

CONDENSED MATTER COLLOQUIUM SERIES

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Natalia Perkins

University of Minnesota



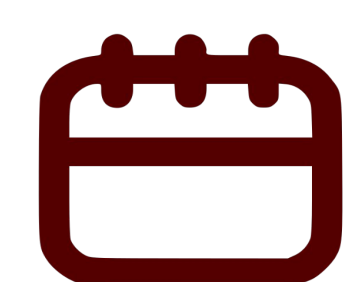
Probing Fractionalized Excitations in Kitaev Spin Liquids

Quantum spin liquids are highly entangled states of matter in which conventional magnetic order is avoided even at very low temperatures. A particularly important example is the Kitaev spin liquid, which provides a rare exactly solvable setting where interactions between localized spins give rise to emergent fractionalized excitations. At the same time, Kitaev physics is believed to be relevant to a growing family of candidate quantum materials, making it possible to search experimentally for signatures of these exotic excitations. Establishing such signatures in real materials, however, remains a major challenge.

In this colloquium, I will discuss several ways in which the fractionalized excitations of Kitaev spin liquids can be probed experimentally. I will focus in particular on lattice vibrations, which provide a natural window into the magnetic sector through spin-phonon coupling, and discuss how signatures of fractionalization can appear in phonon dynamics and Raman spectroscopy. I will also discuss local probes, including tunneling spectroscopy, and the perhaps counterintuitive role of disorder: vacancies and other defects need not simply obscure spin-liquid physics, but can generate characteristic local excitations and provide additional probes of the underlying fractionalized state.

These examples illustrate a broader theme: rather than being passive complications, lattice vibrations and disorder can provide experimentally accessible fingerprints of fractionalization and help connect idealized quantum spin-liquid models to candidate materials.

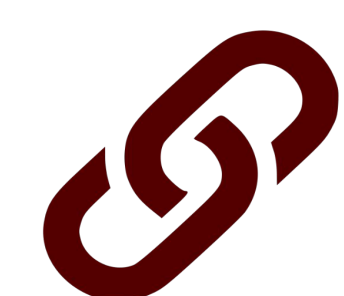
Natalia Perkins is a Professor in the School of Physics and Astronomy in the University of Minnesota. Her work is in the field of theoretical condensed matter physics, and it focuses on understanding various unconventional quantum phases in correlated materials, e.g. quantum spin liquids. Following her PhD from the Moscow State University, Prof. Perkins performed postdoctoral work at the Bogoliubov Laboratory of Theoretical Physics in Dubna, and at the Max Planck Institute for the Physics of Complex Systems in Dresden. She started as an assistant professor in the University of Wisconsin, and is part of the University of Minnesota since 2014.



*November, 10
Tuesday*



19:00, (Ankara Time)



Click [here](#) for zoom link

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