

Electronic Materials with Frustrated Lattices

Joseph Checkelsky
Massachusetts Institute of Technology

Abstract:

Geometrically frustrated lattices give rise to electronic correlation that results in complex magnetic orderings, quantum spin liquid ground states, and other emergent phases. While such systems are typically electronic insulators constructed from low connectivity lattices, recently a variety of frustration-related effects have been explored in systems that have itinerant electrons. Examples include lattice model realizations of the fractional quantum Hall effect and superconductors with exotic pairing symmetries. Here I will present our experiments using itinerant electrons to probe the behavior of kagome, triangular, and related frustrated lattice systems. Electronic transport is found to be a complementary probe to magnetic and scattering experiments. The Hall effect in particular acts as an incisive diagnostic for complex magnetic orderings. I will discuss the prospects for future experiments that build on these findings to realize model frustrated systems.