清华大学高等研究院

Institute for Advanced Study, Tsinghua University

学术报告

Title: **Nematic phase and dynamical Geometry in Quantum Hall family**

Speaker: **Yizhi You** (***University of Illinois at Urbana-Champaign***)

Time: **3:00pm, Thursday, June 5, 2014**

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

Abstract

We derive and study the effective field theories of isotropic-nematic quantum phase transitions of Chern insulators and FQH states, where the nematic orders modify the local geometry tensor and emerge as a dynamical frame field.

In both cases, we demonstrate that the low-energy theory of nematic order parameter has z=2 dynamics due to a Berry phase term of the nematic order, which is related with some unique geometry property in parity and TRS broken states. We present a fermionic Chern-Simons gauge theory for a FQH fluid with attractive quadrupolar interactions which trigger a transition to a nematic phase. By investigating the excitation spectrum at RPA level, we demonstrate that at the quantum phase transition the energy gap of Girvin-MacDonald-Plazman mode condenses at zero momentum.

The vortex of the nematic field contributes to the spin connection which minimal couples with the gauge field. The gravitational term of the nematicity indicates the fractional statistics nature of nematic vortex. Thus, the interplay between nematic vortex and FQH quasiparticle would give rise to new exotic phenomenon.