

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

“Quantum loop states in spin-orbital models on the honeycomb and hyperhoneycomb lattices”

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Abstract: We construct physically realistic and analytically tractable models for spin-1 systems with orbital degeneracy on the honeycomb and hyperhoneycomb lattices, relevant to 2D and 3D honeycomb materials with large Hund’s and weak spin-orbit couplings, and two electrons in t_{2g} orbitals. The 2D model realizes many new phases whose building blocks are orbital loops decorated by Haldane chains. These include a Haldane loop crystal, a symmetry-protected topological phase, and, notably, a regime where the decorated loops resonate. When taken to the three-dimensional hyperhoneycomb lattice, the latter regime becomes a (symmetry-enriched) $U(1)$ quantum spin-orbital liquid, “disordered” both in the spin and orbital channels. We hope this construction will pave the way for realizing many of the Haldane-chain-based phases which have been theoretically proposed in the literature.

12:30pm
Tuesday, January 19, 2016
Duboc Seminar Room (4-331)