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Title: Chiral electron crystal phases induced by Berry curvature

Abstract: An electron system at low density has an instability toward spontaneous crystallization, called "Wigner crystallization", due to the Coulomb interaction between electrons. Here we show that in systems with nontrivial Berry curvature, the spin and orbital properties of this crystal can be strongly modified relative to the conventional expectation. Specifically, we show that Berry curvature can lead to a new kind of crystal state in which the electrons acquire a spontaneous orbital angular momentum. We then derive the general effective Hamiltonian that governs the ordering of the physical electron spin. We show that this Hamiltonian includes a chiral term that can drive the system into chiral spin-density wave or spin liquid phases. The phenomena we discuss are particularly relevant for the valley-polarized electron states observed in multilayer graphene