Quantum Spin Liquids In Quantum Spin ices

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A flurry of recent theory and experiments has highlighted exotic physics in the spin ice materials, $Ho_2Ti_2O_7$ and $Dy_2Ti_2O_7$, which comprise classical Ising spins on a pyrochlore lattice. There are a few related materials in which quantum fluctuations of spins are significant on the same lattice. I will discuss a general microscopic model for these materials, and specifically the case of $Yb_2Ti_2O_7$, where experiments have revealed a puzzling low temperature state in low field, and present a case that this indeed is an example of quantum spin ice. The ground state of this material may well be a quantum spin liquid, with even more exotic physics than in the classical spin ices. I will describe this quantum spin liquid state, its properties, and how this proposal may be further pursued.

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