Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Quantum phase transitions around interacting topological insulators and topological superconductors"

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Abstract: This talk will contain two parts: In part 1, we demonstrate that an extended Hubbard model on a bilayer honeycomb lattice has two novel quantum phase transitions. The first is a quantum phase transition between the weakly interacting gapless Dirac fermion phase and a strongly interacting fully gapped and symmetric trivial phase, which cannot be described by the standard Gross-Neveu model. The second is a quantum critical point between a quantum spin Hall insulator with spin Sz conservation and the previously mentioned strongly interacting fully gapped phase. At the latter quantum critical point the single particle excitations remain gapped, while spin and charge gap both close. We argue that the first quantum phase transition is related to the Z16 classification of the topological superconductor 3He-B phase with interactions, while the second quantum phase transition is a topological phase transition described by a bosonic O(4) nonlinear sigma model field theory with a Θ-term.

In part 2, we will argue that our understanding of interacting topological superconductors can help us fully regularizing the Pati-Salam Grand Unified Theory as a 3d lattice quantum model.

12:00noon
Tuesday, October 14, 2014
Duboc Seminar Room (4-331)

Host: Liang Fu