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Spin liquid on the stuffed honeycomb lattice

Spin liquids are the simplest strongly correlated phases, and provide an important test ground for theoretical techniques. However, these are rare both in experiment and in realistic models; as such it is important to expand their phase space. In this talk, I will introduce the stuffed honeycomb lattice (a honeycomb lattice with a superimposed triangular lattice formed by sites at the center of each hexagon) that interpolates between the honeycomb, triangular and dice lattices, and show that the spin liquid previously found in the triangular lattice limit extends to occupy a large region of phase space. I will present both the classical and quantum phase diagrams, which reveal a novel classical multi-critical point that gives rise to a large spin liquid region, as seen in exact diagonalization results. The spin liquid on the triangular lattice appears to be gapless, which is not well understood based on triangular lattice physics alone. Projective symmetry group analysis combined with variational Monte Carlo simulations suggest that the region could be a novel Dirac spin liquid protected by the reduced stuffed honeycomb lattice symmetries. Finally, I will discuss potential materials realizations.