

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Loop Models, Modular Invariance, and Three Dimensional
Bosonization"

Eduardo Fradkin, University of Illinois-Urbana Champaign

Abstract: I will discuss a family of quantum loop models in 2+1 spacetime dimensions with marginally long-ranged and statistical interactions mediated by a $U(1)$ gauge field, both purely in 2+1 dimensions and on a surface in a 3+1 dimensional bulk system. In the absence of fractional spin, these theories have been shown to be self-dual under particle-vortex duality and shifts of the statistical angle of the loops by 2π , which form a subgroup of the modular group. We show that careful consideration of fractional spin in these theories completely breaks their statistical periodicity and describe how this occurs, resolving a disagreement with the conformal field theories they appear to approach at criticality. We show explicitly that incorporation of fractional spin leads to loop model dualities which parallel the recent web of 2+1 dimensional field theory dualities, providing a nontrivial check on its validity.

12:00pm noon
Tuesday, April 3, 2018
Duboc Room (4-331)