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Faculty of Science

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Entanglement, complementarity and correlations

Entanglement is a central concept in the description of composite systems in quantum mechanics and it has proved to be essential in achieving tasks with no classical analog in quantum information science, such as for example quantum teleportation and the speedup in quantum computation. After briefly reviewing the concept of entanglement, we provide an interpretation of entanglement based on classical correlations between measurement outcomes of complementary properties for composite quantum systems. We discuss in particular what classical correlations in the measurements of these complementary properties tell us about the quantum correlations of the state of the system under consideration. We show that states that have correlations for complementary observables beyond a certain threshold value are entangled. The reverse is not true, however. We also show that, surprisingly, separable states with quantum correlations exhibit smaller correlations for complementary observables with respect to classical states.

A new series of special physics colloquia in honor of Erwin Schrödinger, who was a professor at UZH from 1921 – 1927.
Lectures are intended for a broad audience from the Faculty of Science, aiming at experts and non-experts.