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Title: **Terbium-based Magnetic Pyrochlore Oxides as Emergent Quantum Spin Ices**

In the $Ho_2Ti_2O_7$ and $Dy_2Ti_2O_7$ magnetic pyrochlore oxides, the Ho and Dy Ising magnetic moments interact via geometrically frustrated effective ferromagnetic coupling. These systems possess a zero temperature entropy related to the extensive entropy of ice water -- hence the name spin ice. The classical ground states of spin ice obey a constraint on each individual tetrahedron of interacting spins -- the so-called "ice rules". At large distance, the ice-rules can be described by an effective divergent-free field and, therefore, by an emergent classical (electrostatic) gauge theory. In contrast, while it would appear at first sight to relate to the spin ices, the $Tb_2Ti_2O_7$ material displays properties that much differ from those of spin ices, and the spin liquid behaviour of that system has largely remained unexplained since it was first discovered over ten years ago. In this talk, I will review the key features of the $(Ho,Dy)_2Ti_2O_7$ spin ice materials and the recent experimental results that support the emergent gauge theory description of spin ices. I will then review the highly paradoxical $Tb_2Ti_2O_7$ spin liquid material and comment on the long-range ferromagnetic spin ice order observed in the closely related $Tb_2Sn_2O_7$ compound. I will discuss how Terbium-based magnetic pyrochlore oxides, such as $Tb_2Ti_2O_7$ and $Tb_2Sn_2O_7$, can be viewed as soft (or quantum) spin ices whose softness/quantum nature arise from virtual crystal field fluctuations and many-body effects. This is of interest since the Terbium pyrochlores may then be viewed as real materials that are in the vicinity of the deconfined phase of a quantum (electrodynamics) variant of the gauge theory describing classical spin ices. Finally, if time permits, I will discuss how the underlying low-temperature "quantum melted" spin ice nature of $Tb_2Ti_2O_7$ could be explored experimentally.