Triangular lattice networks of J_{eff}=1/2 moments as hosts of quantum disorder

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Magnetic states defined by nonlocal order parameters, long-range entanglement, and dominant quantum fluctuations are predicted to arise in a number of frustrated networks of moments in extended solids. One of the first networks proposed to host quantum disordered (or quantum spin liquid) states is the triangular lattice with dominant, frustrated nearest-neighbor antiferromagnetic interactions. However, due to the realities of chemical disorder, lattice imperfections, and competing energy scales, realizations of spin liquid states in real triangular lattice materials has been a historical challenge. Recently, however, there has been a resurgence in the field through a number of intrinsically quantum disordered ground states identified in compounds whose triangular lattice networks are populated with spin-orbit entangled (J_{eff}=1/2 or S_{eff}=1/2) magnetic moments. In this talk, I will present some of our recent work in this field exploring quantum disorder within the magnetism of triangular lattice delafossite-like compounds of the form AMO_2 (A=alkali ion, M=metal ion). When the M-site is chosen to host a spin-orbit entangled wavefunction with J_{eff}=1/2 or S_{eff}=1/2, highly unusual magnetic ground states arise that lack long-range order and static moment freezing. I will present an overview of several compounds that host this behavior and motivate future exploration of these materials platforms as hosts of spin liquid behavior.

Bio

Stephen Wilson serves as a Professor of Materials at the University of California Santa Barbara where he also co-directs the National Science Foundation's Quantum Foundry. His research group focuses on the synthesis and characterization of new quantum materials with particular emphasis on quantum magnets, unconventional superconductors, and correlated metals. He received his Ph.D. in Physics from the University of Tennessee, Knoxville before joining Lawrence Berkeley National Laboratory as a postdoctoral fellow.