

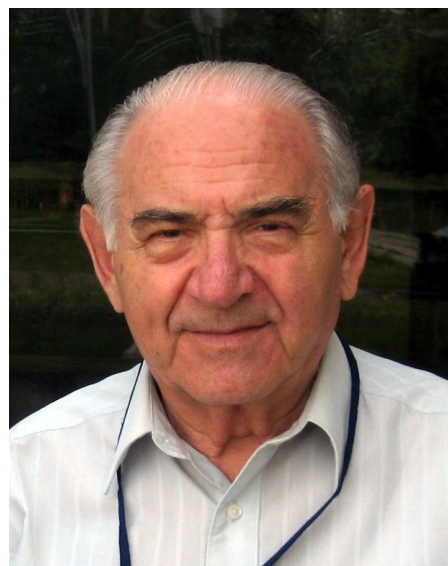
## CELEBRATION OF ACADEMICIAN ISAAC BERSUKER'S 95TH BIRTHDAY!

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On February 10, 2023, the scientific seminar "Spontaneous Symmetry Breaking and Jahn-Teller Effects" took place celebrating the 95th anniversary of Academician Isaac Bersuker. The event was jointly organized by the Institute of Chemistry of The Moldova State University and the Academy of Sciences of Moldova and was moderated by academician Gheorghe Duca, the head of the Center for Physical and Inorganic Chemistry, along with academician Ion Tighineanu, the president of the Academy of Sciences of Moldova and Dr. hab. Aculina Aricu, the director of the Institute of Chemistry [1,2].

Isaac B. Bersuker earned his scientific degrees of "Candidate of Sciences" (~ PhD) and "Doctor of Science" (~doctor habilitate) in 1957 and 1964, respectively, from Leningrad University, where he studied under the guidance of Prof. V.A. Fock, who was one of the contributors to the development of the Hartree-Fock method. From 1964 to 1993, Isaac B. Bersuker served as the Head of the Laboratory of Quantum Chemistry at the Institute of Chemistry of the Academy of Sciences of the USSR, Moldavian Branch (later known as the Academy of Sciences of Moldova), in Chisinau. He is a full Member of this Academy. Since 1993, Isaac B. Bersuker has held the position of Senior Research Scientist and Professor at the University of Texas at Austin [3,4].

In his PhD dissertation, he revealed the influence of core polarization on optical transitions in atoms. This significant paper from 1957 continues to be referenced in scientific literature. Subsequently, his primary focus revolved around the theories of the Jahn-Teller (JT) and pseudo-JT (PJT) effect, along with exploring a multitude of their applications. Among his main achievements in this field, presented by ~425 peer reviewed publications, including 15 books and about 30 major reviews, he predicted tunneling splitting in JT systems; proved that the JT and PJT effects are the only source of structural symmetry breaking in polyatomic systems; revealed the hidden JT and PJT effects; related vibronic energy level degeneracies to multi-conical intersections and



**Academician Isaac B. Bersuker**

Berry phase; revealed the role of JT and PJT effects in mixed-valence compounds; created the vibronic (PJTE) theory of ferroelectricity; discovered the role of spin in spontaneous polarization of crystals and new classes of multiferroics with magnetic-ferroelectric crossover; revealed a novel property of solids - orientational polarizability, resulting in giant flexoelectricity, permittivity, and electrostriction; explained the origin of polar nanoregions in paraelectric phases of ferroelectric perovskites; worked out methods of evaluation Jahn-Teller effect parameters from ultrasonic experiments [3-5].

In a series of publications with a focus on chemistry, Isaac B. Bersuker developed computational techniques to assess molecular instabilities induced by PJT effect. He also introduced the concept of plasticity in stereochemistry, revealed the origin of puckering (buckling) of molecular systems and methods of its suppression. Furthermore, he demonstrated that the bending of linear molecules can be attributed to the PJT effect rather than the Renner-Teller effect. Bersuker extensively explored various chemical applications of the JT and PJT effects, including the PJTE in photochemistry, the

theory vibronic activation by transition metals in coordination compounds, biological systems, and mixed-valence clusters. He also explored the role of the PJT effect in hemoglobin oxygenation; revealed the chemical-structural origin of musk fragrance activity. Bersuker suggested and elaborated a method of combined quantum/classical (QM/MM) modeling for large organometallic and metallo-biochemical systems with charge transfer between the QM and MM fragments, and a more “application oriented” Electron-Conformational method of pharmacophore identification and bioactivity prediction in drug design and toxicology [3-5].

He has supervised more than 50 PhD students and 10 doctor habilitate disciples, serves on many Scientific Councils and Editorial Boards, including the Editorial Board of Chemistry Journal of Moldova. He has received a variety of awards for his scientific merit, including the Medal of Honor and the State Prize Laureate (Moldova), Medal of Scientific Merit, First Class (2021). Moreover, Academician Isaac B. Bersuker is the author of the USSR registered Scientific Discovery no. 202 (1979) [5].

*Happy birthday dear academician Isaac B. Bersuker!*

## References

1. Scientific webinar “Spontaneous Symmetry Breaking and Jahn-Teller Effects” dedicated to the 95th birthday of Academician Isaac Bersuker. <https://ichem.md/en/webinar-spontaneous-symmetry-breaking-and-jahn-teller-effects>
2. Happy birthday to Academician Isaac Bersuker! (in Romanian). <https://ichem.md/la-multi-ani-academicianului-isaac-bersuker>
3. Biography of Professor Isaac Bersuker on the webpage of Oden Institute for Computational Engineering & Sciences <https://oden.utexas.edu/people/directory/Isaac-Bersuker/>
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5. Prominent personalities webpage. (in Romanian) <https://ichem.md/academician-isaac-bersuker>

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