

ADVENTURER EXPLORER TRAILBLAZER REBEL PIONEER CREATOR DEFENDER ADVENTURER EXPLORER TRAILBLAZER
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Chemistry and Biochemistry Research in the Department of Chemistry



UNIVERSITY
OF MANITOBA

Winnipeg, Manitoba

- 740,000 people
- Vibrant creative and cultural community
- Most diverse economy of major cities in Canada
- Home to NHL Hockey, CFL Football and Royal Winnipeg Ballet
- Future home of Canadian Museum for Human Rights
- Rich and varied multicultural community
- Four distinct seasons - 2,727 hours of blue sky annually



Winnipeg, Manitoba, Canada



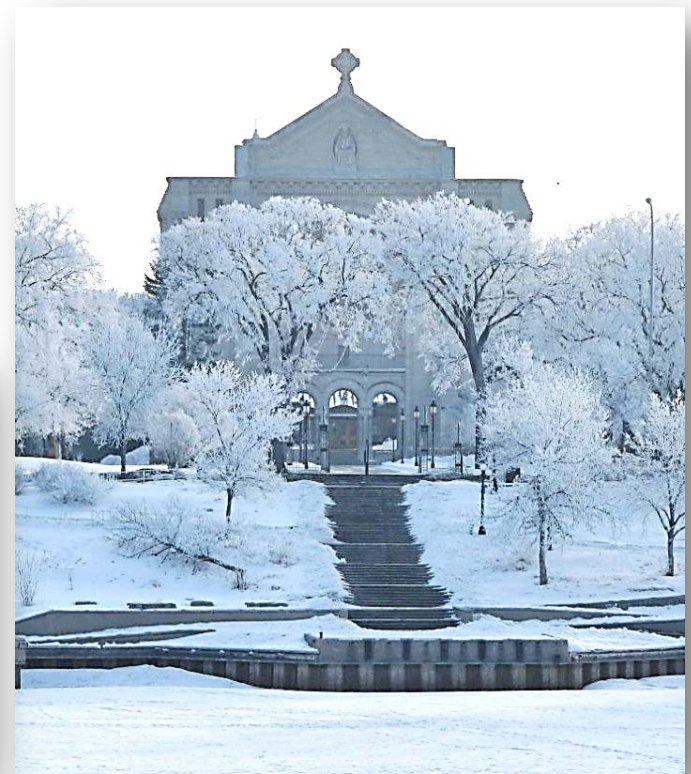
Winnipeg, Manitoba, Canada

- Recognized in 2010 as Culture Capital of Canada
- Winnipeg is centrally located in Canada:

Three hour flight to Vancouver

Two hour flight to Toronto

www.tourismwinnipeg.com



The University of Manitoba

For 130 years, we have been recognized as Manitoba's premier university – shaping our leaders, enhancing our community and conducting world-class research.

Our home is Manitoba but our impact is global.



Many Opportunities to Learn

- No other Canadian university is as embedded in the economic, social and cultural fabric of its home province
- Manitoba's largest, most comprehensive and only research-intensive post-secondary institution
- Offers 90 degrees, diplomas and certificates, more than 60 at the undergraduate level
- Full range of professional programs – we educate doctors, engineers, architects and entrepreneurs



EXPLORER INNOVATOR PIONEER ADVENTURER VISIONARY TRAILBLAZER



UNIVERSITY
OF MANITOBA

Our Campuses

Fort Garry Campus

- 233-hectare complex with over 60 major buildings
- Smartpark Research and Technology Park fosters collaborative university-industry research and development with 30 of Canada's most innovative companies

Bannatyne Campus

- Located in downtown Winnipeg, adjacent to the Health Sciences Centre
- 10 building complex focused on health science education and research in dentistry, medicine, medical rehabilitation, and pharmacy



By the Numbers

- Over 27,000 total student enrolment
- International students represent 8.5% of the student body
 - Students from Africa, Europe, the Middle East, United States, Mexico, Oceania and Central and South America
- Over 2,000 self-declared Indigenous students
- Over 3400 graduate students
- Over 8,400 staff members



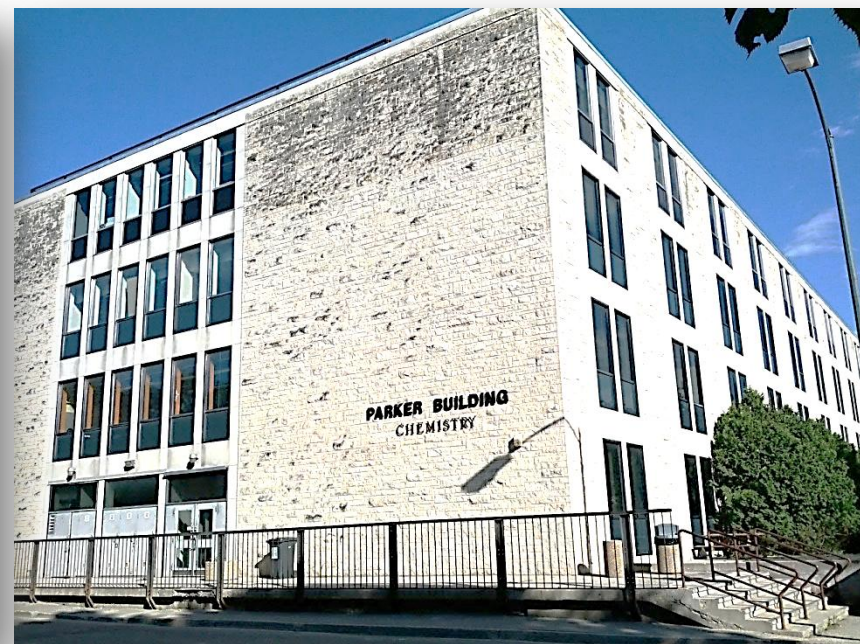
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UNIVERSITY
OF MANITOBA

The Department of Chemistry

As of 2012, we are comprised of 17 research faculty members and 7 adjunct professors



Facilities Available:

Prairie Regional NMR Facility at U of M

300MHz, 400 MHz, 500MHz, 600MHz

Ultra-Clean Trace Elements Laboratory (UCTEL)

Mass Spectrometry Group

Crystallography

High Temperature X-Ray Facility (Bieringer)

Protein (Stetefeld)

SAX/WAXS (MIM Freund)

IR Microscope (Gough)



Raman Spectrometer (Kroeker)

IR Spectrometer

High Temperature Laboratory (Bieringer)

Cold Room Laboratory (Sorensen)

CD Spectrometer (O'Neil)

Robotic Teaching X-ray Diffractometer

High Temperature DSC/DTA/TGA (Bieringer)

Low Temperature DSC (Freund)

Solvent Purification System



Research Areas:

- Analytical
- Biochemistry
- Environmental
- Materials science
- Inorganic
- Organometallic
- Organic
- Physical/Theoretical
- Spectroscopy

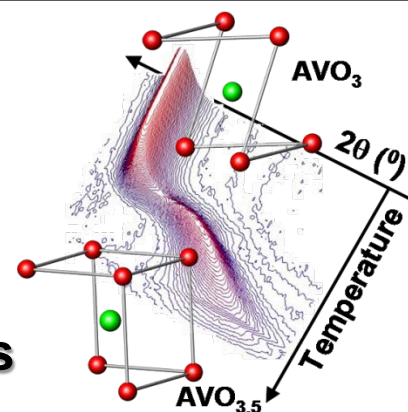




Mario Bieringer

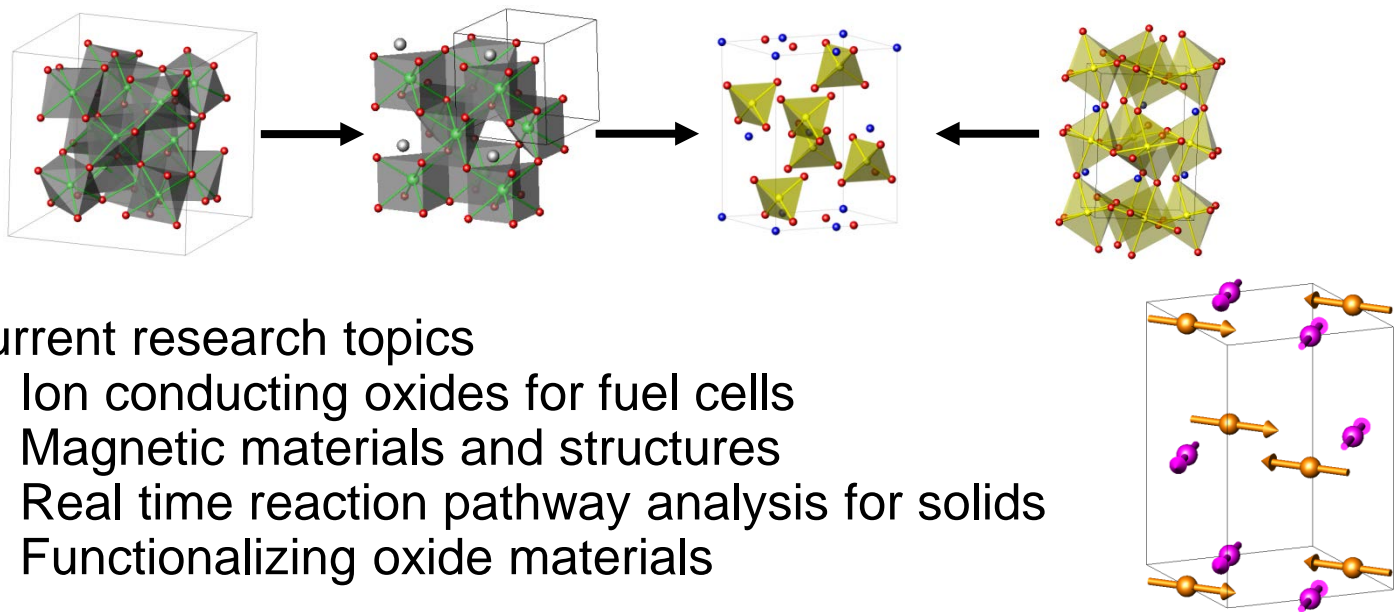
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Mario_Bieringer@umanitoba.ca

Inorganic Materials Chemistry: Structure-Property-Reactivity Relationships in Solids and Materials Discovery



Research Areas:

- Analytical
- Biochemistry
- Environmental
- Inorganic
- Materials Science
- Organic
- Organometallic
- Physical/Theoretical
- Spectroscopy



Current research topics

- Ion conducting oxides for fuel cells
- Magnetic materials and structures
- Real time reaction pathway analysis for solids
- Functionalizing oxide materials

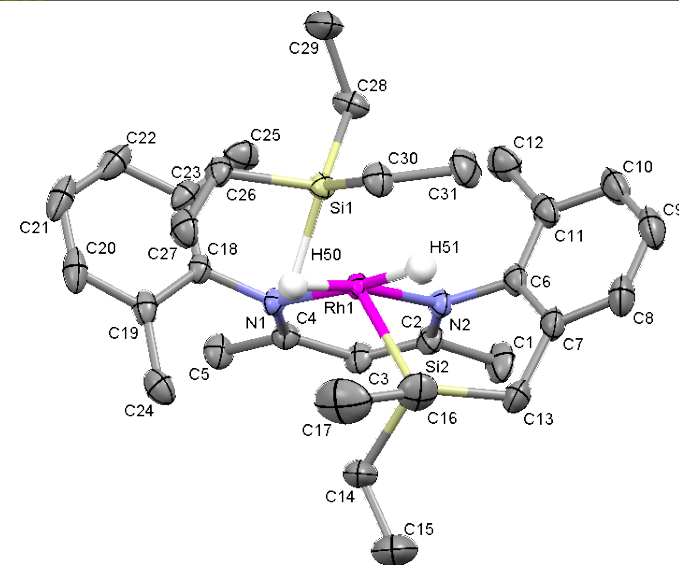




Peter Budzelaar

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Towards designing catalysts through rational strategies



Research Areas:

Analytical
 Biochemistry
 Environmental
 Inorganic
Materials Science
 Organic
Organometallic
 Physical/Theoretical
 Spectroscopy

Current research topics are:

- Platinum metal complexes of β -diiminate type ligands
- Electronic and chemical non-innocence of the diiminepyridine ligand
- Chain transfer in olefin polymerization
- Geometry optimization techniques





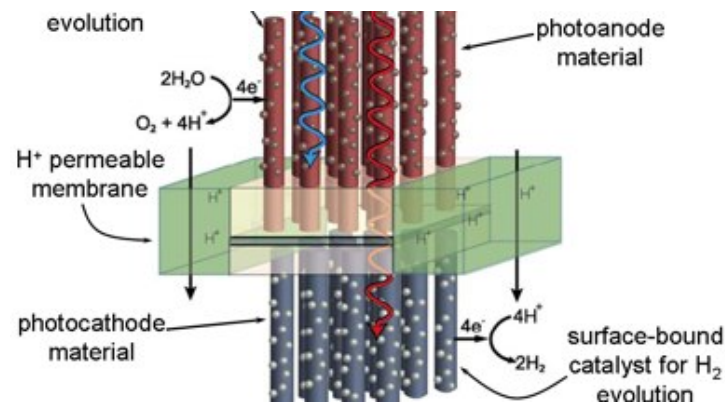
Michael S. Freund

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Development of new strategies for controlling the chemical and electronic properties of electronically conducting polymers as well as their use in sensing applications

Current research topics are:

- Efficient and cost effective artificial photosynthetic systems
- Conducting polymer-based composites for electronic applications



Research Areas:

Analytical

Biochemistry

Environmental

Inorganic

Materials Science

Organic

Organometallic

Physical/Theoretical

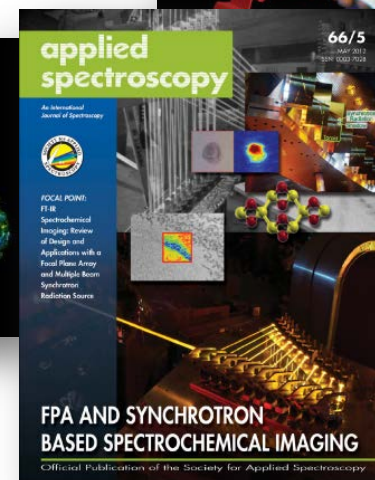
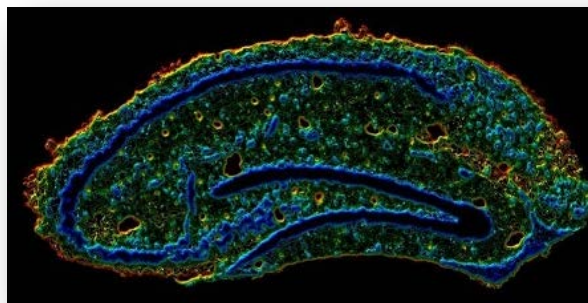
Spectroscopy



Kathleen M. Gough

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Development and applications of IR and Raman spectrochemical imaging



Research Areas:

Analytical

Biochemistry

Environmental

Inorganic

Materials Science

Organic

Organometallic

Physical/Theoretical

Spectroscopy

Current research topics are:

- Brain tissue in Alzheimer's disease
- Comparisons of saprotrophic and endophytic fungi
- Role of nutritional fatty acids in retinal health
- Collagen structures in health, wound healing and stress

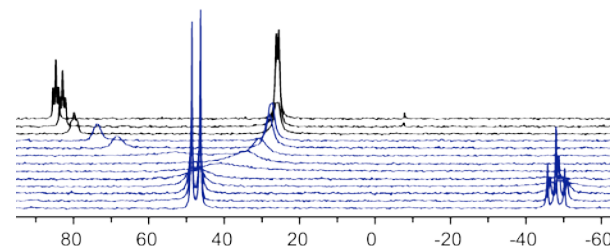


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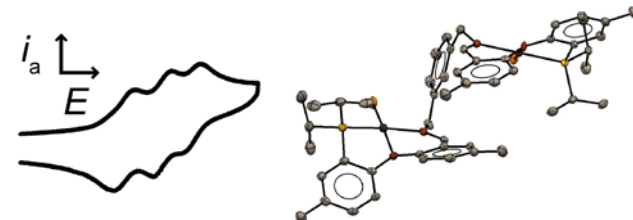


David E. Herbert

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Organometallic chemistry for environmental applications



Research Areas:

- Analytical
- Biochemistry
- Environmental
- Inorganic**
- Materials Science
- Organic
- Organometallic**
- Physical/Theoretical
- Spectroscopy

Current research topics include:

- Electrochemical reduction of carbon dioxide
- Making commodity chemicals from CO₂
- Bio-inspired reaction mechanisms and catalyst design
- Polymeric materials for water remediation





Scott Kroeker

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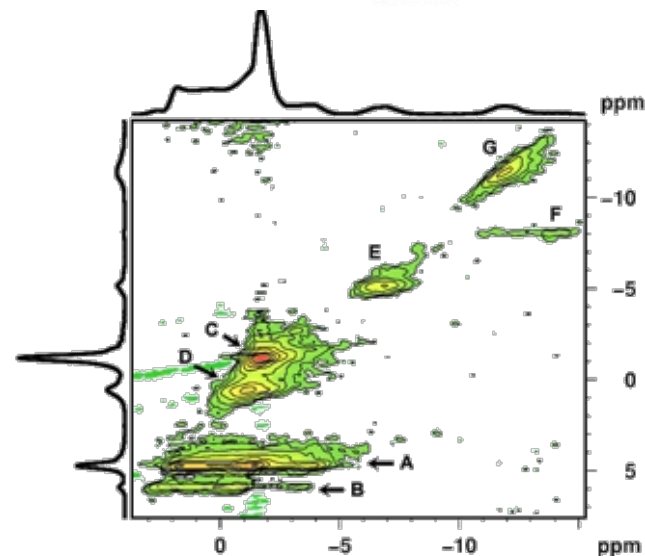
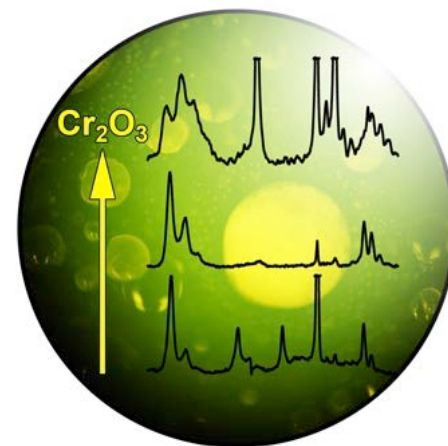
Solid-State NMR Spectroscopy of Inorganic Materials

Research Areas:

- Analytical
- Biochemistry
- Environmental
- Inorganic
- Materials Science
- Organic
- Organometallic
- Physical/Theoretical
- Spectroscopy

Current research topics include:

- Oxide Glasses
- Nuclear Waste Materials
- Minerals
- Coordination Polymers



Sean McKenna

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Exploration at the molecular level of how transient protein-nucleic acid recognition events affect enzymatic activity in important biological systems

Research Areas:

Analytical

Biochemistry

Environmental

Inorganic

Materials Science

Organic

Organometallic

Physical/Theoretical

Spectroscopy

Current research topics are:

- The role of RNA-protein interaction in mediating host-cell immune response to viral infection
- Investigating RNA quadruplex structures and their interactions with quadruplex-specific helicases



Joe O'Neil

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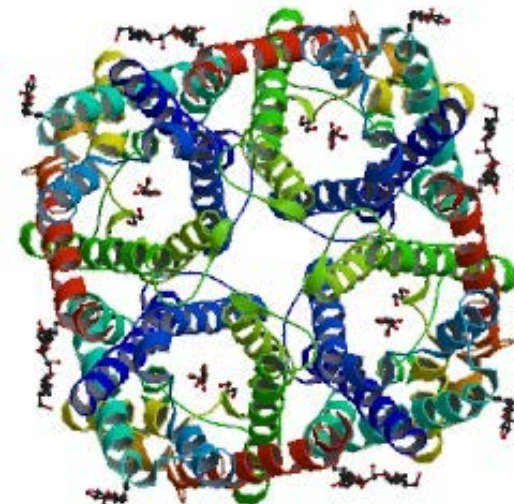
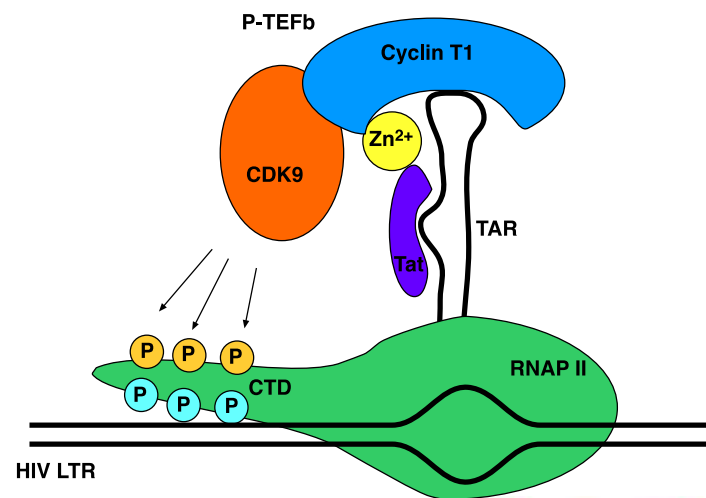
Towards understanding the molecular structural basis of the biological activities of proteins

Research Areas:

Analytical
Biochemistry
Environmental
Inorganic
Materials Science
Organic
Organometallic
Physical/Theoretical
Spectroscopy

Current research topics are:

- Alamethicin antibiotic peptide
- Glycerol facilitator membrane protein
- HIV-1 Transactivator of transcription.





H el ene Perreault

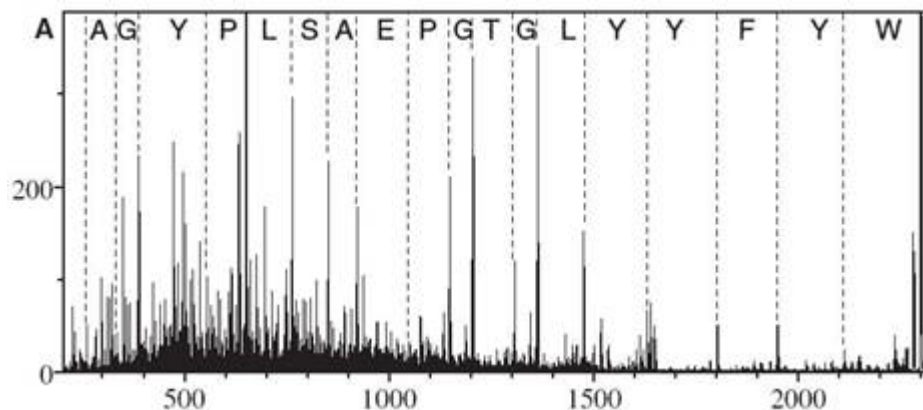
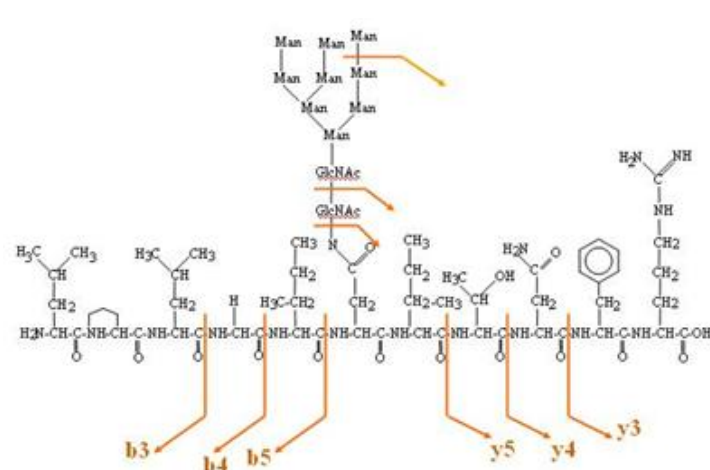
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Characterization of modified proteins using mass spectrometry

Research Areas:
 Analytical
 Biochemistry
 Environmental
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 Materials Science
 Organic
 Organometallic
 Physical/Theoretical
 Spectroscopy

Current research topics are:

- Glycoproteins
- Phosphoproteins
- Modified enzymes





Frank Schweizer

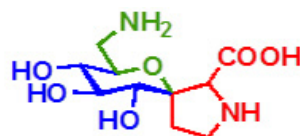
home.cc.umanitoba.ca/~schweize
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Current research topics are:

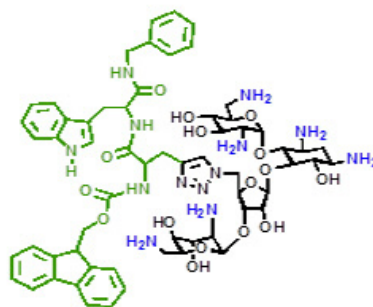
- Aminoglycoside-based mimicry of antimicrobial peptides
- Effects of hydroxyproline glycosylation in structural proteins
- Carbohydrate-templated amino acids
- Antitumor glycolipids
- Development of novel scaffolds with immunomodulatory properties

Research Areas:

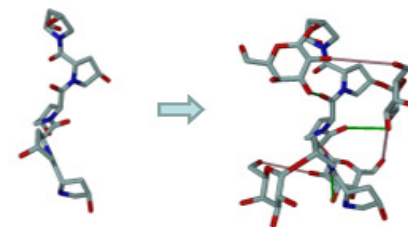
Analytical
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Carbohydrate-templated Amino Acids (CTAAs)



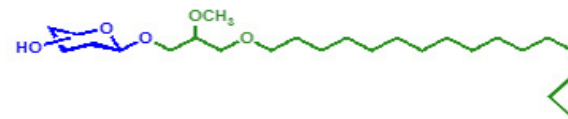
Amphiphilic Aminoglycoside Antimicrobials



Polyproline Helix (PPII)

Glycosylated PPII

Medicinal/ Biological Glycochemistry



Antitumor Glycolipids

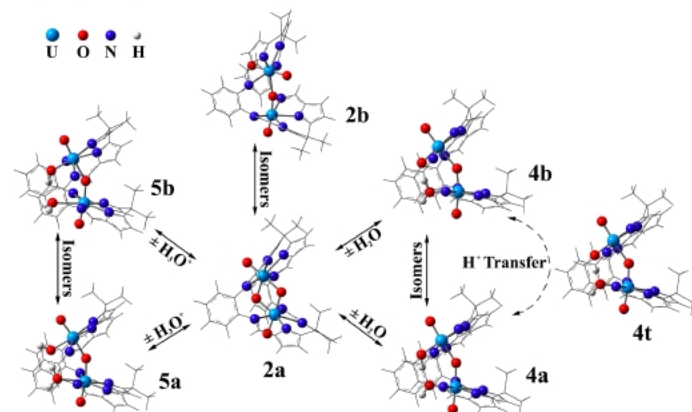




H. Georg Schreckenbach

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Chemistry with Computers: Development and application of state-of-the-art quantum chemical methods to study molecules and their properties



Research Areas:

- Analytical
- Biochemistry
- Environmental
- Inorganic
- Materials Science
- Organic
- Organometallic
- Physical/Theoretical
- Spectroscopy

Current research topics are:

- Theoretical actinide molecular science
- Environmental chemistry of mercury and other heavy metals
- Solar energy: dye-sensitized solar cells and catalytic water splitting
- Method development and benchmarking of methods





John Sorensen

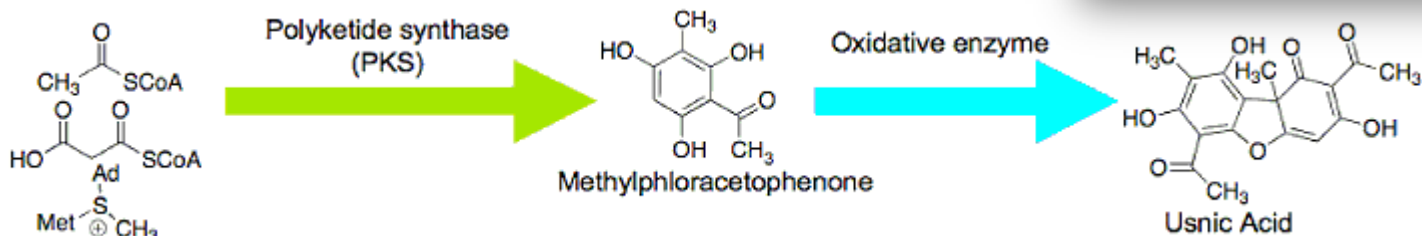
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Research Areas:

Analytical
Biochemistry
 Environmental
 Inorganic
 Materials Science
Organic
 Organometallic
 Physical/Theoretical
 Spectroscopy



Current research topics are:

- Understanding the biosynthesis of usnic acid
- Searching for antibacterial compounds from soil fungi
- Vitamin B12 synthesis inhibitors in bacteria
- Metabolites from pathogenic bacteria
- Biofuels derived from microbial sources



Jörg Stetefeld

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Detail studies in structure-function relationship of proteins as dynamic systems

Research Areas:

Analytical
Biochemistry
Environmental
Inorganic
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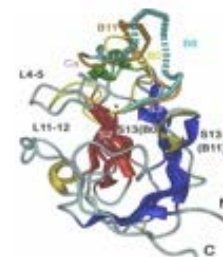
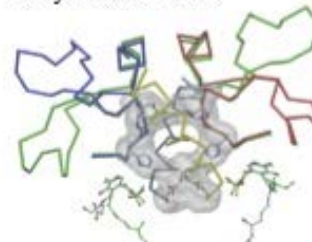
Current research topics are:

- Mechanisms of complex formations and signal transduction within the extracellular matrix
- Signaling linked to catalytic turnover
- The storage function of coiled-coil domains



Coiled coils

Enzymes at work



Signal transduction via ECM





Feiyue Wang

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Investigation of speciation, cycling, and bioavailability of trace metals across environmental interfaces at the molecular and regional scales



Research Areas:

Analytical

Biochemistry

Environmental

Inorganic

Materials Science

Organic

Organometallic

Physical/Theoretical

Spectroscopy

Current research topics are:

- Cryospheric chemistry across the ocean-sea ice-atmosphere interface
- Biogeochemistry of Hg in the Arctic Ocean
- Interaction of climate change and chemical contamination in sentinel ecosystems
- Ultra-trace analytical techniques for chemical speciation





Jennifer van Wijngaarden

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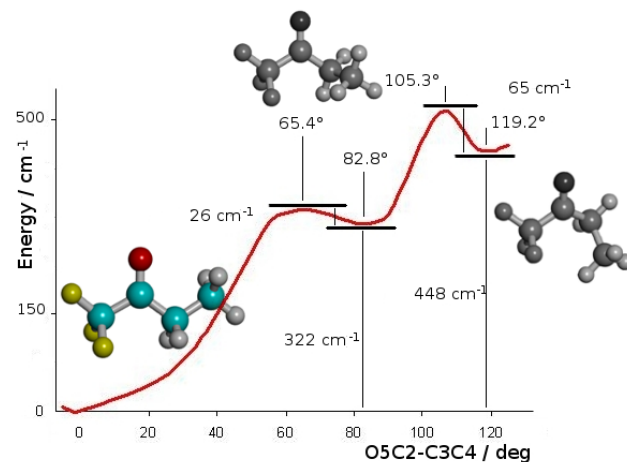
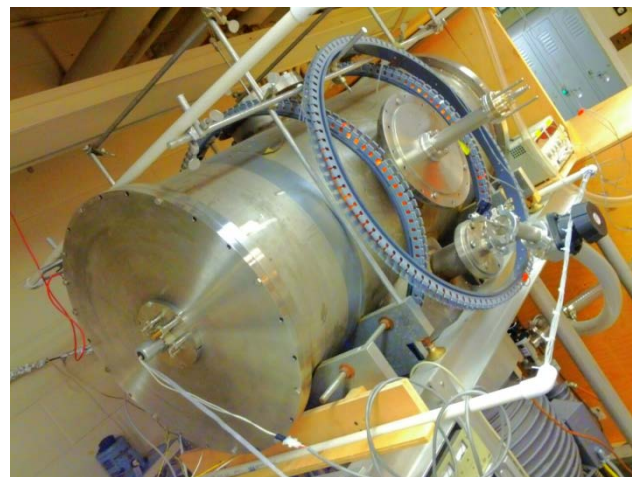
Characterization of reactive intermediates using high resolution spectroscopy and computational chemistry

Research Areas:

- Analytical
- Biochemistry
- Environmental
- Inorganic
- Materials Science
- Organic
- Organometallic
- Physical/Theoretical Spectroscopy

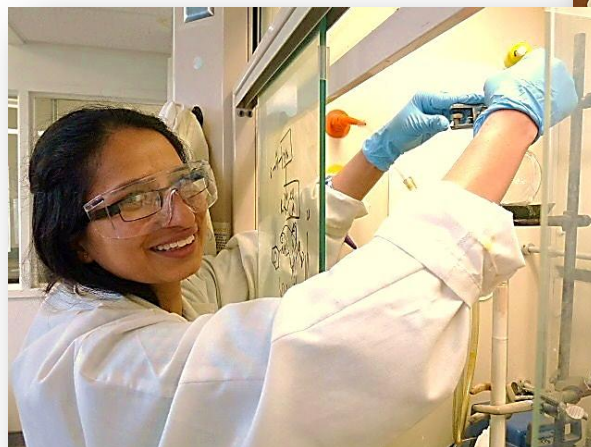
Research themes are:

- Spectrometer development
-microwave, infrared
- Production of ions/radicals
- Synchrotron techniques
- Analysis of complex spectra
- *Ab initio* calculations



Graduate Program

- M.Sc. or Ph.D.
- Coursework
- Research
- Teaching Assistance
- Departmental Seminar
- Thesis



Undergraduate Program

- B.Sc. Major or Honours (4 years)
Chemistry, Biochemistry, or Biotechnology
- Focus Areas
 - Bioanalytical
 - Biophysical
 - Materials Science
 - Quantum/Computational
 - Physical
 - Biopharmaceutical
 - Environmental
 - Organic
- Research experience (Honours)



The Department of Chemistry Profile

Total number of students enrolled in chemistry or biochemistry

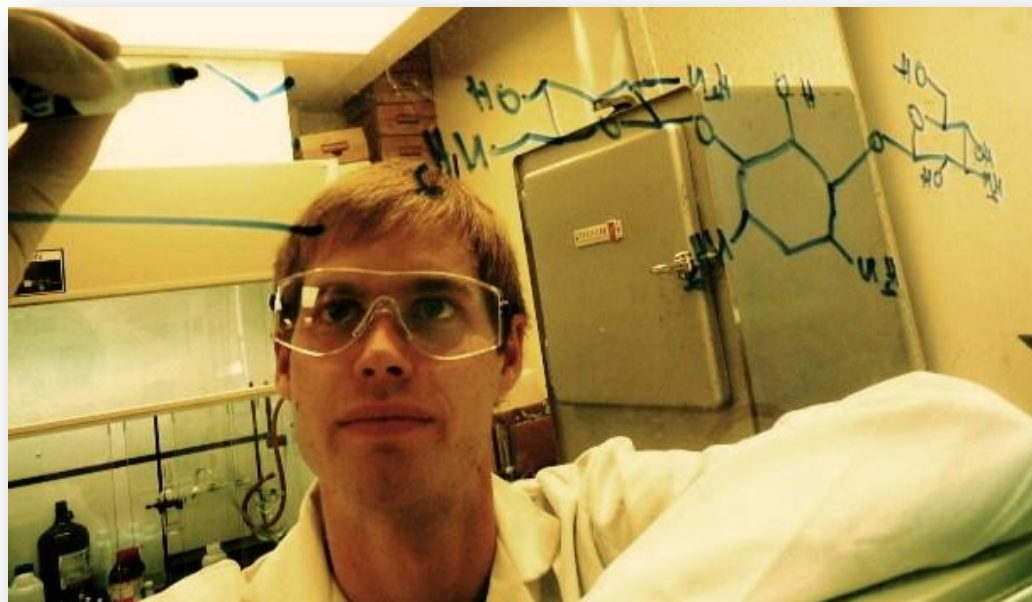
Undergraduate program	119
M.Sc. Program	20
Ph.D. Program	21

Student numbers from 2012/2013



Funding

- All graduate students are guaranteed funding in their first year
- UM Graduate Fellowships
- External Scholarships: NSERC, CIHR, MHRC
- Graduate Stipends



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INNOVATOR CHALLENGER REBEL VISIONARY

REBEL PIONEER CREATOR EXPLORER TRAILBLAZER INNOVATOR

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