

**Plenary Talk**

PV XIV Thu 9:00 U Audimax

**Non-Markovian Dynamics: Correlations, Information Flow and Memory in Open Quantum Systems** — ●HEINZ-PETER

BREUER — Physikalisches Institut, Universität Freiburg, Hermann-Herder-Str. 3, D-79104 Freiburg

The dynamics of open quantum systems is conventionally modelled by means of a Markovian process in which the open system irretrievably loses information to its surroundings, expressing the memoryless nature of the dynamics. However, complex open systems out of equilibrium often exhibit a pronounced non-Markovian behavior which is characterized by a flow of information from the environment back to

the open system. This information backflow implies the presence of memory effects and represents the key feature of non-Markovian quantum dynamics. In addition to standard phenomena like dissipation of energy and relaxation to a thermal equilibrium or nonequilibrium stationary state, non-Markovian time evolution is distinguished by a revival of genuine quantum properties such as coherences, correlations and entanglement. In the talk I will discuss theoretical concepts developed in the past years in order to define, quantify and control quantum memory effects in open systems. In particular, I will explain the connections between memory in the quantum regime, the generation of system-environment correlations and the flow of information between the open system and its environment.