Abstract for an Invited Paper
for the MAR06 Meeting of
The American Physical Society

Drag resistance of 2D electronic microemulsions[1]

STEVEN KIVELSON, Stanford University

In two dimensional electron systems with Coulomb or dipolar interactions, a direct transition, whether first or second order, from a liquid to a crystalline state is forbidden. As a result, between these phases there must be other (microemulsion) phases which can be viewed as a meso-scale mixture of the liquid and crystalline phases. We investigate the transport properties of these new electronic phases and present arguments that they are responsible for the various transport anomalies that have been seen in experiments on the strongly correlated 2DEG in high mobility semiconductor devices with low electron densities. In particular, motivated by recent experiments of Pillarisetty et al, PRL 90, 226801 (2003), we present a theory of drag in electronic double layers at low electron concentration. We show that the drag effect in such systems is anomalously large, it has unusual temperature and magnetic field dependences associated with the Pomeranchuk effect, and does not vanish at zero temperature.

[1]In collaboration with B. Spivak.