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Interaction-driven ground states in strained graphene from functional renormalization MICHAEL SCHERER, Univ Heidelberg, Heidelberg, DAVID SANCHEZ DE LA PENA, JULIAN LICHTENSTEIN, CARSTEN HONERKAMP, RWTH Aachen — We study the interaction-driven instabilities of electrons on the half-filled honeycomb lattice as a model for graphene employing realistic tight-binding and Coulomb interaction parameters. To this end, we employ an implementation of functional renormalization group equations allowing for a high-definition resolution of the interaction vertex' wavevector dependence. We connect to previous lattice quantum Monte Carlo (QMC) results which predict a stabilization of the semimetallic phase for ab initio interaction parameters and confirm that the application of a finite biaxial strain can induce a quantum phase transition towards an ordered ground state. In contrast to QMC simulations which have to avoid the occurrence of a sign problem, our approach is not limited in the choice of tight-binding and interaction parameters. Here, we investigate a range of parameters which are not accessible by QMC, e.g., by take into account an extended tight-binding Hamiltonian for a more accurate description of the band structure of graphene's p_z electrons. Besides the antiferromagnetic ground state, we find other instabilities to become leading, e.g. an incommensurate charge density wave phase and a novel extended s-wave pairing state.

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