清华大学高等研究院

Institute for Advanced Study, Tsinghua University

物理学术报告

Physics Seminars (biweekly)

Title: **Flat bands and correlation effects**

Speaker: **Arun Paramekanti** ***(University of Toronto)***

Time: **4:00pm, Tuesday, April 24, 2018**
(3:30~4:00pm, Tea and Coffee)

Venue: **Conference Hall 322, Science Building, Tsinghua University**

Abstract

I will discuss two different settings where flat band type physics can be interesting. For bosons in flat Chern bands, it is known that tuning interactions can lead to the emergence of fractional quantum Hall liquids in the presence of correlations. As a variant of this physics, we have studied spinful fermions in the honeycomb Haldane model with Hubbard repulsion, showing that in addition to the topological AFM at moderate repulsion, there is a window of a chiral spin liquid which we find within an effective spin model. This spin liquid is equivalent to the fractional quantum Hall liquid of bosons. For this SU(2) invariant case, the spin liquid is argued to result from melting a nearby noncoplanar (tetrahedral) magnetically ordered state. We find a similar example on the triangular lattice. In a different setting, we study how correlated cuprate d-wave SCs are impacted by strain. In particular, we show that a spatially varying strain can lead to flat Landau-level type states of Dirac-Bogoliubov quasiparticles and we discuss potential experimental routes to realizing this physics in thin films or nanowires.