IMPRS UFAST

MAX-PLANCK-GESELLSCHAFT

IMPRS UFAST Focus Course

Diagrammatic many-body theory for light-driven materials

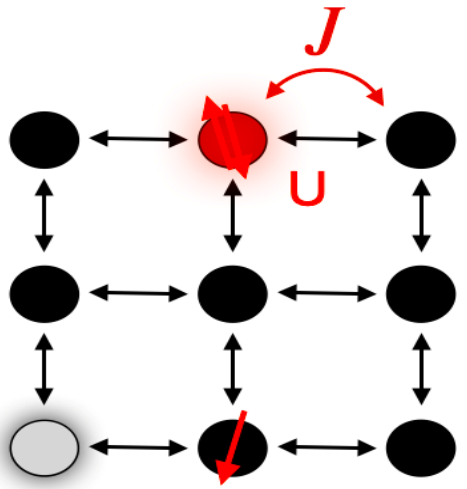
Martin Eckstein

Abstract:

Non-equilibrium Green's functions (NEGF) provide a versatile framework to describe driven quantum many-particle systems, from photo-induced phase transitions in correlated materials to dynamically stabilized states in synthetic quantum matter. The formalism provides both the basis for perturbative approaches (e.g., the GW formalism for electronic structure, time-dependent Migdal-Eliashberg theory for non-equilibrium superconductors, real-time RPA approaches to describe the charge density wave instabilities, etc.), and non-perturbative methods such as dynamical mean-field theory (DMFT), which can describe electrons in the vicinity of the Mott transition (the magic spot for emergent complex phases of matter).

Theoretical concepts:

- Brief summary of important models (Hubbard model, etc.)
- Light-matter interaction in solids
- Green's functions, spectral functions, and self-energies
- Theory for time-resolved spectroscopies (mainly trARPES)
- The Keldysh formalism
- A practitioners guide to Feynman diagrams
- Numerical treatment
- Coherent state path integrals for Fermions
- Dynamical mean field theory in and out of equilibrium



Physics examples:

- Floquet-Bloch states
- Dynamical phase transitions, non-thermal criticality
- Photo-doped Mott-insulators

Hand's on examples using NESSi

29th Nov. - 1st Dec. Seminar Room I, CFEL Foyer
6th Dec. Seminar Room IV, CFEL
7th - 8th Dec. Seminar Room V, CFEL
start: 9:30 h

Register on Geventis I-UF FC5

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