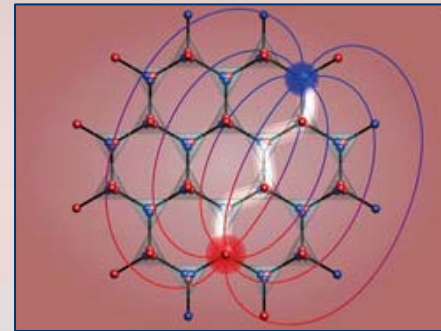


# CU Physics Department Colloquium

Monday, May 2, 2011 4:10 PM 329 Pupin Hall

## Magnetic Monopoles in Spin Ice

Fractionalisation is a counterintuitive phenomenon, in which an 'elementary' particle appears to break into two independent entities. A celebrated example of this is spin-charge separation, in which an electron's magnetic (spin) and electric (charge) degrees of freedom appear to become independent. Spin ice materials such as  $\text{Dy}_2\text{Ti}_2\text{O}_7$  and  $\text{Ho}_2\text{Ti}_2\text{O}_7$  provide a rare instance of fractionalisation in three dimensions: their elementary excitations carry a fraction of the magnetic moment of the microscopic spin degrees of freedom, and they can be thought of as magnetic monopoles. The peculiar nature of these excitations leads to unique signatures in the properties of spin ice materials in and out of equilibrium. These include unusual neutron scattering structure factors, dynamical arrest and long lived non-equilibrium metastable states, as well as a response to external magnetic fields that promotes spin ice as a magnetic analogue of an electrolyte. This talk reviews several of these striking phenomena, and discusses open questions and future perspectives.



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