



Physics Colloquium

Thursday, 5 December 2019 | 17:00 – 18:00, Seminar Room, 3rd floor

Quantum simulation with ultracold matter

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ABSTRACT

In this talk, I will be discussing how quantum simulation of paradigmatic Hamiltonians from condensed matter physics can be achieved with neutral atoms and how quantum matter can be an ideal platform for precision measurements.

In the first part of my talk, I will be introducing the Bose-Hubbard model for ultracold atoms and how it has been utilized to realize experimentally in an atomic system of bosons the Hofstadter-Harper Hamiltonian.

In the second part, I will be presenting our work with Bose-Einstein condensates and degenerate Fermi gases of strontium with the immediate goal to perform quantum simulation of strong magnetic fields, and the prospect to realize a quantum gas microscope, that can detect single-atoms, with sub-micrometer resolution. Laser spectroscopy of a Fermi gas of strontium has revealed an ultranarrow optical transition that can be used for ultrasensitive magnetometry.

I will be briefly touching on some of our earlier work on optical Airy beams.