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**Simulations of Quantum Spin Models on 2D Frustrated Lattices**
ROGER MELKO, Oak Ridge National Laboratory — Algorithmic advances in quantum Monte Carlo techniques have opened up the possibility of studying models in the general class of the S=1/2 XXZ model (equivalent to hard-core bosons) on frustrated lattices. With an antiferromagnetic diagonal interaction (Jz), these models can be solved exactly with QMC, albeit with some effort required to retain ergodicity in the near-degenerate manifold of states that exists for large Jz. The application of the quantum (ferromagnetic off-diagonal) interaction to this classically degenerate manifold produces a variety of intriguing physics, including an order-by-disorder supersolid phase, novel insulating states, and possible exotic quantum critical phenomena. We discuss numerical results for the triangular and kagome lattices with nearest and next-nearest neighbor exchange interactions, and focus on the relevance of the simulations to related areas of physics, such as experiments of cold trapped atomic gasses and the recent theory of deconfined quantum criticality.

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