

**Deep Underground Measurements in Fundamental Physics and Astrophysics**

**Professor Art McDonald**
Queen’s University, Kingston, Ontario, Canada

**December 4, 2019**
4:00 p.m.

By going deep underground and creating ultra-clean detectors it is possible to address some very fundamental questions about our Universe: How does the Sun burn? What are the detailed properties of neutrinos and of the dark matter particles that make up 26% of our Universe and influence how it evolves? With the Sudbury Neutrino Observatory (SNO) we went 2 km underground to observe new properties of neutrinos that are beyond the Standard Model of Elementary Particles and also confirmed that the models of how the Sun burns are very accurate. With SNO+, we are now seeking new properties of neutrinos through measurement of the neutrino-less double beta decay of 130Te. The Global Argon Dark Matter Collaboration is pursuing measurements at the SNOLAB (Canada) and Gran Sasso (Italy) underground laboratories with the DEAP-3600, DarkSide-20k and Argo experiments, using liquid argon as a target for interactions by Weakly Interacting Massive Particles (WIMPs). By these measurements, we hope to push the sensitivity for detecting such potential Dark Matter particles by several orders of magnitude and perhaps observe a whole new type of matter.

**Ramsey Auditorium**