

Tuesday, March 10<sup>th</sup> @ 2pm  
Schwinger Lounge

## “Quantum Nonlinear Bosonization of Fermi surfaces”

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**Abstract:** Fermi surfaces have a number of fascinating properties, including a continuum of gapless excitations, a landscape of possible collective modes, universal super-area law entanglement, and relevant deformations that can produce non-Fermi liquid quantum critical metals. Their extreme gaplessness makes them difficult to tame with the conventional tools of QFT. Bosonization provides a potential nonperturbative approach by describing Fermi surface dynamics through a collective field living on a part of phase space. However, while such a field is sensible semiclassically, the challenge of treating it quantum mechanically has prevented bosonization from providing as powerful a tool as in one dimension. I will show that general Fermi surfaces can be exactly described by a particular large  $N$  limit of a  $U(N)_1$  WZW model, with a tower of irrelevant corrections. This matrix-valued description encodes the noncommutative nature of phase space, and its (solvable) strongly coupled dynamics resolves the naive overcounting of degrees of freedom in the collective field without the need to cut the Fermi surface into patches.