

Department of Physics and Astronomy
Condensed Matter Seminar

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The Enigmatic Dirac Quantum Spin Liquid

Quantum fluctuations can inhibit long-range ordering in frustrated magnets and potentially lead to quantum spin liquid (QSL) phases. A prime example is the gapless Dirac quantum spin liquid (DSL) with an emergent $U(1)$ gauge field, which can be described at low energies in terms of emergent quantum electrodynamics in 2+1 dimension (QED3). Despite the availability of several promising triangular lattice candidate materials and recent advances in numerical methods the description of their dynamical response is an outstanding challenge. In this talk, I will first introduce the enigmatic Dirac QSL and show how to obtain QED3 from a spin $1/2$ model on the triangular lattice. Second, I will explain our recent theory for the dynamical spin structure factor of the triangular lattice J_1 - J_2 Heisenberg model. We not only find good agreement between recent experiments and rigorous numerics but argue that our theory is a powerful tool for understanding the response of other types of QSLs and their instabilities.