

MAR14-2013-020400

Abstract for an Invited Paper
for the MAR14 Meeting of
the American Physical Society

New Frontiers for Quantum Simulation in Optical Lattices¹

DAVID WELD, Univ of California - Santa Barbara

Quantum simulation experiments exploit an analogy between some interesting (generally solid-state) system and some well-controlled quantum mechanical ensemble, typically consisting of atoms, ions, or photons. This analogy is a two-way street, enabling insights into the behavior of strongly correlated electrons but also enabling the application of powerful condensed-matter experimental techniques such as adiabatic demagnetization or dilution refrigeration to ultracold gases. I will discuss some prospects and challenges for quantum simulation experiments with neutral atoms in optical lattices. Initial directions in this field included the study of metal-insulator transitions and magnetic systems. Emerging possibilities include experiments relevant to topologically nontrivial materials, quasicrystals, impurities, and nonequilibrium phenomena.

¹We gratefully acknowledge support from the Air Force Office of Scientific Research and the Alfred P. Sloan Foundation.