Advanced Research Complex (ARC)

- $100M building dedicated to research that opened in September 2014

- Home to the NanoFab, a Core Facility managed by the Centre for Research in Photonics (CRPuO)

- ARC was constructed with research in mind:
  - **The slightest vibration can affect laser experiments**
    - Built on anti-vibration floating floors
      - Raft slabs anchored by concrete-filled steel piles driven into the bedrock
      - If the building shakes, the slab stays put
  - **No ambient light which can affect laser experiments**
    - Some labs are nestled into the slope of a hill
  - **Labs are equipped with diffusers**
    - Push the air sideways (instead of downward) to avoid disrupting sensitive lasers
  - **Air pressure**
    - Clean Rooms kept at a positive pressure
    - Air leaks out of the labs instead of unfiltered air coming in
NanoFab

- Only open facility in Ottawa with a nanoscale focus
  - Complementary to existing facilities at local universities and government labs

- Open for collaboration with academia (professors, students, PDF’s), government and industry, with open access and fee-for-service options for both internal and external users

- Staff: Director, Administrative Assistant, 3 Lab Technologists, 2 Research Assistants

- Emphasis on nano-structuring and nano-characterization:
  - Integrated optical structures
  - Lasers and biosensors
  - Waveguides
  - Metasurfaces
  - Photodetectors
  - Modulators

- NanoFab capabilities:
  - Processing of up to 4” diameter wafers & pieces
  - Electron-beam lithography
  - Focussed ion beam milling
  - Material etching
  - Material deposition
  - Back-end processing
  - Microscopy
  - Optical parameter characterisation

photonics.uOttawa.ca

 Université d’Ottawa | University of Ottawa
NanoFab Facilities

- **Clean Room** (136 m²)
  - Fabrication and characterization
  - Yellow Clean Room & White Clean Rooms (x2)
  - Class 10,000

- **Wet Chemistry lab** (43 m²)
  - Back-end processing

- **Metrology lab** (55 m²)
  - Characterization and back-end processing
NanoFab – Clean Rooms

Vestibule for gowning up

Yellow Clean Room

White Clean Room 1

White Clean Room 2
NanoFab – Yellow Clean Room

Used for fabrication and lithography work – no UV light

- Vacuum curing oven
- HMDS and image reversal oven
- Spinner & Hotplates
- Glove Box
- Ultrasonic Bath

Other Tools for Resist Processing:

Mask Aligner - OAI Model 204IR
Used for Optical Lithography
NanoFab – White Clean Room 1

Used for fabrication and characterisation

Other fabrication tools:
- SAMCO RIE-10NR Etching System (Reactive ion etching - Polymers & dielectrics)
- Oxygen Plasma Etcher
- Material Sputtering System – Quorum 150R
- Rapid Thermal Annealing System (150 to 1150 °C)

Other characterisation tools:
- Dektak Profilometer (surface roughness)
- Zeiss Axio Imager (for optical microscopy)

Raith Pioneer SEM + EBeam
Electron-beam lithography and Scanning electron microscope

SAMCO RIE-110ip Etching System
Inductively coupled plasma reactive ion etching (Si and III-V)

Angstrom Nexdep Evaporator
Evaporation and chemical vapour deposition
NanoFab – White Clean Room 2

Used for fabrication and characterisation

AFM Park NX10
Non-contact Atomic force microscopy

ORION NanoFab HIM/FIB
Focused ion beam milling & Helium ion microscopy (He / Ga columns)

Other fabrication tools:
- AML-AWB Wafer Bonder
NanoFab – Wet Chemistry Lab

Back-end processing for sample preparation

**Tools:**
- High Precision Dicing Saw
- Polishing Machine - Ultratec
- Polishing / Grinding station – Allied High Tech
- Solder Reflow Station
- Fumehood
- Electroplating System
NanoFab – Metrology Lab

Used for characterization and back-end processing

**Zeiss GeminiSEM 500**
Scanning electron microscope with Bruker EDS capabilities (Quantax)

**AFM Bruker Dimension Icon**
Atomic force microscopy for larger samples

**Other characterisation tools:**
- Metricon
  - Refractometer – measures thickness and refractive index
- Ellipsometer - Horiba UVISEL 245-2100 nm
  - For scanning spectroscopic - thin film characterization

**Other back-end processing tools:**
- West Bond Wire Bonder