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**Talk Title:** Probing the phase of a degenerate fermi gas

**Abstract:** In this seminar, I will present new theoretical results for a Fermi gas confined in a tightly confining ring trap subjected to an artificial gauge field.

In the first part, I will discuss how the analysis of persistent currents can be used to observe the BCS-BEC crossover.

At weak attractions, on the BCS side where pairs are weakly bounded, fermions display a parity effect while increasing the interactions, on the BEC side of the crossover, we find a doubling of the periodicity of the persistent current as a function of the gauge field. All our predictions can be accessed in ultracold atoms experiments through noise interferograms.

In the second part, I study the time-dependent interference formed by releasing the ring trap. Particle phase coherence (at intermediate time), indicated by the first-order correlator, and many-body quantum coherence (at large time), indicated by the noise correlator, are displayed as distinct features of the interferogram.

The interplay between these two kinds of coherence is reflected in a specific dependence of the interference pattern on the effective magnetic field.