



Faculty of Science Academic Plan 2014 to 2019

Table of Contents

INTRODUCTION	2
Institutional Context and Fundamental Priorities	3
Financial Environment	4
INITIATIVES	4
Renew the Undergraduate Experience	5
Reinvigorate Graduate Programs and Options	9
Focus on Research Excellence	11
Support Faculty Renewal	13
Steward Resources	17
CONCLUSIONS	19

INTRODUCTION

McMaster University's Faculty of Science is known for its innovative programs, cutting-edge research, leading faculty, and aspiring students. We have earned a strong reputation as a centre for academic excellence and innovation; it is an organization of which to be very proud.

Our vision is to be the leading Faculty of Science in Canada and among the world's best in strategic areas of strength through innovation, creativity, and excellence in research, education, scholarship, and service. The Faculty values people who strive for excellence, think creatively and critically, act responsibly and ethically, and who are respectful of others. We endeavour to foster a collegial atmosphere that is enriching, inclusive, diverse and open.

To maintain and strengthen our position, and to build in a manner that reflects our most fundamental priorities, the Faculty launched a Faculty-wide academic planning process in November 2013.¹ This is a significant time in McMaster and the Faculty's histories. Several factors, internal and external, have the potential to influence the Faculty's future dramatically. Our plan strives to acknowledge those realities and work towards creating a more innovative and sustainable Faculty.

During the academic planning process, individual units, departments and programs, and the Faculty as a whole reviewed the strengths and weaknesses of our academic activities.² An Academic Planning Committee (APC) with representation from all departments of the Faculty oversaw the development of the plan. The Committee familiarized itself with University- and Faculty-wide priorities, and our operating context. It was briefed on the basics of McMaster's activity-based budget model and the overarching financial issues facing the Faculty. It reviewed benchmark data compiled in the fall of 2013, and reviewed and discussed unit-level five-year plans. Meetings were held with Chairs and Directors, as well as student leaders, to further discuss both unit-level and Faculty-wide issues during deliberations. A draft plan was released to the Faculty community of faculty members, staff and students for comment. All comments were considered. This final version of the plan was structured to highlight our key priorities and initiatives.

The result of this community-wide effort is the Plan that follows. Over the next several years, this plan will inform and help guide Faculty- and unit-level decisions on the development of new initiatives and programs, resource allocations, and proposed reorganizations of administrative units. At the same time, the Faculty must remain flexible to allow it to seize new opportunities and deal effectively with unforeseen challenges.

¹Full details on the planning process and committee are available in the document, "[An Outline for Academic Planning in the Faculty of Science, 2014-2019](#)," available at the Faculty's website.

²An overview of the Strengths, Weakness, Opportunities and Threats analysis can be found in the document, "[Faculty of Science Academic Plan DRAFT FOR COMMENT AND DISCUSSION](#)", available on the Faculty's website. This document will remain available to future reference.

The Plan's priorities are not presented in order of importance but in a way that flows from undergraduate and graduate education to research excellence and finally to faculty renewal, the keystone of all work of the Faculty.

Institutional Context and Fundamental Priorities

The Faculty of Science fully understands the need for this Academic Plan to be consistent with the aspirations and priorities of the University as a whole. McMaster University's general priorities have been outlined in both the President's letter, *Forward with Integrity (FWI*, September 2011) and McMaster's *Institutional Vision, Mission and Proposed Mandate Statement* submitted to the Ontario Ministry of Training Colleges and Universities (March 2014). The latter document identifies three priorities that McMaster will focus on for the next three years and beyond:

- Strengthen the excellence of our research and our graduate education and training, while seeking opportunities to integrate research more purposefully into our academic mission;
- Develop a distinctive, personalized, engaging and sustainable student experience; and
- Enhance the connections between McMaster and the communities we serve, locally, provincially, nationally and around the globe.

Faculty of Science Priorities: The Faculty of Science recognizes three overarching academic priorities that are related to and build on the priorities described in the President's *FWI* letter and in the current Strategic Mandate Agreement with the Province of Ontario. The Faculty seeks to:

- Provide high quality, innovative and meaningful undergraduate programs that provide opportunity for: small class experiences, "hands on" research experiences, experiential learning, open communication between students and faculty, and exposure to ideas and debates from a range of different disciplines, professions and the general community;
- Offer high quality, innovative and meaningful graduate, professional and post-doctoral programs that promote excellence within specific research and professional disciplines, and offer support and instruction for personal development and the acquisition of skills relevant to both academia and the broader community; and
- Enhance research intensity with the aim of raising the national and international research profiles of all sectors of the Faculty; attract additional research funding from both government agencies and industry; and maintain infrastructure and facilities consistent with leading research intensive universities.

For the Faculty to support these academic priorities successfully, we must develop and follow appropriate approaches, guidelines and practices to guide our actions. The Faculty must:

- Enhance excellence, reputation and outcomes by attracting and investing in high quality faculty, staff and students, and by balancing faculty workloads with respect to research, teaching and service to ensure excellence in all areas,
- Ensure accountability, financial sustainability and opportunity for future growth in a manner consistent with our excellence-based mission, and

- Create a supportive, cooperative and collaborative Faculty-wide environment based on transparent administrative processes.

Financial Environment

The University moved to a new Activity-based Budget Model (ABM) in fiscal year 2014-15. While the new model will not in itself lead to any sudden or dramatic change, it gives the Faculty more latitude in defining its future, and at the same time, a higher level of responsibility for sound financial management. All universities across Ontario, and indeed all across Canada and in many other parts of the world, are facing difficult economic times. There is little evidence that circumstances will change for the better over the next several years. As a result, we must plan to use our limited resources in the most effective manner possible. The demographics in the Faculty suggest that, while there is no mandatory retirement age, a considerable number of our colleagues will leave the University over the next five years. Careful academic and financial planning are necessary to make sure any openings support the Faculty's renewal in strategic directions.

It will be extremely difficult for the Faculty to implement initiatives devised to meet its overarching priorities, without solving its substantial financial challenges at the same time. Our academic planning is inevitably linked with our financial planning. Our current forecasts, without considering any financial implications of our strategic initiatives, suggest we will face annual deficits of \$4.4 million, \$4.8 million and \$6.2 million from 2014-2015 through 2016-2017. If not adjusted, these deficits will result in the Faculty being responsible for an accumulated debt of \$15.4 million by 2016-2017. The current situation is clearly unsustainable and the Faculty must move on a number of fronts to generate new revenue, increase efficiencies and allocate resources in such a way that we maximize the academic quality of the research and teaching programs of the Faculty as a whole.

INITIATIVES

To meet our fundamental priorities and ensure the Faculty's future is sustainable, the Faculty will work on several key and interlinked fronts to achieve our aspirations.

- Enhance the undergraduate experience by re-developing the vitally important Life Science program and by improving student life by adding more program structure, encouraging interdisciplinary work, and increasing research and experiential opportunities for students.
- Broaden graduate education to help prepare students for a changing landscape.
- Help faculty develop larger and more competitive research programs.
- Allocate faculty positions, and strengthen tenure and promotion practices in ways that maximize the quality of our research and teaching programs.
- Develop practices to better steward and grow our resources, and improve workload distribution among units and individuals.

RENEW THE UNDERGRADUATE EXPERIENCE

The Faculty has experienced considerable growth in undergraduate enrollment and impressive retention rates over the past five years. We are known for our innovative and internationally recognized programs such as the Integrated Science (iSci) Program, and our interdisciplinary approaches to science. Our faculty members have a strong commitment to, enthusiasm for and expertise in undergraduate teaching, with three having won 3M teaching awards in the past five years, and several being awarded the President's Award for Excellence in Teaching. We lead the McMaster community in the creation of high quality blended learning courses, such as BIOL 1A03 – Cellular and Molecular Biology; CHEM 1A03 – Introductory Chemistry; and PNB 1X03 – Introductory Psychology, with others in development. These courses combine best practices in pedagogy with the latest technologies to enhance the student experience. Recognizing the changing needs of incoming students, the Faculty has created Science 1A03 as a way to introduce first year students to university life, aid in the development of basic skills, and better explain the various program options available in upper years.

To build on these efforts and continue to renew the undergraduate experience to offer a welcoming, engaging learning and research environment for students, the Faculty will undertake the following under the broad headings of *New Structures* and *Improved Opportunities for Students*.

New Structures

Redesign the Life Science Program: The 2012 review of the Life Science Program, the Faculty's most popular program in terms of student numbers, pointed to a large number of very serious concerns, concerns that were repeated during the planning process. To address these issues, the Dean's Office will strike a broad-based Working Group to redesign the Life Science Program.

Among the areas it will address are the high enrollment of the program; large class sizes can limit the range of learning opportunities. The program's flexibility, while a strength for some who appreciate the opportunity to select from a wide variety of options, can be a weakness, as students can become lost or graduate with an unfocused degree. They also may miss out on the community-building experience of taking many courses in common with the same group of students. Confusion exists over the "identity" and "purpose" of the program and there are concerns about "overlap" and "duplication of courses" with other life science focused and environmental science programs.

The Working Group will consider focusing the Life Sciences program on humans and ensure it has a clear, distinct identity and purpose. It will investigate the creation of "streams" to help generate cohorts of students and provide more structure to better direct students to potential careers or areas for future study. Several of our Human Geographer colleagues in the School of Geography & Earth Sciences are experts in areas of Health Geography, Health Policy and Global Health, and it may be appropriate to develop a stream in this area of strength. At the same time, the group will consider ways in which other units, particularly those with teaching capacity, can support the various streams. It will also consider the possibility of engaging

colleagues from the Faculty of Health Science as well as relevant professionals from the local area to teach selected aspects of the program.

Establish a New Interdisciplinary Science Unit: McMaster is well known for its interdisciplinary approaches to teaching and research. Many of the complicated research questions of the day require that we move beyond traditional discipline-based inquiry and many colleagues have recognized the value of reaching out to colleagues in other disciplines to gain from their complementary expertise. Given the importance of interdisciplinary research, exposing our undergraduate and graduate students to this approach will be of benefit to all.

To improve and better integrate the interdisciplinary undergraduate programs within the Faculty of Science, the Faculty will strike a second working group to design a new undergraduate Interdisciplinary Science unit. The unit is expected to house the Life Science, Medical Radiation Science and iSci programs, as well as certain Science courses (1A03, 3A03 and 3M03), and the science experiential and research practicum courses associated with the Science Career & Cooperative Education. Uniting these programs and courses under the umbrella of a single unit will allow for a flow and sharing of educational resources and experience. More important, the new unit will be designed to function as a centre for interdisciplinary teaching and innovation, and serve, not only the programs and courses it houses, but advise on interdisciplinary approaches across the Faculty of Science.

The Working Group will plan for a suitable physical location – a welcoming environment that students identify as their academic home and that provides opportunities for students, staff and faculty from the different programs to interact in formal and informal settings.

Colleagues holding appointments in the new unit will be drawn from the full range of disciplines in Science to ensure no one field dominates. Tenured, tenure track and teaching stream faculty will hold partial or 100% appointments in the unit; tenured and tenure track faculty will hold a graduate appointment within an existing graduate unit.

Disestablish the Department of Medical Physics and Applied Radiation Science: The Faculty will develop a proposal to recommend the disestablishment of the Department of Medical Physics and Applied Radiation Science. This act in no way stems from concerns over the quality of the academic programs of the Department, which are widely respected by both industry and academia working in this area, and have graduated successful alumni. However, the Medical Physics undergraduate program has suffered a persistently low enrollment, and in the current environment, the Faculty needs to better balance its use of the limited resources available.

Medical Physics education, training and research will continue within the Faculty of Science. The very successful Medical Radiation Sciences (Med Rad Sci) Program, offered in partnership with Mohawk College and the Juravinski Cancer Centre, will continue in its current form and administrative responsibilities for this program will be housed in the new interdisciplinary unit being planned. The current Medical Physics program will be housed within the new unit;

however, plans will be made to rethink how to best offer the discipline of Medical Physics at McMaster in the near future. It may be that aspects of the discipline will be offered as a stream within the revised Life Science Program, or in combination with the BioPhysics program in Physics.

Our current graduate programs will continue to be offered in a form very similar to the current program and administered as an interdisciplinary program. Faculty members will have their appointments transferred to another unit within the University where their research and teaching interests best fit. Faculty members will be able to maintain their current research programs and no changes in laboratory space are expected. Faculty may wish to move their offices to be closer to colleagues in their new academic homes.

Improved Opportunities for Students

More Research and Experiential Opportunities for Undergraduate Students: McMaster is a research-focused student-centred institution. Our faculty makes a tremendous contribution to this philosophy with their commitment to being complete scholars and blending their research with their teaching. The Faculty of Science has worked to develop research and experiential learning opportunities for its students, especially those in Level IV, but it can do more for students in Levels II and III. It can also improve access to research opportunities for students in our most popular programs, such as the Life Sciences Program.

Exposure to direct research opportunities in Levels II and III will help students decide whether research is a career option and direct experiences will help them better understand content in upper years of their undergraduate programs. These opportunities will also help them develop collaboration skills, skills increasingly valued in both academia, and industry and other sectors.

The Faculty will strike a third Working Group to identify and implement ways to incorporate more research opportunities (both individual and collaborative) for all students in the undergraduate curriculum. For instance, the planning process identified novel ways to encourage colleagues to host more undergraduate students in their labs, to generate research opportunities for students earlier than the fourth year, and to design shared undergraduate research spaces for individual and group projects.

This Working Group will also develop methods to encourage and improve experiential learning opportunities, such as cooperative education and community engagement, and interaction with professionals both in academia and outside it. Developing a broad range of opportunities is critical. For instance, students who arrive at university with an interest in human health and are placed in health care clinics clearly gain valuable experience; however, students exposed to areas of study or work outside the clinic may uncover unexpected and surprising interests and strengthens.

Increase Access to Selected Honors Programs: Many students currently enrolled in three-year programs would prefer to enroll in an Honours program but can't because, after completing

first year, their GPAs are lower than required for entry in Level II programs. Other students find that they are unable to enter programs in their department of choice because of limits on program enrollments and the high GPAs required for entry. These students often “shadow” their Honours program of interest by taking the appropriate courses, and approximately 35% of these students succeed in entering the Honours program in a subsequent session.

To help students begin second year in an Honours program, the Academic Planning and Policy Committee (APPC) will work to ensure all units remove the enrollment limits for at least one Honours BSc program. Units should also review the admission requirements for their program(s) to ensure a less restrictive set of course entry requirements, and accept students to the program(s) with a CGPA of 5.0.

Optimize TA Placement to Improve the Student Experience: TA allocations to units in the Faculty of Science are based largely, if not solely, on the number of graduate students associated with that unit. Providing opportunities for graduate students to serve as TAs is crucial as TA-ships offer valuable teaching experience and serve as a source of income. Basing the allocation of TA resources purely on the number of graduate students in a unit creates some unintended and undesirable consequences, where the number of graduate students does not align with the numbers of undergraduate students in the unit. This leaves some units with too many TAs and other units with not enough.

To improve the undergraduate experience and offer the best training opportunities for our graduate students, the Faculty will ask the Associate Deans (Academic) and (Graduate Studies) to document how various units allocate and utilize TA resources within their undergraduate programs, and make general recommendations on the appropriate ratio of TA to undergraduate numbers and needs. These recommendations will take into account the wide variety of courses across the Faculty and the different needs for TA resources. From this will come a system for allocating TA resources and TA opportunities across the units that continues to provide experience and a means of support for our graduate students while enhancing undergraduate programs, particularly the interdisciplinary undergraduate programs, by delivering better support and access to the best TAs for the program.

Supporting Student Life Outside the Classroom: Attending university for the first time is a huge transition for our students and recent research indicates that increasing numbers of students suffer from issues related to mental health. At a University-wide level the Associate Vice President (Students and Learning) is currently developing a “McMaster Student Mental Health and Well-Being Strategy”. It is of prime importance that our instructors engage with the strategy and the relevant offices to better identify students at risk and be sure they are aware of the accommodations and counseling available to students.

At a Faculty level, the newly developed Science 1A03 course (described above) is designed to better prepare students to adjust to university and the next stages in their lives. For instance, it introduces the concepts of stress management and time management, and identifies existing university resources to provide help and better prepare students for success. We will actively

pursue the development of “cohorts” within our larger programs to help make students develop a better sense of belonging, and ease tensions and stress. The Associate Dean (Academic) will work with the Registrar to determine whether it is possible to group students in the same lab sections across courses and even years of study. Mentoring of a cohort of students by more senior students works well in some programs. Information about the “buddy” system used in iSci will be given to other units to see whether the system can be extended to other programs.

REINVIGORATE GRADUATE PROGRAMS AND OPTIONS

The Faculty attracts high quality graduate students, with 20% of our domestic students holding Tri-Council or Ontario Graduate Scholarships, and an additional 10% of our domestic students holding one of a range of other awards. Our graduate programs have experienced strong growth of 16% in the five-year period from 2008 to 2013, demonstrating that students appreciate our innovative programs and track record of cutting edge research. For instance, faculty members are leaders of three CREATE grants (Molecular Imaging Probes Program, Biointerfaces Training Program, and Integrated Development of Extracellular Matrices), and many more participate in other CREATE programs led by collaborators at other universities. These networks broaden the experiences and types of training we can offer our students. In addition, the Faculty is home to several interdisciplinary graduate programs – Astrobiology, Chemical Biology, the McMaster Integrative Neuroscience Discovery & Study (MiNDS), and the School of Computational Science and Engineering, with a new PhD program in Statistics planned. The Faculty will make it a focus of the next few years to increase our numbers of graduate students, develop more opportunities for graduate students through new programs, and provide better professional development for students in all programs.

Increase Graduate Student Enrollment: Graduate enrollment in the Sciences has risen rapidly since 2005, but this growth is starting to plateau. Training of highly qualified graduate students is a fundamental academic priority of our Faculty, and has an enormous impact on our faculty colleagues’ research programs. We must work to maintain and build our graduate enrollment. This is a challenge given the current strain on our resources but the Faculty sees this as a critical activity to maintain excellence.

To achieve this, the Associate Dean (Graduate Studies) will strike a Working Group to study the current graduate recruiting practices across the Science units. The Working Group will study the obstacles that prevent colleagues from accepting additional graduate students, and make recommendations on how to attract more students, and the most promising students, in particular, those students who have, or are likely to attract, major scholarships.

In conjunction with these efforts, the Dean’s Office will examine the current level of support offered to graduate students across the various units to ensure the Faculty is providing a fair level of support to all students.

Develop Professional Masters Programs: As society becomes more complex, Professional Masters programs are in increasing demand, offering people in mid-career opportunities to develop new skills, and new graduates opportunities to focus on specific career areas. We are in an excellent position to answer this need. The Faculty has recognized expertise in many areas – environmental monitoring, genomic analysis, ergonomics – where professional masters are in demand. Indeed, the Masters in Financial Mathematics (M-Phimac) is already a popular program. Not only will these offerings provide opportunities for attracting new students, they will also allow us to make links with industry and government agencies that will offer increased opportunities for research partnerships and impact, and help us develop more options of experiential education.

The development of Professional Masters programs is largely the responsibility of the individual units. To support these efforts, the Faculty, in particular, the Associate Dean (Graduate Studies) will work with units and the School of Graduate Studies to develop such programs. Other central University support, such as from the Provost, will also be encouraged. The Dean's Office will ensure that, with exception of a small overhead, resources generated by the new programs will flow directly to the units involved. The Faculty will aim to develop three such Professional Masters by July 2015 and possibly two or three more in the following year.

Enhanced Professional Development for Graduate Students: While some of our graduate students will take up positions in academia, the majority will choose to work in research and leadership positions in industry, government agencies, non-governmental agencies, and other sectors. These students, while requiring the same intense exposure to research in their chosen discipline, also need to enhance skills not necessarily developed in traditional programs. Skills such as collaboration, communications, leadership skills, and the ability to network with government, non-governmental agencies and industry will help position our students for successful careers. With the rapidly changing landscape in universities around the world, all graduate students will gain from developing these essential skills.

The Associate Dean (Graduate Studies), in concert with Chairs and Associate Chairs responsible for graduate studies, will work with School of Graduate Studies (SGS) to participate and/or help develop skills programs for graduate students. SGS, in association with graduate schools at several other Ontario universities, recently launched several modules designed for graduate students (www.mygradskills.ca). The Faculty will study the existing modules and determine whether more Science-specific modules are needed for our students.

FOCUS ON RESEARCH EXCELLENCE

The Faculty of Science takes pride in the excellent work of our researchers. We are home to many outstanding researchers and McMaster is recognized as one of the top research intensive universities in Canada. Our colleagues attract solid support from the Tri-Councils, especially NSERC and SSHRC, and several faculty members attract extremely high levels of support from industry and government agencies. We are recognized by our peers, with 13 faculty members who are Fellows of the Royal Society of Canada and many colleagues who serve as journal editors, on NSERC and CIHR review panels, and government advisory boards. Colleagues are leading cutting edge, multi-million dollar projects, such as the Canada Foundation for Innovation (CFI)/Province of Ontario-funded Biointerfaces Institute, the McMaster Institute for Music and the Mind LIVELab, and the Small Angle Neutron Scattering (SANS) instrument, and the Centre for Probe Development and Commercialization (CPDC), funded by Network of Centres of Excellence and the Province of Ontario. Others head major projects funded by the Automotive Partnership Canada and SSHRC Partnership Grant programs. Highly achieving faculty members are joining the McMaster community, attracted to our intense research environment.

To remain strong, the Faculty must not rest on its laurels. The Faculty will continue to use the bench marks developed to support the Academic plan and other data such as publications and citations, patents, invention disclosures and other measures to monitor our research successes and set goals. The Faculty encompasses a wide breath of research in terms of field and degree of application; yet, there are common features. Modern scientific research is dynamic, complex, collaborative and competitive in nature, and the external funding environment is always in flux. For instance, governments, industry, and the community in general see research as driving innovation and economic development, and are expecting short to medium term results for their contributions. Yet, discoveries often happen over the long term and come in unexpected ways. We must be prepared to respond to challenges presented to us.

Focus Research Activity: To thrive in this highly competitive funding environment, the Faculty of Science has created a “Strategic Research Plan for the Faculty of Science”. The goal of the Science SRP is to streamline the research enterprise while supporting key areas of growth in the Faculty. The plan builds on current strengths and identifies emerging areas of interdisciplinary research where we need to encourage intensity and expertise. The Science SRP makes it clear that to succeed during economically challenging times, the Faculty must focus its efforts to support leading edge research while managing expenditures prudently. As such, new positions, programs and initiatives in the Faculty of Science will be tied to one or more of the four identified areas of focus: *Biological Systems and Health, Environmental Science, Fundamental Exploration, and Materials Discovery and Characterization.*

Increasing and Broadening Our Funding Sources and Opportunities: The funding environment has become increasingly more competitive and targeted over the past decade. Colleagues are facing challenges securing research funding as a result. The Dean’s Office and the Associate Dean, Research & External Affairs (Associate Dean, Research) will continue to support the central University’s and other groups’ efforts to stress the importance of basic and fundamental research, and the need for funding in this area to governments and other stakeholders.

For some colleagues, however, external changes have created opportunities to broaden their research funding base. In fact the very nature of their research programs make such partnerships a good fit and some faculty members have formed strong research links with industry, governmental agencies, and/or non-governmental organizations. These links, not only provide direct support for research and graduate students, but can also generate new research questions to explore; create conduits for knowledge transfer, mobilization and commercialization; initiate cooperative and experiential learning experiences for all students, and increase employment opportunities for graduates.

Some colleagues are looking to explore the possibilities but do not know where to start. To leverage our successes and strengthen our links with outside partners of all types, the Faculty will initiate a series of programs to support researchers who elect to pursue partnerships. The Associate Dean, Research will offer a financial incentives program to support new partnerships; an informal mentorship program supported by the Faculty to link experienced faculty members with those in the initial stages of pursuing partnership; and a program of talks led by faculty members currently involved in partnered research. These talks will focus on skills such as how to initiate partnered research, and how to grow and nurture partner relationships.

To help increase the success of large, complex grant proposals, the Dean's Office and the Associate Dean, Research will offer strategic advice and financial support to those projects aligned with the Faculty's research priorities, especially in cases where such funding will influence the outcome. This funding should not be viewed as direct, ongoing support for any individual project. The Faculty will also encourage interdisciplinary research, often at the core of successful partnership projects. Faculty members have a long history of productive collaborations across disciplines and Faculties, especially Health Sciences and Engineering, and many discoveries are made at the intersections of disciplinary work. Wherever possible, the Faculty will work to modify its and the University's policies and practices to further encourage and promote interdisciplinary research.

The Associate Dean's Office will also work closely with the central research offices – Research Office for Administration, Development and Support (ROADS) and McMaster Industry Liaison Office (MILO) – to strengthen these resources for researchers.

Finally, and as important as the above, the Faculty and units will work with researchers to increase the number of Tri-Council grants held, as well as their monetary value. This measure of success is a vital building block in the career of any Canadian researcher, and the overall level of Tri-Council funding determines the Faculty's share of funding from CFI, the number of Canada Research Chairs available, and funds from the Federal Indirect Costs Program. Chairs and the Office of the Associate Dean, Research will redouble their efforts to aid colleagues in writing more competitive grant applications.

Managing Infrastructure Needs: Many research programs require complex and highly technical, central platforms. Such facilities are often required by multiple users and expensive to operate. The Faculty recognized the need for and importance of such infrastructure through its ongoing

support of capital and operating costs. The Faculty, however, needs to focus its limited resources (cash, CFI allocations, space) and exploit these resources to the utmost. All of our research platforms must operate as effectively and efficiently as possible. The Associate Dean, Research and the Director, Finance & Administration of the Faculty will work with Chairs; Associate Deans, Research from other Faculties; the Office of the Vice President, Research; and directors of the research units themselves to ensure they have effective business plans and clear reporting structures, and do not duplicate University or other platforms available in the region. New facilities, funded for instance through CFI or other agencies, must consider sustainability and present a full, detailed business plan (as determined by the Faculty) before they will be endorsed.

SUPPORT FACULTY RENEWAL

The Faculty's ability to achieve its goals for teaching programs and research rests, more than anything else, on the quality of its faculty members. Attracting and retaining high quality faculty are critical to our success. Faculty members are the foundation of all of our efforts to renew the undergraduate experience, reinvigorate graduate studies and drive research excellence; simply, they are essential. However, as we plan to support our faculty members and realize our ambitions, we face challenges with our resources.

Allocating Faculty Appointments: Demographic analysis indicates that there may be many retirements in the Faculty over the next several years, allowing us to plan for faculty renewal. However, financial forecasts indicate the Faculty may need to decrease our faculty complement over the next five years. Thus, it is imperative that we allocate new faculty appointments to achieve the maximum benefit for the Faculty as a whole and ensure the process for allocation is transparent.

The Dean's Office will establish an annual process to review requests for faculty positions in terms of their importance to the teaching and research priorities of the unit and the Faculty as a whole. Vacancies will not be automatically replaced. A broad-based committee will evaluate all proposals in light of the current environment, the best data the Faculty can provide, the proposed position's strategic importance to the Faculty's identified research and teaching priorities, and the Faculty's Strategic Research Plan. The committee will then advise the Dean on which positions are of strategic importance. In special and unusual circumstances, the Dean's office may approve an off cycle search. To help with the transition to a smaller faculty complement, limited and temporary funding for short term sessional appointments will be made available where possible.

Changes to Tenure and Promotion Processes: The Faculty's tenure and promotion (T&P) processes are of the utmost importance to the maintenance of high quality research and teaching programs. Being able to recognize an individual's contribution to the Faculty is a critical component to our success. To ensure the Faculty T&P Committee has the best information to make meaningful recommendations, the Dean's Office, in combination with the Faculty T&P Committee, will design a detailed set of expectations for T&P dossiers in keeping

with the University's yellow document. This will allow the Faculty T&P Committee to focus on the essential academic qualifications and achievements of our colleagues. The Dean's Office, in collaboration with the Faculty T&P committee, will also review the unit-level committee structures and processes, and recommend structures and processes to ensure unit-level committees are in the best position possible to make fully informed, fair recommendations on the academic merits of each candidate.

Encourage Diversity in Faculty Hiring: Given the evidence that students benefit from being taught by role models with whom they identify, whether it be a woman professor or someone from a similar ethnic group, it is vital to the future of undergraduate and graduate teaching programs that the Faculty encourages the hiring of excellent candidates who reflect the diversity of our student population, particularly with the hiring of more female faculty members. Given the importance of attracting top quality teachers and researchers to our Faculty, it will be important to ensure that we actively recruit from a diverse population of potential applicants, recognizing and valuing differences in age, gender, sexual orientation, dis/ability, religion, race/ethnicity, and other social characteristics.

Encouraging applications means much more than broadcasting advertisements across various publications and web sites; the Faculty of Science at McMaster must be seen as a welcoming and positive place for all qualified people to work and prosper. To do anything less will weaken our chances of attracting the very best scientists. Creating a family friendly environment should be a top priority of the Faculty. Efforts including support for access to child care on campus, support for parental leave, leadership development for female faculty members, mentoring programs and ultimately flexibility for faculty members trying to balance their workloads with family responsibilities will go far to create such an environment.

To make the best appointments possible, it is vital that Chairs and search committees fully understand how various practices and processes can influence the perception of quality during the review of letters of application, CVs and letters of reference. There is a rich literature on these subjects and it will be to our Faculty's advantage to take heed of it. The Dean, or a Dean's designate familiar with the issues and practices related to diversity in hiring, will serve as an advisor on each search committee.

The issue of faculty diversity has attracted considerable interest across the University in the past year; it is possible that a University-wide working group or committee will be struck to pursue the relevant issues. The Faculty of Science will be fully engaged with any such group; if necessary, the Faculty will develop a working group on its own.

Sharing Workloads and Teaching Responsibilities: Perhaps the most defining and fundamental feature of universities is that students are taught by faculty who are actively involved in leading-edge research. This clearly distinguishes modern universities from colleges and other institutions designed primarily for teaching and training, and from research institutes aimed primarily at research.

Department Chairs must have some flexibility in assigning teaching responsibilities to colleagues, and in general, the extent of an individual's research program should have some bearing on that individual's teaching assignments. To ensure our faculty's activities are consistent with the fundamental aim of students being taught by active researchers, all faculty are expected to teach a minimum of 6 units per year in undergraduate and/or large required MSc or Professional Masters courses. Colleagues with a very limited or no research program, and who supervise few, if any, graduate students relative to the norms of the discipline, will be expected to take up additional teaching and/or administrative responsibilities as described in the Provost's "Statement on Balancing Teaching, Research and Service Contributions for Tenure-Stream Faculty Members" (April 2014). This will better share the workload among colleagues and reduce the need for sessional teaching.

Colleagues who have won awards from a defined list of prestigious fellowships (e.g., Steacie and Killam) and awards (certain CIHR programs) that normally cover a large proportion of an individual's salary will be granted teaching release to allow them to hold these fellowships and awards. Newly appointed CRCs will be expected to fulfill the minimum teaching requirements described above, but will receive research support equal to the value of a sessional salary required to cover the usual three units of buyout.

In addition, colleagues who accept administrative positions (Chairs and Associate Chairs) within their units may, at their Chair's discretion, be eligible for some reduction in teaching responsibilities. Chairs are encouraged to do some course-based teaching but the degree of involvement will be left to their discretion. Chairs will also have the flexibility of providing a maximum of 6 units total across their unit for administrative work of the Associate Chairs or special projects by colleagues.

Under highly unusual circumstances, faculty may request to be relieved of some teaching responsibilities and, where allowed by the granting agency or sponsor, use their grant support to "buy out" some of their teaching. The value involved will be that stated in the Provostial guidelines "Reimbursement to Home Faculty for Faculty Member Teaching Release, September 2014". Such buyouts would not normally be for more than 3 units or for periods longer than one year.

For Teaching Stream colleagues, a ratio of 80:20 for teaching to service is preferred, although Chairs may want to consider a small research component. Special and specific projects aimed at improving curricula and courses could, with the Chair's approval, be considered part of the teaching component.

To encourage the implementation of these principles, the Dean's Office and the Faculty's Finance Committee will consider the points outlined above when allocating unit's annual budgets and new faculty positions. Requests to the Dean's Office for sessional teaching appointments will also be reviewed in light of the above.

Optimizing Teaching Resources Across the Faculty: Given the breadth of scientific exploration, it is critical that we offer a broad range of programs, programs that encompass both traditional disciplines and more interdisciplinary approaches. We also must use our teaching resources wisely and minimize duplication of content across programs. Eliminating content duplication will have the added benefit of helping student better plan for their postgraduate studies or careers. Students are too often confused about the Level II programs available and where these programs will lead. These efforts, in conjunction with the online McMaster Academic Planner (MAP) and the new course Science 1A03, will help students make better program choices.

Units with many low enrollment programs will be encouraged to contribute to other, larger programs within the Faculty. With the redesign of the Life Science program, it is envisioned that newly developed streams will benefit academically from the contributions of newly designed or even existing courses from non-Life Science units. This will spread the teaching effort across the Faculty and may increase interest in non-Life Science disciplines.

New programs will be evaluated in terms of potential enrollment, especially where new courses are required. The APPC will revise its program review process to require units to provide information on the resource implications of each proposal. This committee will also evaluate all low-enrollment programs with an eye to proposing that persistently low enrollment programs be cancelled or combined with other similar programs. For instance, the current interdisciplinary Origins Institute Research Specialization will be discontinued due to very low enrollments but components of the specialization may form part of a stream within the Life Sciences program. The results of the above efforts should be more focused course offerings that make the best use of our teaching talents while making decision-making clearer for students.

Support for Professional Development and Feedback: The Faculty of Science is home to many highly successful researchers and teachers, and the Faculty should work to develop a system whereby the insights and practices of such experienced colleagues can be passed to other and particularly newly appointed colleagues. Some units have already created their own mentoring programs and the Dean's Office, in collaboration with Chairs, will work to study the array of current initiatives and prepare a set of guidelines designed to ensure mentoring is broadly available and that mentors have access to instruction and support.

In addition, the Dean's office and all Chairs will work with colleagues at McMaster Institute for Innovation & Excellence in Teaching & Learning (MIETL) to develop a strong coaching network and process for colleagues to improve their in-class teaching, exam preparation, and other skills.

STEWARD RESOURCES

During the comprehensive review of the Faculty's activities and with changes in the University's budgeting mechanism, several areas for administrative improvements came to light. The Dean's Office will lead efforts in the following areas to ensure the Faculty acts as a responsible steward of its available resources.

Inter-Faculty Teaching: The Faculty is currently presenting a proposal to the Provost's office to review the rate for which interfaculty teaching is compensated in the new budget model. Given the Faculty's heavy commitment to interfaculty teaching, an increase in the rate for delivering interfaculty teaching would have significant implications for the Faculty's ability to renew its complement and achieve its academic priorities. There is absolutely no guarantee that the rate will change and the Faculty must be prepared to work with the budget model as currently formulated. An additional way to manage the costs of interfaculty teaching costs is to alter the delivery of these courses to suit the compensation.

Developing Advancement Opportunities: Increasing revenue through Advancement is clearly important for the long term sustainability of the Faculty of Science. The Dean is committed to spending as much time as possible in this arena. At the same time, Advancement is an area of much confusion, concern and even frustration among colleagues.

The Dean will work with the Chairs and colleagues from Advancement to flesh out very clear regulations and guidelines about all advancement activities within the Faculty to improve communications and understanding among all involved. It will be important to encourage enthusiastic participation in fundraising activity while, at the same time, respecting and remaining compliant with the needs and priorities of McMaster and the Faculty of Science as a whole. It is of the utmost importance that all our activities respect the wishes and sensitivities of existing and potential donors.

The Dean will also work with the Chairs and Advancement to fully develop the nascent Advancement Plan for Science and supportive communications vehicles. Specifically he, with Advancement, will develop new donor-supported sources of research funding and graduate student support. Chairs should work to improve alumni relations at the level of each unit. The Faculty will also look at ways to better understand where our graduates go once they leave the University.

Administrative Responsibilities and the Role of the Dean's Office: It is essential that the Faculty carry out its administrative responsibilities in the most efficient manner possible to focus our resources on our academic programs. New Chairs will be trained on budget management under the new system. The Mosaic Project, intended to modernize McMaster's business processes, has generated many changes, and will ultimately lead to improved efficiencies. In collaboration with the Chairs and Administrators of each department, the Faculty's Director, Finance & Administration will investigate the efficiencies of centralizing some of the unit level financial and HR activities in the Dean's Office. Where appropriate, different academic units may want to consider sharing staff with similar responsibilities.

Review of Space Utilization: Under activity-based budgeting, the Faculty of Science is charged directly for all space that it occupies; in 2014-2015, the total annual cost is over \$9 million. The Dean's Office will document and review all current space allocations and, in discussion with the units, act to ensure that space is being used effectively. The Dean's Office will work with individual units to ensure any unused space is removed from the Faculty's allocation.

International Students and Recruitment in the Faculty: The Dean's office should also study the number and degree of support for international graduate students across the different programs. International graduate students are often of very high quality and the presence of people from different cultures and backgrounds adds to the quality of the academic experience for undergraduates, graduates and faculty. However, owing to the lack of support for such international students by the provincial government, attracting them is financially difficult and severely limits the number we can accept. The Dean's office, in particular the Associate Dean (Graduate Studies), will work with SGS to investigate all possible sources of funding for International graduate students. At the same time, the Dean's Office may need to study and arrange for some limits on the number of Visa students that each unit can support.

Fewer than 4% of our undergraduate students are registered as international students. As described above, encouraging more international students strengthens the student experience by providing for interactions with students from often very different cultures and walks of life. The Dean's Office will look at ways to attract and support more international undergraduate students.

More generally, the Associate Dean (Academic) and Chairs will review undergraduate recruiting activities across the various units. There is much need to encourage more students to enter the chemical, physical and mathematical sciences, and centralizing these activities in the Dean's office should serve to maximize return on investment. The Dean's Office will closely monitor progress on these efforts.

CONCLUSIONS

Our current academic planning has come at a time of much change within the Faculty of Science, McMaster University as a whole, and post-secondary institutions in Ontario and beyond. Many of these changes relate to financial circumstances and, given the financial challenges facing the Provincial Government, it will likely be some time before we see substantial improvements to our basic funding. However, while we face challenges, it is clear that the Faculty of Science has a strong academic base on which to build. Our undergraduate enrollments are strong and our programs are rigorous, innovative and diverse. Our graduate programs are popular and many of our students have gone on to be leaders at other academic institutions, in industry and at government agencies. Our faculty members are deeply involved in leading-edge research programs and have developed strong international reputations.

The Faculty of Science's Academic Plan should be seen as a means to further develop and exploit our strengths and capture opportunities. Doing so will require that we refocus our resources and some of our activities, and some consolidation will be necessary. We are working from a position of strength and must act to maintain and fortify this status.

The goal is for the Faculty to look back in five years' time and see that, not only have we weathered the financial challenges, but that we have achieved and exceeded our goals in our undergraduate, graduate and research programs.