Abstract for an Invited Paper
for the MAR09 Meeting of
The American Physical Society

Gapless spin liquids on the three dimensional hyper-kagome lattice of $Na_4Ir_3O_8$

YONG BAEK KIM, University of Toronto

Recent experiments indicate that $Na_4Ir_3O_8$, a material in which s=1/2 iridium local moments form a three dimensional network of corner-sharing triangles, may have a quantum spin liquid ground state with gapless spinon excitations. Using a combination of various theoretical approaches, we propose a quantum spin liquid with spinon Fermi surfaces as a favorable candidate for the ground state of the Heisenberg model on the hyper-kagome lattice of $Na_4Ir_3O_8$. We also present a theory of the bandwidth-controlled metal-insulator transition that may occur as a pressure-tuned transition in this material. We discuss our predictions in relation to the current and future experiments.