Electronic structure and transport in graphene

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The electronic and transport properties of graphene are not fully understood. We analyze mechanisms which can lead to the observed dependence of the conductivity on the number of carriers and on temperature in bulk samples. Quantum interference effects in graphene are modified by the presence of fictitious gauge fields, associated to the Dirac equation which describes the electronic dispersion. In mesoscopic systems, electronic transport can also be modified by Coulomb blockade and by the presence of localized states.