

**ANNUAL REPORT 2017**

**BIOLOGY DEPARTMENT**

**MCGILL UNIVERSITY**

## **Biology Department Annual Report 2017**

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 use course lecturers or sessional teachers only 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 laboratory, computer or field 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, eight 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.*** 100 students graduated with a Biology BSc degree, and 15 with a BAsC, slightly up from the level of previous years. In all, 419 students were enrolled in Biology programs, and the overall enrolment in Biology courses, from all sources, stood at 5752 students. Total enrolment shows a slight decrease from prior years, probably reflecting increased enrolment in the Neurobiology program.

The number of MSc and PhD students was 58 and 102, respectively, about the five-year average, but slightly down from the peak enrolment in the year 2015. 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 2017. A list of all publications can be found at: <http://biology.mcgill.ca/biopubs2017.html>. Department members published 135 papers in 2017, continuing a strong trend 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 Ecology & Evolution*), *Science*, *Proceedings of the National Academy of the USA*, *Current Biology*, *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 or influential book series.

- In a paper published in *Science*, **Andrew Gonzalez** and postdoc Bronwyn Rayfield collaborated with researchers from Spain and Switzerland to test a theory that suggests that modularity limits disturbance effects in networks. Experimental work with springtail metapopulations, performed in the Gonzalez lab at McGill, showed that the modular organization of natural networks helps to contain perturbations that occur when animals were removed from one of the experimental network nodes.

Gilarranz, L.J., B. Rayfield, G. Liñán-Cembrano, J. Bascompte & A. Gonzalez (2017) Effects of network modularity on the spread of perturbation impact in experimental metapopulations. *Science*, 357, 199-201.

- **Jon Sakata's** research group continued their successful work on bird song and the neural basis of this behaviour with a research paper published in *Current Biology*.

Ph.D. student Logan James and Jon Sakata revealed that naive zebra finches individually tutored with randomized acoustic sequences produce convergent acoustic patterns that are non-random and similar to those observed in wild finch song and in speech and music. Their data demonstrate that learning biases contribute to commonalities in acoustic patterning.

James, L.S. & J.T. Sakata (2017) Learning biases underlie “universals” in avian vocal sequencing. *Current Biology* 27, 3676-3682.

- **Andrew Hendry** crowned his ground-breaking, two-decade-long contributions to the field of “eco-evolution” with a defining monograph on the subject.

In recent years, scientists have realized that evolution can occur on timescales much shorter than the “long lapse of ages” emphasized by Darwin—in fact, evolutionary change is occurring all around us all the time. This book provides an authoritative and accessible introduction to eco-evolutionary dynamics, a cutting-edge new field that seeks to unify evolution and ecology into a common conceptual framework focusing on rapid and dynamic environmental and evolutionary change.

An invaluable guide for students and researchers alike, *Eco-evolutionary Dynamics* reveals how evolution and ecology interact strongly on short timescales to shape the world we see around us (quoted from the publisher).

Hendry, A.P. (2017) *Eco-Evolutionary Dynamics*. Princeton University Press, Princeton, NJ. 416 pp.

**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 \$9.4M, an average of over \$236,000 per professor. This funding level is slightly up from the previous year and comparable to previous years if one accounts for the fact that no major CFI competition was held in 2017.

## **Departmental news and activities**

### **Chair of the Department**

**Gregor Fussmann** (since June 2016).

### **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**

**Frieder Schöck** took over from **Rudiger Krahe** on Jan. 18<sup>th</sup>, 2017.

#### **Director, Gault Nature Reserve**

After 6 years of service, **Gregor Fussmann** stepped down as Director of the Gault Nature Reserve. Prof. Virginie Millien of the Redpath Museum and Gregor Fussmann were co-directors from Jan. to Aug. 2017. As of Sept. 1<sup>st</sup>, 2017, Virginie Millien is the sole director.

#### **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**

**Anna Hargreaves** (conservation biology) and **Tomoko Ohyama** (neurobiology) arrived in January 2017. We have hired four new professors who will be joining us in the next academic years: **Arnold Hayer** (cell biology) arrives in January 2018, **Jennifer Sunday** (global change biology) in April 2018, **Mélanie Guigueno** (behavioural ecology) in January 2019, and **Laura**

Pollock (eco-informatics) in August 2019. 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**

**Sarah Woolley** (June 2017)

**Retirement and Resignation**

**Rudiger Krahe** (resigned in February 2017 to take up a position at the Humboldt University, Berlin, Germany)

**Jonathan Davies** (resigned in December 2017 to take up a position at the University of British Columbia)

**Rajinder Dhindsa** (retired in December 2017)

**Honours and Awards**

Fellow of the Royal Society

**Graham Bell**

Fellow of the Royal Society of Canada:

**Paul Lasko**

**Graham Bell**

**Siegfried Hekimi**

**Catherine Potvin**

Member of the Royal Society of Canada's College of New Artists, Scholars and Scientists

**Irene Gregory-Eaves**

**Ehab Abouheif**

Named/Endowed Chair Appointments

Liber Ero Chair in Conservation Biology

**Andrew Gonzalez**

James McGill Professor

**Ehab Abouheif** (May 2017)

**Graham Bell**

**Paul Lasko**

Strathcona Chair in Zoology

**Gregor Fussmann** (July 2017)

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)**Andrew Hendry** (CRC in Eco-Evolutionary Dynamics, awarded in November 2017)**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)Leo Yaffe Award for Excellence in Teaching, Faculty of Science**Andrew Hendry (2017).**

This award continues the strong legacy of teaching awards in the Department of Biology and confirms the very high quality of undergraduate teaching offered by the Department. In previous years four Biology professors were awarded the Principal's Prize for Excellence in Teaching: Alanna Watt (2016), Andrew Hendry (2015), Gary Brouhard (2014) and Laura Nilson (2012).

**Departmental Retreat**

On December 11<sup>th</sup>, 2017 at the McGill Faculty Club.

Topic 1: Biology Curriculum Revision

Topic 2: Infrastructure Grant for a new Stewart West Wing

**The future of the Biology Department**

The Biology Department is structured around three major axes: (1) **molecular biology** (including cell biology, genetics and development), (2) **ecology and evolution** (including conservation and behaviour) and (3) **neurobiology**. Over the last decade, these axes have tended to move together and even merge, creating hybrid fields such as evolutionary developmental biology or neuroethology. 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. A good example is the recently funded and Biology-based CFI network "Integrated Quantitative Biology Initiative" (IQBI) that unites biologists from all axes under the umbrella of quantitative biology.

As discussed at the Departmental Retreat in December 2017, the Department will undertake a **multi-year revision of its curriculum**. What and how we teach in Biology has not been critically evaluated in at least a decade. The process was initiated by Gregor Fussmann and kicked off by hiring a group of special teaching assistants who attended the Fall Biology core courses and will report (in writing) about the content of each course and the degree of harmonization among courses (to be continued in Winter 2018). In addition, a special Curriculum Task Force, led by Tamara Western and Torsten Bernhardt, will take up work in 2018.

The year 2017 has been challenging for the Biology Department because of the radical **renovation of the Stewart Biology Building**, brought about by the need to replace aging infrastructure and remove asbestos. In the summer and fall all occupants moved out of the West Wing of Stewart Biology and needed to find new research, teaching and administrative spaces elsewhere. The Department is now distributed among the Stewart North Wing and the Bellini Building (under constrained space conditions), the Lyman Duff Building and the Redpath Museum (undergraduate teaching labs), and the Pulp and Paper building (2 research labs). Redevelopment is under way in the Stewart West Wing and Biology needs this work to progress in a timely fashion so that we can resume our normal teaching and research activities. The prospect of a new building wing with state-of-the-art research and teaching labs as well as an aquatic animal facility 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 2017 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.