

## FIM-S3 SEMINAR

# Semiconductor nanowires for betavoltaics, photovoltaics and energy harvesting

**Wednesday April 28<sup>th</sup>, 2021 – 16.00**

Online streaming using Google Meet

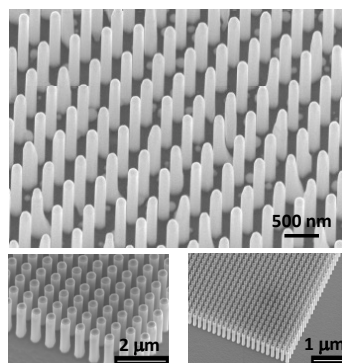
Link: <https://meet.google.com/yud-upbp-mno>

## Speaker

**Ray LA PIERRE** – McMaster University (Canada)

## Abstract

III-V compound semiconductor nanowires (NWs) are being developed for the next generation of optoelectronic devices such as photodetectors, photovoltaics, betavoltaics and thermoelectrics. The self-assisted vapor-liquid-solid method is now a well-established technique for the growth of III-V NWs on silicon substrates. In this method, an array of holes in a SiO<sub>2</sub> film is used for metal droplet formation, which seeds the growth of vertically oriented NWs within a periodic array. The free lateral surfaces of NWs allow elastic relaxation of lattice misfit strain without the generation of dislocations, permitting unique heterostructures and the direct integration of III-V materials on inexpensive silicon substrates. Furthermore, NWs permit high optical absorption due to an optical antenna effect. The optical absorption in NW arrays can exceed that due to a thin film of equivalent thickness, enabling high efficiency NW-based photovoltaic devices. Optical resonances that depend on the NW diameter allow multispectral absorption for infrared camera applications. Embedding a radioisotope in the space between nanowires enables betavoltaic devices, a type of nuclear nano-battery. Some of the challenges associated with NW materials and devices will be illustrated.



Tilted view scanning electron microscopy (SEM) images, showing examples of NWs.

In collaboration with