Lakehead UNIVERSITY | Department of Physics

The Department of Physics invites you to attend a thesis proposal presentation by:

AVNER FITTERMAN

entitled

Batch-mode polarizer optimization

Supervisor: Dr. Mitch Albert

ABSTRACT:

MRI is well known for several eminent advantages: it is non-invasive, no ionizing radiation is involved, and it provides relatively high spatial resolution. However, conventional MR imaging relies predominantly on the presence of bulk water protons in the region of interest, which makes it difficult to image the lungs. Moreover, the lung area is more prone to artifacts compared to other regions of the body. These issues can be resolved to some extent by using Hyperpolarized (HP) gas MRI. The gas is inhaled by the patient and serves as a dramatically increased signal source for the patient's lungs, and therefore produces a much higher signal-to-noise ratio (SNR) for MRI.

The SNR in MRI is based upon the net magnetization that is formed in the sample by the influence of a strong magnetic field (3 Tesla in our laboratory). In conventional MRI the net magnetization is based upon the thermal spin polarization of protons; in the case of HP gases, the spin polarization has been enhanced by fold using spin exchange optical pumping (SEOP). This fact enables utilization of HP gas in areas of the body where conventional MRI fails, such as the lungs. Moreover, it allows the development of techniques such as molecular imaging that may serve in disease detection.

Keeping this motivation in mind, this project aims to optimize a homemade polarizer that we have in our laboratory. Previous work of other groups on optimizing gas polarizers points out specific trends of polarization rates with respect to pressure and temperature variables. Those findings serve as points of reference for optimization process of our polarizer, but must be optimized according to the specific conditions of our experimental setup.

DATE: **MONDAY, SEPTEMBER 15, 2014**

TIME: **12:00** Noon

Room: **CB 4058**