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*Bell's inequalities and violation of local realism
in quantum mechanics.*

Quantum mechanics was created about a century ago in the works of N. Bohr, E. Schrodinger, W. Heisenberg, M. Born and others. Shortly thereafter, vivid discussions started which concerned the violation of the principle of local realism in this theory. The most famous criticism of this property of quantum mechanics was in the A. Einstein, B. Podolsky and N. Rosen paper in 1935. Bell showed in his 1964 paper that, assuming the principle of local realism, certain restrictions on the probabilities of outcomes of certain experiments must hold, and that in quantum mechanics they must be violated due to the phenomenon of entanglement. At present, the violation of inequalities has been reliably established in experiments with entangled photons. The entanglement phenomenon lies at the heart of quantum cryptography and quantum computers (although the effective practical implementation of these technologies is still very far away). In 2022 A. Aspect, J. Clauser, and A. Zeilinger were awarded the Nobel Prize in Physics for the experimental study of the phenomenon of entanglement and verification of the violation of the Bells inequalities. In the talk, I will describe a simple example of a thought experiment in which Bell's inequalities can be obtained, and explain how these inequalities are violated in quantum mechanics.

SCIENTIFIC SEMINAR

“DIFFERENTIAL GEOMETRY AND APPLICATIONS”

headed by Academician of RAS Anatoly T. Fomenko

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