
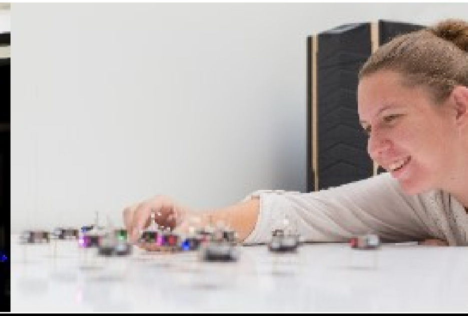


PHYSICS COLLOQUIUM:

Ultracold Strontium for Condensed-Matter Simulations and Quantum Sensing

Date: **11/15/19**

Time: **10:30 AM**

Location: **COB2 140**

Julio Barreiro

Assistant Professor, Department of Physics

University of California San Diego

For more information, contact : **Chih-Chun Chien**

ccihen5@ucmerced.edu

Abstract

Systems of ultracold particles with strong interactions and correlations lie at the heart of many areas of the physical sciences, from atomic, molecular, optical, and condensed-matter physics to quantum chemistry. In condensed matter, strong interactions determine the formation of topological phases giving materials unexpected physical properties that could revolutionize technology through robustness to noise and disorder. In this talk I will report on our work towards the realization of a fractional Chern insulator state using our experimental apparatus producing degenerate Fermi gases of strontium. Our simulation of the topological insulating state will follow an optical flux approach, which engineers the lattice in reciprocal space through polychromatic beams driving a manifold of stimulated Raman transitions, and will benefit from ultracold strontium's low temperatures and reduced heating by spontaneous emission.

On the other hand, systems of ultracold particles without interactions reveal matter-wave properties with enhanced interferometric sensitivity. I will discuss our ongoing efforts to trap ultracold strontium atoms on the evanescent fields of nanophotonic waveguides and nanotapered optical fibers. The existence of magic blue and red detuned wavelengths lead to a trapping volume that can be continuously and robustly loaded with ultracold strontium via a transparency beam. Fundamental studies of Casimir and Casimir-Polder physics as well as several applications, such as field sensors and matter-wave interferometers, will be possible with these platforms.