

## MASSIVE DIRAC FERMIONS IN GRAPHENE

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Recent advances in microfabrication of graphene have made it possible to test the low-energy quasiparticle excitations in this system which can be described as Dirac fermions carrying an additional orbital ("valley") quantum number, besides the physical spin  $1/2$ . In this work, we focus on the effects of strong Coulomb correlations and disorder, drawing some insightful parallels with the phenomena of chiral symmetry breaking and magnetic catalysis in relativistically invariant 2+1-dimensional fermion theories. We make a number of specific experimental predictions and compare them with the available results of tunneling, photoemission, and magnetization measurements, as well as Monte Carlo simulations.