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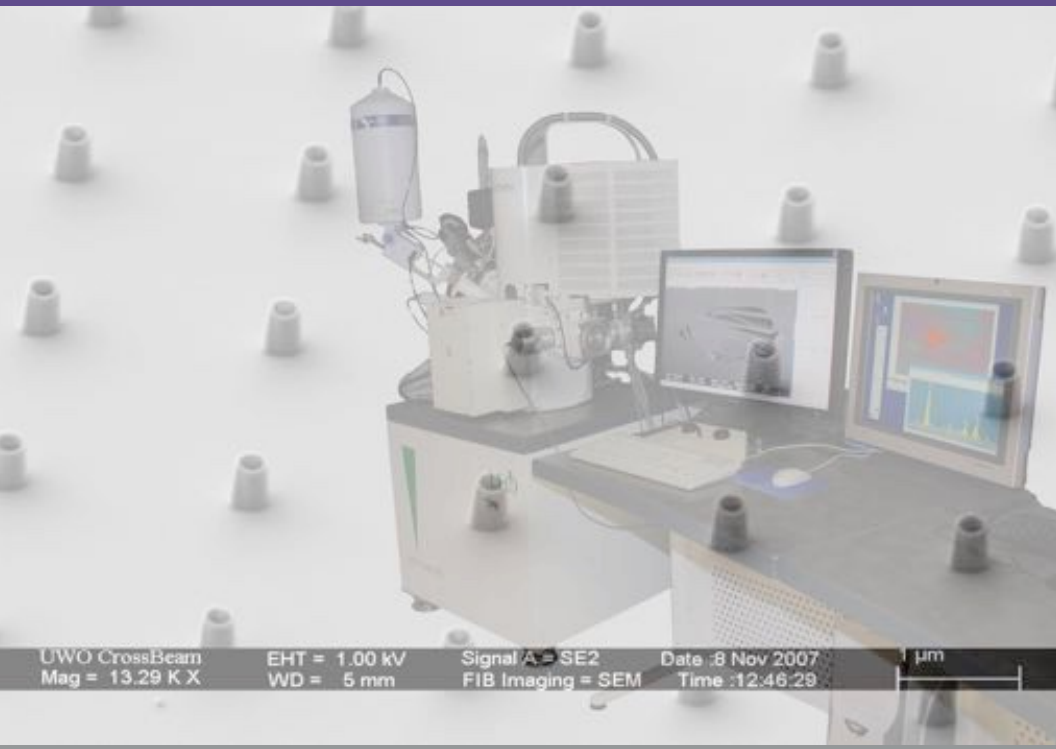

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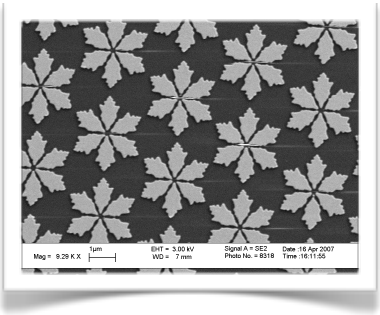
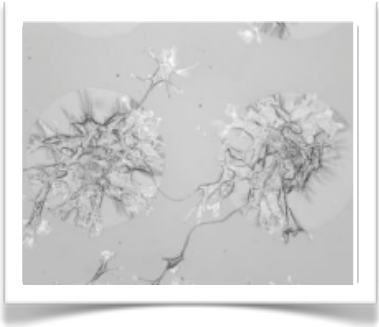
Surface Functionalization



Plasmonic device fabricated by electron beam lithography.

In Prof. François Lagugné-Labarthet's group, graduate student Betty Galarreta fabricates structures by electron beam lithography. Enhancement of the spectroscopic signal from molecules adsorbed on these functionalized surfaces is studied with the goal of improving sensitivity and of understanding the role of these nanostructures in the observed effects.

Under the supervision of Profs. Peter Norton and Nils Petersen, graduate student Jessica Dechene has used the Nanofabrication Facility to pattern the surface of a PDMS substrate to localize the growth of cells at defined locations. These substrates facilitate the study of cell-cell interactions, cell motility and cellular response to geometric perturbations.



Optical micrograph of patterned C2C12 cells on modified PDMS.

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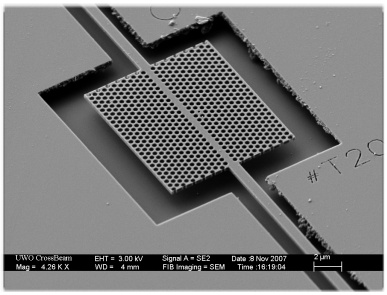
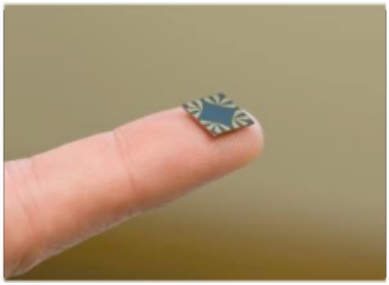
Devices and Sensors

Prof. Jayshri Sabarinathan's group fabricates photonic crystal structures for sensor applications. When pressure is exerted on the waveguide it mechanically deforms, altering the transmission characteristics. The changes in light intensity due to the relative displacement of the photonic crystal waveguide with respect to substrate can be correlated to the fluid pressure.



A photonic crystal air bridge fabricated by electron beam lithography.



A biosensor chip manufactured at the Western Nanofabrication Facility.

University of Toronto chemistry Prof. Bernie Kraatz, is developing chips that detect specific molecules such as those associated with disease or pollutants. Some applications may be worn on clothing with a readout, while others could be connected to a computer.
The device shown has 16 separate ports able to detect four different biologically active agents. The surfaces of these chips can be prepared to detect a number of biological molecules related to disease, cancer and genetic defects.

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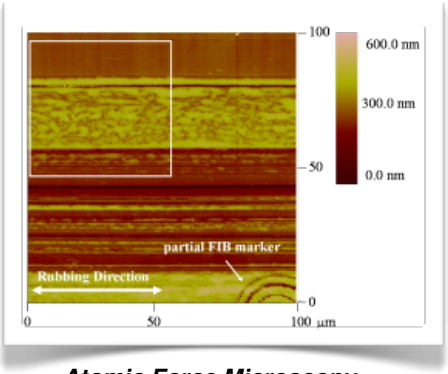
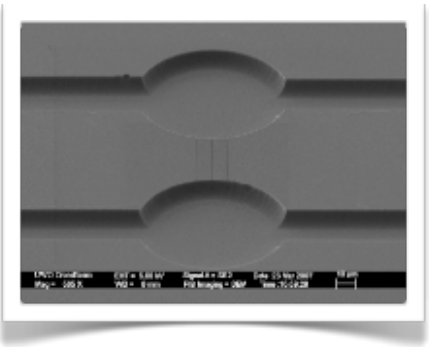
Materials and Biomaterials



Atomic Force Microscopy scan of an antiwear film.

Prof. Peter Norton's group has studied the chemistry of lubricant additives on aluminum engine alloy materials. The application of scanning electron microscopy and fiducial markings produced by focused ion beam has facilitated the analysis of site specific features by multiple techniques, including scanning probe and synchrotron-based spectroscopies.

Under the supervision of Prof. Leo Lau, graduate student Edmond Leung has fabricated microfluidic devices by photolithographic methods and incorporated nano-scale features by focused ion beam milling. The structures are used to control the formation of bacterial nanowires for the study of microbial physiology and behaviour.



SEM micrograph of a microfluidic device containing two microchambers connected by three nanochannels.

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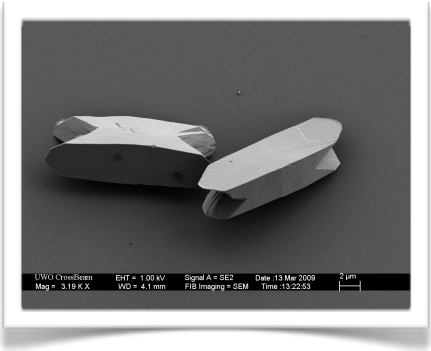
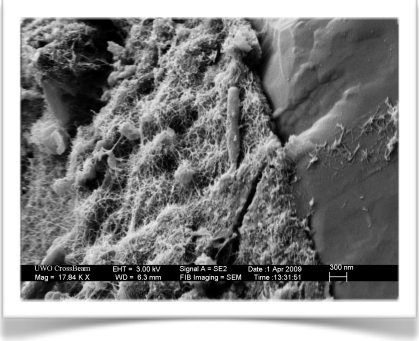
Characterization

Prof. Graeme Hunter in collaboration with Drs. Bernd Grohe, Harvey Goldberg and Mikko Karttunen have been using the Nanofab to study mineral-associated proteins that have been proposed to regulate many aspects of biomineralization. To understand how proteins achieve this level of control, they are studying the interaction between the phosphoprotein osteopontin (OPN) and the kidney stone-related biomineral calcium oxalate monohydrate (COM).



SEM image of a two calcium oxalate monohydrate crystals.



SEM image of a bacterial corrosion film growing across the pyrite.

Prof. Gordon Southam, Vale-UQ Geomicrobiology chair at The University of Queensland Australia, focuses on the vital roles that bacteria play in mineral weathering, e.g., acid mine drainage systems, in the formation of mineral signatures in soils and sediments, and the genesis of authigenic secondary minerals, e.g., placer gold. The imaging and analytical capacity offered through the Nanofabrication Facility has provided an unprecedented view of our microbial world.

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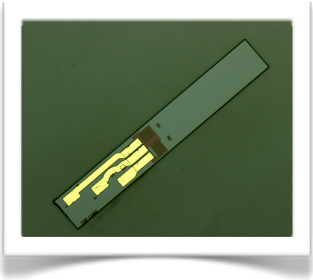
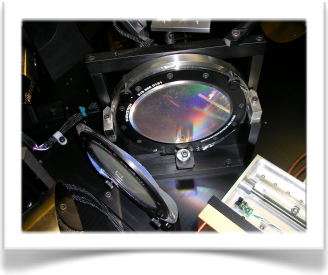
Industrial R&D

The Western Nanofabrication Facility works with industrial clients on a range of projects from characterization to process development to full-service fabrication of prototype devices. These projects are typically proprietary and we are pleased to sign non-disclosure and Intellectual Property agreements when requested.

Our analytical facilities complement those found at Surface Science Western and can be conveniently accessed by existing customers through their contacts at SSW.

Peter Plouf, the R&D Director of Scisence Inc., a leading manufacturer of micro-sensing devices, said: "Access to the UWO Nanofab and its qualified staff has opened R&D doors for Scisense that would have otherwise been closed to a company of our size; the ability to produce low volume Research & Development device runs has not only increased our rate of development, but also opened our eyes to new opportunities."





The Nanofab is working with Sciencetech Inc., a leader in optical spectroscopy instruments, to manufacture Beam Splitter Polarizers. Dr. Quaglia, the CEO of Sciencetech stated: "The surprising result was that the performance of the unit manufactured by the Nanofabrication Lab appears to outperform all the units Sciencetech had received from specialized labs in USA and Canada in the past."

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Facility Instrumentation

The Western Nanofabrication Facility is a 2300 square foot cleanroom designed to support R&D in materials synthesis, surface patterning and functionalization down to sub-micron dimensions in many different material classes. Located in the Physics and Astronomy Building at The University of Western Ontario, the Nanofab represents a multimillion dollar investment in research infrastructure unique in Ontario. It features state-of-the-art tools for specialized lithography, etch and deposition processes. These are complemented by focused ion beam machining and SEM capabilities. The laboratory is both an open user facility and service provider with two full-time specialists caring for operations, training and supervision.

Characterization

Optical microscopy with the Zeiss Axioskop.
Two Leo/Zeiss Field Emission Scanning Electron Microscopes.
Elemental X-ray analysis with the Oxford INCA on the Leo/Zeiss 1540 FIB/SEM.
TEM sample preparation by Focused Ion Beam.
Woolam VASE Ellipsometer for film thickness and optical properties.

Lithography

Electron beam lithography or optical lithography.
Photomask design.
The focused ion beam (FIB) is fitted with a sophisticated lithography system for micro-machining and prototyping applications.

Deposition and Etch

Alcatel 601E DRIE is dedicated to deep vertical etching using the Bosch process, a key technology for fabricating MEMS and microfluidic devices.
Equipment for sputtering, evaporation or chemical vapor deposition.
Fluorine based RIE system for etching oxides and nitrides.

We take your ideas and turn them into fully functioning devices.

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