

# Nuclear Seminar

**\*\*\*\*NOTE NEW DAY+TIME\*\*\*\***

October 30<sup>th</sup> @ 11:00 AM in RM 179

## *Enhanced Sensitivity to Fundamental Constants in Ultracold Atomic and Molecular Systems near Feshbach Resonances.*

Theories unifying gravity with other interactions suggest possible temporal and spatial variation of the fundamental constants of nature. We identify that scattering length can be an extremely sensitive probe to the variation of fundamental constants, in particular, the electron-to-proton mass ratio, which relates the QCD and the electro-weak energy scale. Based on single and two-channel scattering models, we show how the variation of the mass ratio propagates to the scattering length [1]. Our results suggest that variation of the mass ratio on the level of  $10^{-15}$  –  $10^{-18}$  can be detected near a narrow magnetic or an optical Feshbach resonance in an atomic clock experiment [2].

[1] Cheng Chin and V.V. Flambaum, *Phys. Rev. Lett.* 96, 230801 (2006)

[2] Cheng Chin, V.V. Flambaum, M.G. Kozlov, *New Journal of Physics* 11 055048 (2009)

**Cheng Chin**

*University of Chicago*