

Course announcement winter term 2012/2013

Many-body methods in solid state physics

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A system of many interacting particles can behave very differently from its constituents, “*more is different*” (Anderson). In this two-hour course the tools of quantum field theory are introduced (Green’s functions, Grassmann algebra, path integrals) and applied to explain current and illustrative problems in solid state physics (superfluids, quantum phase transitions and the BCS theory of superconductivity). The exercises show how to compute experimental observables.

Contents

- Second quantization
- Green’s functions
- BCS theory of superconductivity
- Coherent states and path integrals
- Perturbation theory and Wick’s theorem
- Self-energy and Dyson equation
- Interacting Bose gas, superfluidity and symmetry breaking
- Quantum phase transitions in the transverse Ising model

Dates/Location

Lecture Thursday 11.15–13.00h, Philosophenweg 12, kHS

Exercise Friday 09.15–11.00h, Philosophenweg 12, kHS

Prerequisites: Quantum mechanics, Statistical physics

Language: English or German, depending on the participants