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Chiral Symmetry Breaking and Effective Interactions in Nodal Fermion Systems WILLIAM SHIVELY, DMITRI KHVESHCHENKO, University of North Carolina at Chapel Hill — In strongly correlated electron systems such as graphene, low-energy quasiparticle excitations behave as Dirac (pseudo-relativistic) particles with two effective fermion “flavors” and with the speed of light replaced by the Fermi velocity. Recent results have revealed that such kinematics may have significant repercussions in a variety of many-body phenomena, such as in recent observations of the quantum Hall effect. Such condensed matter systems also provide formal analogues for a variety of phenomena in particle physics. We discuss excitonic pairing in nodal fermion systems and associated quantum phase transitions, and what these results might reveal about chiral symmetry breaking, Higgs-Yukawa interactions, and (2+1)-D QED.

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