Western University
Department of Physics and Astronomy

PHYSICS & ASTRONOMY COLLOQUIUM

Date: **Thursday, 8 October 2020**
Time: **1:30 p.m.**
via Zoom:

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"Nano-optics in Flatland: What a scanning near-field optical microscope may tell us about two-dimensional materials towards their applications"

ABSTRACT

Virtually any visible-light optical instrument available in every day's life utilizes "far" field radiation that propagates at large distances over the size of the generating source and is limited by diffraction in its ability to resolve any details in the sample. The term "near" field refers to optics utilizing radiation generated in the proximity of a nano-sized source, which may overcome diffraction and may thus probe light-matter interaction at the nanoscale using visible radiation. Since its inception, several activities from my research group ensued from the utilization of scanning near-field optical microscopy (SNOM) to investigate novel two-dimensional (2D) materials, including graphene, and design a variety of optoelectronic and other devices from these ostensibly flat 2D systems. Because SNOM requires the interaction of two distinct nano-sized objects—a probe in the microscope and a nanoscale feature in the sample—the use of nano-optics in such a Flatland looks like a contradiction in terms. In fact, 2D materials are never really flat, and nanoscale features at their surfaces are often the missing key towards their understanding. Here, special emphasis will be placed on advanced SNOM techniques developed in our group, for example to image near-field enhanced optical absorption in solar cells, enhanced optical emission in LEDs, or to contactlessly determine the thermal conductivity in graphene at the nanoscale using near-field photothermal effects. All these examples well represent the versatility of SNOM and its potential. Time permitting, our new ongoing instrument development efforts in cryogenic SNOM will also be briefly mentioned.

Host: **Prof. W. K. Hocking**