

MOLECULAR AND CELLULAR BIOLOGY

The MCB graduate program offers opportunities for interdisciplinary studies in molecular and cellular biology leading to the MSc and PhD degrees in the following five fields:

- **Biochemistry**
- **Cell Biology**
- **Microbiology**
- **Molecular Biology and Genetics**
- **Plant Biology**

The research groups directed by the faculty pursue fundamental and applied research questions involving diverse biological systems (plants, humans and other animals, prokaryotic and eukaryotic microbes). In general, they follow lines of scientific enquiry at the level of molecules to cells. See the department website (<http://www.uoguelph.ca/mcb/graduate/graduate.shtml/>) for additional information.

Administrative Staff

Chair

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Graduate Faculty

This list may include Regular Graduate Faculty, Associated Graduate Faculty and/or Graduate Faculty from other universities.

Tariq Akhtar

B.Sc., M.Sc. Waterloo, PhD Florida - Assistant Professor
Graduate Faculty

Emma Allen-Vercoe

B.Sc. London (UK), PhD Open (UK) - Professor
Graduate Faculty

Hany Anany

B.Sc., M.Sc. Cairo, PhD Guelph - Research Scientist, AAFC
Associated Graduate Faculty

Andrew J. Bendall

B.Sc. Australian National, PhD Macquarie - Associate Professor
Graduate Faculty

Malcolm Campbell

B.Sc. Guelph, MA Oxford, PhD Guelph - Professor and Vice-President (Research)
Graduate Faculty

Anthony J. Clarke

B.Sc., M.Sc., PhD Waterloo - Professor Emeritus, Dean, Faculty of Science,
Wilfrid Laurier University
Associated Graduate Faculty

Joseph L. Colasanti

B.Sc., PhD Western Ontario - Associate Professor
Graduate Faculty

Marc Coppolino

B.Sc. Waterloo, M.Sc., PhD Toronto - Associate Professor and Chair
Graduate Faculty

Georgina Cox

B.Sc., PhD Leeds - Assistant Professor
Graduate Faculty

John Dawson

B.Sc. Wilfrid Laurier, PhD Alberta - Professor and Associate Dean (Academic), College of Biological Sciences
Graduate Faculty

Michael J. Emes

B.Sc., PhD Sheffield - Professor
Graduate Faculty

Jennifer Geddes-McAlister

B.Sc., M.Sc. Lethbridge, PhD British Columbia - Assistant Professor
Graduate Faculty

Joshua Gong

B.Sc. Wuxi College, M.Sc. Beijing Agricultural, PhD Guelph - Research Scientist, AAFC
Associated Graduate Faculty

Steffen P. Graether

B.Sc., M.Sc., PhD Queen's - Professor
Graduate Faculty

George Harauz

B.A.Sc., M.Sc., PhD Toronto - University Professor Emeritus
Associated Graduate Faculty

Nina Jones

B.Sc. Guelph, PhD Toronto - Professor
Graduate Faculty

P. David Josephy

B.Sc., Toronto, PhD British Columbia - Retired Faculty
Associated Graduate Faculty

Cezar Khursigara

B.Sc. Ryerson, PhD McGill - Professor
Graduate Faculty

Matthew S. Kimber

B.Sc., PhD Toronto - Associate Professor
Graduate Faculty

Jasmin Lalonde

BA Ottawa, MA, PhD McGill - Assistant Professor
Graduate Faculty

Joseph S. L. Lam

B.Sc., PhD Calgary - University Professor Emeritus
Associated Graduate Faculty

Ray Lu

B.Sc. Wuhan (China), M.Sc. Beijing Medical, PhD Saskatchewan - Associate Professor
Graduate Faculty

Jaideep Mathur

B.Sc., M.Sc. Lucknow (India), PhD Gorakhpur (India) - Associate Professor
Graduate Faculty

Baozhong Meng

B.Sc., M.Sc. Hebei Agricultural (China) - Professor
Graduate Faculty

A. Rodney Merrill

B.Sc. Lethbridge, PhD Ottawa - Retired Faculty
Associated Graduate Faculty

Richard D. Mosser

B.Sc., PhD Waterloo - Retired Faculty, Molecular and Cellular Biology, University of Guelph
Associated Graduate Faculty

Robert T. Mullen

B.Sc., PhD Alberta - Professor
Graduate Faculty

Lucy M. Mutharia

B.Sc., M.Sc. Nairobi, PhD British Columbia - Retired Faculty

Annette Nassuth

B.Sc., M.Sc. Free (Amsterdam), PhD Leiden - Retired Faculty
Associated Graduate Faculty

Priyanka Pundir

B.V.Sc. G.B. Pant (India), PhD Atlantic Veterinary - Assistant Professor
Graduate Faculty

Scott Ryan

B.Sc. Memorial, PhD Ottawa - Associate Professor
Graduate Faculty

Shaun Sanders

B.Sc., PhD British Columbia - Assistant Professor
Graduate Faculty

Stephen Y. K. Seah

B.Sc., M.Sc. National (Singapore), PhD Sheffield - Professor
Graduate Faculty

Rebecca Shapiro

B.Sc. McGill, PhD Toronto - Assistant Professor
Graduate Faculty

Matthew Sorbara

B.Sc., PhD Toronto - Assistant Professor
Graduate Faculty

Roselynn M. W. Stevenson

B.Sc., PhD Manitoba - Professor Emeritus
Associated Graduate Faculty

Ian Tetlow

B.Sc. Newcastle (UK), PhD North Wales - Professor
Graduate Faculty

James Uniacke

B.Sc., PhD Concordia - Assistant Professor
Graduate Faculty

Siavash Vahidi

PhD Western Ontario - Assistant Professor
Graduate Faculty

George van der Merwe

B.Sc., M.Sc., PhD Stellenbosch (South Africa) - Associate Professor
Graduate Faculty

Terry Van Raay

B.Sc. Windsor, M.Sc. Guelph, PhD Utah - Associate Professor
Graduate Faculty

John Vessey

B.Sc., M.Sc. Dalhousie, PhD Eberhard Karls (Tübingen) - Assistant Professor
Graduate Faculty

Christopher Whitfield

B.Sc. Newcastle, PhD Edinburgh - Professor
Graduate Faculty

Melanie Wills

B.Sc., PhD Guelph - Director, G. Magnotta Lyme Disease Research Lab, University of Guelph
Associated Graduate Faculty

Janet M. Wood

B.Sc. Victoria, PhD Edinburgh - University Professor Emerita
Associated Graduate Faculty

Yang Xu

B.Sc. Northwest A&F, M.Sc. South China, PhD Alberta - Assistant Professor
Graduate Faculty

Krassimir (Joseph) Yankulov

B.Sc. Sophia, PhD ICRF London - Professor
Graduate Faculty

Wei Zhang

B.Sc. Beijing, MA York, PhD Toronto - Assistant Professor
Graduate Faculty

Ting Zhou

B.Sc. Henan Agriculture, PhD McGill - Research Scientist, AAFC
Associated Graduate Faculty

MSc Program

Admission Requirements

To be considered, applicants must have completed a four-year honours undergraduate science degree (or its equivalent) in a relevant discipline. Normally, the applicant must have achieved a “B” (75%) average or higher during the last two years of full-time study. In exceptional circumstances, students with a “B-minus” average (70%) will be considered provided there is strong supporting evidence of research aptitude and potential.

Each applicant must obtain the support of a faculty member willing to serve as their thesis advisor and list them accordingly on their application for admission, at the time of its submission.

Admission may be granted for entry in September, January or May. Completed applications should be uploaded at least one full semester (four months) before the expected date of admission (at least eight months for international students).

All components of the application, including transcript(s), graduate certificate(s), grading scale(s), language test results, assessment forms, a statement of interest must be uploaded no later than two months after an application is submitted through the OUAC portal. Applications that are incomplete after this time period will be closed.

Admission Process

Graduate student applications to programs in the College of Biological Science are handled by the Office of the Associate Dean, Research (ADR). Before submitting an application, applicants are strongly encouraged to review the information found on the CBS-ADR website to learn more about the application process (<https://www.uoguelph.ca/cbs/academics/graduate/programs/>).

Complete application instructions may also be found on the Office of Graduate Studies (<http://www.uoguelph.ca/graduatestudies/apply/>) webpage or in the Graduate Calendar (<calendar.uoguelph.ca/graduate-calendar/general-regulations/admission/application-admission/>).

Program Requirements

The objective of the program is to provide graduate students with a high level of relevant knowledge and expertise in contemporary molecular and cellular biology, including experimental techniques, library research, writing and communication skills. Graduates will have the knowledge and skills needed to carry out high quality scientific research and will be prepared for employment in positions with some responsibility in the research and teaching enterprises of academic institutions (as instructors and technical staff), in science-related positions in the broad biotechnology sector (e.g. food and beverage industries, pharmaceuticals, biomedical, and agriculture-related industries), or in government sector institutes and laboratories. They will be well prepared to continue their graduate education at the PhD level. Alternatively they may opt to complete a professional degree (such as law, medicine, or business) or a teaching certificate.

Students in the MSc program must complete a minimum of 2 courses (1.5 credits) at the graduate level. MCB*6500 MSc Research Topics in Molecular and Cellular Biology is mandatory. This two-semester should be completed in the first year of study and normally in the first two semesters. Senior undergraduate courses may be taken on the recommendation of the Advisory Committee but these will not count towards the 1.5 credit requirement. An average of "B-minus" (70%) must be achieved in the prescribed courses.

The MSc thesis research must involve original enquiry into a well-defined question in the molecular biosciences. It is expected that the research will not have been previously reported in the literature and, wherever possible, the research should yield publishable data.

All students beyond year 1 in the program are required to participate annually in the CBS Graduate Student Symposium by giving a presentation describing their research progress.

PhD Program

Admission Requirements

There are three pathways for admission to the PhD program:

1. Students who have achieved an "A-minus" (80%) average or higher during the last two years of full-time study while completing a four-year honours BSc program (or its equivalent) and who provide evidence of research aptitude and potential based on laboratory research experience may apply to enter the PhD program directly, or
2. An MSc student may apply to transfer to the PhD program before completing the MSc degree. To be eligible for transfer, the student must have completed a high quality undergraduate degree with a grade average of B+ or higher. Before applying for transfer to the PhD program students must complete MCB*6500 MSc Research Topics in Molecular and Cellular Biology plus an additional course with at least 0.5 graduate course credit, attaining an overall A minus average (at least 80%). Applications for transfer must be approved by the end of the fourth semester in the MSc program.
3. Applicants may have completed a recognized Masters degree in a relevant discipline with a minimum academic standing of "A-minus" (80%).

Each applicant must obtain the support of a faculty member willing to serve as their thesis advisor and list them accordingly on their application for admission, at the time of its submission.

All components of the application, including transcript(s), graduate certificate(s), grading scale(s), language test results, assessment forms, a statement of interest, must be uploaded no later than two months after an application is submitted through the OUAC portal. Applications that are incomplete after this time period will be closed.

Admission may be granted for entry in September, January or May. Completed applications should be uploaded at least one full semester (four months) before the expected date of admission (at least eight months for international students).

Admission Process

Graduate student applications to programs in the College of Biological Science are handled by the Office of the Associate Dean, Research (ADR). Before submitting an application, applicants are strongly encouraged to review the information found on the CBS-ADR website to learn more about the application process (<https://www.uoguelph.ca/cbs/academics/graduate/programs/>).

Completed application instructions may also be found on the Office of Graduate Studies (<http://www.uoguelph.ca/graduatestudies/apply/>) webpage or in the Graduate Calendar (<calendar.uoguelph.ca/graduate-calendar/general-regulations/admission/application-admission/>).

Program Requirements

The objective of the program is to develop independent and creative scientists specializing in molecular and cellular biology. Graduates will be prepared for positions as scholars in academic institutions, as leaders in the research and development sector of the biomedical and other industries or government agencies, and in social institutions.

Students in the PhD program must complete MCB*7500 PhD Research Topics in Molecular and Cellular Biology. This two-semester course should be completed in the first year of study and normally within the first two semesters. Students without an MSc degree in Molecular and Cellular Biology or the equivalent are required to take one additional graduate course. Other courses may be taken on the recommendation of the Advisory Committee. An average of "B-minus" (70%) must be achieved in the prescribed courses. To be a candidate for the PhD degree, each student must pass a PhD Qualifying Exam. The Qualifying Examination is completed before the end of the fifth semester (for

students with an MSc) or the end of the seventh semester (for students without an MSc).

The PhD thesis research must involve original enquiry into a well-defined question in the molecular biosciences. It is expected to result in the publication of one or more papers in high-quality peer-reviewed journals. The research must represent a significant contribution to the relevant research field.

All students beyond year 1 in the program are required to participate annually in the CBS Graduate Student Symposium by giving a presentation describing their research progress.

Collaborative Specializations

Neuroscience

The Department of Molecular and Cellular Biology participates in the MSc/PhD collaborative specialization in neuroscience. Please consult the Neuroscience (<https://calendar.uoguelph.ca/graduate-calendar/collaborative-specializations/neuroscience/>) listing for a detailed description of the MSc/PhD collaborative specialization.

One Health

The Department of Molecular and Cellular Biology participates in the collaborative specialization in One Health. Master's and Doctoral students wishing to undertake thesis research or their major research paper/project with an emphasis on one health are eligible to apply to register concurrently in Molecular and Cellular Biology and the collaborative specialization. Students should consult the One Health (<https://calendar.uoguelph.ca/graduate-calendar/collaborative-specializations/one-health/>) listing for more information.

Toxicology

The Department of Molecular and Cellular Biology participates in the master's/doctoral collaborative specialization in toxicology. The research and teaching expertise of these faculty include aspects of toxicology; they may serve as advisors for master's and doctoral students in Toxicology. Students choosing this option must meet the requirements of the Toxicology collaborative specialization, as well as those of their home department. Please consult the Toxicology (<https://calendar.uoguelph.ca/graduate-calendar/collaborative-specializations/toxicology/>) listing for a detailed description of the master's/doctoral collaborative specialization.

Courses

MCB*6310 Advanced Topics in Molecular and Cellular Biology Fall Only [0.50]

This course will consider fundamental cellular processes from multiple perspectives: biochemistry, cell biology, microbiology, molecular biology and genetics, and plant biology. Topics will vary from semester to semester but a multi-disciplinary approach to advanced concepts and experimental strategies will be a common theme.

Department(s): Department of Molecular and Cellular Biology

Location(s): Guelph

MCB*6370 Protein Structural Biology and Bioinformatics Unspecified [0.50]

This course explores structural biology from three perspectives: 1) the fundamental concepts in structural biology; 2) the methods used to determine structures (including x-ray crystallography, NMR, electron microscopy, and computational modeling); 3) the bioinformatic concepts and tools used to compare, contrast and assign biochemical function to protein structures and sequences. The course emphasizes building a conceptual and practical skill set that will be applicable to any structure related problem.

Department(s): Department of Molecular and Cellular Biology

Location(s): Guelph

MCB*6500 MSc Research Topics in Molecular and Cellular Biology Unspecified [1.00]

This mandatory two semester course emphasizes the development and refinement of the skills of scientific communication. Students submit a written thesis proposal and present a public seminar on a contemporary subject in the molecular biosciences. MCB MSc students normally complete this course within the first two semesters of their program. Students will register in each semester and receive a grade of INP (in progress) at the end of the first semester and a grade at the end of the second semester.

Department(s): Department of Molecular and Cellular Biology

Location(s): Guelph

MCB*7500 PhD Research Topics in Molecular and Cellular Biology Unspecified [1.00]

This mandatory two semester course emphasizes the development and refinement of the skills of scientific communication. Students submit a written thesis proposal and present a public seminar on a contemporary subject in the molecular biosciences. MCB PhD students normally complete this course within the first two semesters of their program. Students will register in each semester and receive a grade of INP (in progress) at the end of the first semester and a grade at the end of the second semester.

Department(s): Department of Molecular and Cellular Biology

Location(s): Guelph

Code	Title	Credits
BINF*6110	Genomic Methods for Bioinformatics	0.50
BIOT*6500	Molecular Biotechnology	0.50