Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"A composite fermion duality for the electron exciton condensate"

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Abstract: Superfluids can be viewed as Bose-Einstein condensates of particles or as insulators of vortices. Conversely, insulators of particles can be viewed as superconductors of vortices. Over the last two decades this particle-vortex duality has been a powerful conceptual device to understand various fractionalized phases of matter. Very recently, a remarkable incarnation of these ideas has been applied to the compressible state observed in half-filled Landau levels deep in the quantum Hall regime. The basic idea is that the celebrated composite fermion is a vortex-like object with Dirac nature. Superconductors of these composite fermion vortices, therefore, correspond to insulators of physical electrons. In this talk we will discuss an extension of these ideas to quantum Hall bilayers. We will demonstrate that the experimentally realized exciton condensate at filling factor 1/2+1/2 in Gallium Arsenide bilayers has an equivalent dual description as a superconductor of composite fermions paired in a specific particle-hole invariant interlayer channel. We will discuss how various spectacular properties of exciton condensate, such as its superfluidity for layer charge imbalance and its fractionally charged vortices, find a natural description in the composite fermion perspective.

12:00pm
Tuesday, September 20, 2016
Duboc Room (4-331)

Host: Michael Pretko