

# Condensed Matter Theory Center Seminar



Friday, February 10  
11:00 am – 12:15 pm  
2205 John S. Toll Physics Building

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## “Perspectives on the Half-Filled Landau Level”

**Abstract:** There has been a flurry of recent theoretical activity related to the problem of a half-filled Landau level, based on a model of a system of Dirac fermions interacting with an emergent  $U(1)$  gauge field. This activity has produced a number of important insights into the physics of a partly filled Landau level and has shed light on the relation between this problem and several other problems in condensed matter theory. However, there has been some confusion in the community about the relation between this new approach and the earlier “HLR” picture based on non-relativistic fermions and a Chern-Simons gauge field. For many years, it has been widely believed that the HLR approach is incompatible with particle-hole symmetry, which is known to be present in a certain limit of the problem, while this symmetry is built into the Dirac formulation. However, we find that when properly evaluated, the HLR theory actually predicts an emergent particle-hole symmetry in physical properties near half filling.

**Reference:** C. Wang, N. R. Cooper, B. I. Halperin, and A. Stern, Particle-hole symmetry in the Fermion-Chern-Simons and Dirac descriptions of a half-filled Landau level, arXiv:1701.0007.

Host: Jay Sau & Dong-Ling Deng

Web: <http://www.physics.umd.edu/cmte/seminars.html>

