

Causal relations in a quantum world

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Quantum theory radically changes the way we perceive and understand the physical world. One of the concepts that needs to be revisited is that of causality. In this talk I will discuss two questions related to the notion of causality in the quantum realm, which are currently the subject of active research. First, I will discuss how the violation of Bell inequalities (i.e. of Bell's assumption of "local causality") challenges our classical understanding of causality, and which causal structures can underly nonlocal correlations. Second, I will present a possible approach to the study of quantum correlations with indefinite causal structure—allowing for some form of "superposition" of causal orders (i.e. of "A causes B" and "B causes A").

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