Benjamin Fregoso

Title: “Energy relaxation in Dirac semimetals”

Abstract:

Electron-phonon interactions mediate BCS-superconducting and charge density wave instabilities in metals but at the same time, phonons are the main pathway to thermalization in electronic systems. In this talk we describe how the temperature evolves in time after a sudden excitation, i.e., laser pulse, in simple models of nodal-line semimetals, Weyl/Dirac semimetals, and graphene. These materials have zero-energy nodal points that constrain the electron-phonon dynamics in particular ways. Above the Bloch-Gruneisen temperature, we find inverse log, inverse, power law, exponential, and linear relaxation behaviors in various limits. The most common relaxation behavior is linear at low and high temperature. The effect of the nodal line is to constrains the electron momenta to be near the nodal line in scattering processes and hence the relaxation is a power law in graphene and Weyl/Dirac semimetals but exponential in nodal-line semimetals at low densities and temperatures.

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Short Bio:

Phd: Urbana-Champaign advisor Eduardo Fradkin and Gordon Baym, worked on dipolar gases and stripe physics. Postdocs: U Maryland and UC Berkeley working on nonequilibrium problems, nonlinear transport and Floquet physics. Academic position: Kent State University since 2017, working on nonlinear transport.