as an assistant the Chair of Theoretical Physics headed at that time by Academician V A Fock. His graduation thesis, "Charge exchange in atomic collisions", proved to be quite relevant and determined the main direction of his research for many years. Yurii Nikolaevich's PhD thesis was devoted to the variation principles in collision theory, which were closely related to the investigations of V A Fock. He defended a PhD thesis in 1954 and later wrote a monograph on the same topic, which was then translated into English and received a university prize in 1962. Yu N Demkov defended his doctoral dissertation, "Slow collisions of atoms and molecules", in 1967 and became a full professor in 1970. Yurii Nikolaevich worked successively as an assistant, senior researcher, associate professor, head of the laboratory of the theory of atomic collisions, and professor. From 1975 to 1991, he was the head of the Chair of Quantum Mechanics.

The work of Yu N Demkov on the collision theory of atoms and ions brought him scientific authority in theoretical physics in our country and later worldwide prominence. He obtained pioneering results in the theories of charge exchange, electron detachment, and other processes. The concepts of the 'Demkov model' and 'Demkov coupling' are well known in modern atomic physics. The second set of results obtained by Yu N Demkov concerns the problems of symmetry in atomic physics, in particular, when applied to the Fock symmetry of the hydrogen atom and harmonic oscillator. The most important among these results was the explanation of the internal symmetry of the Mendelev Periodic Table and the so-called $(n + l, n)$ energy-level occupation rule. Here, he managed to combine in whole the



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(12.04.1926 – 15.11.2010)

work of Maxwell on the so-called 'fish eye', of Mendelev, Bohr, and Fock on the hydrogen atom symmetry. Yurii Nikolaevich also obtained, together with G F Drukarev and V N Ostrovskii, fundamental results in the development of the method of zero-radius potentials in atomic physics. The results of these studies are presented in the monograph *Method of Zero-Radius Potentials* by Yu N Demkov and V N Ostrovskii [(Leningrad: Leningrad State University, 1975), which was translated into English (Plenum Press, 1988)] and awarded a University First-Class Prize. Yu N Demkov's significant achievement was the discovery of a new class of problems in collision theory, so-called harmonic scattering, and the development (together with I V Komarov, A P Shcherbakov, and D I Abramov) of the original theory of this scattering using conformal mappings. This work was awarded an Academician V A Fock Prize of the Russian Academy of Sciences. Other work of Demkov includes original and unexpected results obtained in neutrino focusing studies; polynomial solutions of the problem of the

two Coulomb centers found by him; proposals for designing ultralong-focus telescopes in space with record angular resolution, and the prediction of the superfocusing effect during channeling a well-collimated proton beam in single crystals.

Yu N Demkov is rightly considered one of the creators of the modern theory of atomic collisions, having founded new directions in atomic physics and a school of disciples and followers. The city seminar on the physics of atomic collisions, which he headed for many years, played an important role in the development of the theory of atomic collisions. It is at this seminar that young scientists engaged in further studies in collision physics were educated. Among Yurii Nikolaevich's disciples are more than 10 doctors and about 30 candidates of science who are fruitfully working in Russia and abroad. Yurii Nikolaevich collaborated for a long time with researchers at the Ioffe Physical-Technical Institute, Gertsen Pedagogical University, Petersburg Institute of Nuclear Physics, Joint Institute for Nuclear Research, Voronezh State University, Institute of Theoretical and Experimental Physics, Institute of Chemical Physics, Lebedev Physical Institute, RAS, and other scientific institutions. His activity considerably facilitated the development of new research areas and international collaboration. It is impossible to list all the foreign research centers where Yurii Nikolaevich presented his reports. Beginning in 1965, he regularly presented plenary reports at the International Conference of Physics of Electronic and Atomic Collisions, and was a member of the Program Committee of this conference from 1967 to 2003.

Yu N Demkov was decorated with an Order of the Patriotic War of the Second Class, Order of the Red Banner of Labor, and Order of Lenin for his achievements in science and teaching young scientists, and also with medals and honorary diplomas. He was an Honored Scientist of Russia and Professor Emeritus at St. Petersburg State University.

The creative activity and encyclopedic knowledge of Yurii Nikolaevich in many fields of science and culture, his talent, devotion to science, and fidelity to his principles always attracted many people to him, independently of their age. His beneficial influence on the formation of a new generation of scientists is doubtless. The demise of Yu N Demkov is a huge loss for Russian and global science, a great grief for his numerous disciples and followers.

The lucid image of Yurii Nikolaevich Demkov, an outstanding scientist and wonderful man, will always remain in the memory of his friends and disciples.

*I V Abarenkov, E B Aleksandrov, M Ya Amus'ya,
V V Afrosimov, D A Varshalovich, L N Labzovskii,
E E Nikitin, Yu V Novozhilov, V I Ochkur,
I B Khriplovich, V M Shabaev*