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Is Graphene a Fermi Liquid?[1] WANG-KONG TSE, SANKAR DAS SARMA, EUYHEON HWANG, University of Maryland — In this talk, we answer the question posed in the title above by considering theoretically the electron-electron interaction induced many-body effects in undoped ('intrinsic') and doped ('extrinsic') 2D graphene layers. We find that (1) intrinsic graphene is a *marginal* Fermi liquid with the imaginary part of the self-energy, $\mathrm{Im}\Sigma(\omega)$, going as linear in energy ω for small ω, implying that the quasiparticle spectral weight vanishes at the Dirac point as $(\ln\omega)^{-1}$; and, (2) extrinsic graphene is a well-defined Fermi liquid with $\mathrm{Im}\Sigma(\omega) \sim \omega^2 \ln\omega$ near the Fermi surface similar to 2D carrier systems with parabolic energy dispersion. We provide analytical and numerical results for quasiparticle renormalization in graphene, concluding that all experimental graphene systems are ordinary 2D Fermi liquids since any doping automatically induces generic Fermi liquid behavior.

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