

Physics Colloquium

Prof. Colin Parker

“Spin Susceptibility Above the Superfluid Onset in Ultracold Fermi Gases”

Ultracold atomic Fermi gases have emerged as powerful tools for the detailed study and emulation of many-body quantum systems, particularly those arising in complex materials. A particular strength of this technique is the simplicity and tunability of the inter-particle interactions. Many creative techniques now exist in the ultracold atom community to expand the repertoire of many-body Hamiltonians capable of being emulated. I will discuss some of the techniques we are developing at Georgia Tech, the first of which is a novel method to determine spin susceptibility across the interaction strength-temperature phase diagram using a radiofrequency “dressing” on ultracold 6Li gases. An attractive interaction between fermions is expected to reduce the susceptibility, and this property is an important point of comparison to assess the extent to which cold gases with contact interactions are a generalizable model for strongly interacting fermions. We observe this reduction in susceptibility, and I will argue that its persistence to high temperatures permits a phenomenological mean-field description, in contrast to some theoretical predictions and to measurements in one suggested material analog, the “pseudogap” phase of high-T_c cuprates. I will also discuss techniques that are under development for creating “designer” Fermi systems with unusual Fermi surface shape, and for developing impurity models using lithium and cesium mixtures.

Dr. Parker received his B.S. in physics in 2006 from Harvey Mudd College, and his Ph. D. in physics from Princeton University in 2011 under the guidance of Dr. Ali Yazdani, studying the high-T_c cuprate superconductors using scanning tunneling microscopy. Following this he branched into the area of ultracold atomic physics as a Kadanoff-Rice postdoctoral fellow at the University of Chicago under the guidance of Dr. Cheng Chin. In 2016 Dr. Parker joined the faculty at the Georgia Institute of Technology in Atlanta, GA, where he leads a dynamic research group that investigates quantum phenomena at the interface of atomic, optical, and, condensed matter physics.

Thursday February 18th at 4:25 via Zoom

If you are outside the Lehigh Physics Department, please email Marina Long (mal516@lehigh.edu) for a link.