

Memorandum

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TO: Board of Governors
FROM: Dr. Bruce Lennox, Dean, Faculty of Science
SUBJECT: Overview of the Faculty of Science
DATE: April 20, 2023
DOCUMENT #: GD22-73

ACTION REQUIRED: INFORMATION APPROVAL/DECISION

ISSUE & EXPECTED OUTCOME An overview of activities, initiatives and developments of the Faculty of Science is provided to the Board of Governors for information.

BACKGROUND & RATIONALE Presentations feature regularly on-Board agendas in order to keep Board members apprised of the University's academic and campus activities.

The following presentation has been prepared by the Dean of the Faculty of Science and provides an overview of the Faculty's Teaching and Research strategies, present and in the future.

This presentation was originally scheduled for the December 15, 2022 meeting of the Board of Governors, but was deferred due to time constraints.

ALIGNMENT WITH MISSION AND STRATEGIC PRIORITIES Presentations of University Faculties apprise the Board of the University's academic priorities.

COMPLIANCE WITH UNIVERSITY POLICY Faculty presentations are a regular feature on Board agendas.

COMPLIANCE WITH LEGISLATION/ EXTERNAL REGULATIONS There are no external legislation requirements applicable.

RISK FACTORS There are no risk factors applicable.

SUSTAINABILITY CONSIDERATIONS	The Sustainability Systems Initiative is a strategic research initiative of the Faculty of Science's Strategic Research Plan.
IMPACT OF DECISION AND NEXT STEPS	This item is presented for information.
MOTION OR RESOLUTION FOR APPROVAL	This item is presented for information.
APPENDICES	Appendix A: Faculty of Science and McGill's Third Century: Discovery, Invention, and Learning

Faculty of Science and McGill's Third Century: Discovery, Invention, and Learning

R. B. Lennox

Dean, Faculty of Science

April 20, 2023



....and the 3rd Century is tracking to feature great impact

McGill's 1st Century - Ernest Rutherford, Harriet Brooks, Frederick Soddy, Carrie Derrick, William Dawson....

McGill's 2nd Century: Ron Melzack, Bernard Belleau, Kelvin Ogilvie, D.O. Hebb, T.H. Clark.....

McGill's 3rd Century? :

- A remarkable tradition of impact in Science combined with the teacher-scholar model in the past and present, and poised for the future



McGill Faculty of Science – by the numbers

10 departments, 265 professors, 23 Faculty Lecturers, 185 staff, 16 buildings, 5 Field Stations

- Atmospheric and Oceanic Sciences
- Biology
- Chemistry
- Computer Science
- Earth and Planetary Sciences
- Geography
- Mathematics and Statistics
- Physics
- Psychology
- Redpath Museum
- plus ca. 50 faculty and 30 staff in School of Biomedical Sciences teaching in BSc program



McGill Faculty of Science – by the numbers

Undergraduate teaching

- BSc, BAsSc, BA degrees
- **6,325** degree students (increase of **44%** since 2015)
- **64,700** course registrations (increase of **24%** since 2015) and **9,300** taught in FMHS plus another **12,300** laboratory course registrations
- 625 courses per year
 - **32** courses with **> 400** students
 - **71** courses with between **200** and **400** students
 - **94** courses with between **100** and **200** students



McGill Faculty of Science – by the numbers

Graduate enrollments

- **1,295** PhD and MSc enrolled (increase of **29%** since 2015)
- 70% PhD, 30% MSc
- 22% hold major Canadian or Quebec fellowships
- Current take-home income is \$21.5k +/- \$4kan initiative to provide a guaranteed minimum *take-home* income of \$25k to \$27k is underway

Postdoctoral Fellows

- **265** (increase of **29%** since 2015)
- Salaries range from \$38k p.a. to \$70k; mean = \$42k



McGill Faculty of Science - Teaching & Learning Initiatives

Challenge: To facilitate learning and assessment in large enrollment courses; creating an individualized learning environment for undergraduates

→ *Office for Science Education*

Challenge: To train and bring science to the Montreal public, especially to under-represented groups

→ *Office for Science Outreach*

Challenge: To communicate science and the scientific process to the public and our students; differentiate real science vs. fake science and differentiate science in policy vs. science in politics

→ *Office for Science and Society*

→ *FACSCI 500: Science Communications*

McGill Faculty of Science - Teaching & Learning Initiatives

Challenge: To reflect the emergence of data sciences, statistics, computation, and AI/ML as *the* tools and languages of the 21st Century

→ *Development of Data Sciences BA, BAsc, and BSc*

→ *BA (Computer Science) and BA (Maths and Statistics)*

→ *Computer Science 541: Applied Machine Learning with 500 students (!)*

Challenge: To formalize the intersection between Humanities, Social Sciences, and quantitative sciences including Data Sciences

→ *MAsc (with Arts)*

Challenge: To provide an applied MSc in Computer Science with internship components

→ *New 16 month coursework MSc in Computer Science*

Challenge: To bring to students a recognition and understanding of the interplay between science and its outcomes, including modelling, and policy

→ *Re-energize Trottier Inst. for Science and Public Policy with development of a Graduate Option in Public Policy*

McGill Faculty of Science - Teaching & Learning Initiatives

Challenge: To provide undergraduates with opportunities to learn about approaches to integrative, thematic science (and societal) problems

→ *Sustainability, Science, & Society concentration in the BASc*

→ *FACSCI 398 - Research Course in Science Education*

→ *FACSCI 198 - Climate Crisis and Climate Actions*

Challenge: To provide quality experiential learning experiences for students in field work settings and Field Stations in the High Arctic, Panama, Barbados, East Africa, Central France, and Gault

→ *Organize operational field station expertise, business plans, and re-investment strategies in this unparalleled network of permanent field stations from 80°N to 10°N*

Challenge: To address the chronic shortage of Clinical Psychologists in the public sector and the availability of clinical psychology services to our students

→ *Create the Virginia Douglas Centre for Clinical Psychology with expanded training and treatment capabilities*

McGill Faculty of Science – Research by the numbers

Research funding

> **\$31 M p.a.** via NSERC, CIHR, SSHRC, FRQ, and Foundations

→ **A very high percentage of researchers are in the top 25% percentile of funding in their national peer group.**

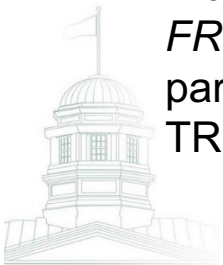
Research Chairs

- 29 CRC Chairs + 1 Canada 150 Chair
- 31 William Dawson Scholars, James McGill Chairs, and Distinguished James McGill Chairs.
- 22 endowed Chairs

→ **30% of faculty members are Chairholders**

Research Centres and Institutes

- *Trottier Space Inst, Cdn Robotics Strategic, Mila/ClfAR – Machine Learning, FRQ Green Chemistry and Catalysis, FRQ Biodiversity, etc.* plus longstanding partnerships with major international research consortia including CERN, TRIUMF, RIKEN, EuSI, etc.



McGill Faculty of Science – Research Highlights

- Biodiversity and Sustainability
- Climate Change and Adaptation
- Green Chemistry and Catalysis
- RNA/DNA Chemistry
- Behavioural Neuroscience
- Conservation Ecology and Evolutionary Biology
- Developmental Biology
- Machine Learning and Reinforcement Learning
- Geographic Information Systems and Remote Sensing
- Cosmology and Space Science
- Nanoscience and Quantum Optics



Faculty of Science Strategic Research Plan

A Systems Science Approach - An interdisciplinary approach that recognizes that highly complex problems emerge at the interface of multiple scientific and social systems

- Complex systems interconnect to neighboring systems and their perturbations are often described as "wicked problems"
- Often require sustained collaboration across scientific disciplines and sectors (govt, business/industry, legal/regulatory)

A Systems Science framework:

- leads to new discoveries and new technologies
- provides a template for training the next generation of scientists, public leaders, and business leaders
- serves as a catalyst for new ways of thinking, teaching, and discovering both within McGill and beyond

Faculty of Science Strategic Research Plan

- **Sustainability Systems Initiative** - pure and applied biologists, environmental scientists, climatologists, materials scientists, and chemists who work in concert with policy experts, legal scholars, and government and industry leaders
 - **Biodiversity and Biosystems Institute** –evolutionary biologists, Northern and Tropical ecologists; atmospheric, oceanic, freshwater scientists
 - **Green Chemistry Institute** – involving catalysis chemists, electrochemists and battery scientists, materials chemists, computational materials physicists
- **Trottier Space Institute** - astrophysicists, cosmologists, instrumentation designers and software engineers
- **Computational and Data Systems Initiative/Centre** –statisticians, AI/ML computer scientists, bioinformaticians, biostatisticians
- **Earth Systems Institute** – Earth scientists, oceanographers, climatologists and climate modellers, hydrologists, and remote sensing experts
- **RNA/DNA Institute** - chemists, biologists, pharmacologists, computational drug designers

Science and McGill's Third Century

McGill's 1st Century - Ernest Rutherford, Harriet Brooks, Frederick Soddy, Carrie Derrick, William Dawson....

McGill's 2nd Century: Ron Melzack, Bernard Belleau, Kelvin Ogilvie, D.O. Hebb, T.H. Clark.....

McGill's Third Century ?

- If "like dissolves like" (think ethanol and water), then "like hires like" is also shown to be true

.....A remarkable tradition of impact in science now positions McGill Science to be in a great place for the future.....almost all of our 90 or so early career stage professors are "out of this World" in terms of talent, capability, and demonstrated impact

