

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Quantum spin liquids and magnetic models for the new three-dimensional honeycomb-like iridates"

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Abstract: We review the recent theoretical developments triggered by the experimental discovery of remarkable 3D polymorphs of Li_2IrO_3 , where $J=1/2$ moments form two new 3D lattices which generalize the 2D honeycomb lattice. We show how the non-coplanar and counter-rotating spiral order, which was recently observed in the materials, can arise from a simple model Hamiltonian, which is necessarily dominated by anisotropic magnetic exchange of the Kitaev type. In the theoretical limit of pure Kitaev interactions on this lattice, a 3D quantum spin liquid (QSL) phase is obtained, with emergent Majorana fermions and \mathbb{Z}_2 flux loop excitations. We also include Heisenberg exchange and numerically solve the resulting model in a fully quantum infinite-dimensional approximation, which captures both the magnetically ordered and the gapped QSL phases. Our technique enables a systematic study of the perturbations to the Kitaev Hamiltonian, as extracted from experimental measurements, and of their relative effects on the stability of the 3D QSL.

12:00noon
Friday, October 31, 2014
***Low Seminar Room (6C-333)**