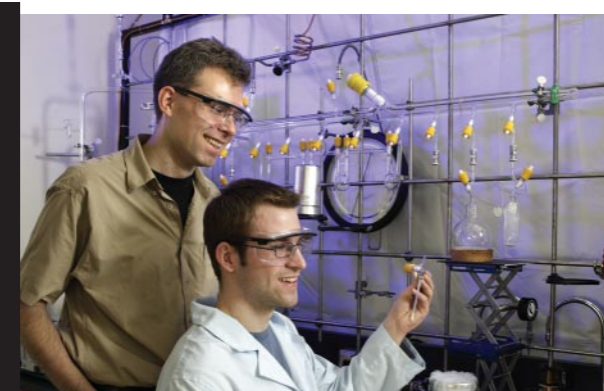




School of Graduate Studies
 University of Lethbridge
 4401 University Dr W
 Lethbridge AB T1K 3M4
 Ph: (403) 329-2301
 Fax: (403) 329-2057



Graduate Studies

Application Deadlines:

March 1 to start in May or September
 May 1 to start in September
 October 1 to start in January
 Application fee: \$60

Minimum GPA Requirement for Admission (GPA based on a 4.0 scale):

M.Sc.: 3.0
 Ph.D.: 3.5

Graduate Course Requirements:

M.Sc.: from two to four courses Ph.D.: maximum of six courses

Admission to Ph.D. Program:

Direct application with an M.Sc. or Transfer from U of L M.Sc. program

Funding Support:

Graduate Teaching Assistantship: \$7,000 per year
 In addition, the research supervisor offers a research stipend;
 the size of this stipend may vary; please contact the researcher directly.

Available Scholarships:

NSERC, Alberta Heritage, Alberta Ingenuity

Tuition Fees per term (for the 2007/08 calendar year):

	1st year M.Sc. & 1st and 2nd year Ph.D.	Continuation Fees
Summer	\$1,716.67 (+ \$130.80 additional fees)	\$515 (+ \$38.50 additional fees)
Fall	\$1,716.67 (+ \$380.80 additional fees)	\$515 (+ \$356.50 additional fees)
Spring	\$1,716.66 (+ \$135.80 additional fees)	\$515 (+ \$111.30 additional fees)

Visa students:

Summer	\$3,823.33 (+ \$150.80 additional fees)	\$1,147 (+ \$58.50 additional fees)
Fall	\$3,823.33 (+ \$400.80 additional fees)	\$1,147 (+ \$376.30 additional fees)
Spring	\$3,823.33 (+ \$155.80 additional fees)	\$1,147 (+ \$131.30 additional fees)

Cost of Housing:

Approximately \$400 for a room in a house and starting with \$600 for a single apartment.

For more information, visit The University of Lethbridge Calendar:
www.uleth.ca/reg/calendar/index.html

Research Facilities

500 MHz Varian INOVA Solution- and Solid-State NMR Spectrometer

300 MHz Bruker Avance II Solution-State NMR Spectrometer

Macromolecular Bruker-Nonius X-ray Diffractometer

Small-molecules Bruker SMART Apex II X-ray Diffractometer

Nicolet Avatar 380 FT Infrared Spectrometer

Bomem MG-102 FT Infrared Spectrometer with Csl Optics

Bruker FT Raman Spectrometer

High-Performance Computing Facility (5 TFlops)

MicroCal Isothermal Titration Calorimeter

Picker Flow Microcalorimeter

High Temperature and Pressure Densimeter

PARRSTAT 2273 Electrochemistry Workstation

Cary 50 UV-Visible Spectrophotometer

Cary Eclipse Fluorescence Spectrometer

HP 5593 Gas Chromatograph

BioRad DuoFlow HPLC

Pharmacia-FPLC

Perceptive-Perfusion Chromatograph

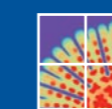
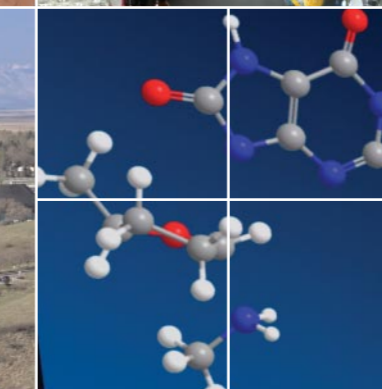
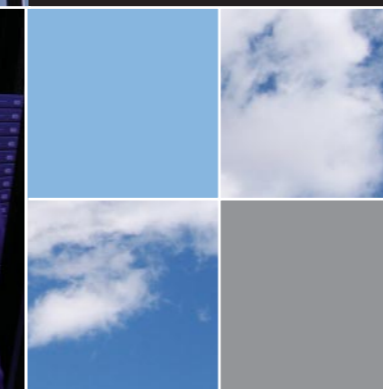
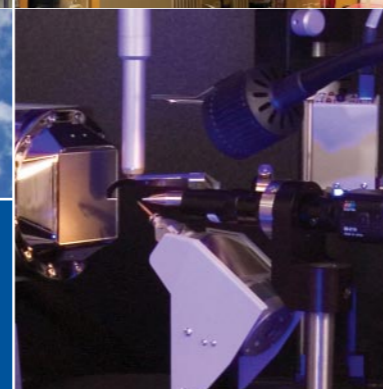
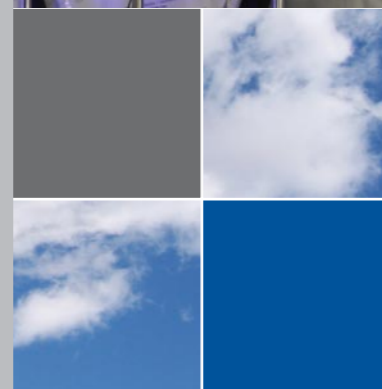
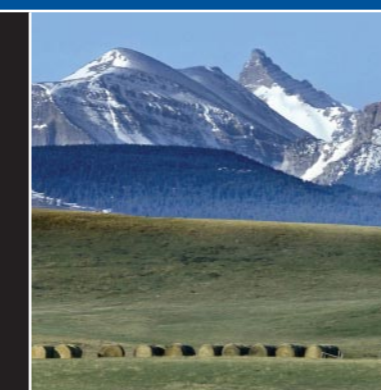
Biacore X Surface Plasmon Resonance Spectrometer

Protein Solutions Dynamic Light Scattering Device

SF-2004 Fluorescence Stopped-Flow Instrument (KinTek Corp)

RQF-3 Rapid Chemical Quench-Flow (KinTek Corp)

PerkinElmer Tri-Carb 2800TR Liquid Scintillation Analyzer



The Department of
Chemistry and Biochemistry



The Department of Chemistry and Biochemistry

has twelve research-active faculty members in six fields of chemistry:

- biochemistry
- computational and theoretical chemistry
- food chemistry
- inorganic chemistry
- organic chemistry
- physical chemistry

www.uleth.ca/fas/chm

e-mail: chem@uleth.ca

The department offers M.Sc. programs in Chemistry and Biochemistry and has Ph.D. programs in the multidisciplinary areas of (a) biomolecular science, (b) earth, space, & physical science, and (c) theoretical and computational science. In these multidisciplinary areas the Department of Chemistry and Biochemistry works closely together with other departments, providing a highly collaborative research environment for graduate students. The twelve research groups of the department are externally funded and utilize research facilities that include state-of-the-art instrumentation, like a 500 MHz NMR spectrometer, a macromolecular X-ray diffractometer, and a high-performance computing facility, the 9th biggest in Canada at the time of its installation (Jan. 2007). The Department of Chemistry and Biochemistry at the University of Lethbridge provides close supervision and support for its graduate students. Research results are commonly published in international, peer-reviewed journals and are presented at many national and international conferences by graduate students and professors.

If you are interested, please contact the individual researchers or visit our webpage at www.uleth.ca/fas/chm

> Biochemistry



Steve Mosimann
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Structure and Function of RNA Processing Enzymes

Our research group focuses upon the relationship between protein structure and its biological function. In order to study the structure of proteins at atomic resolution we primarily utilize single crystal X-ray diffraction experiments. The result of this experiment is a detailed three-dimensional model that allows us to understand and predict the biological function of the protein under investigation. In particular, we use oligonucleotide-directed mutagenesis to design experiments that test our predictions and refine our understanding of the role of specific amino acids in proteins. Recently, we have begun utilizing the techniques of isothermal titration calorimetry and plasmon resonance to characterize protein-protein and protein-ligand interactions that relate to their biological function.

Representative Publications:
R. Gruninger, L. B. Selinger, S.C. Mosimann. "X-ray structure of a PTP-like phytase active site mutant." (Preparation).
S. C. Mosimann, M. Gilbert, D. Dombrowski, R. Toh, W. Wakarchuk, N.C. J. Strynadka. *J Biol Chem*, **2001**, 276:11, 8190-8196.
M. Paetzl, S.C. Mosimann, N.C. J. Strynadka. *Nature Struct. Biol.* **2000**, 7:10, 918-924.

> Food Chemistry

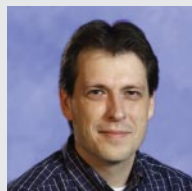


Roman Przybylski
(Professor)
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Development of Antioxidants for Edible Oils and Food Systems

The basic research interest of our laboratory centers on two interrelated areas: (1) chemistry and interaction of endogenous edible oil components; (2) biological activity of components available in plants and food products. The focus of (1) is to understand the molecular mechanism involved in protection of oil and prevention of formation of unhealthy compounds. Integral part of this research is the development of an effective antioxidative system usable in oilseeds and food product. In the research on bioactive compounds, the main goal is to establish sources of these components and develop strategies to utilize them as ingredients in food to help control common health problems. We have established that products from buckwheat can control blood glucose levels and, hence, diabetes..

Representative Publications:
M.A. Khalique, J.K. Daun, R. Przybylski. *J. Food Comp. Anal.* **2005**, 18, 359-364.
J. Kawa, C. Taylor, R. Przybylski. *J. Agric. Food Chem* **2003**, 51, 7287-7291.
J. Kawa, R. Przybylski, C. Taylor. *Exp. Bio. Med.* **2003**, 228, 907-914.



Hans-Joachim Wieden
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Structural and Functional Dynamics of Protein Biosynthesis

In my research, a purified reconstituted E. coli translation system is used to study translation, applying a multidisciplinary combination of biochemistry, fluorescence spectroscopy, fast kinetics (Quench-flow / Stopped-flow), molecular biology, and molecular dynamics techniques, complemented with structure determination methods such as cryo-EM and X-ray crystallography. A detailed understanding of the functional and structural dynamics of translation factors and ribosomes allows us to analyze the mechanistic basis how antibiotics and toxins affect translation. Presently, I am focusing on two aspects of the translation machinery: (a) Kinetics and structural dynamics of elongation factors and (b) functional roles of novel translation factors.

Representative Publications:
L. D. Dahl, H.-J. Wieden, M. V. Rodnina, C. R. Knudsen. *J. Biol. Chem.* **2006**, 281, 21139-21146.
U. Kothe, H.-J. Wieden, D. Mohr, M. V. Rodnina. *J. Mol. Biol.* **2004**, 336, 1011-1021.
H. Stark, M.V. Rodnina, H.-J. Wieden, F. Zemlin, W. Wintermeyer, M. van Heel. *Nature Struct. Biol.* **2002**, 9, 849-854.



Ute Kothe
(Assistant Professor)
B.Sc. Ruhr-University Bochum, Germany
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Molecular Mechanisms of Small Ribonucleoproteins

My research aims at understanding small ribonucleoproteins, essential cellular complexes consisting of both proteins and RNAs. They are involved in the assembly of large ribonucleoproteins, e.g. the ribosome and the spliceosome. We want to obtain structural information of the ribonucleoproteins in different functional states in order to relate this information to their mechanisms of action. Therefore, we apply different molecular biological, biochemical and biophysical techniques. Fluorescently labeled ribonucleoproteins are used to map their 3D structure by fluorescence resonance energy transfer (FRET) measurements. In addition, kinetic experiments address the molecular mechanism. Thus, our research will reveal the functional cooperation of proteins and RNA in the assembly of cellular machines.

Representative Publications:
U. Kothe, M. V. Rodnina. *Mol. Cell* **2007**, 25, 167-174.
U. Kothe, M. V. Rodnina. *Biochemistry* **2006**, 45, 12767-12774.
M. Diaconu*, U. Kothe*, et al., *Cell* **2005**, 121, 991-1004. * contributed equally

> Inorganic Chemistry



René Boeré
(Professor)
B.Sc. Hon., Dalhousie University
Ph.D. University of Western Ontario
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Main-Group Inorganic Chemistry

We study ring systems containing catenated C-N-S and C-N-Se sequences, including those that incorporate transition metals, and characterize them using electrochemistry, since their redox behaviour is a key factor in conductivity and magnetic properties. In addition to the generation of stable free radicals of ring compounds, we are now also investigating phosphorus, boron and other main group radicals for their intrinsic interest. Our group also works on coordination chemistry of imides, amidines, guanidines and related nitrogen ligands with super-bulky substituents and their phosphorus and arsenic analogues. The goal is to synthesize and study a series of homologous ligands containing N, P, and As by choosing substituents just bulky enough to stabilize low-coordinate P and As, but not too bulky for N.

Representative Publications:
H. F. Lau, V. W. L. Ng, L. L. Koh, G. K. Tan, L. Y. Goh, T. L. Roemmele, S. D. Seagrave, R. T. Boeré, Angew. Chem.; *Int. Ed. Engl.*, **2006**, 45, 4498-4501.
R. T. Boeré, M. L. Cole, P. C. Junik, J. D. Masuda, G. Wolmershäuser, *Chem. Commun.*, **2004**, 2564-2565.
R. T. Boeré, T. L. Roemmele, *Coord. Chem. Rev.*, **2000**, 210, 369-445.

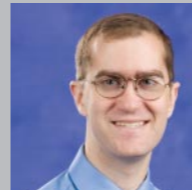


Michael Gerken
(Assistant Professor)
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Ph.D. McMaster University
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Inorganic Fluorine Chemistry

My research is focused on the preparation and characterization of new, highly reactive fluorine compounds of main-group and transition-metal elements. These structurally simple molecules (a) have interesting geometries, (b) exhibit interesting reaction behaviour, and (c) serve as precursors for materials. Target compounds are oxide fluorides, $MO_nF_m^x$, and sulfide fluorides, $MS_nF_m^x$, of main-group as well as transition-metal elements. Many of these compounds are air- and moisture-sensitive and have to be handled in a nitrogen atmosphere of a dry box or on a vacuum line. New compounds prepared in my laboratory are fully characterized by Raman and infrared spectroscopy, solid- and solution-state NMR spectroscopy, and X-ray crystallography.

Representative Publications:
M. Gerken, P. Hazendonk, A. Iuga, J. P. Mack, H. P. A. Mercier, G. J. Schrobilgen, *J. Fluorine Chem.*, **2006**, 127, 1328-1338.
R. Haiges, M. Gerken, A. Iuga, R. Bau, K. O. Christie, *Inorg. Chem.*, **2006**, 45, 7981-7984.
M. Gerken, P. Hazendonk, J. Nieboer, G. J. Schrobilgen, *J. Fluorine Chem.*, **2004**, 125, 1163-1168.



Paul Hayes
(Assistant Professor)
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Ph.D., University of Calgary
p.hayes@uleth.ca
<http://people.uleth.ca/~p.hayes/>

Organometallic Chemistry and Catalysis

Research in the Hayes group involves the synthesis of high-energy and reactive inorganic molecules for application in new chemical transformations and catalysis. Three unique projects directly address this goal. The first involves the preparation of novel tridentate pincer ligands to support low-valent complexes and metal main-group multiple bonding within lanthanide and group 3 metals. Another project tackles the challenge of preparing new materials that are both biodegradable and biocompatible through the use of discrete alkaline earth metal complexes. The third project is tailored toward the catalytic functionalization of hydrocarbons and small molecule activation. Though diverse, these projects are unified in focus on catalytic reactivity.

Representative Publications:
P. G. Hayes, R. Waterman, T. D. Tilley. *Acc. Chem. Res.*, **2007**, in press.
P. G. Hayes, W. E. Piers, M. Parvez, *Chem. Eur. J.*, **2007**, 13, 2632-2640.
P. G. Hayes, C. Beedie, M. B. Hall, R. Waterman, T. D. Tilley, *J. Am. Chem. Soc.*, **2006**, 128, 428-429.

> Organic Chemistry

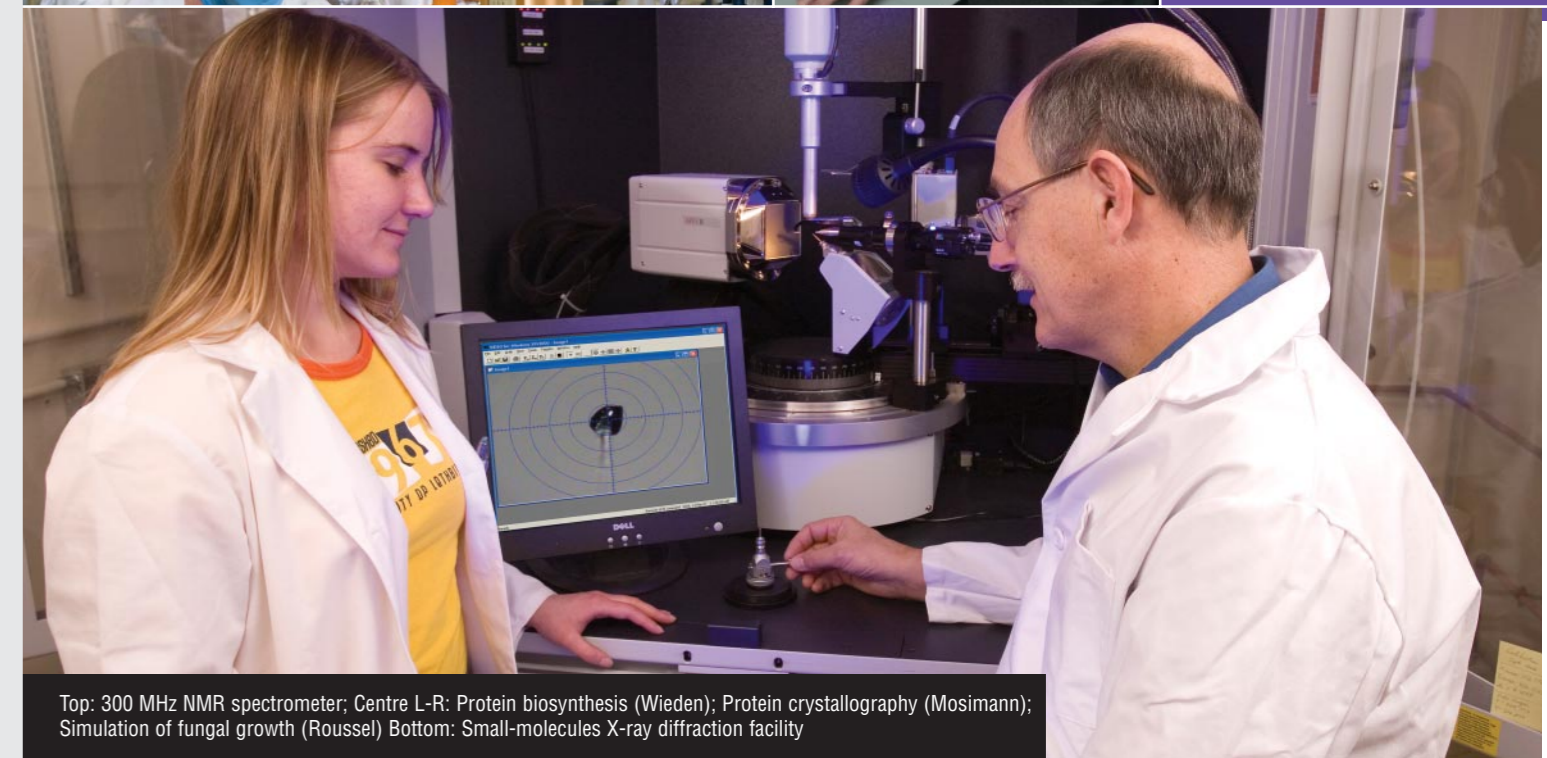
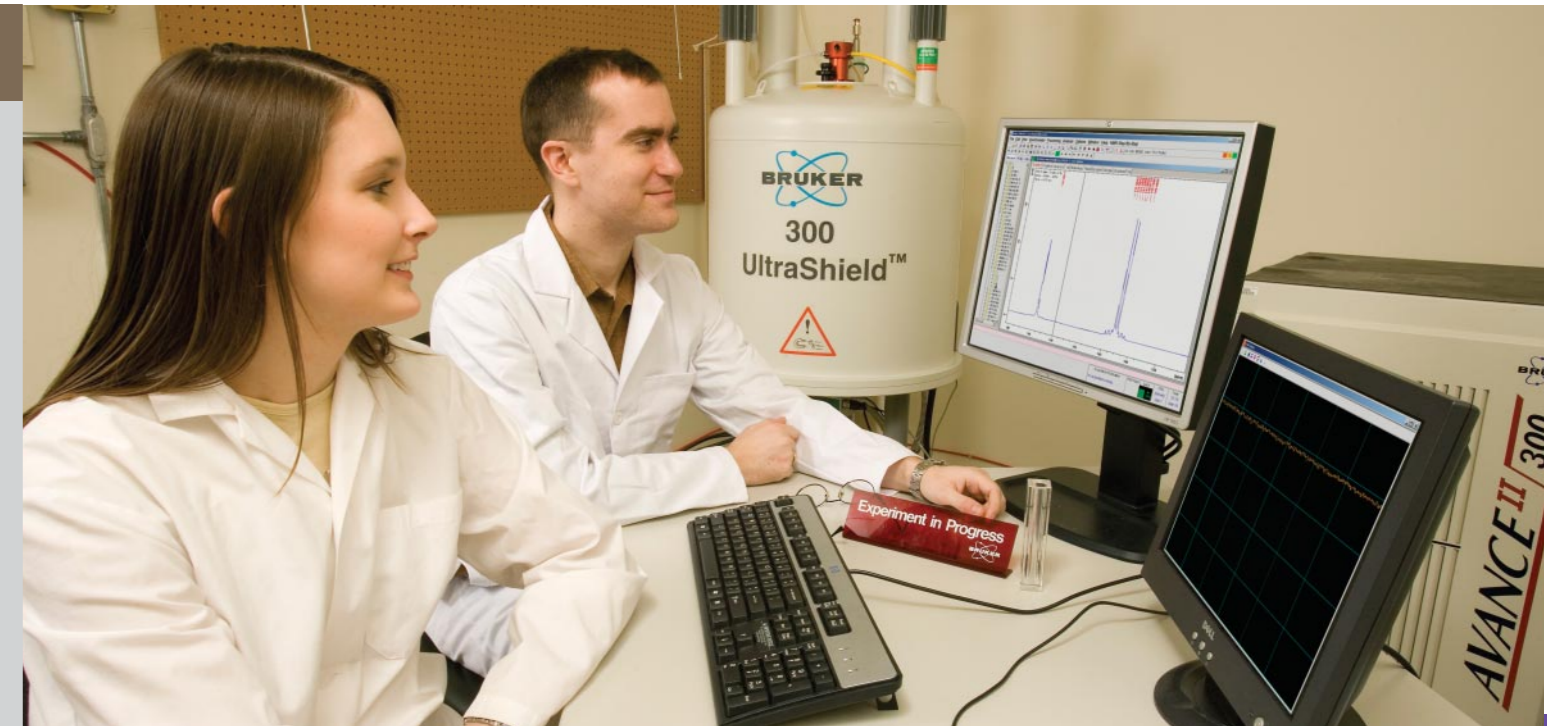


Peter Dibble
(Associate Professor)
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dibble@uleth.ca

Synthetic Organic Chemistry

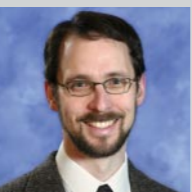
The work in our lab revolves around the preparation and reactivity of isobenzofuran. Isobenzofuran is a o-quinoid heterocycle and is one of the most reactive Diels-Alder dienes known. It and its benzologues have been of substantial theoretical interest in terms of their electronic structure and reactivity. Our recent work involves the synthesis of molecules that contain two isobenzofuran moieties linked by various structural units. One such example is naphtho[1,2-c:5,6-c']difuran. Reaction of these bis(isobenzofuran)s with tethered bisdienophiles gives us access to novel cyclophane products with varying amounts of strain. X-ray structures tell us how this strain is accommodated for N-N tethers of different length and structure.

Representative Publications:
T. L. L. Closson, S. Manning, M. E. Thibault, P. W. Dibble, *J. Org. Chem.* **2003**, 68, 8373-8378.
R. H. Mitchell, T. R. Ward, Y. Chen, Y. Wang, S. A. Weerawarna, P. W. Dibble, M. J. Marsella, A. Almutairi, Z.-O. Wang *J. Am. Chem. Soc.* **2003**, 125, 2974-2988.
M. Thibault, L. A. Pacaryuk, T. L. Closson P. W. Dibble, *Tetrahedron Letters*, **2001**, 42, 789-791.



Top: 300 MHz NMR spectrometer, Centre L-R: Protein biosynthesis (Wieden); Protein crystallography (Mosimann); Simulation of fungal growth (Roussel) Bottom: Small-molecules X-ray diffraction facility

> Computational and Theoretical Chemistry



Marc Roussel
(Professor)
Ph.D., M.Sc., University of Toronto
roussel@uleth.ca, <http://people.uleth.ca/~roussel/>

Mathematical and Computational Analysis of Biological and Chemical Phenomena

The work of my group lies at the interface between chemistry, biology and mathematics, with occasional excursions into physics. We use a combination of mathematical reasoning and computer simulation to try to understand a variety of phenomena, with a particular emphasis on biological and chemical systems. Along the way, we have the opportunity to study fundamental mathematical problems. Ongoing research topics in my group include model reduction, the mathematical description of transport in biological tissues, and the dynamics of systems with few molecules.

Representative Publications:
K. L. Davis, M. R. Roussel. *FEBS J.* **2006**, 273, 84-95.
C. J. Roussel, M. R. Roussel, *Prog. Biophys. Mol. Biol.* **2004**, 86, 113-160.
M. R. Roussel, R. Zhu, *J. Chem. Phys.* **2004**, 121, 8716-8730.



Stacey Wetmore
(Associate Professor)
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Ph.D., Dalhousie University
stacey.wetmore@uleth.ca
<http://people.uleth.ca/~stacey.wetmore/>

Molecular Modeling of Biological Systems

Research in my laboratory uses high-level calculations on computers to study the structure, properties and reactions of chemical systems. Calculations are particularly useful in chemistry when information is difficult to obtain from experiment (i.e., due to the high reactivity (short lifetime) of intermediates). Research projects in our group fall into three broad categories: 1) the properties of damaged DNA components (base, sugar, phosphate), as well as the mechanism by which these form, 2) the mechanisms of action of enzymes that repair damaged DNA, and 3) the properties of modified DNA components that have various biochemical or medicinal applications, such as hybridization probes, PCR primers and gene technologies.

Representative Publications:
K. C. Hunter, A. L. Millen, S. D. Wetmore, *J. Phys. Chem. B* **2007**, 111, 1858-1871.
L. R. Rutledge, C. A. Wheaton, S. D. Wetmore, *Phys. Chem. Chem. Phys.* **2007**, 9, 497-509.
L. R. Rutledge, L. S. Campbell-Verdun, K. C. Hunter, S. D. Wetmore, *J. Phys. Chem. B* **2006**, 110, 19652-19663.

> Physical Chemistry

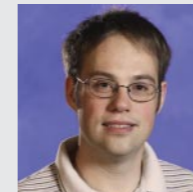


Andrew Hakin
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Experimental Thermodynamics

My research specializes in using calorimetry and densimetry to probe the thermodynamic properties of aqueous electrolyte systems and aqueous systems of biochemical/biological interest over extended temperature and pressure surfaces. With respect to electrolytes, we are engaged in determining the volumetric and thermochemical properties of aqueous rare earth element (REE) containing salt systems. These data may be used to optimize the extraction of REEs from their naturally occurring minerals. Turning to systems of biochemical interest, we are currently attempting to obtain precise volumetric data for aqueous amino acid systems at pressures up to p = 200 MPa from high pressure speed of sound measurements. These measurements are being completed with collaborators at the University of Bergen, Norway.

Representative Publications:
J.L. Liu, A.W. Hakin, G.R. Hedwig, *J. Chem. Thermodynamics* **2006**, 38, 1640-1650.
A.W. Hakin, J.L. Liu, *J. Solution Chem.* **2006**, 35, 1157-1171.
A.W. Hakin, H. Holland, *Phys. Chem. Chem. Phys.* **2005**, 7, 2199-2207.



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Ph.D., McMaster University
paul.hazendonk@uleth.ca
<http://people.uleth.ca/~paul.hazendonk/>

Solid-State NMR Spectroscopy of Fluorine-Containing Materials

My research is centred on Solid State Nuclear Magnetic Resonance Spectroscopy of fluorine-containing materials. Fluoropolymers see wide commercial application anywhere from coatings, such as TEFLON™ non-stick surfaces, to garments, such as GORTEX™, and, of particular interest to my research, as proton conducting membranes in Polymer Electrolyte Membrane Fuel Cells. One of the main objectives of this research is to provide a mechanistic understanding of the macroscopic properties of these materials at a molecular level. These insights provide feedback on synthetic and processing strategies to a systematically improve these materials. Since the fluorine nucleus poses a particular spectroscopic challenge, my research has a strong focus on the development of new NMR techniques and theory.

Representative Publications:
A. Iuga, D. Iuga, A. Cross, M. Gerken, P. Hazendonk, *J. Chem. Phys.* **2007**, 126, in press.
P. Hazendonk, G. de Denuis, A. Iuga, P. Cahoon, B. Nilsson and D. Iuga, *J. Inorg. Organomet. Polym. Mater.* **2006**, 16 343 - 357
S. Ando, R.K. Harris, P. Hazendonk, P. Wormald, *Macromol. Rapid Commun.*, **2005**, 26, 345-356.