Brandenburgische Technische Universität Cottbus - Senftenberg

Fakultät 1
Institut für Physik

Invitation to Physics Colloquium

Lecturer:

Dr. Jörg Bünemann
TU Dortmund

Topic:

"Gutzwiller methods for correlated electron systems"

Established ab initio methods such as density functional theory generally struggle to accurately describe the electronic properties of solids when these are significantly influenced by the Coulomb interaction between electrons. In practice, this applies primarily to 3d transition metals and most of their compounds. In the theory of correlated electron systems, attempts are made to achieve an improved description using Hubbard models. The investigation of such models, except for one-dimensional systems, remains a challenging many-particle problem that can only be solve approximately. An important approximation method is based on variational wave functions introduced by Martin Gutzwiller. The lecture will first introduce these wave functions, discuss their analytical evaluation, and illustrate their superiority over effective single-particle methods using the example of ferromagnetic systems.

In order to be able to investigate not only metallic systems but also metal-insulator transitions, the variational space was recently cleverly extended by Lanatà et al. I will present this idea and some results in the second part.

The third part focuses on time-dependent Gutzwiller theory. This can be used to calculate frequency- and wavevector-dependent susceptibilities such as the magnetic susceptibility, as well as dynamics away from the ground state. I will present results for both applications in the talk.

Date: Thursday, 28.05.2026
Time: 03:30 p.m.
Location: ZHG, room SR1

Im Auftrag von Prof. Flege - Stefanie Jannasch

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