KN01 | Ground State Selection In Quantum Pyrochlore Magnets

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The pyrochlore lattice, a network of corner-sharing tetrahedra, is one of the most pervasive crystalline architectures in nature that supports geometrical frustration. We and others have been interested in a family of rare earth pyrochlore magnets, that can display quantum S=1/2 magnetism on such a lattice. The ground states for some of these materials may be disordered, as occurs for "spin ice", a version of this phenomena with the same frustration and degeneracy as solid ice, as well as by a quantum version of this model known as "quantum spin ice" that possesses an emergent quantum electrodynamics. Non-colinear antiferromagnetic ground states are also expressed in rare earth pyrochlore magnets, and I will describe how this comes about and these ground states can be understood, with an emphasis on modern neutron scattering. I'll also discuss a generalized phase diagram for the ground states of these materials, with emphasis on the $Yb_2Ti_2O_7$, $Er_2Ti_2O_7$, and $Er_2Pt_2O_7$, and comment on how fragile some of these quantum ground states seem to be with respect to weak quenched disorder, which is hard to avoid in real materials.