Hydrodynamic description of transport in strongly correlated electron systems

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In this talk I will present results for the hydrodynamic description of transport in heterostructures of strongly correlated electron systems. In particular, I will focus on discussing how decoupling of charge and heat transport near charge neutrality of non-Galilean invariant liquids leads to a number of profound anomalous thermoelectric effects. We will discuss: (i) breakdown of the Wiedemann-Franz and Mott relations in the Hall-bar devices; (ii) hydrodynamic paradoxes emerging in the Corbino geometry; (iii) origins of the Coulomb and thermal drag resistances in electronic double layers; and (iv) near-field heat transfer conductance. Practical estimates will be presented for the monolayer and bilayer graphene systems.

[1] Songci Li, Anton Andreev, Alex Levchenko,
Hydrodynamic electron transport in graphene Hall-bar devices,
[Phys. Rev. B 105, 155307 (2022)]

[2] Songci Li, Alex Levchenko, Anton Andreev,
Hydrodynamic thermoelectric transport in Corbino geometry,
[Phys. Rev. B 105, 125302 (2022)]

[3] Alex Levchenko, Songci Li, Anton Andreev,
Fluctuation-driven thermal transport in graphene double-layers at charge neutrality,
[arXiv:2206.07718]