Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **2071** Type: **Poster Competition (Undergraduate Student) / Compétition affiches (Étudiant(e) du 1er cycle)**

POS-52 Calibration of a Nonlinear Optical Polarimeter

Tuesday, 12 June 2018 18:10 (2 minutes)

Nonlinear optical microscopy is a novel technique used for imaging biological structures in tissues. The technique uses nonlinear optical processes such as second and third harmonic generation (SHG and THG, respectively), for producing image contrast. Imaging of biological tissues with SHG and THG signals has several advantages over traditional microscopy methods that rely on single-photon excitation fluorescence, including intrinsic three-dimensional imaging at submicron spatial resolution without the use of dyes. Furthermore, nonlinear microscopy techniques reduce photodamage to tissue samples since SHG and THG are parametric processes. Finally, a novel property of nonlinear microscopy is its innate ability to obtain structural information of endogenous biological structures, which is accomplished by the use of polarization resolved measurements.

Performing polarization resolved measurements in nonlinear microscopy allows the extraction of nonlinear susceptibility elements which can be analysed for structural sample analysis. These measurements are typically performed by modulating the polarisation of the incident laser, and measuring the polarization of the outgoing SHG and THG signals. Currently, polarisation nonlinear microscopy is a slow process due to the use of rotating actuators limiting dynamic information. While several groups have begun using faster polarization schemes, they do so while sacrificing polarization states.
Fast polarization modulation at different wavelengths are being investigated for nonlinear optical microscopy. Modeling of polarization modulation by liquid crystal phase retarders was implemented with Python using Jones and Mueller polarization calculus to quantify measurement states with the least error and the most information. Monte-Carlo modeling results will be presented quantifying the different polarimetry states. Additionally, experimental data of calibrating liquid crystal polarization modulators will be presented. Future implementation of this multi-spectral polarimeter with a nonlinear microscope is expected to allow structural determination in for example, live tissue, where diseased tissue can be monitored during treatment, potentially replacing current invasive and time-consuming traditional histology methods.

Primary author: Ms BUDDEN, Katherine (Saint Mary's University)

Co-authors: TOKARZ, Danielle (Saint Mary's University); Dr CISEK, Richard (Saint Mary's University); Ms JOSEPH, Ariana (Saint Mary's University)

Presenter: Ms BUDDEN, Katherine (Saint Mary's University)

Session Classification: DPMB Poster Session & Finals: Poster competition and Mingle session with Industrial partners/employers (9) | Session d'affiches DPMB et finales: Concours d'affiches et rencontres avec partenaires industriels et employeurs (9)

Track Classification: Physics in Medicine and Biology / Physique en médecine et en biologie (DPMB-DPMB)