Quantum spin liquid from electron-phonon coupling

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Quantum spin liquids (QSLs) are exotic Mott insulating phases characterized by fractionalized excitations. Conventionally, QSLs are understood to arise from strong repulsive electronic interactions. This talk introduces a new theoretical paradigm: QSLs driven by electron-phonon coupling. We demonstrate this mechanism in two realistic microscopic models via sign-problem-free quantum Monte Carlo simulations. The first is a triangular-lattice Su-Schrieffer-Heeger (SSH) electron-phonon coupling model, and the second is the SU(N) SSH electron-phonon coupling model in the anti-adiabatic limit. This work opens new avenues for discovering QSLs in materials and, potentially, for achieving high-Tc superconductivity by lightly doping them.