**URL:** <http://www.utoledo.edu/nsm/ic/>

**Director**: Dr. Kristin Kirschbaum

Bowman-Oddy Laboratories

Mail Stop 602

419.530.7847 Office Phone

419.530.2141 Fax

[kristin.kirschbaum@utoledo.edu](mailto:kristin.kirschbaum@utoledo.edu)

**Description**

*Square Footage*: More than 6000 ft2 purpose-built instrument space containing instrument laboratories, preparation laboratories, an instrument workshop, a computer room, offices, and a conference/seminar room.

*Facility Location*: Main Campus, Bowman-Oddy Laboratories, Room 0200 - 0227

In 1985, the state of Ohio appropriated money for the creation of the Instrumentation Center at The University of Toledo. The center supports faculty research, provides access and training for graduate students in the use of advanced instrumentation, and provides a scientific support base for local industries through technical advice and sophisticated problem solving capabilities. The Center also offers outreach programs that allow cyber-access to instruments. Areas of advanced technologies include scanning electron microscopy (SEM), mass spectrometry (MS), super resolution microscopy, and crystallography.

**Major Equipment**

* **Super Resolution Microscope (STORM/FRET):** InvertedNikon Eclipse T*i*2 STORM super-resolution microscope with high power 4-line laser system. Lateral resolution ~20nm, axial resolution ~50 nm. Objectives available: 10x, 20x, 40x, 63x, 60x oil, 100x silicon. High resolution sCMOS camera with high-power 7 line LED light engine with image splitter for FRET. Live cell imaging. Tokai Hit Stage-Top incubator with temperature and flow control.

The image acquisition and data analysis are performed by NIS-Elements Software on a Z4 Biostems workstation.

* **Single Crystal Diffractometer:** 
  + Bruker APEX II with Cu Kα (ImuS) and Mo Kα (sealed tube) X-ray sources and an APEX II CCD detector enabling complete structural determination of small molecules, nanoclusters and proteins. Cu Kα radiation is available for absolute configuration for light atom structures. Protein crystal screening and for good crystals protein data collection with full refinement is possible.
  + Rigaku Rapid diffractometer with large, curved RAPID imaging plate detector. Mo and Ag rotating anode X-ray sources for high-resolution measurements and Cr rotating anode X-ray source for proteins (maximum resolution up to 1.2 Angstrom). Low   
    temperature measurements, as low as 20 K with our helium cryosystem, and in-house software for processing data which affords highly accurate intensity measurement.
* **Powder Diffractometer:** PANalyticalX’Pert Pro MPD with Cu Kα radiation. Sample stage temperature range from -150°C to 400°C. Capillary tubes can be used for air sensitive or small volume samples. Analysis programs include JADE and various versions of PANalytical X’Pert software.
* **Scanning Electron Microscope (SEM):** JEOL JSM-7500F Cold Cathode Field Emission Microscope with LABE, STEM, EBIC and EDS detectors, including computer controlled specimen holder ranging from one to 10 samples, ability to analyze large samples up to 200mm (diameter) x 10mm (height), offering magnification up to 1,000,000 times with the resolution 1 nm at low kV. SEM allows data analysis for elemental determination, quantification, sample morphology, particle dimensions using JEOL and Esprit Software. The instrument is cyber enabled for remote use.
* **Sputter Coater:** Two coating instruments are available, a gold sputter coater, Denton Vacuum Desk II, and carbon thermal evaporation machine, Emitech K950X. Thin film carbon and gold coatings are applied with controlled coating cycles prior to SEM analysis.
* **Polarized Stereoscopic Light Microscope with Image Processing:** Computer controlledOlympus SZX7 with Olympus SC100 camera, cellSens processing software offers magnification up to 560X, polarized light emitter and analyzer, image export in widely accessible formats incl. videos.
* **MALDI**: Bruker Daltonics UltrafleXtreme Matrix-Assisted Laser Desorption/Ionization tandem time-of-flight mass spectrometer enables user to detect and characterize large organic molecules, proteins, bio- and synthetic polymers. Tissue imaging experiments are possible with the PROTEINEER fc spotting robot for facile LC-MALDI and a sublimation system for deposition of matrix onto tissue. Data measurement and analysis is facilitated by Bruker Compass 1.4 software Flexanalysis with ready access to software tools including Biotools with peptide finger printing databases and protein analysis, Polytools enabling data analysis for determination of degree of polymerization, polydispersity, average molecular weight for polymer systems and Fleximaging software for imaging of biomolecules in a tissue sample.
* **Dynamic Light Scattering, Static Light Scattering and Zeta Potential:** Anton-Paar Litesizer 500 with Kalliope Software facilitates the user to analyze particle size ranging from micro to nanometer sized particles in a sample. With the principle of dynamic light scattering (DLS), electrophoretic light scattering (ELS), and static light scattering (SLS) Anton-Paar Litesizer 500 measures particle size, zeta potential and molecular weight determination, respectively.
* **Differential Scanning Calorimeter:** TA Instruments Q20 DSC with chiller for temperature scanning range of -90°C to 550°C; Tzero Cells are available for both heating and fast cooling; controlled purge gas flow rates ranging from 0-240 mL/min.
* **UV/Vis/Near-IR Spectrophotometer:** Cary 5 Double-beam Spectrophotometer with Diode Array detectors. Scanning range from 190 nm to 3200 nm. Sample holders for liquid, solid and reflectance measurements, with NIST defined mirror for reflectance calibration. Temperature controlled optical stage. The instrument control and analysis is facilitated by CaryWinUV software.
* **Thermogravimetry Analyzers (TGA):** Two TGAs are available: Q600 and SDT 2960: Both instruments allow measurement of weight change and differential heat flow of the sample simultaneously as a function of time and temperature from ambient to 1500 °C in a controlled atmosphere. Both instruments are equipped with TA Universal Analysis Software enabling the Data analysis for the experiments.
* **Combustion Analyzer:** PerkinElmer Series II 2400 CHNS/O fully automated with 60 position auto sampler that allows elemental analysis in three modes CHN, CHNS, and oxygen with EA Data Manager Software enabling determination weight fraction of carbon, nitrogen, hydrogen, sulphur or oxygen in a sample. The EA Data Manager software facilitates in collecting data, calculations, and generate report.
* **Gel and Western Blot Imager:** Azure Biosystems c500 with 8.3 MP Camera with UV 302/365 nm sources for UV fluorescence measurement, chemiluminescent detection, infrared laser excitation for NIR-IR detection (reduced background noise for sensitivity to low abundance proteins). Allows use of blue excited DNA dyes.
* **Clinical Cryostat for cryosectioning:** Leica CM1950, high performance cryostat with an encapsulated microtome and a UV disinfection system. Sectioning thickness range: 1 – 100 µm; trimming range: 10 – 600 µm; specimen cooling temperature range: -10ºC to -50ºC.