

**B**iology is one of the most rapidly evolving and diverse sciences, exploring all aspects of life from biomolecules to ecosystems. The discipline is a vibrant and changing subject as new approaches have been/ and continue to be developed. Old questions are being re-examined and new avenues are being explored. Biology has been transformed in recent decades by the application of powerful new tools to answer fundamental questions on how cells, living organisms and ecosystems work. Biology today opens the door to a large number of career paths and attracts a large body of graduate students.

The Department of Biological Sciences officially forms July 2007. This new department integrates the Departments of Botany and Zoology and the Introductory Biology Teaching Program. This new department brings together



a multidisciplinary team of researchers and educators committed to advancing our understanding of biological structure and function, and developing new tools and technologies to address current and emerging problems facing all living organisms, including humans. A hallmark of the Department is the integration of research and teaching expertise to create opportunities for future growth, to promote novel synergisms in emerging areas of the biological sciences, provide graduate and undergraduate students with a spectrum of research

and program opportunities and to enhance the training of future scientists and leaders. Research is supported with state-of-the-art tools and infrastructure that enable exciting biological research to be done. Vigorous research environments bring together like-minded investigators and their graduate students to facilitate the sharing of expertise, equipment, infrastructure and resources.

A key goal of the Department of Biological Sciences is to promote and foster world class research in three research fronts that are central to biology both today and into the foreseeable future. These research areas allow us to participate strongly in longstanding important traditional areas, as well as in newly emerging areas of biology. The three broad research areas are: 1. cell and developmental biology; 2. comparative and environmental physiology; 3. biodiversity, ecology, environmental and conservation biology; and subdivisions thereof. Graduate training leading to the Master of Science and Doctor of Philosophy degrees are offered in all these areas. The research faculty includes a complement of scientists who work to advance our knowledge in these broad areas using a range of organisms including protists, fungi, algae, plants and animals.

Summarized below is the current research expertise in the department. This covers the spectrum of research prospects for graduate study in the Department of Biological Sciences.

### **Program Description and Research Interest Area**

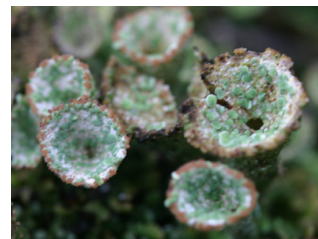
#### **Cellular and Developmental Biological Research:**

The broad area of molecular, cell and developmental biology is a rapidly growing area that has deeply impacted modern

biological approaches. This area has developed an array of new and innovative molecular tools and approaches which has changed virtually all other areas of biology. Molecular, cell and developmental biology are widely recognized as vitally important unifying areas of biology and are ever expanding in importance and impact. We are fortunate to have an outstanding community of researchers in this area covering the range from molecular biotechnology, fungal and plant genetics, plant biochemical and developmental biology through to animal developmental biology. We have excellent equipment and core facilities including microscopy and imaging as well as molecular and analytical facilities to support research in this area. In terms of equipment, infrastructure and expertise researchers in this area have strong links with a number of researchers who work in the biodiversity and physiological areas described below. This is particularly applicable to researchers with interests in molecular evolutionary biology.

#### **Biodiversity, Ecological and Environmental Biological Research:**

Biodiversity, ecology and environmental biology are important research areas that involve a significant portion of our current biology faculty. Biodiversity and ecological research is widely recognized as vital to society and modern biology. Knowledge of biodiversity, understanding the role(s) of the biota in our environment and the impacts of the environment on them are essential research goals of this area. Many innovative research projects are underway on various aspects of biodiversity from evolutionary and environmental perspectives. Molecular phylogenetics is increasingly important in biodiversity and ecological research. Aquatic ecosystems, both fresh water and marine, are a focus of a number of investigators in the Aquatic Research Group. Terrestrial ecological research, spanning plants, fungi, algae, plants and animals also has major significance. Conceptual and fundamental biological principles and concepts are common to both terrestrial and aquatic ecological research. The broad contingent of highly talented biodiversity and ecological researchers are a vital component of the department.



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DEPARTMENT  
OF

BIOLOGICAL  
SCIENCES



## Physiological Research

Physiology complements the departments' cell and developmental biology, biodiversity and the ecological research. Physiology deals with the functioning of organisms and the internal integration of a host of biochemical, cellular, tissue and whole organism mechanisms. Research in this area covers a spectrum from regulatory physiological mechanisms to the effects of environmental factors on biological functions. The departments' excellent complement of physiologists bring an array of innovative techniques to bear in research advancing frontiers in physiology.

The department recognizes that evolutionary biology and genetics are common threads that run throughout biology and are integral in many ways to all the above research areas.

## Research Facilities

Research laboratories are well-equipped in areas of individual and group expertise. Special facilities include an extensive CCAC approved animal holding facility for small terrestrial and aquatic animals; three herbaria; greenhouses, growth chambers and controlled environment chambers; DNA sequencing facilities, ultracentrifuges; isotope equipment; culturing facilities; various types of light microscopes (interference, polarizing, fluorescence and 3-D imaging and image analysis; EM preparatory facility and transmission electron microscope (STEM). The department has access, by arrangement, to equipment and facilities in other units. These allow for capability for NMR, mass spectrometry, IR microscopy, Environmental SEM, advanced chemical analysis. As well facilities exist for plant chemistry and various analytical approaches at the Richardson Centre for Functional Foods and Nutraceuticals. The Canadian Light Source in Saskatoon is also a research resource. Field and laboratory research is carried out on a variety of prairie, marsh and woodland habitats and on a wide array of inland lakes and rivers, as well as Arctic tundra and marine habitats. The University Field Station (Delta Marsh) provides year-round research facilities and accommodation for biological research in the 17,000 hectare Delta Marsh on the southern shore of Lake Manitoba. Field station facilities are also available to faculty members and their graduate students at Star Lake (Whiteshell), Taiga Biological Station (Wallace Lake), the Experimental Lakes Area (N.W. Ontario) and the Churchill Northern Studies Centre.



## Affiliations

Graduate training in Biological Sciences may also be supervised by several scientists who work in institutions outside the Biological Sciences Department and who may be appointed as Adjunct Professors. Current institutions and research areas include The Freshwater Institute of the Department of Fisheries and Oceans; University of Winnipeg and other universities; Manitoba Provincial Government Wildlife Department, Ducks Unlimited. A node for Manitoba of the National Centre of Excellence—Sustainable Forest Management, has recently been established. Collaborations exist with the Canadian Forestry Service, Alberta Forest Service, Manitoba Model Forest, Cereal Research Centre (AAFC), Canadian Grain Research Lab., Parks Canada, the Canadian Wildlife Service, the Institute for Wetland and Waterfowl Research, and various universities in North and South America and Europe.

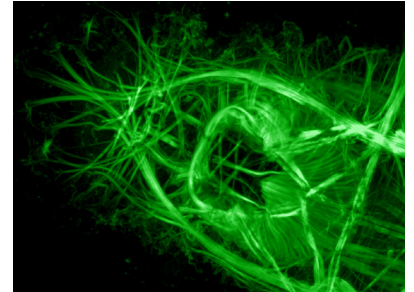
## Admissions Information

Although the unification of the Department is effective July 1, 2007, the graduate program and regulations as previously existed for the Departments of Botany and Zoology will initially remain in effect. This will continue until harmonized graduate regulations for the new department are developed and replace the Botany and Zoology regulations. Both departments currently have identical minimum course requirements, very similar degree requirements and ongoing individual researcher programs. Thus, in the interim, we will continue recruiting and registering graduate students into the Botany or Zoology degree programs. This is not viewed as impediment to maintaining our current strong graduate programs within the new department.

Admissions requirements must meet Faculty of Graduate Studies criteria.

## Awards and Scholarships

University of Manitoba Fellowships for Master's and PhD students are available through annual competitions. Natural Sciences and Engineering Research Council (NSERC) and Canadian Institutes of Health Research (CIHR) also provide scholarships on a competitive basis but are restricted to Canadian citizens and permanent residents. In addition, the department offers teaching assistantship opportunities and other funding sources.



## About the University of Manitoba

The University of Manitoba (est. 1877) is the largest, most comprehensive and only research-intensive post-secondary educational institution in Manitoba. The University attracts the brightest students and Faculty from around the world. Located in the heart of Canada, Winnipeg is one of the most culturally diverse cities in the country with nearly 100 languages represented.

Winnipeg's climate of four contrasting seasons provides a multitude of outdoor activities to be explored. The campus is fully networked, and hosts over 40 Research Centres and Institutes. The 13 branch Research Library Facility ensures all of the information you need for your studies is at your fingertips. Access to reasonably-priced on- and off-campus housing makes the U of M one of the most affordable universities to study at in Canada.

The University of Manitoba (U of M) attracts exceptional scholars to its 18 Faculties and 4 Schools and provides a world-class education in the Social, Medical, Natural and Applied Sciences, as well as Engineering, the Arts and Humanities. Programming in over 80 disciplines at the graduate level lead to 82 Master's degrees and 51 Ph.D.'s including: business management, engineering, agricultural and nutritional sciences, social sciences and humanities, education, physical and earth sciences, medical and life sciences and exciting

interdisciplinary opportunities. International students at the U of M have exclusive graduate funding opportunities available throughout their graduate program including entrance scholarships, bursaries and graduate fellowships.



An aerial view of the Fort Garry campus of the University of Manitoba, situated on a bow of the Red River.