Speaker: Kyungmin Lee

Title: Pomeranchuk Instability of Composite Fermi Liquids

Abstract:

Nematicity in quantum Hall systems has been experimentally well established at excited Landau levels. The mechanism of the symmetry breaking, however, is still unknown. Pomeranchuk instability of Fermi liquid parameter $F_\ell \leq -1$ in the angular momentum $\ell = 2$ channel has been argued to be the relevant mechanism, yet there are no definitive theoretical proofs. Here we calculate, using the variational Monte Carlo technique, Fermi liquid parameters F_ℓ of the composite fermion Fermi liquid with a finite layer width. We consider F_ℓ in different Landau levels $n = 0, 1, 2$ as a function of layer width parameter η. We find that unlike the lowest Landau level, which shows no sign of Pomeranchuk instability, higher Landau levels show nematic instability below critical values of η. Furthermore, the critical value η_c is higher for the $n = 2$ Landau level, which is consistent with observation of nematic order in ambient conditions only in the $n = 2$ Landau levels. The picture emerging from our work is that approaching the true 2D limit brings half-filled higher Landau-level systems to the brink of nematic Pomeranchuk instability.