



Prof. Murray Holland

JILA University of Colorado Boulder, USA

“Extreme sensing, clocks, and squeezing atoms and molecules with light”

**Thursday, November 28th, 2019, 4:15 p.m.
Building C6 4, Lecture Hall II**

I will describe recent ideas from JILA for lowering the temperature of systems of ultracold atoms and molecules into the extreme quantum regime, for using interactions to entangle atoms and molecules in non-classical quantum states, and for using these non-classical states to realize quantum advantages for metrology, clocks, and matter-wave interferometry. One such topic is a new experimentally demonstrated idea for laser cooling by Sawtooth Wave Adiabatic Passage (SWAP). This is mostly relevant to atoms and molecules that possess narrow linewidth transitions, such as the ultranarrow clock transitions, and promises to be an important extension to the toolbox of AMO physics for laser cooling and trapping. We are exploring ways to use optical cavities and direct dipole-dipole interactions to entangle atoms so that we may improve clock performance, make repeated quantum measurements beyond the standard quantum limit, and continuously track squeezed quantum phases. These approaches take full advantage of the powerful combination of the extreme optical coherence that is possible using atomic clocks, with the rich possibilities offered by many-body physics that arises when the atoms interact strongly. Atomic clocks have already progressed to the point that understanding how to take advantage of quantum effects will be crucial in order to progress to the next generation.

Giovanna Morigi (57472) takes care of the guest

Interested people are cordially invited

Coffee at 4:00 p.m. in front of the Lecture Hall