Condensed Matter Physics Seminar Series

Novel phases and dynamics of highly frustrated quantum magnets

Hitesh Changlani

Florida State University and National High Magnetic Field Laboratory

We know from everyday life that a collection of atoms organizes itself into a solid, liquid, or gas, depending on the external conditions. But how do many interacting electrons collectively behave? This question has traditionally been formidable for systems where the correlations between electrons are strong - which is the case for quantum magnets with frustration. While “valence bond solids” and “quantum spin liquids” have been predicted to exist in idealized model Hamiltonians, I will discuss our theoretical and numerical work hunting for these phases in highly frustrated pyrochlore materials ($NaCaNi_2F_7$, $Ce_2Zr_2O_7$, and $Yb_2Ti_2O_7$). These compounds have been recently synthesized and analyzed using thermodynamic measurements and inelastic neutron scattering. The second part of the talk, inspired by questions that arise from the first one, is based on our contributions to the exciting developments in the study of nonequilibrium dynamics of quantum magnetic systems. I will highlight our proposal for a simple model of frustration that offers a way to understand glassiness (in the absence of disorder), a variant of which has been recently realized and studied experimentally in an artificial atom setup. I conclude by discussing avenues for future research on equilibrium and nonequilibrium dynamical phenomena.

Hitesh Changlani is an Assistant Professor at Florida State University. He received his Ph.D. in physics from Cornell University in 2013. He was a Postdoctoral Fellow at Institute for Quantum Matter, Johns Hopkins University from 2016 to 2018 and a Postdoctoral Fellow at Institute for Condensed Matter Theory, University of Illinois at Urbana-Champaign from 2013 to 2016. He joined the faculty at Florida State University in 2018. His research interests include the study of quantum systems of many strongly interacting particles (such as bosons, fermions, and spins). Several physical phenomena at low temperatures arise out of the intricate interplay of quantum mechanics and strong correlations.

Friday, June 2nd at 1:00 PM

Zoom: https://ucla.zoom.us/j/92576210045 and 4-330 PAB