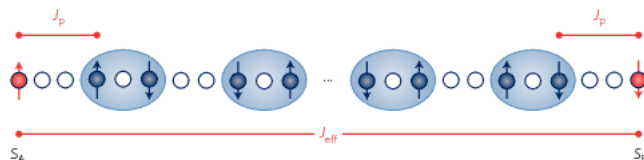
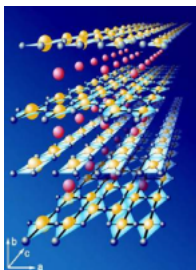


8.513: Modern quantum many-body physics for Condensed Matter Systems

2021 Fall, 2:30 PM to 4:00 PM on Tuesdays and Thursdays in 4-237, MIT



We will stress the quantum effect in solids, such as the phenomena related to topological phases of matter. We will try to cover the following topics:

- 1) Semi classical approach
- 2) Emerging dynamics of quasiparticle (beyond Newton Law).
- 3) Geometric phase, Chern number, and fiber bundle.
- 4) Quantum Hall insulator – a topological phase of matter.
- 5) Interaction bosonic superfluid.
- 6) Quantum 1D Ising model and symmetry breaking.
- 7) Critical point in 1D Ising model and its dual free fermion model.
- 8) Topological superconductors
- 9) Half-qubits – Majorana zero modes
- 10) K-theory for symmetry protected topological phases of free fermions.
- 11) Z_2 topological order for 2D interacting bosons.
- 12) Emergent fermions and string operators.
- 13) Topological order and long range entanglement.
- 14) Higher category theory for topological excitations.

There will be weekly homework, due on Thursday at lecture.
There will also be a term paper.