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New Frontiers of Quantum Simulations with Atoms and Ions

Department of Physics Colloquium



WISCONSIN

Recently, the condensed matter and atomic physics communities have mutually benefited from synergies emerging from the quantum simulation of strongly correlated systems using atomic setups. In the first part of the talk we give an overview of analog and digital quantum simulation with cold atoms in optical lattices and trapped ions. In the second part we discuss possible future directions: while there is presently significant interest in artificial gauge fields mimicking magnetic fields in (neutral) atom setups to observe phenomena like fractional quantum Hall physics, we will discuss prospects of realizing simple models of dynamical gauge fields (lattice gauge theories) as a next generation of possible cold atom experiments, where the (very long term) vision is to perform quantum simulation of lattice gauge theories of QED and QCD.