Hauptvortrag/Plenary lecture

Donnerstag/Thursday, 10:30, Wolfgang-Paul-Hörsaal

Feynman path integrals as infinite dimensional oscillatory integrals

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In 1942 R. Feynman proposed an heuristic path integral representation for the solution of the Schrödinger equation, describing the time evolution of the state of a $d-$dimensional quantum mechanical particle moving in a potential.
In 1976 S. Albeverio and R. Høegh-Krohn gave a well defined mathematical meaning to Feynman's heuristic formula in term of a well defined functional integral: the infinite dimensional Fresnel integral.
Oscillatory integrals on finite dimensional spaces are a classical topic, largely developed in connection with several applications in mathematics (for instance in the theory of Fourier integral operators) and physics (for instance in optics). Infinite dimensional oscillatory integrals arose as a generalization of finite dimensional oscillatory integrals to the case the integration is performed on an infinite dimensional real separable Hilbert space.
Among the many existing approaches to the rigorous mathematical realization of the heuristic Feynman path integrals, infinite dimensional oscillatory integrals are particularly powerful, as they allow to deal with a large class of potentials and to implement an infinite dimensional version of the stationary phase method for the study of the asymptotic semiclassical behavior of the solution of the Schrödinger equation.
The general theory will be described, as well as some recent developments and applications to the quantum theory.