



# PHYSICS AND ASTRONOMY CAP LECTURE

## Dr. Beatrice Franke

TRIUMF

### **“Ultracold neutrons: from Ping Pong to the Big Bang Theory and back to the Standard Model”**

#### Abstract

The most remarkable feature of ultracold neutrons are their very low energies of the order of nano-electronvolts. Thus even a single neutron of a mass of around only  $10^{-27}$ kg is noticeably affected by Earth's gravitational potential: one can make them bounce off a specially prepared neutron mirror, and observe their ballistic trajectories. Like those of a ping pong ball bouncing off a ping pong table. This enables researchers not only to investigate gravity at a high level of precision, but also to search for smallest deviations of Newton's gravitational law. Being thus low-energetic, ultracold neutrons can also be confined in certain material bottles in order to be observed for several minutes. This facilitates the examination of some basic properties of the neutron like its beta-decay lifetime, or the search for an electric dipole moment of the neutron (in spite of not possessing a net charge, there could be some inhomogeneous charge distribution inside of the neutron). Improved knowledge of these properties helps scientists to better understand the processes during the Big Bang and the formation of our Universe. This lecture shall give an overview of the many exciting experiments one can perform with ultracold neutrons. In particular, TRIUMF's ultracold neutron program will be introduced, showing how Canadian researchers can contribute to verifying, testing, and questioning the Standard Model of Particle Physics in this unique field.

Wednesday, January 25, 2017

3:00 p.m.

Elliott Building

Room 167