GENERAL INFORMATION

Introduction 3
Application & Admission Procedures 3
Financial Aid 4
Housing 5
Program Requirements 5
Research Facilities 5

RESEARCH PROGRAMS

Plant molecular biology, physiology and biochemistry 8
Developmental biology and genetics 16
Plant-microbe interactions, mycology and virology 20
Evolutionary biology and systematics 26
Plant and microbial ecology 30

Earth Sciences Centre. Photo by Michael Arlt.
INTRODUCTION

The Department of Botany at the University of Toronto offers graduate programs leading to the M.Sc. and Ph.D. degrees in a variety of disciplines within plant and microbial biology, including: Plant molecular biology, physiology and biochemistry; Developmental biology and genetics; Plant-microbe interactions, mycology and virology; Evolutionary biology and systematics; Plant and microbial ecology.

Our Department is one of the largest plant biology departments in North America, with 41 full members of the graduate faculty and 14 associate and emeritus members. Over 70 M.Sc. and Ph.D. students are actively engaged in research in our graduate programs. Faculty and student research interests span a wide range of subdisciplines, with major strengths in the areas listed above. Many labs engage in collaborative efforts with others in the department, either within or across disciplines, which has been an effective means of unifying the department. The department also has research links with other departments in the university such as Chemical Engineering, Forestry, Geology, Geography, Medical Genetics, Microbiology, and Zoology. Members of the department also collaborate with colleagues in other universities, industry or government organizations, enhancing the breadth of intellectual experience for many graduate students.

Our Department is situated on three campuses: St George (downtown Toronto), Erindale (University of Toronto at Mississauga), and Scarborough (University of Toronto at Scarborough). Graduate student research and graduate courses are offered on all three campuses, although the greatest diversity of subject areas and courses are offered on the St. George campus. The St. George campus is also the location of Collaborative Graduate Programs in Developmental Biology (with Anatomy and Cell Biology, Molecular and Medical Genetics, and Zoology Departments) and in Toxicology and Environmental Studies (with several other graduate departments). Graduate programs are integrated across all three campuses, so that an individual student may carry out research on one campus, but travel to another once a week for a graduate course. All three campuses have excellent facilities for plant molecular biology, microscopy, and plant growth facilities.

One unique unifying force within the Department of Botany has been the adoption of Arabidopsis as the organism of study by many researchers. This model system is now employed by eight faculty research groups who meet on a weekly basis to describe the research progress and other aspects of their programs. This group has provided an effective venue for scientific discussion and interaction of approximately 30 individuals, including faculty, post-docs, graduate students and undergraduate research students. The University of Toronto Arabidopsis Working Group represents the largest collection of research labs working on this model organism in a single institution in Canada.

APPLICATION & ADMISSION PROCEDURES

Further information and application forms and instructions can be found on our website at www.botany.utoronto.ca or you may write to the Graduate Office, Department of Botany, University of Toronto, 25 Willcocks Street, Toronto, Ontario, M5S 3B2. Telephone: 416-978-7172 FAX: 416-978-5878 e-mail: grad@botany.utoronto.ca

The minimum academic requirement for admission into the graduate program is a B+ in the final year of a four year B.Sc. and a mid-B overall in the previous year. Applicants with a M.Sc. degree must have an overall average of B+. Applicants with a B.Sc. degree are encouraged to apply for direct entry into the Ph.D. program. The department also offers the opportunity for M.Sc. students to transfer to the Ph.D. program at the end of their first year. Applicants must arrange for three letters of reference. In addition, because our graduate program is primarily research oriented, all students accepted in the Department must have a faculty member who is willing to supervise their research and provide financial support. Students should contact faculty members whose...
The normal start date for our program is September 1st. There is a February 1st deadline for receipt of application with complete documentation in order to be considered for any University of Toronto fellowships or scholarships. All students who gain admission to our program are eligible for these awards. If you do not apply for U of T fellowships or scholarships, the deadline for receipt of completed applications (including all transcripts, letters of reference, etc.) is April 15th for all applicants.

International student fees are higher than domestic student fees and individual professors may or may not have the extra funds necessary to support a Visa student. The competition for fellowships at U of T is very intense; therefore any funding that you can find from other sources will help offset this fee differential. All non-English speaking applicants are required to obtain a satisfactory score on the Test of English as a Foreign Language (TOEFL). The School of Graduate Studies requires a minimum score of 580 (paper-based test) or 237 (computer-based test), and a score of at least 5.0 on the Test of Written English (TWE).

FINANCIAL AID

Minimum Stipend
The Department of Botany guarantees an annual minimum stipend of $15,000 plus the cost of tuition for Canadian ($5600) and international ($10,100) students in the 2001-2002 academic session. The stipend is made up of a combination of scholarships and fellowships, teaching assistantships and support from supervisors’ grants. We guarantee a teaching assistantship position to all students who are accepted into our program.

Scholarships
Canadian graduate students with excellent academic records are encouraged to apply for a Natural Sciences and Engineering Research Council (NSERC) scholarship. Students should apply through their home universities. Applications are available in most graduate schools across Canada or at www.nserc.ca. The Ontario Graduate Scholarship program also has substantial scholarships available for graduate students studying in Ontario schools. Students should apply through their home university or at osap.gov.on.ca/eng/not_secure/OGS.htm. The deadline for both NSERC and OGS scholarships is early in the fall of each year. International students must obtain a student visa to register in the graduate program at the University of Toronto and must pay higher international tuition fees. International students are therefore encouraged to apply to any available scholarships for overseas studies in their home country.

UofT Fellowships
The University of Toronto awards UofT Fellowships, International Recruitment Awards, and Connaught Fellowships on a competitive basis. All applicants who have returned their completed applications with all supporting documentation by February 1st will automatically be considered for these awards.

Departmental Awards
The Department of Botany has several small awards given out to graduate students on a competitive basis. Students are nominated by faculty members.

Teaching Assistantships
The Department of Botany guarantees all students accepted into our programs a Teaching Assistant position. Application forms are sent to new students after an admission offer has been made. A typical teaching position consists of three hours of teaching/lab demonstration per week and two hours per week of preparation, invigilating, or marking from September until April.
Support from Research Grants
Supervising professors must provide income support from their research grant if a student’s combination of scholarships and teaching assistantships does not meet the minimum departmental income level for graduate study.

HOUSING

Living arrangements are the responsibility of the student. The Graduate/Second Entry residence newly completed in 2000 provides over 400 spaces for graduate and professional students at the University of Toronto (www.sgs.utoronto.ca/residencegradtwo/). Many alternatives for off-campus housing also exist (www.library.utoronto.ca/housing_service/).

PROGRAM REQUIREMENTS

Original research and the completion and defense of a thesis are requirements for students in both the Master’s and the Doctoral programs. All graduate students registered in the Department of Botany are required to attend the departmental seminar series and Ph.D. proposal and Ph.D. thesis evaluations throughout the academic year. Regular supervisory committee meetings are also a requirement.

M.Sc. students are required to complete a minimum of one graduate half (one semester) course. For Ph.D. students, there is a minimum formal course requirement of three half courses for students that have completed a M.Sc. or who have transferred from a M.Sc. to a Ph.D. in the department. It is strongly suggested that one of these courses be from the Botany graduate seminar course series (BOT1700H).

There is an opportunity for M.Sc. students to transfer into the Ph.D. program within the first year of their program. A Ph.D. proposal/transfer exam is required within the first 16-20 months of the graduate program. Ph.D. students must successfully complete a Ph.D. proposal seminar to the department by the middle of their second year. M.Sc. students must successfully defend their thesis research to an examining committee in order to complete their degree. Both a thesis evaluation presented to the department and a final oral thesis examination presented to an examining committee is required for Ph.D. students.

Collaborative programs in Toxicology, Developmental Biology and the Institute for Environmental Studies have separate course and program requirements.

RESEARCH FACILITIES

Imaging and Microscopy
The Department of Botany has a well-equipped imaging and microscopy laboratory, with scanning and transmission electron microscopes and ancillary equipment such as microtomes, sputter-coater and critical point drier. Recently opened on the St. George Campus is the Olympus Imaging Laboratory with a Confocal Laser Scanning Microscope and compound and dissecting light microscopes, all with digital cameras and image capture and manipulation software. The facility is under the supervision of a full time electron microscopy technician.

Molecular Biology
The Department has full facilities for molecular biology work, including phosphor-imaging, biolistic transformation, in situ hybridization, as well as standard accessory equipment such as ultracentrifuges, freezers, incubators, and gel apparatus. Research labs in the department have ready access to major institutional resources at the University of Toronto such as DNA sequencing, protein purification/sequencing, and animal care facilities.
**Plant Growth Facilities**

The Department has extensive plant growth facilities that are being upgraded continuously; these include over 10,000 feet of greenhouse space, including new greenhouses located on the roof of the Earth Sciences Building. The Earth Sciences Building also houses a large basement growth facility with 45 growth chambers and 9 walk-in growth rooms. The facilities are run by two full-time horticulturists and a technician who helps administer the basement facilities.

**Noranda Earth Sciences Library**

The Noranda Earth Sciences Library is adjacent to the Department of Botany in the Earth Sciences Center and houses periodicals and monographs in botany, forestry and geology. Other major biological journals are housed in the Gerstein Science Information Centre and in the Zoology library, both located about a 5 minute walk away. The University of Toronto Library catalog and electronic databases and journals are readily accessible through the Departmental network.

**Herbaria**

The Vascular Plant Herbarium and the Mycological Herbarium, both housed at the Royal Ontario Museum, provide large collections of plant specimens for research and teaching. Both herbaria provide plant material for DNA sequencing and can borrow specimens from institutions around the world on behalf of individual investigators.

**Field work**

Members of the Department conduct fieldwork at diverse locations around the world, from the arctic to the tropics. In addition, a 900 acre field location is available for field experiments at Joker’s Hill, about a 45 minute drive northwest of Toronto.

**RESEARCH PROGRAMS**

The Department of Botany has active research programs in the following areas:

- Plant molecular biology, physiology and biochemistry
- Developmental biology and genetics
- Plant-microbe interactions, mycology and virology
- Evolutionary biology and systematics
- Plant and microbial ecology

Although Associate and Emeritus Faculty Members are not normally involved in primary supervision of graduate students, they may play an active role on a student’s supervisory committee. Faculty members can be contacted about their research programs using the e-mail addresses given at the bottom of each profile. Alternatively, you can write to graduate faculty members at:

**St. George Campus members:**

Department of Botany  
University of Toronto  
25 Willcocks Street  
Toronto, ON M5S 3B2  
CANADA  
FAX: (416) 978-5878
**Erindale Campus members:**
Biology Group
University of Toronto at Mississauga
3359 Mississauga Road
Mississauga, ON L5L 1C6
CANADA
FAX: (905) 828-3792

**Scarborough Campus members:**
Division of Life Sciences
University of Toronto at Scarborough
1265 Military Trail
Scarborough, ON M1C 1A4
CANADA
FAX: (416) 287-7642
TERENCE J. BLAKE
Full Member
Ph.D., University of Melbourne, 1974
St. George Campus/Forestry

Plant physiology. Defence reactions in ‘stressed’ plants. The role of plant growth regulators, antioxidants, and phenols in inducible (acquired) resistance to environmental ‘stress’. The role of anti-senescence agents (anti-oxidants, anti-ethylene agents, membrane protectants, etc.) in protecting plants when they are challenged by drought, flooding, heat, uv and pollution. Effects of ‘stress’ on growth processes and membrane stability.


terry.blake@utoronto.ca

DINESH CHRISTENDAT
Full Member
Ph.D., Concordia University, 1998
St. George Campus

Plant Biochemistry: Structural and Functional Proteomics of Metabolic Pathways. Genomics research has produced a wealth of new information which revealed that less than 50% of plant proteins have a known function. My lab focuses on functional characterization of these proteins using a number of synergistic technologies including protein crystallography, protein-protein interactions, protein-ligand complexes and enzyme kinetics. My group also studies enzymes of the shikimate pathway by protein crystallography and mechanistic enzymology.


JOHN R. COLEMAN
Full Member
Ph.D., York University, 1981
St. George Campus

Molecular biology and biochemistry of photosynthetic carbon metabolism in higher plants and cyanobacteria. Specific projects include: regulation of gene expression in response to changing CO₂ concentrations; identification and characterization of CO₂ responsive mutants of Arabidopsis; structure/function analysis of plant carbonic anhydrases and characterization of transgenics; genetic engineering of carbon metabolism in cyanobacteria.


Fett, J.P. and J.R. Coleman. 1994. Characterization and expression of two cDNAs encoding...
Plant physiology. Stress physiology: plant responses to drought and extreme temperatures; arctic adaptations in plants; thermal acclimation of photosynthesis and respiration; tree physiology.


cummins@credit.utm.utoronto.ca

FRANK DiCOSMO
Full Member
Ph.D., University of Waterloo, 1981
St. George Campus

Biotechnological studies of plant-derived anti-cancer drugs. The biophysics of protein adsorption, cell adhesion and biofilm formation. Interaction of taxol and vinblastine with model membrane systems. Fundamental and applied studies of biochemistry and biophysics of cultured plant cells.


dicosmo@botany.utoronto.ca

GEORGE S. ESPIE
Full Member
Ph.D., York University, 1985
Erindale Campus

Membrane transport, microbial physiology, photosynthesis, cyanobacterial and eukaryotic algal molecular biology and biochemistry. Current research is directed towards: acquiring an understanding of the molecular and biochemical mechanisms involved in energization of CO₂ and HCO₃⁻ transport; molecular analysis of carbonic anhydrase targeting to carboxysomes and its role in the CO₂–concentrating mechanism of prokaryotic and eukaryotic algae; regulation of expression carbonic anhydrase by environmental factors; the role of CO₂ / HCO₃⁻ in the regulation of photosynthetic electron transport. We are also pursuing a molecular analysis of cyanate transport and metabolism and its interaction with the CO₂ -concentrating mechanism in cyanobacteria.


espie@credit.utm.utoronto.ca
JACK FERRIER
Member Emeritus
Ph.D., Ohio State University, 1973
St. George Campus/Dentistry

Biophysics: mechanical and electrical properties of cells and tissues, intracellular and cell to cell communication.


j.ferrier@utoronto.ca

DAPHNE R. GORING
Full Member
Ph.D., University of Toronto, 1990
St. George Campus

Research interests are in the molecular and cellular mechanisms of receptor kinase signalling in plants. One model system being used is the Brassica self-incompatibility response where “self” pollen is recognized and rejected. While it is known that this response is mediated through the S receptor kinase, little is known about the signalling pathway leading to the rejection of the self-incompatible pollen, and this is the focus of current research. Research projects have also been initiated which use functional genomics approaches to study signal transduction gene families in Arabidopsis.


callose in the stigma papillae does not affect the *Brassica* self-incompatibility phenotype. Planta 203: 327-331.


goring@botany.utoronto.ca

**TAMMY L. SAGE**  
Full Member  
Ph.D., University of California, Davis, 1989  
St. George Campus

**Evolution of self-incompatibility and pollen-carpel interactions in primitive and advanced flowering plants; cell biology of self-incompatibility; late-acting/ovarian self-incompatibility; structure/function of plant reproduction; cell-cell interactions.**


tsage@botany.utoronto.ca

**NEIL A. STRAUS**  
Emeritus Member  
Ph.D., University of Toronto, 1970  
St. George Campus

**Molecular biology and molecular genetics. Recombinant DNA technology is being employed to study the molecular genetics of photosynthesis and evolution.**


straus@botany.utoronto.ca

GREG C. VANLERBERGHE
Full Member
Ph.D., Queen’s University, 1991
Scarborough Campus

Biochemistry, physiology, and molecular biology of plant metabolism; mitochondrial electron transport; respiratory carbon metabolism; environmental and stress physiology; transgenic plants; gene regulation; enzyme structure and function.


gregv@utsc.utoronto.ca

JOHN P. WILLIAMS
Full Member
Ph.D., Imperial College, London, 1963
St. George Campus

Physiology and biochemistry. Determination of the metabolic pathways and sites of biosynthesis of lipids in plants; examination of the effects of environmental factors on these biosynthetic pathways; the improvement of stress resistance and oil quality in oilseed


williams@botany.utoronto.ca
THOMAS BERLETH
Full Member
Ph.D., University of Tuebingen, 1989
St. George Campus

Developmental genetics. Plant embryo and vascular development. Projects focus on the molecular genetic analysis of signaling pathways involved in embryo axis formation and vascular tissue patterning. The strategy is based on the identification of genes by mutation in the model plant Arabidopsis thaliana that are subsequently isolated and analyzed at the molecular level. Genomic tools are employed for the identification and characterization of mutants. These include isolation of insertion mutants based on enhancer-trap expression patterns and microarray transcript profiling of mutants. www.botany.utoronto.ca/ResearchLabs/BerlethLab/index.html


berleth@botany.utoronto.ca

NANCY G. DENGLER
Full Member
Ph.D., University of California, Davis, 1968
St. George Campus

Plant anatomy and development. Tissue pattern development and cell differentiation in plants with C₄ photosynthesis. Cell cycling and cell differentiation during leaf development.


dengler@botany.utoronto.ca

RONALD E. DENGLER
Full Member
Ph.D., University of California, Davis, 1967
Scarborough Campus

Anatomy and cell ultrastructure. Structure and development of foliar organs with an emphasis on species with the C₄ photosynthetic pathway.


dengler@utsc.utoronto.ca

CLARE A. HASENKAMPF
Full Member
Ph.D., Florida State University, 1984
Scarborough Campus

Meiosis and chromosome structure and function. DNA replication and genome evolution. Currently DNA and protein purification techniques are being combined with immunocytochemistry and in situ hybridization to identify and characterize DNA sequences and proteins important in the process of meiosis, and in the coordination of meiosis with plant development. The work is being done with lilies and Arabidopsis.


We have embarked on a program to identify genes that regulate plant hormone signal transduction. Although we specifically study the plant hormone abscisic acid (ABA) in *Arabidopsis thaliana* many of our genetic screens have identified mutations that affect other hormone signaling pathways such as gibberellin (GA) biosynthesis/sensitivity or ethylene sensing. We are therefore also interesting in understanding how this cross talk occurs between various hormones.


mccourt@botany.utoronto.ca

**C. DANIEL RIGGS**

Full Member  
Ph.D., Florida State University, 1986  
Scarborough Campus

Cellular and molecular aspects of plant development mediated by homeodomain proteins and alterations in chromatin structure. Meiosis and microsporogenesis. The role of proteinases in plant development.


riggs@utsc.utoronto.ca
MOUNIR G. ABOUHAIDAR
Full Member
Ph.D., Strasbourg, 1976
St. George Campus


abouhaid@botany.utoronto.ca

ROBIN K. CAMERON
Full Member
Ph.D., McGill University, 1991
St. George Campus

Plant defense responses, including Systemic Acquired Resistance (SAR) and Age-Related Resistance (ARR): biochemical, physiological, molecular genetic and signal transduction studies using the model plant-pathogen system, Arabidopsis thaliana/Pseudomonas syringae pv tomato. The outcome of the SAR response is similar to the vaccination process in mammals, except that in plants, vaccination with certain pathogens produces immunity to many other unrelated pathogens. Little is known about the signal transduction pathway that leads to SAR. Therefore elucidation of the SAR pathway will allow us to genetically engineer crop plants to respond to all pathogen attacks with a SAR response making it
possible for farmers to reduce pesticide use.


rcameron@botany.utoronto.ca

MICHELE C. HEATH, F.R.S.C.
Full Member
Ph.D., Imperial College, London, 1969
St. George Campus

Plant-microbe interactions and mycology. Cellular and molecular studies of plant resistance or susceptibility to biotrophic fungal pathogens. Current emphasis is on the cellular events that condition resistance or susceptibility of fungal-invaded cells, the identification of plants genes within the invaded cells that are up- or down-regulated, and the identification of fungal products that induce these plant responses.


heath@botany.utoronto.ca
VERNA J. HIGGINS
Full Member
Ph.D., Cornell University, 1969
St. George Campus

Plant pathology/host-parasite interactions. Physiological basis of genetically determined disease resistance. Model systems are used to study specific steps in the cascade of events leading to resistance. Current emphasis is on the role of active oxygen species in defense.


higgins@botany.utoronto.ca

PAUL A. HORGEN
Full Member
Ph.D., State University of New York and Syracuse University, 1972
Erindale Campus

Work with commercially important fungi, and on water quality with respect to pathogenic microbes. The framework of the current experimental approaches involve aspects of biotechnology, molecular genetics, developmental and cellular biology, and genomics. Two fungal systems are currently studied: (1) the cultivated button mushroom Agaricus bisporus, and (2) the causal agents of Dutch elm disease, Ophiostoma novo-ulmi, and Ophiostoma ulmi. The water quality work is with an interdisciplinary research team looking at rapid detection of water born microbial pathogens, utilizing traditional endpoint PCR, real time or quantitative PCR, and transferring this technology to optical fibre Biosensors.


binding motifs and is similar to a yeast gene involved in mRNA splicing. Current Genetics 37(2): 94-103.

phorgen@credit.utm.utoronto.ca

JOHN C. KRUG
Associate Member
Ph.D., University of Toronto, 1970
St. George Campus

Systematics of Ascomycetes, especially coprophilous and terricolous genera, using both morphological and molecular criteria. Taxonomy of tropical fungi. Phytogeography of lichenized and non-lichenized Ascomycetes.


jkrug@botany.utoronto.ca

DAVID W. MALLOCH
Full Member
Ph.D., University of Toronto, 1970
St. George Campus

Research is largely ecological, dealing with interactions between fungi and animals, including humans. Two major areas are currently under investigation: 1) mutualistic relationships between ants and fungi and 2) adaptation of fungi to human environments. In addition, a long-term study of secondary metabolite production by coprophilous fungi has been maintained with Dr. J.B. Gloer of the University of Iowa. Research with ants involves neotropical fungus-cultivating ants and the means these animals employ to protect their “crops” against parasites. Recent work addresses the relationships between north-temperate carpenter ants (Camponotus) and certain associated fungi.


malloch@botany.utoronto.ca

JEAN-MARC MONCALVO
Full Member
Ph.D., University of Lausanne, Switzerland, 1991
St. George Campus and Royal Ontario Museum

**Mycology. Molecular systematics, biogeography, and biodiversity of fungi, in particular of the basidiomycetes. The use of phylogenies to study fungal life histories, ecology, and morphological evolution. Fungal environmental genomics.**


jeanmarc@duke.edu
Molecular plant microbe interactions, genomics, molecular evolution, and biotechnology. We use the causal agent of common smut of corn, *Ustilago maydis*, as a model to investigate gene expression during key developmental transitions in the smut life cycle. The long-term objective of the lab is to determine the function of all genes whose expression is altered in *U. maydis* during pathogenesis. In the near term we are focusing on two growth stages, teliospore germination and filamentous growth within the plant. In both instances we are creating EST libraries and studying gene expression on a near genome wide scale. Supporting lines of investigation include the identification and functional analysis of key signal transduction genes in *U. maydis*.


bsaville@credit.utm.utoronto.ca
JAMES B. ANDERSON
Full Member
Ph.D., University of Vermont, 1980
Erindale Campus

Fungal genetics and population biology including sexual and somatic recognition, growth, reproduction, mutation, and recombination. Current research focuses on the evolution of antifungal drug resistance in the yeasts Candida albicans and Saccharomyces cerevisiae and the genetics of adaptation in the filamentous fungus Schizophyllum commune.


janderso@credit.utm.utoronto.ca

SPENCER C.H. BARRETT, F.R.S.C.
Full Member
Ph.D., University of California, Berkeley, 1977
St. George Campus


barrett@botany.utoronto.ca

TIMOTHY A. DICKINSON
Full Member
Ph.D., University of Western Ontario, 1983
St. George Campus

Systematics of Crataegus; patterns of phenetic variation and phylogeny. Integration of developmental data in taxonomic studies; morphometric analyses of shape variation; numerical taxonomy and cladistics; comparative morphology.


tim.dickinson@utoronto.ca

JAMES E. ECKENWALDER
Full Member
Ph.D., University of California, Berkeley, 1977
St. George Campus

Vascular plant systematics. Taxonomy and phylogeny of fossil and recent seed plants; analysis and implications of natural and artificial hybridization; numerical taxonomy and cladistics. Emphasis on woody plants (esp. Gymnosperms, Populus), Convolvulaceae.

Evolutionary Biology & Systematics


eckenwal@botany.utoronto.ca

DAVID S. GUTTMAN
Full Member
Ph.D., State University of New York at Stony Brook, 1994
St. George Campus

Molecular Evolutionary Genomics. We are interested in where the genetic potential for virulence originates and how bacteria acquire and maintain that potential. Our approach starts with the identification of key genetic systems involved in pathogenesis. Genetic techniques are used to understand how these systems are controlled, and comparative genomic techniques are used to compare bacteria that have different hosts and cause different diseases. Finally, direct functional assays are used to deduce the role these key systems play in the context of the bacteria-host interaction. We are focused on the interaction between the plant pathogenic bacterium Pseudomonas syringae and the plant Arabidopsis thaliana.


guttman@botany.utoronto.ca
Fungal systematics and population biology. I study the phylogeography and population structure of plant pathogenic fungi in wild populations as well as in agricultural crops. I am also interested in taxonomic studies and monography. Current projects include: (1) the origins of pathogenicity on rice in populations of *Magnaporthe grisea*, cause of rice blast and grey leaf spot of turf, (2) genetic diversity and the sources of the emergence of *Sclerotinia sclerotiorum* as a major pathogen of soybeans in central Canada and the north-central United States, (3) genomic divergence as an indicator of metapopulation structure in wild ascomycetous fungi. I also study the evolution of drug resistance in experimental populations of *Candida albicans*, the human commensal and opportunistic pathogen.


kohn@credit.utm.utoronto.ca

JOHN McNEILL
Associate Member
Ph.D., University of Edinburgh, 1960
St. George Campus/Royal Ontario Museum

Taxonomy and biosystematics of recent vascular plants; numerical systematics, cladistics and biological nomenclature. Emphasis on weedy herbaceous species.


johnm@rom.on.ca
KENNETH F. ABRAHAM
Associate Member
Ph.D., Queen’s University, 1980
Ontario Ministry of Natural Resources

Plant-goose interactions in subarctic marshes. Habitat and population ecology of wetland birds. Goose ecology.


Ken.Abraham@mnr.gov.on.ca

ANURAG A. AGRAWAL
Full Member
Ph.D., University of California, Davis, 1999
St. George Campus

Ecology and evolution of plant-animal interactions: induced plant defense against herbivores, diet choice in omnivores, mutualisms between plants and arthropods. General interests include phenotypic plasticity, ecological entomology, cost-benefit analyses of adaptations, and tropical ecology.


agrawal@botany.utoronto.ca
TERENCE J. CARLETON
Full Member
Ph.D., University of Toronto, 1978
St. George Campus


carleton@botany.utoronto.ca

MARIANNE S.V. DOUGLAS
Full Member
Ph.D., Queen’s University, 1993
St. George Campus/Geology

Limnology and paleolimnology, especially of polar regions. Use of diatom algal microfossils to reconstruct Quaternary environments and past climate and global change.


**Microbial Ecology.** Bacteria degrading chlorinated aromatic substances and other toxic chemicals are being used as models to study the role of biogeography in the evolution and dispersal of catabolic bacteria and genes. In addition, bacterial activities and microbial community structures in industrial waste treatment systems are studied using DNA fingerprinting and DNA microarray technologies.


**Arctic ecology.** Plant-herbivore interactions, trophic cascades and the biogeochemistry of nitrogen in coastal ecosystems. Responses of plants to salinity.


jefferie@botany.utoronto.ca

PETER M. KOTANEN
Full Member
Ph.D., University of California, Berkeley, 1994
Erindale Campus

Seed biology; herbivory; biological invasions. Experimental and comparative studies of (1) impacts of predators and pathogens on tree seeds and seedlings, (2) factors promoting the survival and spread of exotic plants, and (3) responses of arctic vegetation to damage by Snow Geese. www.erin.utoronto.ca/~w3pkota/


pkotanen@credit.utm.utoronto.ca

HERBERT J. KRONZUCKER
Full Member
Ph.D., University of British Columbia, 1996
Scarborough Campus

Physiological ecology of nitrogen (N) acquisition in terrestrial plants. Our lab examines the role of plant N fluxes in a range of key areas: forest succession, yield potential in cereals, cellular ionic interactions, light and nutrient stresses. The approach is highly multidisciplinary, from the mathematical modelling of biophysical processes to field ecological analyses. Techniques include compartmental analysis, influx kinetics, electrophysiology, gas exchange, fluorescence kinetics, ionic and metabolic profiling of tissues, growth analysis.


herbertk@utsc.utoronto.ca

KENNETH LEE
Associate Member
Ph.D., University of Toronto, 1982
Fisheries and Oceans, Canada

Microbial transformation of contaminants in aquatic environments. Development and evaluation of oil spill countermeasure technologies including phyto- and bio-remediation; environmental impact assessment of industrial activities (e.g. offshore oil exploration).


JOHN H. McANDREWS
Emeritus Member
Ph.D., University of Minnesota, 1964
St. George Campus

Ecology and Quaternary studies. The stratigraphic record of vascular plants, mammals (including humans) and geological-climatological events over the past 100,000 years in North America and the Caribbean.


jock.mcandrews@utoronto.ca

CZESIA NALEWAJKO
Emerita Member
Ph. D. University College, London, 1962
Scarborough Campus

Limnology, phytoplankton ecology, microbial ecology in anthropogenically-impacted ecosystems.


ealewajko@utsc.utoronto.ca

ROWAN F. SAGE
Full Member
Ph.D., University of California, Davis, 1986
St. George Campus

Plant physiological ecology. Mechanisms and significance of plant response to global climate change; comparative photosynthesis of C₃ and C₄ plants; stress physiology; mechanisms affecting productivity, competition, and species distributions.


r sage@botany.utoronto.ca
JENNIFER S. THALER
Full Member
Ph.D., University of California, Davis, 1999
St. George Campus

Ecology, Plant-Insect Interactions. Experimental studies on the influence of plant defense on tritrophic species interactions. Coordination of plant chemical responses to multiple biotic and abiotic stresses.


thaler@botany.utoronto.ca

SEAN C. THOMAS
Full Member
Ph.D., Harvard University, 1993
St. George Campus/Faculty of Forestry

Applied forest ecology and silviculture; ecophysiology and evolutionary ecology of forest trees; forest canopy biology; ecological aspects of global environmental change; forest understory vegetation; old-world tropical forests; tree reproductive biology.


sc.thomas@utoronto.ca

VICTOR R. TIMMER
Full Member
Ph.D., Cornell University, 1979
St. George Campus/Forestry

Forest soils, tree nutrition, soil fertility, mineral nutrient cycling, restoration of degraded soils, reforestation, agroforestry, soil and plant relationships.


vic.timmer@utoronto.ca