

**ON THE OCCASION OF 70TH ANNIVERSARY OF CORRESPONDING MEMBER
OF THE ACADEMY OF SCIENCES OF MOLDOVA BORIS TSUKERBLAT**



On July 24, 2009 Corresponding member of the Academy of Sciences of Moldova, Prof. Boris S. Tsukerblat — a scientist well recognized all over the world — celebrated his 70th anniversary. In our century of narrow specialization, not so many physicists involved in theoretical physics can be considered all-round craftsmen. Without any doubt, B.S. Tsukerblat is one of these personalities. His works deal with different directions of the modern theory of solid state and physics of molecules and are well recognized all over the world. B.S. Tsukerblat began his scientific activity in the sixties, when first optical quantum generators on the base of doped crystals appeared. In these years, the understanding of processes which take place in lasers just ripened. In tight collaboration with Corresponding member of the Academy of Sciences of Moldova Prof. Yu.E. Perlin, B.S. Tsukerblat performed a cycle of studies dealing with optical and non-radiative many-phonon processes in doped crystals. This work facilitated the development of the modern theory of optical and relaxation processes in active centers of laser media. The model of the impurity center of small radius suggested by Yu.E. Perlin and B.S. Tsukerblat allowed establishing the interrelation between the structure of the center and key parameters of laser generation.

A significant part of the scientific activity of B.S. Tsukerblat is connected with the development of the theory of exchange coupled clusters in molecular crystals. B.S. Tsukerblat in collaboration with M.I. Belinsky has elaborated the theoretical background of magnetochemistry and spectroscopy of exchange coupled clusters on the basis of the comprehensive study of their electronic structure, group-theoretical classification of the states and the generalized model including both Heisenberg and non-Heisenberg interactions.

By the end of the eighties, B.S. Tsukerblat and S.I. Klokishner elaborated the theory of cooperative phenomena and electronic phase transitions in molecular mixed valence crystals. The enigmatic phenomenon of the coexistence of localized and delocalized-type Mössbauer spectra in biferrozene derivative crystals has been explained on the basis of the concept of pseudo-Jahn-Teller effect. Also, for the first time, it has been proved that the disordered low-temperature phase may coexist with the high-temperature ordered one in mixed valence crystals.

B.S. Tsukerblat, in collaboration with A.V. Palii and other researchers, has obtained a series of important results related to the theory of the structure and properties of mixed valence compounds. Among these results, one can mention the solution of the electronic problem of double exchange for the most general case of polynuclear mixed valence systems comprising arbitrary numbers of paramagnetic centers and itinerant electrons.

The main results obtained by B.S. Tsukerblat during the last years refer mostly to the domain of molecular magnetism representing a rather new field of physics and chemistry of nanoscopic materials which developed very rapidly in the last two decades. In collaboration with A.V. Palii and the team of Spanish researchers headed by professor E. Coronado from the University of Valencia, B.S. Tsukerblat has developed the many-electron theory of orbitally-dependent magnetic superexchange and double exchange and successfully applied these theories to the explanation of the strong magnetic anisotropy exhibited by clusters comprising metal ions with unquenched orbital angular momenta. For the first time in his common work with S.I. Klokishner and E. Coronado, B.S. Tsukerblat has theoretically investigated the photochromic effect in sodium nitroprusside representing one of the hottest problems in the study of electronic structure of molecules because of the possibility of application of photochromic systems in memory and data storage devices. One should particularly mention a series of recent works on orbital effects in single molecule magnets and single chain magnets, reported by B.S. Tsukerblat in collaboration with the group of researchers from the Institute of Applied Physics of the Academy of Sciences of Moldova (S.I. Klokishner, A.V. Palii, S.M. Ostrovsky, O.S. Reu) and the group of USA colleagues headed by professor K. Dunbar from Texas A&M University. These studies have demonstrated for the first time that the strong single-ion and exchange magnetic anisotropy related to the orbital degeneracy of the single-ion states can give rise to the unusually slow relaxation of magnetization in molecular systems of the kind. These results have been published in such prestigious scientific journals with high impact factors as *J. Am. Chem. Soc.*, *Chem. Phys. Chem.*, etc. Finally, an extremely important result obtained by B.S. Tsukerblat in recent time is the explanation of the Rabi oscillations observed in the magnetic cluster VIV15. This work performed by B.S. Tsukerblat in collaboration with Prof. A. Müller from the University of Bielefeld (Germany) has been recently published in *Nature*. The obtained results are of practical interest since they create a background for the potential application of this type of clusters as promising elementary building blocks for future quantum computers.

Professor B.S. Tsukerblat has published more than 315 scientific papers. He is the author and co-author of three monographs. His book "Group Theory in Chemistry and Spectroscopy. A simple guide to advanced usage" has been published by Academic Press. Another significant part of the life of B.S. Tsukerblat is his pedagogic activity. For many years, B.S. Tsukerblat was a Professor of the Theoretical Physics Department at the State University of Moldova. He was a supervisor of 20 PhD theses. Four of his PhD students became Doctors Habilitatus in Physics and Mathematics. Now B.S. Tsukerblat is a Professor at the Ben-Gurion University of the Negev and his lectures, as always, attract many students and university colleagues.

The scientific activity of B.S. Tsukerblat gained public international recognition. He was repeatedly invited to deliver lectures and to carry out scientific research in leading European and U.S. Universities. Many times he was a member of the Organizing Committees of prestigious international conferences on molecular magnetism and Jahn-Teller effect.

His brilliant individuality, intelligence, kindness, and openness stimulate permanent sympathy and respect for him of disciples, colleagues, and all people who communicate with him.

Congratulating Prof. B.S. Tsukerblat with his seventieth jubilee we wish him, with all our heart, sound health, enthusiasm, creative forces, successes in science and life.

Researchers of the Institute of Applied Physics of the Academy of Sciences of Moldova,
Sophia Klokishner, Andrei Palii, Sergei Ostrovsky, Oleg Reu