Dr. Vicki Meli, Chemistry and Biochemistry

Dr. Meli specializes in the development and testing of various nanoparticles and nanoparticle-containing thin films as well as liquid crystalline thin films. She has particular interest and expertise in using gold nanoparticles for a variety of applications, surface chemistry, nano-patterning, and nano-to-microscale analysis of surfaces and interfaces (i.e. air/water and oil/water). Practical applications of her research include using liquid crystals and nanoparticles as platforms for sensing (of water-borne pollutants and/or (bio)chemical agents). Dr. Meli’s lab has the following equipment:

- An atomic force microscope capable of providing both topographic and chemical contrast at the nanometer scale to the samples after preparation;
- An epi-fluorescent microscope for routine fluorescence and polarized light imaging, with associated laterally-resolved fluorescence spectroscopy;
- Synthetic preparative equipment (refrigerator/freezer, temperature controlled hotplates/stirrers, sonicator, rotary evaporator, centrifuge, pH-meter) as well as surface preparation tools (plasma surface cleaner, spin coater).

Dr. Vett Lloyd, Biology

Dr. Lloyd oversees the Mount Allison University Cell Culture Facility. Her research expertise is in modeling a variety of human genetic and metabolic conditions to understand cell properties and behaviour. Cell culture is a key component of her research and has contributed to our understanding of the cellular basis of Hermansky-Pudlak syndrome, neurological and cancer-related epigenetic disorders. In collaboration with Drs. Westcott & Cuperlovic-Culf she has developed methodologies for the rapid and efficient screening of a wide array of chemical entities for their potential anticancer properties. Dr. Westcott’s lab has the infrastructure for advanced chemical synthesis and analysis. Cancer cell cultures and cell culture metabolomics with metabolite quantification can be applied to multiple applications. The cell culture facility includes:

- Biohazard Level 2 Certification
- A Sanyo Model MCO-19AICUVH CO2 Direct Heat, Air Jacketed Incubator CO2 incubator (for experiments involving mammalian cell cultures)
- A non-CO2 incubator (for experiments involving non-mammalian cell cultures)
- A biological safety cabinet (the Baker SterilGARD® III)
- A full suite of molecular and microscopy equipment for supporting molecular analysis and cell imaging
- Capabilities and methodologies established to handle a wide range of organic and inorganic compounds.

This equipment can be used to conduct experiments and tests on many different cell culture lines. For example, in the cancer research field, this would include breast, prostate, colon and glioblastoma cell
lines, where outcomes may lead to novel cancer therapeutics. There is significant potential to support the pharmaceutical and biomedical sector interests in developing and testing of various compounds for fast and informative drug testing potential.

Typical fees are $7,000 for a single experiment (5 treated cell lines + controls) lasting 6 months.

Dr. Andrew Hamilton-Wright, Mathematics and Computer Science

Dr. Hamilton-Wright’s research focuses on the development of computational decision support tools for high-risk decision making. His central area of focus is the facilitation of clinical diagnostic characterization of muscular disease state based on the use of electromyographic (EMG) data, which is acquired through the use of a needle electrode placed in a contracting muscle. This data contains information regarding muscle structure, and as such can be examined for markers of structural changes due to disease state. This new approach offers potential for more objective and reproducible diagnostic support of the level of muscular disease involvement. Projects requiring collection of and/or analysis of EMG data can be supported with his access to the Sierra Wave II (Cadwell Laboratories), which is currently in use in hospitals and clinics around the world. Dr. Hamilton-Wright and his collaborators have developed three key pieces of software to support analysis:

- "DQEMG" is used to decompose EMG data for quantitative analysis.
- "Muscle simulator" is used to provide "gold standard" validation data for electromyographic decomposition and analysis based on a physiologically based complete muscle model, including progressive involvement models for several types of muscular disease.
- "Fuzzy Pattern Discovery" is used for information-based modeling and decision-making based from quantitative data.

EMG simulation programs are now used in several laboratories around the world for creation of synthetic EMG data for calibration and research purposes.

Dr. Amanda Cockshutt, Chemistry and Biochemistry

Dr. Cockshutt’s research interests are in protein dynamics and environmental biochemistry. She combines unusual strength in molecular biology with broad experience working with non-model biological systems and sample types. She collaborates with colleagues to connect molecular quantitations to mathematical models of environmental processes, and on the development of quantitation systems for proteins that mediate or reflect major environmental processes or organismal responses to environmental factors. In 2008 she was recognized, jointly with Dr. Douglas Campbell, by NBIF at the R3 Gala as a Provincial Innovator.

Dr. Matt Litvak, Biology

Dr. Litvak has expertise in fish ecology and aquaculture. He is a leader in endangered species ecology (sturgeon), fish sperm research and development of alternate species for aquaculture. For example, he has developed a number of advanced tools to investigate the effects of genotype on performance traits (phenotype) of fishes, developed the first successful microinjection system to control size and constituents of yolk reserves in fish embryos, and developed efficient sperm cryopreservation protocols.
for winter flounder, cod and haddock. He participates in a number of large research networks and is a principal investigator of the Ocean Tracking Network. Dr. Litvak is working towards establishing a fish sperm bank that can be used to help answer ecology, conservation and aquaculture research questions. An understanding of sperm swimming behavior and semen composition provides an insight on the reproductive tactics employed by fish species and therefore important information on their ecology and protection. He has extensive experience working with industry. He has/is conducted research in partnership with several private companies, including Breviro Caviar, Bay Shore Lobster Ltd., Tech Sea 2000, Canadian Caviar, Harbor D'Loutre Products, InVenture and Target Marine.

Dr. Litvak has access to and uses the following equipment and facilities:
- Digital Microscopy Facility with SEM and AxioImaging capacities
- Gas Chromatograph Mass Spectrometer, FT-IR Spectrometer, and Atomic Spectrometer
- Versamx Microplate reader
- VersDoc Imaging for genetic research
- Microinjection facility equipment
- 6,000 litre tank system for rearing juvenile fishes including sturgeon
- 57 tank recirculation rack system for rearing zebrafish and for microinjection
- 19' Carolina Skiff boat with 70 hp and trailer
- Argo Amphibious Vehicle and trailer
- Hoverguard 700 Hovercraft with fly-on fly off trailer

The following equipment will soon be purchased and available:
- All-weather truck camper to act a mobile lab
- Streamside live haul trailer equipped with oxygen injection and temperature control
- CASA (computer assisted semen analysis system) to examine sperm motility and swimming characteristics in real-time
- High speed camera for finer inspection of flagellar beats
- Controlled rate freezer for sperm cryopreservation
- Vapor pressure osmometer
- Olympus dissecting scope with fluorescence light for imaging egg development and larvae

Centre for Aquatic Biosciences

The Centre is led by Dr. Suzanne Currie, Professor of Biology and the Crabtree Research Chair in Aquatic Animal Physiology. She specializes in the ecophysiology of fish, in particular the mechanisms of thermal tolerance in fish and the interactions of abiotic stress and environmental contaminants. In 2010 her research achievements in aquatic sciences were recognized by NBIF at the R3 Gala as a Provincial Innovator. She collaborates with others at MTA on developing protein quantitation systems in fish, and on monitoring changes in gene expression during acclimatory processes. Dr. Currie recently completed an NSERC Engage project with Aquabounty to assess the physiological effects of egg incubation temperature on non-transgenic and transgenic Atlantic salmon eggs and larvae.

Equipment and infrastructure available in the Centre includes:
- Holding tanks of various dimensions and volumes with environmental controls, wet tables, tide chambers, proportional diluter and analytical instrumentation
- Two RT-RT-Q-PCR machines
• Three CCD molecular imagers
• Two spectrofluorometer/ spectrophotometer plate readers
• Molecular cloning facilities
• Deconvolution fluorescence microscope
• Cell transfection system, cell free overexpression systems, algal cell culture facilities, and ancillary instrumentation

Our aquatic biotechnology facilities and equipment can offer biotechnological analyses and solutions to aquatic and environmental sciences challenges and issues. For example:
• Design and validation of immunoquantitations for profiling environmental functions;
• Mechanisms of thermal stress tolerance in fish;
• Practical applications in bio-fuel development industry, water treatment and conservation;
• Solutions to climate change and carbon sequestration;
• Immunodiagnostic development for use in crop science, aquaculture and fish health, and bioscience.

Digital Microscopy Facility

The Digital Microscopy Facility (DMF) provides microscopy-based analytical services to academic, non-profit and commercial clients worldwide, and offers the following diagnostic capabilities:
• Traditional (tungsten emitter) scanning electron microscopy (SEM)
• Energy dispersive x-ray spectroscopy (EDS)
• Optically sectioned fluorescence microscopy (Zeiss Axiolumer.2/Apotome)
• Image processing and analysis
• Broad range of sample preparation equipment for biological, geological and materials science specimens

Specific equipment includes:
• JEOL JSM-5600 scanning electron microscope with features such as:
  o 3.5 nm resolution
  o magnification from x18 to x300,000
  o secondary and backscattered electron imaging modes
  o eucentric goniometer stage for specimens up to 15 cm in diameter
  o Deben X/Y/rotation axis stage automation and custom transecting/position mapping software
  o digital image acquisition (640 x 480, 1280 x 960 or 2560 x 1920 pixels) and storage in a variety of standard formats
  o a full range of image processing software

• Oxford Inca Energy 200 energy dispersive spectrometry (EDS) system with features such as:
  o 138 eV resolution Pentafet detector
  o SATW window for detection of Boron and all heavier elements
  o Autocolumn for control of SEM functions (magnification, beam current, focus, etc.) from Inca console
  o software for qualitative, semi-quantitative and quantitative analyses
  o SmartMap of a "virtual specimen" allowing mapping of any element from stored data
• Zeiss AxioImager.Z2 compound fluorescence light microscope with:
  o Apotome optical sectioning system
  o Colibri fast, high intensity monochromatic illumination system with 365 nm, 470 nm, 590 nm and neutral white LEDs
  o AxioCam MRm high sensitivity 12-bit monochrome camera
  o AxioCam ICc3 12-bit RGB camera
  o Fluorescence, DIC and brightfield illumination including fluorescence filter cubes 20, 44, 49 and 62HE

• Support equipment including:
  o Hummer 6.2 cold process plasma sputtering system
  o Denton DV-502A high vacuum evaporator
  o Denton DCP-1 Critical Point Dryer
  o Homebrew Freeze Dryer
  o Stereomicroscope for specimen preparation

The DMF is available to on-campus researchers on a cost-recovery basis, and the facilities are available to private sector users at a rate of $125 to $250 per hour. Examples of private sector users of the DMF include Benchmark Biolabs Inc., which specializes in streamlining the research-to-commercialization process within the biological development sector; and Armstrong Morrell Inc. (AMI), 'Solutions Science' based company that applies scientific and engineering principles to real world problems. Expanded and full details on the activities, projects, services, equipment and detailed rates are available at: http://www.mta.ca/dmf/.

Aquatic & Environmental Analyses Services

This group provides quantitative analyses of Carbon, Nitrogen, Hydrogen, Oxygen & Sulfur, using an elemental analyzer. More generally, the group can provide statistical analyses of biological data, and controlled, characterized algal and phytoplankton cultures.