

# SEMINAR NOTICE

*Department of Physics and Engineering Physics*  
*University of Saskatchewan*

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**SPEAKER:** Dr. Lindsay LeBlanc, University of Alberta

**TOPIC:** *Light-Matter Interactions in Cold and Ultracold Neutral Atomic Gases: Applications to Quantum Technologies*

**DATE:** Tuesday November 28th, 2023

**TIME:** 3:30-4:30 p.m.

**PLACE:** *Physics 103*

## **Abstract:**

Neutral atomic gases provide fantastic opportunities for studying and controlling quantum phenomena, ranging from many-body physics to quantum computers. In our research, we use the well-known interactions between cold gases and electromagnetic radiation to harness various quantum degrees of freedom. Quantum memories, used for storing and manipulating photonic signals, will be a key component in quantum communications systems, especially in realizing critical quantum repeater infrastructure. Cold atoms have significant potential as high performance spin-wave quantum memories, due to the long storage times associated with low temperature and slow thermal diffusion. In our work, we demonstrate two memory protocols in ultracold (sometimes Bose-condensed) atoms, which hold the potential for high-performance light storage: the Autler-Townes splitting (ATS) and superradiant approaches. These methods provide a path towards practical implementations in both ground- and satellite-based quantum communications systems, and we are working on both increasing performance and developing practical implementations. In a other directions, our lab also uses ultracold ensembles to study unconventional quantum gates for quantum computing, and warm vapours in microwave cavities to exploit simultaneous microwave and optical transitions.