

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Quantum Hall ferroelectrics and the momentum space bosonization approach to 2+1 interacting Dirac fermions"

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Abstract: In this talk, which is essentially my academic farewell from these great years at MIT, I will survey two recent pieces of my work. The first will be our recent proposal to realize a "quantum Hall ferroelectric" state: an integer quantum Hall state that spontaneously breaks inversion symmetry. I will argue for the ubiquity of these and nematic quantum Hall states in multi-valley systems whose low energy dispersions are anisotropic and discuss material platforms to realize these phases. The second will be a report on an ongoing effort to develop a bosonization approach to the problem of interacting Dirac fermions at zero chemical potential. The approach can be viewed as a minimal extension of Hartree-Fock theory dressed with a selected set quantum fluctuations that allow to map the problem into a Heisenberg model of interacting spins. I will focus on the case of Dirac fermions interacting via the long range Coulomb potential and discuss the nature of chiral symmetry breaking transition and the behavior of the optical conductivity within this framework.

12:00pm
Tuesday, May 9, 2017
Duboc Room (4-331)