CENTENARY OF YA I FRENKEL'S BIRTH

## Ya I Frenkel' — man, scientist, teacher

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This issue of Uspekhi Fizicheskikh Nauk celebrates the centenary of Yakov Il'ich Frenkel', an outstanding theoretical physicist of our country. His name is known to every physicist, and not just in Russia alone, because of his work in practically all branches of theoretical physics, and also because of his text books and monographs. Therefore, everyone, or almost everyone can say something about his or her personal meeting, face-to-face or otherwise, with Yakov Il'ich. I take this opportunity to do the same in this brief introductory note celebrating his centenary.

My contacts with Yakov Il'ich have come about because in 1944 I became a student of the Physicomechanical Faculty of the Leningrad Polytechnic Institute where Frenkel' gave all his courses of theoretical physics and held a chair. I was fortunate to be able to prepare a diploma thesis under Frenkel's supervision. It was concerned with a theory of vibrational-rotational spectra of nuclei. After graduation from the Leningrad Polytechnic Institute I worked at the 'Svetlana' factory on microwave electronics and gas discharges, so that I was able to appreciate Frenkel's classical work on the theory of microwave resonators. Finally, from 1958 I was at the A F Ioffe Physicotechnical Institute, with which the creative activities of Yakov Il'ich were linked for thirty years, I realised then the enormous influence that he had on the development of modern physics, particularly those fields which had been and are being studied at the Ioffe Institute, namely the physics of semiconductors, condensed matter physics, and nuclear physics. On visits abroad I have been frequently reminded of the high regard for Frenkel's work among his foreign colleagues.

Much of the work of Yakov Il'ich had become classical during his own lifetime. This includes studies of real crystals (Frenkel defects), kinetic theory of liquids, semiconductors, quantum-mechanical theory of electrical conduction in metals, and physics of magnetic phenomena.

There are however in Yakov Il'ich's heritage some contributions which have reached the status of fundamental work after his death, which is often the fate of pioneering studies. This applies to his 'soliton' paper of 1939 on the motion of dislocations (Frenkel solitons). Another example is the work on viscous flow in crystals (1945), which had become the scientific basis of powder metallurgy. I need not mention Frenkel excitons (1931). However, in the course of preparations to celebrate

*Uspekhi Fizicheskikh Nauk* **164** (4) 345-356 (1994) Translated by A Tybulewicz the centenary of Frenkel's birth we have learnt much new about how his work carried out in the twenties, thirties, and forties has gained a 'second wind' in our time. This is true of astrophysical research, including a theory of white dwarfs (1928), a theory of formation of real surfaces of crystals (1945), the work on the tunnel effect as applied to contact phenomena (1930) and to the physics of nuclei (1946).

My meetings with Yakov Il'ich in the late forties and early fifties gave me an insight not only into his professional capacity at lectures, seminars, and consultations which he readily provided to anybody who asked him at the loffe Institute. I have visited the hospitable home of the Frenkel' family and there, in an unpretentious and unaffected atmosphere, I have been able to appreciate the human qualities of Yakov Il'ich, his high intellect, artistic talent, bright wit, sensitivity, kindness, and readiness to help those in need.

At this uneasy time the name of Yakov Il'ich Frenkel', his selfless devotion to science, his civic courage, and high mental faculties give us an encouraging and inspiring example.