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Energy-driven drag in Graphene JUSTIN SONG, Harvard University/MIT, LEONID LEVITOV, MIT — When solid surfaces slide against each other they experience friction which can be enhanced by inserting molasses between them or reduced by using a lubricant. In the same way, two spatially isolated conducting layers that are placed in close proximity with each other feel friction because the long-ranged Coulomb interaction allows electrons in adjacent layers to "rub shoulders at a distance." Recent measurements of Coulomb drag in Graphene by Gorbachev and co-workers from Manchester (doi:10.1038/nphys2441) have found that it is dramatically enhanced near the Dirac point, in stark contradiction with earlier theories predicting vanishing drag. We argue that a new kind of drag develops when heat transport in the two layers becomes strongly coupled due to efficient energy transfer between the layers. As a result, spatial charge inhomogeneity couples the motion of the electron liquid with heat transport through it, damping motion of electron flow in one layer by heat dissipation in the other. Interestingly, and somewhat paradoxically, this leads to strong drag without momentum transfer between layers. We predict distinct experimental signatures and discuss its magnetic field dependence.

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