FACULTY OF SCIENCE
MEETING OF FACULTY
Tuesday, 19 March 2019
Leacock Council Room - L232

ATTENDANCE: **As recorded in the Faculty Appendix Book**

DOCUMENTS: **S-18-28** **to** **S-18-30**

Dean Lennox called the meeting to order at 3:05 p.m., and welcomed members to the seventh Faculty of Science meeting of the 2018-2019 academic year.

1. **Adoption of Agenda**

Prof. Kemme **moved**, seconded by Prof. McKenzie, that the Agenda be adopted.

The motion carried.

2. **Minutes of 19 February 2019** **S-18-28**

Prof. Roulet **moved**, seconded by Prof. Fussmann, that the Minutes be adopted.

The motion carried.

3. **Business Arising from the Minutes**

There was no business arising from the Minutes.

4. **Report of Committee**

- Academic Committee **S-18-29**

The following proposals were approved at the Academic Committee meeting held on 26 February 2019:

I. **New Courses:**

(1) **Physics**

PHYS 321	Data Sci & Obs Astrophys 3 credits	**AC-18-77**

Associate Dean Hundemer explained that this course will familiarize students with the sophisticated statistical techniques required to analyze the vast quantities of data that are gathered in modern Astrophysics.

Associate Dean Hundemer **moved**, seconded by Ms. Verzani, that the course be adopted.

The motion carried.

(2) **Biology**

BIOL 517	Cognitive Ecology 3 credits	**AC-18-78**

Associate Dean Hundemer described a new Complementary course, BIOL 517. He said that the idea of the new course is to analyze how the environment of an organism shapes its cognition and in the long term shapes the evolution of the brain of living beings. BIOL 517 is a follow-up BIOL 307 (Behavioural Ecology).

Associate Dean Hundemer **moved**, seconded by Prof. Fussmann, that the course be adopted.

The motion carried.

II. Course Revisions:

(1) Biology

BIOL 301 — Cell and Molecular Laboratory — **AC-18-79**
Changes: prerequisites, restrictions
4 credits

The proposed changes to BIOL 301 are to remove unnecessary prerequisites, and to include two courses in the restrictions.

Associate Dean Hundemer **moved**, seconded by Prof. Fussmann, that the changes be approved.

The motion carried.

BIOL 324 — Ecological Genetics — **AC-18-80**
Changes: description, schedule type
3 credits

Associate Dean Hundemer said that BIOL 324, currently a lecture course, will be offered as a lecture and computer lab or conference course. This format was requested by students for more hands-on experience.

Associate Dean Hundemer **moved**, seconded by Prof. Fussmann, that the changes be approved.

The motion carried.

BIOL 428 — Biological Diversity in Africa — **AC-18-81**
Removal of restriction
3 credits

Associate Dean Hundemer explained that since BIOL 428 was renumbered (from BIOL 328) about 10 years ago, the restriction is no longer necessary.

Associate Dean Hundemer **moved**, seconded by Prof. Fussmann, that the changes be approved.

The motion carried.

BIOL 544 — Genetic Basis of Life Span — **AC-18-82**
Changes in course activities, prerequisites
3 credits

Associate Dean Hundemer said that BIOL 544 is being revised from a lecture-type course to a seminar-type course to mirror another seminar course, BIOL 546, Genetics of Model Systems; both offered in alternate years. Also, the prerequisites were updated accordingly.

Associate Dean Hundemer **moved**, seconded by Prof. Fussmann, that the changes be approved.

The motion carried.

(2) Biology/McGill School of Environment

BIOL 540/ENVR 540	Ecology of Species Invasions	**AC-18-83**
	Changes in prerequisites	**AC-18-84**
	3 credits	

Associate Dean Hundemer explained that the changes in prerequisites for the above double-prefix courses were made to offer the course to students from varied backgrounds.

Associate Dean Hundemer **moved**, seconded by Prof. Fussmann, that the changes be approved.

The motion carried.

(3) Mathematics & Statistics

MATH 249	Honours Complex Variables	**AC-18-85**
	Change in prerequisites	
	3 credits	
MATH 314	Advanced Calculus	**AC-18-86**
	Change in restrictions	
	3 credits	
MATH 316	Complex Variables	**AC-18-87**
	Change in prerequisites	
	3 credits	
MATH 319	Intro to Partial Diff Equas	**AC-18-88**
	Change in prerequisites	
	3 credits	
MATH 458	Honours Differential Geometry	**AC-18-89**
	Change in prerequisites	
	3 credits	
MATH 475	Honours PDEs	**AC-18-91**
	Change in prerequisites	
	3 credits	

Associate Dean Hundemer said that at the last Faculty of Science meeting, the Department of Mathematics and Statistics created a new advanced calculus course (MATH 358, Honours Advanced Calculus) and it also revised MATH 248 (Honours Vector Calculus), to be taught as a more introductory advanced calculus course. MATH 248 and MATH 358 are equivalent prerequisites for courses that require advanced calculus. As a result, the prerequisites and restrictions for all the above courses needed to be updated.

Associate Dean Hundemer **moved**, seconded by Prof. Neslehova, that all the above course changes be approved.

The motion carried.

MATH 466	Honours Complex Analysis Changes in prerequisites; corequisite 3 credits	**AC-18-90**

Associate Dean Hundemer said that the current prerequisite (MATH 248) and corequisite (MATH 454) are not required to succeed in MATH 466.

Associate Dean Hundemer **moved**, seconded by Prof. Neslehova, that the changes be approved.

The motion carried.

(4) Atmospheric & Oceanic Sciences

ATOC 531	Dynamics of Current Climates Change in corequisite 3 credits	**AC-18-93**
ATOC 541	Synoptic Meteorology 2 Change in prerequisite 3 credits	**AC-18-94**
ATOC 558	Numerical Methods & Laboratory Change in prerequisite 3 credits	**AC-18-95**

Associate Dean Hundemer said that the changes in prerequisites or corequisites in the above courses are because the corequisite or prerequisite, ATOC 412, was replaced by ATOC 312 (Rotating Fluid Dynamics).

Associate Dean Hundemer **moved**, seconded by Prof. Merlis, that the changes be approved.

The motion carried.

III. Program Changes:

- Mathematics & Statistics

B.Sc. Program Changes:

- Honours in Mathematics and Computer Science **AC-18-92**

Associate Dean Hundemer described the program changes in the B.Sc. Honours in Mathematics and Computer Science. The changes were also triggered by the advanced calculus courses, MATH 248 and MATH 358. The changes pertain to COMP 202, COMP 204 and COMP 208, and in addition, offer students the choice between taking MATH 248 or MATH 358.

Associate Dean Hundemer **moved**, seconded by Prof. Kemme, that the above program changes be approved.

The motion carried.

IV. For Information Only:

Mathematics & Statistics
B.A. Program Changes:
- Honours in Mathematics and Computer Science

B.Eng. Program Changes:
- Minor in Mathematics

The changes in the B.A. Program in Honours in Mathematics and Computer Science are identical.

The B.Eng. Minor Program in Mathematics has been completely modified.

5. Dean's Business

a) Announcements

(i) Vice-Dean David Stephens
Dean Lennox announced that Professor David Stephens, current Chair of the Department of Mathematics and Statistics, will be taking on a new role of Vice-Dean in the Faculty of Science. Vice-Deans exist in some other faculties, and it is a recognition of the many portfolios in the Faculty, including the RVH Project. Vice-Dean Stephens will take the lead on the academic portfolio, including undergraduate and graduate education. Vice-Dean Stephens will chair the next Faculty of Science meeting. Dean Lennox thanked Vice-Dean Stephens for agreeing to take on this new portfolio.

The Department of Mathematics and Statistics is in the process of selecting a new Chair to replace Vice-Dean Stephens.

(ii) McCall & McBain Foundation
As announced at the last Faculty of Science meeting about the very large McCall & McBain Foundation's donation to McGill, Dean Lennox will be meeting with the Dean of the Faculty of Arts and with representatives from the McCall & McBain Foundation. The first discussion will be about the vision of the formulation of the new Master of Arts and Science program. The Foundation will be providing significant support to students, training opportunities, mentorship, leadership, and communication. In developing the degree program, Dean Lennox will be reaching out to members of the Faculty. The idea behind the M.A.Sc. would be to make it the Canadian equivalent of a Rhodes Scholar.

- Out of 75 students, the expected number of M.A.Sc. students will be approximately 50.
- The expected completion of the M.A.Sc. degree is 2021.
- At least 1/3 of fellowships will go to Canadian students.
- At least 2/3 of fellowships will go to International students.

b) Faculty of Science Strategic Plan Presentation **S-18-30**

Dean Lennox gave a presentation on the Faculty of Science Strategic Plan still under development. Several groups of people have seen the plan in various draft forms, and the plan presented at the current meeting is not the final version.

Who are we in the Faculty in 2019?
There are 10 departments, 265 professors, and 160 staff members.
There are 4900 undergraduate students enrolled in the Faculty of Science.
There are 1070 graduate students, and 205 postdoctoral fellows.
In addition, there are five affiliated departments in the Faculty of Medicine which offer B.Sc. degrees, and the number of undergraduates is included in the total number above.

In these five departments, there are 130 professors and 140 staff members.
A number of departments in the Faculty are teaching many non-Science students, e.g. Computer Science, Mathematics & Statistics, etc.
All the departments in the Faculty of Science rank in the top 50 in the world according to the QS World University Rankings. In terms of public universities, the Faculty of Science ranked in the top 15 in the world, and 31st amongst public and private.

Dean Lennox said that in its 1st and 2nd Centuries, the Faculty of Science has had some remarkable scholars, and that there is outstanding talent currently in the Faculty for the 3rd Century.

Strategic Planning Frameworks:
Dean Lennox said that strategic planning is about developing foresight and that it is important to be purposeful because the future outcomes can be influenced by the decisions and choices McGill makes in the present.

Dean Lennox said that there are many features that are part of our structure at McGill. The McGill Strategic Academic Plan (MSAP) presented by the Provost is linked to the Principal's Priorities.
The McGill Strategic Research Plan is complementary to the MSAP.
The Royal Victoria Re-development Plan, which has its own academic plan and was accepted by the Québec government in 2016, is very interconnected with the other components.
The Bicentennial Campaign is a developing and incredibly important element because it will enable all the components.

The Faculty of Science Strategic Academic Plan is directly linked to the Science Advancement Plan and to the Bicentennial Campaign. The Science Strategic Academic Plan and Advancement Plan is an expression of the Faculty's needs and vision for donors, rolled up into one document.

Three Core Ideas of the Principal's Priorities are:
To be open to new ideas;
To be connected with the local and global community, across disciplines, geographic and sector boundaries;
To be purposeful because the purpose of learning, discovering, and expanding our understanding has never been more important.

The Five Themes within the Three Core ideas are:
Be open to the world; lead innovation; expand diversity; connect across disciplines and sectors; and connect with our communities.

The Process of Developing the Science Strategic Plan:
Dean Lennox said that on the issue of the Faculty of Science's place within McGill's framework, the Science Strategic Plan process began in January 2018 involving the Science Chairs and Directors, the Science Advancement Team, and other Faculty contributors. The Plan was developed over several months of discussions.

As moderator of the discussions, Dean Lennox asked:
What does the Faculty of Science foresee to be important 20 years from now?
How can the Faculty be out and in front in new developments in Science?
How do you see the role of the Faculty in terms of being part of what you are developing in foresight; recognizing that not all Science occurs in the Faculty of Science?

Some of the discussions were about the type of structures that could be sought, interdisciplinarity, and challenges and acceptance within the scientific culture, the

relationship between disciplinary sciences as a contributor to knowledge, and the importance of taking the system science approach based on disciplines and mixing. Very many science problems have been and will be at the interface between disciplines or even within the interface between systems. What type of structures could be envisaged that would enable the release of some of the constraints or inhibitors? As a result of these discussions, the two types of structures that came about were: Institutes and Laboratories (placeholder names at present). Dean Lennox described Institutes and Laboratories.

Institutes – organizations that enable the integration of research problems outside discipline-specific structures (departments)
Laboratories – physical and/or virtual spaces where ideas are synthesized and matched to problems, concepts tested, successes built on, failures learned from and adapted to… above all, a place where creativity is promoted and tested
Institutes and **Laboratories** transcend common disciplinary organizational structures and enable integration, allowing researchers to work and think in a "space" where they might not formally belong, or traditionally have lacked the credibility to work.
Institutes and **Laboratories** will promote the construction of a "wiring/circuit diagram" between fields and problems… leading to a "Connectome of Science."
Departments (*Physics, Geography, Chemistry, etc*.) will be sustained and improved in parallel as they are the backbone of the disciplinary organization of teaching and learning; professors will concurrently be members of Departments *and* Institutes/Laboratories.

Listed below are just some of the initial systems institutes that were discussed, all of which will require refinement in terms of academic practicality. The Measurement Innovations Laboratory would be associated with the five Institutes.

Molecule-Materials Systems Institute
Earth-Planetary-Space Systems Institute
BioSystems Institute
Computational Data Science Systems Institute
Cognitive Systems Institute
Measurement Innovations Laboratory

For example, the Computational Data Science Systems Institute might include membership from every unit in the Faculty of Science, and most likely include units outside the Faculty. This would enable shared expertise and interactions, and very likely graduate programs.

Departments:
Dean Lennox emphasized that departments have successfully organized the teaching of Science. There is an identification and an identity that both students and Faculty seek when associated with departments. The Science Chairs and Directors were comfortable with department structures remaining as the vehicle for undergraduate education. At the centre of the departments is the Science Education Innovations Laboratory, which currently is the Office of Science Education, and this is where innovations in education and teaching at the undergraduate level in particular would be developed. In the past 10-20 years, there has been a huge shift in how students are learning, and what tools students are using to learn. Dean Lennox said he was very set on having the Science Education Innovations Laboratory as a central entity to inform all science disciplinary teaching, with disciplinary teaching reciprocally informing the Science Education Innovations Laboratory.

Dean Lennox said that uncoupling research activities will create new research opportunities, new opportunities for creating infrastructure, and, very importantly, create

new conversations with donors. Large-scale department-based philanthropy is not successful in the Faculty. There is only one department in the Faculty with significant department-based philanthropy and that is the Department of Earth & Planetary Sciences. The McGill Space Institute came about as a theme, and is largely supported by philanthropy. It currently includes researchers from the Departments of Physics, Atmospheric & Oceanic Sciences, and Earth & Planetary Sciences. Coupling of the Faculty of Science Strategic Academic Plan and Advancement Plan was purposefully developed to be unified because it will attract donors.

The Royal Victoria Academic Plan is parallel with the Faculty of Science Strategic Plan. The Royal Victoria Academic Plan will include approximately 180 researchers. The research structures will be associated with the Sustainability Systems (involving many departments in the Faculties of Science and Engineering) and the Max Bell School of Public Policy. The site of the Royal Victoria Plan/McGill Academic Pavilion will be the equivalent of two Stuart Biology Buildings and four Otto Maass Buildings.

Vision, Mission, Overview and Context:
Dean Lennox showed an overview of the vision, mission, overview and context of the Measurement Innovations Laboratory. The description of each of these indicates the goals within an academic content, and the details will be developed by the various working groups.

Although the Faculty of Science Strategic Plan is an advanced plan, not a final one, Dean Lennox encouraged members to submit questions and comments to him about the Plan.

Next Steps:
- Discussions at Departmental and Faculty levels of Institute and Laboratory models
- Information sessions regarding the Royal Victoria academic planning and fit/design
- Charter statements and development planning for each Institute and Laboratory with a series of Working Groups
- Identification of leadership groups associated with each Institute and Laboratory

Nomenclature:
The nomenclature (Institutes, Networks, Clusters, and Laboratories) and role of departments, institutes and laboratories will have to be developed. An Institute would include a Director and a common structure would be built for all Institutes through philanthropy. It will be very important to develop our ideas and get the innovation into another space, e.g., a policy space, a commercial space, an innovation space. Dean Lennox would propose funding a professor of practice for each of these institutes. It would be an individual who has been out in a policy space or commercial space or innovation space, and would be hired as a non-tenure-track professor. This is a common and effective model in the USA and would be supported by a team through philanthropy. Every Institute would need a research and grants facilitator to lead the research strategies. There is an abundant amount of potential talent in the Faculty of Science but the current structure is bound between the Tri-Council relationships to our VP (Research) Office. It is necessary to invent ways to support innovations so researchers can get their ideas out there. The themes were distilled from discussions held a year ago with the Chairs and Directors, but these are not set in stone.

In his presentation, Dean Lennox pointed out some anticipated questions, and encouraged members to choose the questions they wished to ask, especially the structural ones. Some examples are: Who would belong to an institute? How is academic/professorial hiring going to work? Dean Lennox added that unlike departments, institutes will not have “hiring licences.” Members are encouraged to submit their questions to the Dean, and the questions and answers will be posted on the website. Dean Lennox then opened the floor to discussion.

In response to a member who asked if there are plans for an open discussion to facilitate people to engage at a higher level outside their departments, Dean Lennox replied that he had given this a lot of thought. Most likely in the first instance, this is probably going to be a six-month to two-year plan, and significant resources have been set aside to actually create that facilitation; a facilitator is in the plan to help move this process forward. In relation to the MSE, the focus was on undergraduate education, whereas this is not the case with the Strategic Plan. In research, so many professors are working outside their discipline-defined departments.

As a follow-up question on the literature on interdisciplinary institutes that have been set up, expecting people to self-identify is an iterative process for people to see what the opportunities are for them. There are many researchers who identify as research nodes that work together across departments very easily, and these already exist, but moving them to another level requires the opportunity for people to know that they will have opportunities or know to whom they should be self-identifying. Academics are good at wanting to change from the existing system, but academics find it very difficult to determine to what they want to change.

In reply, Dean Lennox said that there are existing institute-type models in the Faculty: The Materials Institute for Advanced Materials (MIAM); the McGill Sustainability Systems Initiative (MSSI), and the McGill Space Institute (MSI). The MIAM has never been very successful because it has never had significant resources, whereas the MSSI and MSI are successful because of tremendous seed funding. These latter models bring people together, working in the same physical space, and this is why the Strategic Plan was developed together with donors in mind.

The Director of the MSI commented that the funding was extremely important to the MSI, but the intellectual connections between the various researchers were ultimately the reason for MSI's success.

Another member asked whether the proposed Institutes will evolve with time, to follow the hot topics and keep the right researchers together, and whether there will be a system in place, for example, the CFAR model which has a five-year timeline for addressing key problems. Dean Lennox said that it would be essential that the Institutes conduct aggressive reviews every five years, and that he would be very interested in the CFAR model.

In response to a member who asked what kind of resources the Institutes would be expected to own, Dean Lennox said that with the exception of the Royal Victoria Project, he did not foresee that Institutes would have any ownership on space. Researchers would work in tandem with departments, and new buildings would not be built due to the lack of space in the University. In terms of research space and research groups being owned by the Institutes or by the departments, Dean Lennox replied that because departments are responsible for hiring and developing every individual hire's career, the departments will have to be the principal party responsible for space but there must be a different model, as space cannot become a classic territorial situation. The Faculty's role in brokering the relationship of space between departments would be advantageous without creating a threatening situation.

In reply to a question about whether members from other faculties would be included in these Institutes, Dean Lennox deemed it essential that members from other faculties be included. The themes have been selected because, in many ways, these represent university-wide activities.

A member echoed a previous member's concern, as the role of a facilitator would be very valuable in the success of the plan.

In response to another member, Dean Lennox said that the themes have been discussed with the Science Chairs and Directors, and are not firm, but were presented a number of times at various meetings, and these themes need to be elaborated on from the bottom up.

Dean Lennox encouraged Faculty members to look at the anticipated questions in the presentation. He would be happy to make written responses available on the website.

6. Director's and Associate Deans' reports

a) Director (Advising Services) Nicole Allard
b) Associate Dean (Academic) Axel Hundemer
c) Associate Dean (Education) Tamara Western
d) Associate Dean (Graduate Education) Laura Nilson

There were no reports for the current meeting from the Director and the Associate Deans.

e) Associate Dean (Research) John Stix

Thanks to the hard work and diligent efforts of Associate Dean Stix and Mr. Eduardo Ganem Cuenca, Dean Lennox gave an overview on the number of internal and external applications handled over the past six to seven weeks:

- A very large quantity of CFI10 internal applications were submitted (7), plus 11 headed by non-McGill faculty;
- Two of eight William Dawson applications were awarded;
- All the James McGill applications submitted were awarded;
- Seven of ten CRC internal applications were successful.

7. Reports on Actions of Senate

Senator Peter Grütter's Report of the Senate Meeting of 20 February 2019 will be postponed to the next Faculty of Science Meeting, scheduled for 16 April 2019.

8. Members' Question Period

In response to a member about the number of CRC/CIHR applications submitted by other faculties, Dean Lennox said that he would look into the number of submissions.

9. Other Business

There being no further business, Prof. Gyakum **moved**, seconded by Prof. McKenzie, that the meeting be adjourned at 4:55 p.m.

The motion carried.

Next Faculty Meeting: Tuesday, April 16, 2019