

ANNUAL REPORT 2016

BIOLOGY DEPARTMENT

MCGILL UNIVERSITY

Biology Department Annual Report 2016

The Department of Biology takes responsibility for undergraduate teaching, graduate teaching and research in the life sciences.

The Biology Department offers a popular Major program and operates or contributes to several other Major and Minor programs. It also offers large-enrolment courses to students in other Faculties, especially those intending to enter medical fields. The central principle of the undergraduate program is the design and delivery of courses by professors. Almost all the courses in our programs are given by full-time or affiliated tenure-track academic staff of the Department; we do not use course lecturers or sessional teachers, except in exceptional circumstances. Moreover, all the faculty members participate in undergraduate teaching. The undergraduate program is at the heart of the Biology Department.

Graduate training in the Biology Department is firmly based on the apprentice model: both MSc and PhD programs emphasize bench research in close collaboration with a faculty member who acts as supervisor. Although coursework makes only a minor contribution to the degree, we have developed a wide range of advanced and specialized courses for graduate students. The graduate program is attractive and highly selective. Financial support for graduate students from Faculty allocations, teaching assistantships and research funds is offered for the duration of the program. Retention rates are high and graduation is timely. Most of our doctoral students succeed in obtaining academic employment.

Almost all faculty members are actively engaged in research supported by operating grants from the Tricouncil agencies. Our research programs fall into three clusters of related fields: the Conservation, Ecology, Evolution and Behaviour (CEEB) group, the Cellular, Molecular and Development (CMD) group, and the Neurobiology (Neuro) group. They are supported by a range of facilities, research centres and field stations. Publication rates are high and rising, and faculty members publish many highly-cited papers in high-impact journals. As an indicator of superior research performance, peer-reviewed NSERC and CIHR awards are consistently above the national average. Our members have received many national honours, and the Department includes one FRS, four FRSC, seven CRC holders, two recent Steacie Fellows and one Killam Fellow.

Department members play a full part in the mission and governance of the University. They teach students from many other Faculties, and are closely involved in Field Semester programs. Two members are Associate Deans, and others serve on some of the most important university committees. Several faculty members have made prominent contributions to local, national and international organizations devoted to outreach and policy development.

Teaching and learning

The Biology Department is responsible for core teaching in biology in science and biomedical departments. It delivers large introductory laboratory and lecture courses as well as a full suite of advanced courses. It also has a large graduate program. The statistics underline the extent of undergraduate and graduate teaching undertaken by the Department.

Graduate and undergraduate teaching. 81 students graduated with a Biology BSc degree, and 19 with a BASc, slightly down from the level of previous years. In all, 433 students were enrolled in Biology programs, and the overall enrolment in Biology courses, from all sources, stood at 5970 students. Total enrolment remained unchanged from 2015, but shows a decrease from years prior to that (6447 in 2014), probably reflecting increased enrolment in the Neurobiology program.

The number of MSc and PhD students was 56 and 106, respectively, about the five-year average, but slightly down from the peak enrolment in the previous year. This confirms the trend towards an increasing proportion (65%) of graduate students in the PhD program, which started in 2013.

Research and publications

Faculty in the Biology Department continued to push back the boundaries of knowledge in 2016. A list of all publications can be found at: <http://biology.mcgill.ca/biopubs2016.html>. Department members published 159 papers in 2016, a rate of over three a week, continuing the steady increase in research output that has doubled the publication rate in the last decade. Many of these papers were published in the top flight of academic journals – *Nature* (plus *Nature Communications* and *Nature Microbiology*), *Science*, *Proceedings of the National Academy of the USA*, *Proceedings of the Royal Society*, and others - and have a very high impact on their field. Here are three examples of fundamental contributions to biology published in leading journals.

- Building upon earlier work, **Laura Nilson** and her trainees produced a major publication in *Current Biology* that explains how a relatively small number of signaling pathways can drive a large number of developmental decisions. Studying the development of anterior follicle cells in the ovary of the fruit fly, Dr. Nilson and her group demonstrated how a bistable binary switch is produced from what are initially gradients of signaling pathway activity.

“Determination of EGFR signaling output by opposing gradients of BMP and JAK/STAT activity,” Fregoso Lomas, M., De Vito, S., Boisclair Lachance, J.-F., Houde, J. and Nilson, L.A. *Current Biology*.

- **Jon Sakata’s** research group continued their work on bird song and the neural basis of this behaviour with a research paper published in *Proceedings of the National Society U.S.A.*

Adult songbirds modify their vocalizations when singing to juveniles in the same way that humans alter their speech when talking to babies. The resulting brain activity in young birds could shed light on speech learning and certain developmental disorders in humans.

“Mechanisms underlying the social enhancement of vocal learning in songbirds,” Yining Chen, Laura E. Matheson, and Jon T. Sakata, Proceedings of the National Academy of Sciences.

- **Andrew Gonzalez and Andrew Hendry** are co-authors on an already influential review in the journal *Science*.

With global temperatures continuing to rise at an alarming rate, predictions for the impact of climate change on plants and wildlife must improve to give scientists a clearer picture of which species are most at risk of extinction. Current predictions ignore important aspects of biology like species adaptation and movement that can have a profound influence on whether a plant or animal survives changes to its environment. While more sophisticated forecasting models exist, they can't be used because we don't have enough species information to make them work.

“Improving the forecast for biodiversity under climate change,” M.C. Urban et al, *Science*, 2016:
<http://science.sciencemag.org/cgi/doi/10.1126/science.aad8466>

Funding. The total research support to Biology faculty through operating and equipment grants, principally from the major science funding agencies (NSERC, CIHR, CFI and FQRNT), amounted to \$7.8M, an average of over \$200,000 per professor. This funding level is comparable to previous years if one accounts for the fact that no major CFI competition was held in 2016.

Departmental news and activities

Chair of the Department

On June, 1st, 2016 **Gregor Fussmann** took over as Chair of the Department from **Graham Bell**, who finished a five-year term.

Appointments

Associate Dean in the Faculty of Science

Laura Nilson, Associate Dean of Graduate and Postdoctoral Studies

Tamara Western, Associate Dean, Academic

Director, Stewart Biology Building

Rudiger Krahe served as Building Director in 2016.

Director, Gault Nature Reserve

Gregor Fussmann

The main public interface of the Department is at the Gault Nature Reserve. Besides hosting a number of active research programs, the Reserve welcomes about 300,000 visitors each year.

Scientific Director of the CIHR Institute of Genetics

Paul Lasko

Founder and co-Director of the McGill Centre of Islam and Science

Ehab Abouheif

Director of the Quebec Centre for Biodiversity Science

Andrew Gonzalez is Director of the Quebec Centre for Biodiversity Science, an FQRNT-funded and McGill-based network that links researchers from all universities across Quebec, along with hundreds of graduate students and postdocs.

Director of the NSERC CREATE program *Biodiversity, Ecosystem Services and Sustainability*

Andrew Hendry

Director of the joint McGill-Smithsonian Neotropical Environment Option

Brian Leung

Scientific Director, Integrated Quantitative Biology Initiative (IQBI) and Cell Imaging and Analysis Network (CIAN)

Jackie Vogel

Co-Director of the Centre for Applied Mathematics in Bioscience and Medicine

Frédéric Guichard

New faculty

Stephanie Weber (molecular biology) arrived in August 2016, **Anna Hargreaves** (conservation biology) and **Tomoko Ohyama** (neurobiology) in January 2017. We have hired two new professors who will be joining us in the next academic year: **Arnold Hayer** (cell biology) arrives in January 2018, with **Jennifer Sunday** (global change biology) following in April 2018. All start as assistant professors and come with exciting research programs that will sustain our reputation as an internationally renowned full-service biology department.

Grant of tenure and the promotion to Associate Professor

Jonathan Davies (June 2016)

Jon Sakata (June 2016)

Promotion to Full Professor

Gregor Fussmann (May 2016)

Frédéric Guichard (May 2016)

Laura Nilson (April 2017)

New Emeritus Professor

Gregory Brown (May 2016)

Martin Lechowicz (November 2016)

Honours and Awards.**Fellow of the Royal Society****Graham Bell** (elected April 2016)**Fellow of the Royal Society of Canada:****Paul Lasko** (elected November 2016)**Graham Bell****Siegfried Hekimi****Catherine Potvin****Member of the Royal Society of Canada's College of New Artists, Scholars and Scientists****Irene Gregory-Eaves** (elected November 2016)**Ehab Abouheif** (elected November 2016)**Named/Endowed Chair Appointments****Liber Ero Chair in Conservation Biology**

Martin Lechowicz held the Liber Ero Chair until his retirement in October 2016. **Andrew Gonzalez** took over from him as the chair holder in November 2016. It is a great accomplishment that we were able to keep this important endowed chair in the Department.

James McGill Professor**Ehab Abouheif** (March 2017)**Graham Bell****Paul Lasko****Strathcona Chair in Zoology****Siegfried Hekimi** (2004-2016)**John & Anne Molson Chair in Genetics****Paul Lasko****Robert Archibald & Catherine Louise Campbell Chair in Developmental Biology****Siegfried Hekimi****Sir William C. Macdonald Chair in Botany****Daniel Schoen****Tier 1 Canada Research Chairs****Lauren Chapman** (CRC in Respiratory Ecology and Aquatic Conservation)**Andrew Gonzalez** (CRC in Biodiversity)**Catherine Potvin** (CRC in Climate Change Mitigation and Tropical Forests)**Tier 2 Canada Research Chairs****Michael Hendricks** (CRC in Neurobiology and Behaviour, awarded in April 2017)**Melania Cristescu** (CRC in Ecological Genomics of Aquatic Invasions)

Irene Gregory-Eaves (CRC in Freshwater Ecology and Global Change)

Rodrigo Reyes-Lamothe (CRC in Chromosome Biology)

Killam Fellowship by the Canada Council for the Arts

Andrew Gonzalez (2016-2018)

NSERC E.W.R Steacie Memorial Fellow

Ehab Abouheif (2014-2016)

Innovation Prize from the International Society of Tropical Foresters

Catherine Potvin (for the project *Participatory Intercultural Land-use Planning in Eastern Panama*)

Trudeau Fellow

Catherine Potvin (with the project *Acting on Climate Change: Indigenous Innovations*)

Principal's Prize for Excellence in Teaching.

This prize was instituted to celebrate exceptional individuals who embody the best in teaching, supervising, advising and mentoring.

It was awarded this year to **Alanna Watt** (Assistant Professor Level).

She follows **Andrew Hendry** (2015), **Gary Brouhard** (2014) and **Laura Nilson** (2012) as a winner of this prestigious award, confirming the very high quality of undergraduate teaching offered by the Department.

MBSU (McGill Biology Student Union) Awards 2016

Alanna Watt (Professor of the Year)

Jackie Vogel (Award for Visionary Excellence)

Gregor Fussmann (Award for Classroom Excellence)

The future of the Biology Department

The Biology Department is currently undertaking a fundamental review of its research and teaching programs over the next thirty years. This has been prompted by two developments that will inevitably alter the historical priorities of the Department.

The first is the shift of focus within the general area of biology. Our Department is currently structured around three major axes: molecular biology (including genetics and development), ecology (including evolution and conservation) and neurobiology. In the past, these three areas were clearly delineated and mutually exclusive. Over the last decade, they have tended to move together and even merge, creating hybrid fields such as evolutionary developmental biology, in which methods and approaches from two or more traditional areas are combined. We believe that this trend will continue, in part because new technologies will enable us to pose new questions, or bring more powerful methods to bear on old problems that have resisted solution in the past.

The second development is the radical renovation of the Stewart Biology Building, brought about by the need to replace aging infrastructure and remove asbestos. We are currently in the process of moving out of the West Wing of Stewart Biology, which will initiate the first phase of redevelopment in the summer of 2017. The prospect of a new building wing (in the next 2-3 years) and a whole new life science complex (within the next decade) will provide us with a unique opportunity to refresh the academic mission of the Department. We look forward to constructing and designing facilities that will enable us to reinforce our position as a major research department in North America and a major teaching unit within the University.

The Biology Department continues to make an exceptional contribution to McGill University in every area of academic activity. In particular, **the productivity of Biology faculty in 2016 maintained or surpassed previous levels of research output, grant income, undergraduate teaching and graduate training.** Faculty, staff and students will work together to ensure that we remain at the forefront of modern research and teaching in the study of life.