

# Graduate Lectures in Theoretical Physics

## Quantum Theory of Condensed Matter

Lecturer: John Chalker

I aim to discuss a reasonably wide range of quantum-mechanical phenomena from condensed matter physics, with an emphasis mainly on physical ideas rather than mathematical formalism. The most important prerequisite is some understanding of second quantisation for fermions and bosons. There will be two problems classes in addition to the lectures.

Michaelmas Term 2013: Wednesdays at 10:00 and Fridays at 11:00 in the Fisher Room, Denys Wilkinson Building. First lecture: Wednesday 16th October.

### OUTLINE

- Overview
- Spin waves in magnetic insulators
- One-dimensional quantum magnets
- Superfluidity in a weakly interacting Bose gas
- Landau's theory of Fermi liquids
- BCS theory of superconductivity
- The Mott transition and the Hubbard model
- The Kondo effect
- Disordered conductors and Anderson localisation
- Anderson insulators
- The integer and fractional quantum Hall effects