Helmut Rauch

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Helmut Rauch
Atominstitut, TU Vienna, AT

Ignorance governs quantum experiments

We discuss the situation related to neutron interference experiments. One describes these experiments with the time independent Schrödinger equation which combines particle features and features of the apparatus. This indicates that a lot of information from earlier experiments enters the description from the particle side as well as from the instrument side. This information comes from statistical measurements and causes an intrinsic random feature of the description. Thus the statistical output is a result of the statistical input. The Schrödinger equation then describes the situation in the limits of our knowledge of all boundary and initial conditions. Thus one does not know when a neutron enters the apparatus, thus one does not know when it will be detected at the end or one does not know which momentum the neutron has within the collimation range etc. Thus pre- and post-selection experiments can make the situation more clear but intrinsic limitations remain. Various such pre- and post-selection experiments in ordinary, in momentum, in spin and in the time domain will be described. Decoherence and the transition between the quantum and classical world seems to be a lack of knowledge of the interaction processes in the interaction with the environment. This guides us to a more event related description of the observed phenomena. In all these discussions the entanglement of various degrees of freedom with geometric phases should not be forgotten, since these are not taken into account in many cases.

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