Western University
Department of Physics and Astronomy

PHYSICS & ASTRONOMY COLLOQUIUM

Date: **Thursday, 22 April 2021**

Time: **1:30 p.m.**

via Zoom: https://westernuniversity.zoom.us/j/91758925743?pwd=L21oSmliamFFT3pka1lLaWozRmV2dz09

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"Advances in biophotonic therapies and dosimetry for the diseased and aging eye"

ABSTRACT

Vision disorders such as age-related macular degeneration affect over 240 million people world-wide. There is an urgent need to develop more effective approaches for detection of early hallmarks of retinal tissue degeneration, such as wear and tear Drusen lipoproteins and Lipofuscin pigments, as well as improve therapies to lesioned tissues with individualized treatments for patients, eventually eliminating or even reversing disease pathogenesis. Biophotonic techniques are emerging as powerful methods, offering inherent specificity and sensitivity for identification and quantification of aging biomarkers characteristics of disease progression. Advances in fast pulse lasers are in parallel giving rise to accessing control over the light-tissue interaction phototherapeutic pathways. These are providing opportunities for precise laser tissue targeting while limiting collateral damage of surrounding healthy cells. Photomechanical treatment methods, such as through vaporized photocavitation, offer a means for confined treatments by controlling rates of energy deposition achieved through pulse-modulated selective retinal therapy. However, these laser treatments still require optimization of spatial confinement of delivered laser energy, and present challenges in ascertaining correct dose measures in optically complex, multilayer tissue structures, such as the retina. Here, we will focus on a photochemical approach, photodynamic therapy (PDT), for the treatment of macular degeneration and cancer wherein we investigate a novel online dosimeter related to radical oxygen species produced in PDT. We explore how weak magnetic fields can be used in conjunction with photosensitizer fluorescence lifetime measurements for the quantification of the oxygen micro-environment during phototherapy, thereby providing real-time molecular feedback during laser treatment. Advances in our understanding of photochemistry mechanisms responsible for targeted cell death, and dynamic dosimetry measures from multiple phototherapeutic pathways will enable development of more personalized and accurate laser treatments of debilitating diseases.

Host: **Prof. T. Poepping**