Condensed Matter Theory Center Informal Seminar

Tuesday, November 21
11:00 am – 12:15 pm
2205 John S. Toll Physics Building

Shubhayu Chatterjee
Harvard

"Intertwining topological order and discrete broken symmetries in the hole-doped cuprates via quantum fluctuating antiferromagnetism"

Abstract: The enigmatic pseudogap metal phase of the hole-doped cuprate superconductors has two seemingly unrelated characteristics: (i) a gap in the electronic spectrum along the axes of the square lattice Brillouin zone, and (ii) the presence of discrete broken symmetries (like rotation, inversion or time-reversal). In a normal metal with full translational symmetry, a gap in the electron spectrum in the anti-nodal region cannot be explained by such broken symmetries. We propose a resolution to this puzzle by intertwining topological order with broken symmetries in the pseudogap metal. We show that the required flavors of topological order, corresponding to precisely the broken symmetries observed in the cuprates, arise naturally in a SU(2) gauge theory of quantum fluctuations of magnetically ordered phases that lie proximate to the Néel phase. We explore how alternative descriptions of fluctuating Néel antiferromagnets, in terms of the semiclassical O(3) non-linear σ model, and the CP1 model, also naturally lead to the same phases. If time permits, we will also discuss comparisons between the gauge theory and recent numerical (DMFT and QMC) results on the two-dimensional Hubbard model.

References: arXiv: 1703.00014, arXiv: 1705.06289

Host: Jay Sau
Web: http://www.physics.umd.edu/cmtc/seminars.html