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From Quantum Spin Ice to Ordered Spin Ice in the Pyrochlore Tb2Ge2O7

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The rare earth pyrochlores family of materials that are renowned for the diversity and novelty of their magnetic ground states. However, despite more than 20 years of effort, a consensus on the nature of the magnetic ground states of the terbium pyrochlores has remained elusive. Indeed, there are numerous confounding factors that come into play in these materials, including: a low-lying crystal electric field level, multipolar interactions, and magnetoelastic coupling. In my talk, I will introduce one member of this family, Tb2Ge2O7, and elucidate its phase behavior using heat capacity and neutron scattering measurements. We find that the magnetic state of Tb2Ge2O7 evolves through a complex series of transitions, starting from a correlated paramagnet, passing through a short-range ordered state that I will discuss in the context of quantum spin ice, and culminating in a fully long-range ordered spin ice state.

Author: HALLAS, Alannah (Department of Physics and Astronomy and SBQMI, University of British Columbia)

Presenter: HALLAS, Alannah (Department of Physics and Astronomy and SBQMI, University of British Columbia)

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