

Interactions and "Higgs" Phase Transitions on Graphene's Honeycomb Lattice

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Abstract. Due to the Dirac nature of its low-energy excitations, two-dimensional graphite, or graphene, has recently emerged as a desktop laboratory for fundamental physics. I will discuss the emergent 'chiral' symmetries of graphene's electronic spectrum, and the pattern of its eventual breakdown at strong Coulomb repulsion. Although the electron interaction is probably not strong enough to turn the usual semi-metallic state of graphene into an insulator, it will be argued that even an infinitesimal interaction will suffice to do so in an external magnetic field. Recent Hall effect experiments at fields up to 45 Tesla will be interpreted as a manifestation of this magnetically induced transition, and a global phase diagram of graphene will be introduced.