

Thursday, January 19th, 2023

Refreshments at 3:15pm in PSF 186
Colloquium from 3:30 PM – 4:30 PM in PSF 101

Disorder in the Kitaev Spin Liquid

Professor Natalia Perkins

University of Minnesota



Abstract:

Quantum spin liquid (QSL), an exotic magnetic phase with fractionalized spin excitations and intricate entanglement structure, has been pursued both theoretically and experimentally since its first proposal by Anderson in 1973. Theoretical models and candidate materials with strong geometrical or exchange frustration are expected to greatly reduce the ordering temperature and reveal the quantum fluctuations. However, the presence of residual interactions in real systems usually leads to magnetic ordering and shatters the hope for finding QSL. Nevertheless, various compounds were discovered with no magnetic ordering even down to the lowest measurable temperature, and commonly the quenched randomness was found to serve as a potential cause of the sustaining disordered phase and intriguing dynamics of low-energy degrees of freedom. Therefore, the competition between quantum fluctuations and randomness raises a critical question about the true nature of the low-energy phase in those materials.

In some Kitaev materials, the so-called second-generation Kitaev materials, the so-called second-generation Kitaev materials, experimentally observed peculiar low-energy excitations may be ascribable to spin fractionalization in weakly disordered QSL, but it may also relate to the random singlet (RS) phase in strongly disordered magnets. In my talk, I will discuss these possible scenarios by considering disorder in the exactly solvable Kitaev spin liquid.

Biography:

Natalia Perkins is a Professor in the University of Minnesota's School of Physics and Astronomy, where she studies theoretical condensed matter physics. Her research focuses on developing and analyzing microscopic models of electronic systems with strong interplay between charge, spin, and orbital degrees of freedom, and geometric frustration. In particular, she is interested in understanding various unconventional quantum phases in correlated materials. She received her Ph.D. from Moscow State University in 1997 and has been a fellow of the American Physical Society since 2016.

Host: Prof. Onur Erten

View our Spring 2023 Physics Colloquium schedule at <https://physics.asu.edu/colloquia>