Physikalisches Institut
Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

SONDERKOLLOQUIUM

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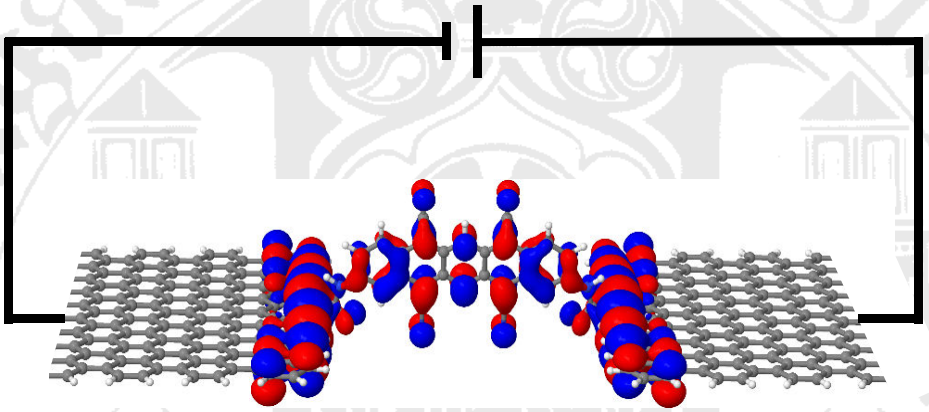
IM SEMINARRAUM GUSTAV-MIE-HAUS

QUANTUM TRANSPORT AT THE MOLECULAR SCALE



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Nonequilibrium transport processes in many-body quantum systems have been of great interest recently. A promising architecture to investigate such processes at the nanoscale is provided by molecular junctions, which consist of a single molecule bound to electrodes. Recent experimental and theoretical studies of molecular junctions have revealed a wealth of interesting transport phenomena.

In this talk, mechanisms that determine quantum transport at the molecular scale are discussed. This includes tunneling and resonant transport processes, quantum interference and decoherence, fluctuations as well as transient phenomena. Furthermore, the important role of electronic-vibrational interaction is analyzed, an aspect that distinguishes nanoscale molecular conductors from mesoscopic devices. The studies employ a combination of first-principles based models and many-body transport methods, including nonequilibrium Green's functions and the multilayer multiconfiguration time-dependent Hartree method, which allows a numerically exact treatment of the time-dependent quantum transport problem.