



PHYSICS AND ASTRONOMY SEMINAR

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“Quantum Simulation with Ultracold Atoms in Optical Lattices: The Good, the Bad, and the Ugly”

Abstract

“Progress in cooling neutral atoms to quantum degeneracy has enabled the precise construction and manipulation of large multi-particle quantum states. Lasers defining optical lattices constrain the atoms so that their motion is very accurately captured by Hubbard models. As a result, these experiments are being used to effectively simulate poorly understood strongly correlated states of quantum matter. I will review experimental setups and some of the intriguing states the community hopes to simulate. I will also review recent experimental progress in realizing certain states, e.g., Mott insulators, and probes to access these states, e.g., measures of compressibility. Work in my group uses numerical modeling to help guide experiments in searches for many-body quantum states. We find that while some of these experiments do find evidence of Mott insulators, other more non-trivial states are difficult to unambiguously identify. I will discuss attempts to use artificial disorder to probe exciting but poorly understood regimes: many-body localization and the Bose glass. We find that heating and restrictions on measurements are still limiting factors in identifying these regimes. Our studies shed light on routes forward to establishing a more pristine environment for quantum simulation with ultracold atoms.”

Wednesday, July 3, 2019

2:00 p.m.

Elliott Building – Room 060