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# Quantum information chemistry: The shift of viewpoint

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## Abstract

Quantum information chemistry investigates how entanglement influences chemical substances, properties, and reactions. Many or all of them can be reduced to quantum physical interactions, first of all, the electromagnetic one among them. As far as entanglement is a quantum phenomenon very well confirmed experimentally, especially as to electromagnetic interaction, it is relevant to chemistry: quantum information chemistry appears. The relation of entanglement and the Standard model (quantum electrodynamics, first of all) underlies fundamentally the relation of quantum information chemistry and quantum chemistry. As far as the former two are complementary (in Bohr's extended sense) to each other rather than competitive, the latter two as well. Entanglement is Einstein's "spooky action at a distance" implied mathematically by the formalism of quantum mechanics. Thus, the "Holy Grail" of quantum information chemistry is the "chemical action at a distance" implied by entanglement. Though electromagnetic interaction (unlike the other two in the Standard model) is not space limited, it refers to atoms in chemistry, and their stability needs strong interaction (mostly). Thus, all phenomena in chemistry (until now) are "here and now", though those "here and now" might be very remote as in astrochemistry. On the contrary, quantum information chemistry investigates remote chemical phenomena happening at a distance arbitrary in general. Another exciting horizon promised by quantum information chemistry is the direct chemical transformation cherished by "alchemy": entanglement might transform any given chemical substance into another in principle. uantum information mechanics allows for a new fundamental generalization and technics option: information (together with energy and matter) to be considered as a physical substance, even the most fundamental one among them as well as mutually transformable with them. This reflects on quantum information chemistry as determining relevant chemical substances, to which similar transformations would be verifiable experimentally and technically usable ever.

## Biography

Vasil Dinev Penchev MSc (Electronics), Technical University – Sofia, 1983. M.Sc. degree: Sofia, 1978– 1983, Technical University of Sofia, Department of electronics, Title of graduation thesis: "An electronic module–gauge for measuring of absolute pressure and relative dampness". Data of defence of thesis: 06.04.1983. Accomplishments in school: excellent marks (6.00) by the six point marking system. Area of scientific research: Philosophy of history of the Soviet Union and Russia, Philosophy of physics (quantum mechanics and quantum information), phenomenology (especially Heidegger's philosophy), Radichkov's works as a philosophical topic; mathematics and history.

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