DEPARTMENT OF CHEMISTRY
Seminar Series

February 9, 2018 - 12:00 Noon, H313

“Fear is not always a bad thing... (Super)hydrophobic surfaces and their use in microfluidic devices”

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Abstract: Droplet based microfluidic platforms are attractive methods to move and manipulate discrete samples. The actuation of discrete droplets can be performed by generating electrostatic forces on an array of electrodes coated with an insulating dielectric i.e. electrowetting on dielectric, or alternatively through magnetic based actuation. Droplet-based systems rely on a hydrophobic (superhydrophobic) layer to minimize surface interaction/friction between the droplet and surface. As a result droplets can be made to slide across the surface with forces less than a microNewton. We examine the use of fluorinated polymer and fluorinated silica nano particle based coatings to manipulate droplets to carry out droplet actions such as dispensing, splitting, merging and mixing using gravity, magnetic and electrowetting on dielectric actuation methods. Microfabricated and 3-D printed devices are utilized to carry out several proof of principal assays. Furthermore a laser micromachining approach is used to pattern “wettability” enabling the generation of droplet arrays through discontinuous de-wetting and it is applied to fluorescent assay development.

Bio: Dr. Richard Oleschuk obtained his B.Sc.H. (1994) and Ph.D. (1998) from the Department of Chemistry at the University of Manitoba. His doctoral studies with Arthur Chow involved researching both polymer based extraction methods for metal complexes and membrane based sample preparation methods for mass spectrometry. In 1998, Richard was awarded a Natural Sciences and Engineering Research Council (NSERC) Postdoctoral Fellowship, which he tenured in D. Jed Harrison's laboratory at the University of Alberta. His postdoctoral work involved developing miniaturized analysis devices, incorporating solid phase extraction and electro-chromatography into lab-on-a-chip devices. Richard is interested in the area of microfluidics, specifically focusing on microfluidic devices constructed from different polymer materials and integrating these devices with mass spectrometry.