



**Faculty of Science Academic Plan**  
**DRAFT FOR COMMENT AND DISCUSSION**

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## 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.

To maintain and strengthen our reputation, and to build in a manner that reflects our most fundamental priorities, the Faculty launched a Faculty-wide academic planning process in November 2013.<sup>1</sup> 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. 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 does give the Faculty more latitude in defining its future, and at the same time, a higher level of responsibility for sound financial management to ensure continued academic and research excellence. All universities across Ontario, and indeed all across Canada and in many other parts of the world, are facing difficult economic times, and there is little evidence that circumstances will change for the better in the next several years. As a result, we must plan to use our limited resources in the most effective manner possible. The timing of our planning is critical, given the Government of Ontario has recently encouraged the Province's universities to consider a system of differentiation that may well influence future resource allocation; the Faculty of Science needs to do its part to ensure McMaster is well positioned in this process. Closer to home, 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. Lastly, the Provost charged the new Dean, appointed in July 2013, with strategic planning, stating that the new Dean should "work towards setting a new course for the Faculty early in his/her tenure."

The Faculty's 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 individuals who strive for excellence, think creatively and critically, act responsibly and ethically, and are respectful of others in a collegial atmosphere that is enriching, inclusive, diverse, and open." The academic planning process has provided an opportunity for the individual units, departments and programs, and the Faculty as a whole to review the strengths and weaknesses of our academic activities and to develop strategic initiatives to support our vision and values.

The development of the Plan that follows was guided and overseen by an Academic Planning Committee (APC) with representation from all Departments of the Faculty. Departments and

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<sup>1</sup>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 <https://www.science.mcmaster.ca/index.php/about-the-faculty/administrative-links/46-new/about/96-faculty-of-science-academic-planning.html>. Details on the scheduling of planning activities are presented in Appendix 1.

other academic units were asked to provide unit-level academic plans covering the next five years. Over the past several months, the Committee has familiarized itself with University- and Faculty-wide priorities, and with the general context described in the Academic Planning outline document. It was briefed on the basics of McMaster's ABM and the overarching financial issues facing the Faculty. It reviewed benchmark data compiled last fall, and reviewed and discussed each of the unit-level plans. Meetings were held with Chairs and Directors, as well as student leaders, to further discuss both unit-level and Faculty-wide issues.

This document outlines recommendations for the Faculty's academic plan for 2014-2019. First, it discusses the broader, institutional context and direction of McMaster as a whole and then describes the key priorities and approaches of the Faculty of Science. It includes a brief Faculty-wide analysis of strengths, weakness, opportunities and threats. Most important, it presents a series of strategic initiatives designed to act on our strengths, weaknesses, opportunities and threats, and guarantee we meet our academic priorities. It concludes with a brief discussion on the financial implications of the plan.

To be successful, it is imperative that the Plan not "sit on the shelf." It must be consulted and studied to inform and help guide Faculty- and unit-level resource allocations, the development of new initiatives, proposed reorganizations of administrative units, and proposed disestablishment of some low enrollment programs and low priority initiatives. At the same time, the Faculty must remain flexible to allow it to deal effectively with unforeseen challenges and seize new opportunities.

## **INSTITUTIONAL CONTEXT AND FUNDAMENTAL PRIORITIES**

McMaster University's general priorities have been outlined in both the President's letter, *Forward with Integrity (FWI)*, September 2011) and the "Institutional Vision, Mission and Proposed Mandate Statement" submitted by McMaster to the Ministry of Training Colleges and Universities (March 2014). The latter document identifies three priorities that McMaster will focus on "over 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.

The Academic Planning Committee was fully cognizant of the need for the Academic Plan for Faculty of Science to be consistent with the aspirations and priorities of the University as a whole.

**Faculty of Science Priorities:** The Faculty of Science recognizes three overarching academic priorities that are part of, and in addition to, 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;
- Provide high quality, innovative and meaningful graduate, professional and post-doctoral (PDF) 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;
- Enhancing research intensity with the aim of raising the national and international research profiles of all sectors of the Faculty; attracting additional research funding from both government agencies and industry; and acquiring new infrastructure and facilities consistent with leading research intensive universities.

For the Faculty to support these academic priorities successfully, the Faculty must develop and follow appropriate approaches, guidelines and practices to guide its actions. To be successful, 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 and teaching to ensure excellence in both of these 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.

## **FACULTY OF SCIENCE: STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS**

The section below provides a brief review of the current strengths and weaknesses of the Faculty of Science as well as an assessment of possible threats and opportunities.

### **Strengths**

#### **Strengths: Undergraduate**

- The Faculty has experienced considerable growth in undergraduate enrollment and impressive improvement in retention rates over the past five years.

- We have developed innovative, internationally renowned programs such as the Integrated Science (iSci) Program, and we are currently working on new programs in partnership with Mohawk College.
- The Faculty of Science leads McMaster in the creation of high quality blended learning courses (BIOL 1A03 – Cellular and Molecular Biology; CHEM 1A03 –Introductory Chemistry; and PNB 1X03 – Introductory Psychology). A new course, PHYS 1A03 – Introductory Physics, is currently being finalized.
- 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.
- There is strong faculty commitment, enthusiasm and expertise in undergraduate teaching. Three of our colleagues have won 3M teaching awards in the past five years, and several have won the President’s Award for Excellence in Teaching.
- Recent external reviews of our undergraduate programs have been very positive.

### **Strengths: Graduate**

- We have experienced strong growth (16%) in graduate programs in the five-year period from 2008 to 2013.
- The Faculty attracts high quality students. Approximately 20% of our domestic students hold Tri-Council or OGS scholarships, and an additional 10% of our domestic students hold one of a range of other awards, offered by either internal (i.e., by the Departments or the School of Graduate Studies) or external groups.
- Faculty members are leaders of three CREATE grants (Molecular Imaging Probes Program, Biointerfaces Training Program, Integrated Development of Extracellular Matrices), and participating members in three other CREATE grants.
- The Faculty is home to three interdisciplinary graduate programs (Chemical Biology, the McMaster Integrative Neuroscience Discovery & Study – [MiNDS], and the McMaster School of Computational Science and Engineering).
- A new PhD program in Statistics is in development.
- Several Departments are pursuing the creation of several new Professional Masters programs.

### **Strengths: Research**

- Overall, our colleagues attract solid support from the Tri-Councils, especially NSERC and SSHRC.
- Several faculty members attract extremely high levels of support from industry and government agencies.
- The Faculty is home to 13 Fellows of the Royal Society of Canada. And many colleagues serve as journal Editors, on NSERC and CIHR review panels, and government advisory boards.
- McMaster’s world rankings are good; in some areas of Science we are among the top 100 universities in the world.

- We have recruited high quality faculty from other institutions who are attracted to our intense research environment.
- Colleagues have achieved a high level of success with multi-million dollar CFI/Province of Ontario-funded projects, e.g., the Bionterfaces Institute and the McMaster Institute for Music and the Mind LIVE Lab, and the Small Angle Neutron Scattering (SANS) instrument. Researchers also head major partnership grants funded by the Automotive Partnership Canada and SSHRC Partnership Grant programs.

### **Strengths: Community**

- We have many robust connections to community. The McMaster Physical Activity Centre of Excellence (PACE) is a state-of-the-art, exercise research and training centre devoted to studying and improving health and well-being among older adults and people with chronic disease or disability. The Royal Botanical Gardens (RBG) is the largest botanical garden in Canada and McMaster University is currently formalizing an arrangement with the RBG that will help maintain and develop programs related to environmental protection and restoration, education and research, and the conservation of the natural environment. Similarly, the Faculty of Science is a partner in Clean Air Hamilton, a multi-stakeholder group dedicated to improving air quality in Hamilton's community.
- The Faculty of Science is home to many public outreach programs including high school outreach to promote science knowledge and career opportunities, community and school visits to the planetarium, Magic of Molecules shows, Centre for Climate Change Public Speaker Series and Origins Institute Public lectures.
- The Faculty of Science has an active and positive relationship with Mohawk College. We jointly offer the Medical Radiation Sciences Program and are discussing other possible initiatives.
- Our student cooperative education programs and employment counselling offered by the Science Career & Cooperative Education (SCCE) office provides important learning opportunities for our students while, at the same time, helping build relationships with local businesses and institutions.

### **Weaknesses**

As identified by the work of the APC, the Faculty is facing several external and internal challenges in various areas.

- The Faculty faces a very significant structural deficit and a looming debt load.
- Unpredictable retirement dates owing to the elimination of mandatory retirement make faculty renewal difficult to plan.
- The proportion of women Faculty is low relative to that our students.
- With the density of buildings on the Westdale campus, there is little chance of significantly increasing undergraduate enrollment over the next five years.

- The Life Science program faces many pedagogical and administrative challenges; the Faculty must work expeditiously to address the very serious concerns facing its most popular program.
- Many of our buildings and research platforms are aging and starting to deteriorate.
- The Tenure and Promotion (T&P) processes within the Faculty – the content of T&P files, unit-level T&P processes and unit-level committee structures – vary from Department to Department, which leads to questions around fairness and transparency.
- There is a lack of transparency and generally accepted practices on teaching “buyout”.
- The Faculty lacks strong connections with its alumni and potential donor communities.

## **Opportunities**

While there are many factors in the environment with which to be concerned, the Faculty of Science also possesses a critical mass of innovation and creative thinking. There are opportunities that we can seize to maintain and strengthen our academic mission.

- The University’s new approach to budgeting, the ABM, allows for strategic changes to advance academic initiatives.
- The development of Professional Master’s programs would offer financial support to the Faculty, and broaden its reach and reputation in the community.
- In the long run, there is a possibility of new campuses and/or freeing of space on the Westdale Campus that would allow for expansion of Science programs.
- There are increased opportunities for research partnerships with government agencies (e.g., Atomic Energy of Canada Limited), the non-profit sector (e.g., Experimental Lakes Area) and industry (e.g., Fraunhofer, Bruker Industries).

## **Threats**

Many external factors may influence our future. We must acknowledge them and prepare for the changes that may result.

- The Government of Ontario may institute further reductions in the basic income unit (BIU) rate and may continue to apply “policy levers” that could work to erode our revenue.
- Increased enrollment in the Life Science Program could exacerbate imbalances in the allocation of resources.
- The ABM may result in the development of “silo mentality” across the University and thus reduce cooperation among Faculties in research and teaching.
- Changes in Tri-Council funding policies may negatively impact research capacity, especially in the fundamental sciences, and graduate program enrolment.
- Recent changes with CIHR programs have led to some colleagues having difficulties securing appropriate levels of funding to support research programs.

## PROPOSED STRATEGIC INITIATIVES

Below the Academic Planning Committee presents strategic initiatives designed to take action on issues and concerns described above and to ensure the Faculty can meet our identified priorities and thrive in the current environment.

### Faculty

**Faculty Renewal:** The Faculty's ability to achieve its priorities on research and teaching programs in the future will depend, more than anything else, on the quality of its faculty. Attracting and retaining high quality faculty are critical to our success. Given this, and the financial pressures faced by the Faculty, it is imperative that we develop a process designed to allocate new faculty hiring opportunities where they will provide the maximum benefit for the Faculty as a whole.

To achieve this, the Dean's office will develop a standard process whereby units are required to justify requests for faculty positions in terms of their importance to the teaching and research needs of the unit and the Faculty as a whole. Over the next five years, no potential opportunity created through retirement, resignation, completion of a contract, or death will be filled "automatically" and no new hire should be viewed as a mere "replacement". To standardize the requests, the Dean's office will create a template that lays out the information and level of detail required. A broad-based committee will evaluate all requests and advise the Dean on which searches and contract renewals should proceed. In addition to the proposal, the committee will have access to information from the Dean's office on the unit's student enrollment, existing complement, research activity, graduate activity etc. As described in the "McMaster University Revised Policy and Regulations With Respect To Academic Appointment, Tenure and Promotion" (here after referred to as the "Yellow Document"), requests will be submitted by a set deadline each year. Scheduling of submission deadlines and the committee's review will be set to coincide with the regular hiring "season". In particular, review of proposals will be completed in late spring or early summer when detailed information for the subsequent year's budget will be available. This should provide sufficient time to mount a rigorous advertising campaign and for the selection process to be completed in time for a possible new hire approximately one year later. Under certain and unusual conditions (e.g., spousal appointments), the Dean's office may approve an off cycle search.

Given the expectation that the faculty complement will shrink over the coming five years, limited funding for short term sessional appointments will be made available to help units transition to a smaller complement. Such funding will be temporary and is not meant as a less expensive "replacement" for the loss of a permanent position; it will be provided to buy time for the unit to modify its programs to fit its budget allocation.

**Tenure and Promotion:** The Faculty's tenure and promotion (T&P) processes are of the utmost importance to the maintenance of high quality research and teaching programs. The basic requirements and expectations of the tenure and promotion processes are detailed in the Yellow Document, and all processes within the Faculty of Science will be in full compliance with University policy.



Currently, unit level files submitted to the Faculty T&P Committee vary widely in their format and level of detail. To ensure the Faculty T&P Committee is in the best possible position to make appropriate recommendations, the Dean's office, in combination with the Faculty T&P Committee, will design a fulsome template and set of expectations for the submission of T&P files. Making sure all relevant details are provided, and the use of a standard format for CVs and associated information, will allow the Faculty T&P Committee to focus on the essential academic qualifications and achievements of our colleagues.

There is also wide variation in the structure and procedures of T&P Committees at the unit level. The Dean's office, in collaboration with the Faculty T&P committee, will 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 recommendations on the academic merits of each candidate and that decisions are as "arm's length" as possible.

**Teaching Responsibilities of Tenured/Tenure Track Faculty:** Perhaps the most defining and fundamental feature of universities is that students are instructed 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. Faculty members not only teach and engage in original research, they blend the two together. Nevertheless, despite the general recognition of the need to blend research and teaching, they are somewhat different activities, and the issue of the amount of time and energy that faculty should apply to each one is often difficult.

The APC felt strongly that Chairs should have some flexibility in assigning teaching responsibilities to colleagues and that it would be disadvantageous for all colleagues to be assigned the exact same level of teaching responsibilities. The Committee agreed that, in general, the extent of an individual's research program should have some bearing on that individual's teaching assignments. However, to be sure our faculty's activities are consistent with the fundamental aim of students being taught by active researchers, it recommends that a minimum level of teaching be assigned to every colleague. In general, all faculty will be expected to teach a minimum of 6 units per year in undergraduate and/or large required MSc or Professional Masters courses.

Obvious exceptions relate to colleagues who have won awards from a defined list of prestigious fellowships (Steacie, Sloan, Killam) and awards (certain CIHR programs) that normally cover a large proportion of an individual's salary during the tenure of the award and stipulate reduced teaching responsibilities. 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. The Faculty will not unilaterally change existing appointments for CRCs, but will encourage current CRCs to voluntarily change the terms of their appointments to exchange teaching relief for the research funding described above.

In addition, colleagues who accept administrative positions (Chairs, Associate Chairs) within their units will also be eligible for some reduction in teaching responsibilities. It is expected that

in addition to the Chair, each unit will have two Associate Chairs and Associate Chairs will have their teaching responsibilities reduced by three units. Chairs are encouraged to do some course-based teaching but the degree of involvement is best left to their discretion.

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 support of such “buy outs”. The value involved will be that stated in the Provostial Teaching Buyout document of February 2011: “The financial value of teaching will be calculated by the formula:  $Cost = S \times N/M$ , where S is the annual compensation of the individual, N is the requested course reduction in units and M is the normal course load in units as approved by the Dean. Teaching buy-out must cover benefits as well as salary.” This is a higher rate than typically used in the past and the extra resources will allow Chairs to attract top people to instruct the students in the course in question and to provide extra support for the unit. Such buyouts should not normally be for more than 3 units or for periods longer than one year.

To ensure the above based guidelines are followed across all units, the Dean’s office and the Finance Committee will assume the described minimum of 6 units of teaching from each tenured/tenure track colleague when reviewing and allocating the annual budget allocation for each unit. Of course allowances for the exceptions described above will be taken into account. All postings for sessional teaching appointments must be approved by the Dean’s office and requests for positions must be submitted along with a detailed list of the teaching responsibilities of each faculty member. The Dean’s office will review course enrollments on a regular basis and, as is the current practice in some units, question whether courses with very low enrollments should be considered as part of a colleague’s teaching responsibilities. Units offering courses that frequently fall below enrollments of 10 should consider eliminating the course and/or modifying other courses and the program to cover any absolutely essential material in the course in question; units should also consider offering low enrollment courses in alternate years.

Colleagues with very limited or no research program, and who supervise few if any graduate students relative to the norms of the discipline, are 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). An increase in teaching or administrative responsibilities is not meant, and should not be seen, as a form of punishment; instead, it is an effort to better share the workload among colleagues. Depending on the need for regular courses, and where appropriate, the increased teaching commitment may, in part, take the form of an increased expectation to supervise a higher than normal number of undergraduate thesis students. Such supervision may be done in concert with colleagues with active research programs; the Faculty will work to develop funding to support such research projects. In addition to benefiting students, such activity may help rejuvenate the colleague’s research program.

The APC did not discuss the level of teaching responsibilities of Teaching-Stream colleagues in detail, but there was general consensus with the feedback and discussions at the General

Faculty Meeting of March 27, 2014 on the “Report from the Sub-Committee of the Committee on Appointments to Review Policies Surrounding Teaching-Stream Faculty”. The Report has been submitted to the Senate Committee on Appointments, but at the time this document was prepared, it is not currently University policy. Colleagues in the Faculty of Science were concerned over the report’s definition of “excellence in educational leadership”. There was widespread concern that the definition was too narrow and devalued the importance of experimenting with course design, new forms of assessment, different teaching modalities, etc. Such pedagogical activities are often used to guide changes in practice within our programs as a way to improve the undergraduate experience. This work may not meet the rigorous standards of pedagogical publishing, but we should not pretend that high quality teachers in diverse scientific disciplines are in a position to conduct psychological or social science research in education.

Given these concerns, the proposed workload ratio of 60:20:20 for teaching to service to educational leadership was viewed as problematic. A ratio of 80:20 for teaching to service was preferred. Special and specific projects aimed at improving curricula and courses could, with the Chair’s approval, be a part of the teaching component.

**Diversity in Faculty Hiring:** The January 2014 McMaster report, *Women Faculty, Now and in the Future: Building Excellence at McMaster University*, coupled with our own Faculty analyses indicates a large difference in the proportion of women faculty in tenured and tenure track positions compared with the number of women undergraduate and graduate students. Also, the November 2010 NSERC report, *Women in Science and Engineering in Canada*, indicates that the national average for the number of women faculty members in Science and Engineering at Canadian institutions rose considerably from 1999 to 2008. However, the January 2014 McMaster report indicates that between 2005/06 and 2011/12 the proportion of women tenured faculty remained relatively unchanged while the proportion of women in tenure track positions decreased. These data indicate the Faculty of Science at McMaster lags behind other institutions in this important area.

Given the evidence that women students profit from being taught by women professors, who often serve as role models, it is vital to the future of undergraduate and graduate teaching programs that the Faculty encourages the hiring of more women faculty members. Similarly, while the Faculty does not keep records of all aspects of diversity, it is apparent that, at least in some disciplines, the diversity of our students is not reflected by that of our faculty. Also, given the importance of attracting top quality faculty members to our Faculty as discussed above, it will be important to ensure that the Faculty actively encourage applications from “all qualified candidates including women, persons with disabilities, First Nations, Metis and Inuit persons, members of racialized communities and LGBTQ-identified persons.” 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.

To attract applications from all top quality candidates, 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.

To make sure we hire the very best candidates possible, the APC recommends the creation of a Working Group to review and summarize the information on best practices in hiring for diversity, and develop a set of guidelines for our search committees to follow. 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 same fundamental issues. If an University-wide group is struck soon, then it may be best to simply ensure Science faculty are engaged in the University group and task them with informing the Dean's office on the development of any material and to make recommendations specific to the sciences.

Once such information is made available, the Dean's office will work to ensure all Chairs of Search Committees are thoroughly familiar with the issues. In addition 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. Designates will provide reports to the Dean on the progress of the search in matters related to diversity.

**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, 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 should work with colleagues at McMaster Institute for Innovation & Excellence in Teaching & Learning (MIETL) to develop a strong counseling network and process for colleagues who need input on how improve their in-class teaching, exam preparation, etc.

Finally, the Dean and Associate Deans interact frequently with Chairs and Directors, but the Dean and Associate Deans will be more effective in serving their colleagues if the Dean's office schedules regular but very informal meetings with colleagues to hear their concerns and aspirations, and discuss ways to improve. Meetings could be held once a term with participants (one or two faculty who are not Chairs or Associate Chairs) being selected by each unit.

## **Research**

**Broaden Research Support:** The Faculty of Science is home to many outstanding researchers and McMaster is recognized as one of the top research intensive universities in Canada. The Faculty embraces a wide variety of research both in terms of area of study and in the degree of application.

To thrive in the highly competitive funding environment that colleagues face, the Faculty of Science recently developed the “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 and to support leading edge research while managing expenditures prudently.

New programs and initiatives in the Faculty of Science will be tied to four areas of focus.

- Biological Systems and Health,
- Environmental Science,
- Fundamental Exploration, and
- Materials Discovery and Characterization.

The APC agreed with the above approach outlined in the Science SRP and provided some additional recommendations. One research-related concern of the APC was the limited availability of funding for basic or curiosity driven research. The Tri-Councils are, by far, our colleagues’ most important source of funding for discovery-based research. The NSERC Discovery program in particular is very well suited to support basic research, but it is not growing at a rate to support all curiosity-driven research. In general terms, much of the new funding flowing from the Tri-Councils is allocated to “partnership programs” that require the involvement of industry or other sponsors. Research supported by such programs is far more likely to be directed at a specific problem, which thus may exclude a great number of researchers. The Faculty of Science is adamant that basic science is of fundamental importance to society and will continue to help McMaster lobby the provincial and federal governments to increase the availability of funding for basic research.

The APC was also concerned that a significant number of our colleagues have lost, or never acquired, Tri-Council funding. Given that most forms of scientific research require financial support, the lack of such basic support clearly limits the development of their research programs. A lack of Tri-Council funding is also troubling because the Faculty’s share of Tri-Council funding across various programs determines the Faculty’s allocation of funding from Canada Foundation for Innovation (CFI), the number of Canada Research Chairs available, and funds from the Federal Indirect Costs Program. Simply put, everyone is heavily dependent on Tri-Council funding, and we must improve our level of success. To improve the situation, the Chairs and the Office of the Associate Dean, Research & External Affairs (Associate Dean, Research) should redouble their efforts in aiding colleagues to write more competitive grant applications. Even more important, and considering the high level of competition for Tri-Council funding, the Chairs and the Associate Dean, Research should ensure young colleagues are fully aware of the strength and depth of research programs required to be competitive in funding calls. Finally, it may be appropriate to establish a “library” of successful grant applications from colleagues that could be used as examples for others to study.

While fully supportive of basic research and support from the Tri-Councils, the Faculty is equally supportive of colleagues who form strong research links with industry, governmental agencies, non-governmental organizations, as these are often excellent conduits for transfer and mobilization of knowledge generated on campus. Such links not only serve to fund research programs, they can also provide invaluable learning experiences and employment opportunities for undergraduate and especially graduate students. Indeed, several programs (e.g., MITACS, NSERC CREATE) help provide PDF, graduate and undergraduate, and partnerships with industry or other agencies are often desired, even required, for applications to be successful. The Dean's office will help facilitate such funding opportunities by working closely with the central research offices, Research Office for Administration, Development and Support (ROADS) and McMaster Industry Liaison Office (MILO). In addition, the Associate Dean, Research has begun a series of meetings with colleagues who have proven successful in making strong links with industry and will continue to seek their help and spread their experiences to other colleagues interested in broadening the base of their research support.

The Dean's office will also help facilitate success of grant applications, including those to programs that do not require a "partner", by providing seed funding where warranted and where there is a reasonable expectation that the seed will affect the outcome. However, while the Dean's office may be in a position to offer seed funding for selected research opportunities, it is essential that all colleagues recognize that our financial limitations prevent the Faculty from providing direct, ongoing support for any individual project.

**Review, Restructure and Renew Major Research Platforms:** Many of our colleagues' research programs require complex and highly technical platforms, such as NMR suites, mass spectrometry, and animal care facilities. Given that these facilities are often very expensive and required by multiple users, it is appropriate for the Faculty to help support their capital and operating costs. However, making sure that these platforms and services are run as efficiently as possible requires that all such science units develop well-reasoned business and staffing plans as well as have a clear reporting structure. The APC charges the Dean's office, and in particular the Associate Dean, Research and the Director, Finance & Administration to work with the Chairs of Departments overseeing such units and the Directors of the units themselves to ensure that plans are developed and followed.

The Dean's office should ensure all existing centres and institutes are reviewed on a regular basis, as per University policy, and that clear benchmarks for success are created and met. Clear processes should be developed for closing any such unit when it falls below a certain level of sustainability or is no longer of sufficient academic interest. In addition, all new large CFI and other major infrastructure proposals must be accompanied with a full, detailed business plan (as determined by the Faculty) that illustrates how the future operating and indirect costs of the infrastructure will be supported.

### **Undergraduate Students and Programs**

**Redesign the Life Science Program:** The 2012 review of the Life Science Program pointed to a large number of very serious concerns. It concluded that: "Despite the sound academic

principles upon which the Life Sciences program is founded and the dedication of faculty and staff who contribute to the delivery of the program, there must be fundamental changes to the program if it is to live up to its promise.” The review also called for immediate action, it stated: “the program is in imminent danger of collapse. The status quo is not an option.” Since that time, some of the most immediate concerns have been addressed. Nevertheless, it is clear that the program – the largest of all programs in the Faculty of Science – faces several critical challenges. The Faculty must move quickly to redesign the program and provide sufficient resources and an appropriate administrative structure to ensure it is properly supported.

One overriding concern is the sheer size of the program; the high enrollment creates barriers that make it difficult to maintain a high quality program that serves our students well. The Academic Planning Committee frequently heard about the academic and social importance of cohort building among students and it is inevitable that high enrollments make it difficult for students to get to know each other or have a shared experience. High student/faculty ratios also make it extremely difficult for students to engage in much desired individual research projects and put constraints on the methods of delivery and evaluation available to instructors.

The Life Science Program is very flexible and students appreciate the opportunity to select from a wide variety of options. Nevertheless, the program is so flexible that students can graduate with very few courses in common. Some students plan carefully and select a coherent series of courses and thus create their own “structure” within the program. Others appear “lost” and apparently pick courses based on their alleged degree of difficulty; certainly some graduate with a less than satisfactory sense of direction or competency.

The high degree of flexibility may, in part, explain some Life Science students’ perception that they are viewed by students in other programs as being enrolled in an “easy” program and that they often see themselves as “second class citizens”. The perception of being a “second class citizen” is also no doubt based on the physical location of the program. The three administrative offices of the program, including that of the Director, open directly onto a very busy, main floor hallway in the Burke Science Building; the space is neither welcoming nor identifiable and the students have no sense of it as an “academic home” on campus. The second class interpretation also reflects the fact that Life Science students are effectively blocked from taking some courses that are of direct interest but restricted to students enrolled in other programs.

Another overarching concern, voiced by colleagues and students both in and outside the program, was confusion over the “identity” and “purpose” of the program. There are concerns with too much “overlap” and “duplication of courses” with other life science programs and with some environmental science programs. The program also suffers from the current administrative model and the associated access to resources. While there is a degree of understanding that other units are expected to contribute to the teaching of the program, the degree of contribution expected is vague and poorly documented. This leads to confusion and even ill will between programs in the Faculty. McMaster’s SMA states: “At McMaster, we strive to foster the creative and intellectual potential of our students, while at the same time preparing our graduates to build successful careers.” This is indeed a laudable goal for any

program and it is the collective responsibility of the entire Faculty to ensure that all programs, including the Life Science Program, reach the standards and expectations set by the university as a whole.

The APC recommends that a broad-based Working Group be struck to redesign the academic components of the Life Science Program. The group should consider the creation of “streams” within the program to help generate cohorts of students and to provide more structure and thus better direct students to potential careers or areas for future study.

The group should consider focusing the program on humans and ensure it has a clear and distinct identity and purpose, while, at the same time, consider ways in which other units, particularly those with current teaching capacity, can support the various streams. Linking some streams to other units will serve to lessen the large variance in student/faculty ratios across the units and may increase student’s awareness and appreciation of other disciplines. One possible stream to consider relates to the expertise of many of our colleagues in the School of Geography & Earth Sciences. Several of the Social Geographers in that unit are experts in areas such as Health Geography, Health Policy and Global Health. A stream in this area will strengthen the Life Science program and give more exposure to our highly qualified Social Science colleagues in SGES. The group should further 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.

**Disestablish the Department of Medical Physics and Applied Radiation Science:** The APC recommends the disestablishment of the Department of Medical Physics and Applied Radiation Science. It is imperative to state that this recommendation does not stem from concerns over the quality of the academic programs. Instead, it is driven by the persistently low enrollment in the Medical Physics program and the need to better balance the use of limited resources across all programs in the Faculty.

As described below, the APC recommends the creation of a new interdisciplinary unit that would house the Medical Radiation Sciences (Med Rad Sci) Program; this program is expected to continue in its current format in partnership with Mohawk College and the Juravinski Cancer Centre. The current Medical Physics program will also be housed in the new unit. However, owing to its extremely low enrollments, the APC proposes that a subcommittee of the Working Group struck to redesign the Life Science program be charged with rethinking how aspects of the discipline of Medical Physics should be offered in the near future. It may be that aspects of the current Medical Physics program become part of a new stream within the newly designed Life Science Program.

The Dean’s office will strike a small working group to develop a proposal to disestablish the Department. It is expected that the proposal will recommend the current graduate programs be continued more or less as is with the exception that they would be administered as an interdisciplinary program in a manner very similar to that of our ChemBio and MiNDs programs. All faculty would have their appointments transferred to another unit where their research and teaching interests fit best. There is no expectation that any faculty member will change their



research programs or have their laboratory space altered, although faculty may wish to move their offices to be closer to colleagues in their new academic homes.

**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 disciplinary strengths and many of our 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, it is appropriate to expose our undergraduate and graduate students to this approach.

One of the difficulties in mounting and maintaining interdisciplinary programs is a tendency to consider them as an “afterthought” or “add-on” to more traditional programs. As such, they may suffer from a lack of resources and can be seen as a drain on resources from more traditional programs. Interdisciplinary programs that rely on the “good will” of Chairs and Directors of traditional programs can face ongoing uncertainties in the availability of high quality instructors, access of their students to disciplinary courses, and even access to, and involvement with, higher levels of administration.

To stabilize and improve the interdisciplinary undergraduate programs in the Faculty of Science, the APC recommends a working group be struck to design a new undergraduate Interdisciplinary Science unit (possibly the “School of Interdisciplinary Science”?). The unit could house the Life Science, Medical Radiation Science and iSci programs, as well as certain Science courses (1A03, 3A03 and 3M03), and possibly the Science experiential and research practicum courses associated with the SCCE. The APC recommends the interdisciplinary Origins Institute Research Specialization be discontinued because of its need for specialized courses and its very low enrollments. Housing these programs and courses within a single unit should provide for a flow and sharing of educational resources and experience between programs.

The Working Group should plan for a suitable physical location to house the unit. The space should be a welcoming environment that students can identify as their academic home and one that provides opportunities for students, staff and faculty from the different programs to interact in both formal and informal settings.

It is expected that some faculty will hold partial appointments in the unit (e.g., 51% Biology and 49% new unit) and it may be that a few will have 100% appointments in the new unit. All tenured and tenure track faculty who hold appointments in the unit would hold a graduate appointment within an existing graduate unit. It is reasonable that many of the teaching stream colleagues whose current responsibilities are tied to the relevant programs would move their appointments to the new unit. However, the APC feels strongly that the unit would be best served if a significant number of tenured and tenure track colleagues hold full or partial appointments in the unit as well. Also, to maintain a broad degree of interdisciplinarity and to prevent the unit from being skewed towards any one discipline, colleagues holding appointments in the new unit should be drawn from the full range of disciplines in Science and the unit should not be dominated by any particular field.

The new unit should be designed and recognized as far more than a vehicle for interdisciplinary programs. It should be the centre for interdisciplinary teaching and innovation and serve, not only the programs it houses, but advise on interdisciplinary approaches across all units.

**Increase Access to selected Honors Programs:** Approximately 15% of science students in Level II or above are enrolled in a three year degree program or follow the undeclared Science option. Many of these students would prefer to enroll in an Honours program but are blocked because their GPAs are lower than that required for entry in Level II. Registration data indicate that many students “shadow” the Honours program that they are interested in by taking the appropriate courses, and approximately 35% of these students succeed in entering the Honours program in a subsequent session.

The APC recommends that, in concert with the APPC, all units remove the enrollment limits for at least one Honours BSc program. Units should also review the admission requirements for the 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. Such programs should allow students to switch into them without undue backtracking to collect pre-requisites.

Making these changes will help address the issue of students being forced to enroll in programs in areas that may not be their first choice. In addition, allowing more students to enter selected Honours programs will provide more suitable learning opportunities for students who, for various reasons did not have a good start in their first year at university, but who may do very well in an Honours program in subsequent years. These changes may also help reduce the high enrollment in the Life Science program, and, owing to the number of BIUs allocated for each student in Honours vs non-Honours programs, provide increased revenue for students who are effectively following an Honours program.

**Research and Experiential Opportunities for Undergraduate Students:** McMaster’s current SMA with the Province of Ontario describes our University as a research-focused student-centred institution. Our Faculty is in a strong position given our colleagues’ commitment to being complete scholars and blending their research with their teaching. It is also readily apparent that our undergraduate students are eager for research opportunities and keen to learn, first hand, from the research expertise of our faculty.

The Faculty of Science has done much to develop research and experiential learning opportunities for its students. For example, virtually all of our honors programs offer some form of a 4<sup>th</sup> year “individual study” or “thesis” course, and students frequently report that, while such courses are very demanding, they are often seen as the “best part” of their programs. Many programs involve also courses that include some individual or group research projects; these too are appreciated by students and are important for developing skills and mastering content. While the Faculty has done much in this area, we need to do more.

Not surprisingly, students from some of our most popular programs often have great difficulty in finding research opportunities as part of their programs. While the high student/faculty ratios make this somewhat understandable; it is distressing that many, perhaps the majority, of our

students are not exposed to this important component of the learning experience. As described above, colleagues who no longer have sufficient funding to support graduate students may be particularly interested in accepting more undergraduate students to pursue research projects. This could provide more research opportunities for students and continuing research involvement for faculty.

Another concern is that, while 4<sup>th</sup> year “thesis” courses are often viewed as preparation for graduate studies, we must remember that abilities to formulate and test hypotheses, to interpret and present information, and to make informed decisions based upon published research are all critical to careers in Science, including those that are not research focused. While 4<sup>th</sup> year students will have more content knowledge than those in earlier years of their programs, such students have probably already decided whether they plan to go on to graduate studies. Exposure to direct research opportunities in years 2 and 3 will help students decide whether further research is a direction they want to take and the experiences will better position them to understand the additional content they will be exposed to in subsequent years of their undergraduate programs. Finally, while it is imperative that students be engaged in individual projects, it is obvious that most current research science is conducted in collaboration with others. Thus, exposure to group research projects is vital. Given the limited space available in faculty research labs, such undergraduate group projects may best be carried out in newly developed space purpose built to house individual and group undergraduate research projects.

The APC recommends the striking of a Working Group to promote more research opportunities (both individual and collaborative) for all students by developing ways to incentivize all colleagues to have more undergraduate students work in their lab, by generating a system of research opportunities for students earlier than the fourth year, and by considering designs of shared undergraduate research space for individual and group projects.

Defining and refining a career path are critically influenced by experiences at university and by co-curricular experiences. The APC recommends that the Working Group should also work to develop methods to encourage and improve experiential learning opportunities (co-op, community engagement) and interaction with professionals both in academia and outside it. Developing a broad range of opportunities is critical. Students who enter the university with an interest in human health and are placed in health care clinics clearly gain valuable experience; however, being exposed to different areas of study or work may generate interest and uncover skills and interests of which the students were not aware.

The APC was made aware that some units are actively engaged in assisting students find community placements while others rely largely on the SCCE. As currently set up, the SCCE does not have the resources to advise large numbers of students on experiential placements. The Working Group should study best practices across the University and consult with the AVP Students on ways to further develop appropriate opportunities.

**Optimize the allocations and effectiveness of TAs to Improve Student Experience:**

TA allocations to each of the 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 important; TAing offers valuable teaching experience and serves as a source of income. Nevertheless, basing the allocation of TA resources purely on the number of graduate students in a unit creates some unintended and undesirable consequences.

Units with many graduate students but relatively few undergraduate students may not require the TA allocations they receive and thus the allocation may not be used as effectively as it could be. The APC heard of cases where the ratio of TA/undergraduate students was extremely high or where TAs responsibilities were extremely light. In contrast, interdisciplinary programs not directly associated with a graduate program may have a great need for TAs but struggle to acquire such resources from the Dean's office and from the various units.

The APC recommends the Associate Deans (Academic) and (Graduate Studies) cooperate to document how various units allocate and utilize TA resources within their undergraduate programs. The Associate Deans can then make general recommendations on the appropriate ratio of TA/undergraduate; these recommendations will not be overly prescriptive as the wide variety of courses across the Faculty inevitably calls for different allocations of TA resources. Subsequently, in concert with the Dean, the Associate Deans should propose a system for allocating TA resources and TA opportunities across the units in a way that continues to provide experience and means of support for our graduate students but does not disadvantage the interdisciplinary undergraduate programs in terms of the total amount of support or access to the most appropriate individuals to serve as TAs. At the same time, and in an effort to maintain and improve the quality of the undergraduate experience and encourage professional development of the graduate student TAs, all units should devise or enhance existing systems to provide feedback on each TAs performance.

**Optimize program offerings across the Faculty:** Given the breadth of areas within Science it is important for the Faculty to offer a broad range of programs, programs that encompass both traditional disciplines and more interdisciplinary approaches. Nevertheless, to conserve resources, the Faculty must minimize duplication of content across programs. It is inevitable that many programs will share common courses but each program should be clearly distinct from each other.

Minimizing duplication of content will also provide students with as clear a pathway as possible to postgraduate studies or careers. The APC learned that too many students are confused about which Level II programs are available to them and, as a result, some land in programs not suited to their interests. This fact contributes to the large number of students in the Life Science Gateway entering the Life Science Program. The new online McMaster Academic Planner (MAP) and the new course Science 1A03 APPC will help address this issue, but the APPC and the Registrar's office should continue to improve the clarity of the options available to students as they leave the Gateway.

Units should refrain from proposing any new program unless reasonable enrollment is assured; this is clearly most important for proposed programs requiring new courses. The APPC should revise its program review process to ensure units are required to provide information on the resource implications of each proposal. The APPC should also evaluate all low enrollment

programs with an eye to proposing that persistently low enrollment programs be cancelled or combined with other similar programs. Doing so will conserve resources and lessen the confusion and frustration students face in selecting programs.

Those units that only offer low enrollment programs should be encouraged to contribute to other, larger programs within the Faculty. As described elsewhere, the Faculty intends to redesign the Life Science program to include more specific streams; it is certainly possible that such streams will be academically stronger with contributions from newly designed or even existing courses from non-Life Science units. Doing so will spread the teaching effort across the Faculty and may increase interest in non-Life Science disciplines. Also, units that contribute heavily to programs housed in other Faculties beyond the traditional first year courses are encouraged to focus further course development for Science programs.

**Enhancing the Student Experience:** The APC was very pleased and encouraged by its discussions with the leaders of student societies. The meetings provided insights into the student experience and helped identify strong and weak points of our programs from a student point of view. The Dean and Associate Dean (Academic) should hold regular but informal meetings with the executives of the various societies to keep in touch and learn of issues as they arise.

One concern important to all is the degree of stress of students and general mental health awareness. Much recent literature describes very worrying increases in the number of students suffering from issues related to mental health. The Student Wellness Centre at McMaster is the key contact point for matters related to student mental health and it is of prime importance that our instructors work with that office to better identify students at risk and be sure they are aware of the accommodations and counseling available. At the same time, we expect the development of “cohorts” within our larger programs will help ease tensions and stress. Also, the newly developed Science 1A03 course will introduce students to concepts of stress management and time management, and existing university resources to provide help. Given our responsibilities to facilitate the learning of students with disabilities at McMaster and within the Faculty, it is also important that departments and instructors work to ensure the accessibility of courses. Student Accessibility Services and MIETL are key contact points for matters related to accessible classroom instruction and course design.

As mentioned above, it is difficult to develop student cohorts in high enrollment programs but the academic and personal benefits of students identifying with a group of peers makes the effort worthwhile. It may be possible for units to work with the Registrar 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; others appear to have no mentoring system. Units may want to study the “buddy” system used in iSci to see if it can be extended to other programs.

The APC recognizes that all programs and many courses include components designed to enhance student’s learning skills (writing, computational skills, oral communication, critical thinking, problem solving). However, owing in part to time and resource constraints and a

concomitant emphasis on specific content, as well as a need for trained personnel, examples of courses where such skills are actually taught are rarer. Some second year courses in PNB focus on skills and introduce students to various sub-disciplines in the field; the iSci program also puts much effort into skills development. It will be useful to interact with colleagues involved in these courses and programs to determine whether they can be adapted and scaled to other programs. The iSci methods of skill development have already been transferred to the new Science 1A03 course and will be taught via the Mini Research Investigations that form the core of the course. All units are encouraged to work to better develop such all-important skills.

The APC was surprised to learn that only 3.6 % of our undergraduate students are registered as international students. As described below for Graduate Students, encouraging more international students strengthens the student experience by providing for interactions with students from often very different cultures and walks of life. Expansion of our international student enrollment may also generate revenue for the entire faculty.

### **Graduate Students and Programs**

**MOAs for Interdisciplinary Graduate Programs:** The Faculty of Science has partnered with other Faculties to develop a number of Interdisciplinary Graduate programs. As described above for interdisciplinary undergraduate programs, such programs are a natural outgrowth of the increasing need for colleagues in specific disciplines to partner with colleagues from different disciplines on broad, complex research initiatives. These programs have attracted high quality graduate students and helped increase graduate enrollment.

Despite their academic benefits, several administrative concerns may arise in such programs. For example, under the ABM, there is some confusion over the sharing of revenue (tuition and BIUs) and costs of the program. There are also issues with the clarity of the reporting structures and the responsibility for mounting of specific graduate courses, the housing of administrative personnel, etc. To ensure the success of our existing interdisciplinary programs, and to encourage the possibility of more, the APC recommends that the Dean's office, and in particular the Associate Dean (Graduate Studies), use the ideas and information in the report from the Taskforce on Interdisciplinary Programs (TIPs) to develop clear MOAs with the relevant faculties so all understand the relevant academic, administrative, and financial responsibilities and consequences. This model can be used to develop future sustainable programs.

In addition, the Associate Dean (Academic) and the Associate Dean (Graduate Studies) should work to link the interdisciplinary graduate programs with the most relevant undergraduate programs. As discussed above, our interdisciplinary undergraduate programs can suffer from a lack of access to qualified graduate students to serve as TAs and linking the interdisciplinary graduate programs to interdisciplinary and/or specific discipline-based undergraduate programs may help provide appropriate access and opportunities for both undergraduate and graduate programs.

**Professional Development for Graduate Students:** As noted in the above analysis, the Faculty attracts many strong graduate students. Many of our graduate students are interested in

academic careers and that many of our graduates hold appointments in academic institutions is testament to the fact that we are serving them well. However, many of our graduate students will choose to work in research and leadership positions in industry, government agencies, non-governmental agencies, etc. These students, while requiring the same intense exposure to research in their chosen discipline, will benefit from an enhancement of skills not necessarily developed in traditional programs. Given the rapidly changing landscape in universities around the world, all graduate students are likely to profit from exposure to skills development initiatives that are not necessarily offered in their traditional degree programs. Wherever possible graduate students should be exposed to the development of grant and contract proposals and be involved with industry, government agencies, and non-governmental agencies.

The APC recommends that the Associate Dean (Graduate Studies), in concert with Chairs and Associate Chairs, Graduate Studies, work with SGS to participate and/or help develop skills programs for graduate students. SGS, in association with graduate schools at several other Ontario universities, was recently awarded Program Innovation Funding to develop modules on: Communication, Mentoring, Teaching and Learning, On-line Learning, Making Lesson Plans, Versatile Graduate Training, Converting a CV to a Resume, Intellectual Property, Entrepreneurship, Community Engagement, Mental Health, Inter-cultural competencies, Academic & Research Integrity, and Detecting and Avoiding Plagiarism. These modules are aimed at graduate students in general; the Faculty may want to offer more specific modules aimed at our graduate students.

**Increase Graduate Student Enrollment and Funding:** As described above, graduate enrollment in the Sciences rose rapidly since 2005, but our growth has slowed considerably in the past few years and total enrollment of BIU eligible students has now declined. This has a direct consequence for our Faculty's revenue. As the training of highly qualified graduate students is a fundamental academic priority of our Faculty, and considering the enormous impact graduate students have on our faculty colleagues' research programs, it is of the utmost importance that we work to rebuild our graduate enrollment.

The APC recommends the Associate Dean (Graduate Studies) strike a Working Group to study the current graduate recruiting practices across the Science units, determine what obstacles prevent colleagues from accepting additional graduate students, and make recommendations on how to improve the current situation. The Working Group should focus its efforts on attracting more BIU eligible students and, in particular, those students who have, or are likely to attract, major scholarships.

The APC also recommends that the Dean's office studies the current level of support offered to graduate students across the various units. There is no reason why all students in all programs should be supported to the same level but the committee heard of some significant variation in the level of supported expected from colleagues' grants across the different departments. The Dean's offices must have access to such information in order to make informed decisions as to the amount of funding that each unit is allocated.

**International Graduate Students in the Faculty:** The Dean's office should also study the number and degree of support for international students across the different programs. International students are often of very high quality and the presence of students 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 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), should 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.

**Develop Professional Masters Programs:** The APC was encouraged to see that several units plan to develop new Professional Masters programs in the very near future. There is a societal need and strong student demand for Professional Masters in a variety of areas that overlap well with our existing areas of expertise in both research and teaching. As outlined above, the tuition and BIU funding associated with our undergraduate programs is restricted due to government-imposed limits on rates and by our limited capacity to grow on the Westdale campus. However, Professional Masters programs will provide a new source of revenue and often require little in terms of space or infrastructure. Another advantage of developing Professional Masters programs in selected areas of strength is increased opportunities to link with industry and government agencies; developing such connections may feed back to our colleagues in the form of increased opportunities for research partnerships and support.

The development of Professional Masters programs is largely the responsibility of the individual units. However, the Faculty, in particular the Associate Dean (Graduate Studies), will work with the unit and SGS to aid in the preparation of such programs. Also, the Provost has indicated that, despite the Faculty of Science being in a "Hold Harmless" situation under which new revenues first go to decreasing the extent of the hold harmless, he plans to develop a system whereby at least some of the resources generated by such new programs will flow despite the implications of the hold harmless. Finally, the Dean has indicated that, with a possible exception of a small overhead, resources generated by the new programs will flow directly to the units involved. The Faculty should aim to develop three such Professional Masters by July 2015 and possibly 2 or 3 more in the subsequent year.

### **Administrative Responsibilities and the Dean's Office**

**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 APC recommends that the Dean work with Chairs and personnel from Advancement to flesh out very clear regulations and guidelines about all advancement activities within the Faculty. 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.

Finally, the Dean should work with Chairs to flesh out the existing, but very nascent, Advancement Plan for Science and to consider the development of a Faculty newsletter. The Dean and Chairs should also work to better understand and improve alumni relations at the level of each unit.

**Administrative Responsibilities and the Role of the Dean's Office:** The priorities listed above all relate to academic teaching and research programs. It is also essential that the Faculty carry out its administrative responsibilities in the most efficient manner possible in order to focus our resources on our academic programs. At the same time, the APC did not propose any changes designed to reduce the number of staff nor were there any intentions to do so. It is possible, however, that some of the proposed changes will lead to changes in staff complement and job descriptions.

The introduction of the Mosaic Project, an initiative to modernize McMaster's business processes, has generated many changes, and while it will take some time before it is fully functional, it will ultimately lead to improved efficiency in administrative procedures. However, there is evidence that effective use of the system requires relatively high levels of familiarity with the various components and this may lead to difficulties for staff who only occasionally need to access certain components. Several of our administrative staff are asked to perform several different functions and the range of responsibilities of any one person can result in a lack of familiarity with all of the required details. The APC recommends that, in collaboration with the Chairs and Administrators of each Department, the Faculty's Director, Finance & Administration investigate the suitability of centralizing some of the unit level financial and HR activities in the Dean's office. The APC also recommended that, where appropriate, different academic units should consider sharing staff for specific responsibilities. It should also prove advantageous for new Chairs to be trained on budget management under the new system.

The APC also recommends that the Chairs and Associate Dean (Academic) review the operations and successes of the recruiting activities across the various units. We must determine the level of success relative to our expenditures. Again, it may be worth centralizing these activities in the Dean's office in an effort to maximize return on investment.

**Review of Space Allocations:** Under the ABM, the Faculty of Science is charged directly for all space that it occupies; the total annual cost is over \$9M. The APC charged the Dean's office to document and review all current space allocations; in essence, we need to understand what space we control, who uses it, for what, and when. The Dean's office should also work with individual units to ensure any unused space is removed from the Faculty's allocation and to determine whether we can possibly free up more space through efficient time tabling and/or possible renovation.

## FINANCIAL IMPLICATIONS

Early in the planning process, the APC studied both the basics of ABM and high level budget summaries and forecasts; the Committee felt it important to put their deliberations in that context. However, while the Committee spent much time in detailed discussion about each unit's plan, and the implications of some proposed changes to individual units, the APC did not discuss the financial details of any particular unit. This was done, in part, because any attempt to apply the ABM at the level of the units would result in dramatic and damaging changes to the Faculty as a whole. The APC wanted to ensure the overall integrity of the Faculty's academic mission with the recognition that, inevitably, revenues and costs will vary widely across the units. Thus, while the APC was well aware of the overall financial constraints facing the Faculty and the need to both increase revenue and trim costs, it did not discuss the financial implications of each strategic initiative. Instead it focused on developing strategic initiatives aimed at meeting the Faculty's academic priorities.

Nevertheless, it will be very difficult for the Faculty to implement the strategic initiatives devised to meet its overarching priorities, without solving its substantial financial challenges. Simply put, our academic planning is inevitably linked with our financial planning. Proposals designed to improve any one aspect of our academic programs may trigger additional costs that result in a reduction in the quality of a different area of academic activity. The aim is to allocate our limited resources in such a way that we maximize the academic quality of the programs of the Faculty as a whole.

The APC fully expects that several of the initiatives within the Academic Plan will generate additional revenue or financial efficiencies. For example, we expect to see financial benefits flow from the development of Professional Masters programs, optimizing TA allocations, optimizing program and course offerings, and issues related to graduate student funding. However, until further work is done to move these initiatives forward, it is difficult to provide an estimate of the amounts. The proposed reduction in students in three year degrees may result in a net revenue increase of \$500K/year, but the actual amount will depend heavily of several factors. Other initiatives such as reducing our footprint may save up to \$250K/year, and savings of approximately half that amount may stem from reorganizations of some research platforms; but again, at this stage, these numbers are simply guesses. Also, other strategic initiatives, such as revising the Life Science Program, encouraging more research experience for undergraduates and creating the new interdisciplinary unit, will incur additional costs.

Our current forecasts, without considering any financial implications of our strategic initiatives, suggest we will face annual deficits of \$4.8M, \$4.8M and \$6.2M from 2014-2015 through 2016-2017. If not adjusted, these deficits would result in the Faculty being responsible for an accumulated debt of \$14.5M in 2016-2017. Based on the very crude estimates of the financial implications of various strategies described above, it is clear that, while positive, many of the proposed changes will have a relatively small effect on the deficit.

One possible change that may improve our financial situation relates to interfaculty teaching. The Faculty is currently presenting a proposal to the Provost's office to review the rate at 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 and/or savings generated by altering the delivery of these courses to suit the compensation would have significant implications on the ability of the Faculty to renew its complement and achieve its academic priorities. However, there is absolutely no guarantee the rate will change and the Faculty must be prepared to work with the ABM as currently formulated.

Finally, faculty renewal, the first issue listed in the material above, will inevitably play an important role in reducing the deficit. Given a need to reduce the deficit by over \$4M per year and the fact that the costs to the Faculty of each faculty member is approximately \$220K (salary and benefits) suggests the Faculty may need to decrease its complement by as much as 10%, or 20 Faculty members, over the next five years. This rather grim scenario underscores the utmost importance of the Faculty taking great care to ensure it only approves searches that will help the Faculty meet our highest academic priorities.

## **CONCLUSION**

As described above, 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 revenue streams. 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; and our faculty are deeply involved in leading-edge research programs and have developed strong international reputations.

Therefore, the plan described above should be seen as a means to further develop and accentuate our strengths and opportunities. Doing so will require that we refocus our resources and some of our activities, and some consolidation will be necessary, but given we are working from a position of strength, our actions must be measured.

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 our priorities in undergraduate, graduate and research programs.

## **Appendix 1: Academic Planning in the Faculty of Science: Process to Date**

- Overview document discussed and released in November 2013
- Academic Planning Committee struck in December 2013
- Unit level plans submitted January 2014
- Academic Planning Committee:
  - Reviewed University and Faculty Priorities
  - Reviewed general context (finances, research support, enrollment etc.)
  - Studied basics of New Budget Model; studied faculty wide financial details but not unit level
  - Reviewed and discussed Benchmarks
  - Reviewed and discussed each unit's plan
  - Requested further written material from Chairs
  - Met individually with all Chairs and Directors for clarification, discussion
  - Met with student groups
  - Reviewed and discussed requests for faculty hires from each unit
  - Discussed overarching issues and drafted faculty wide proposals
- Discussion of some proposals at Faculty Council
- Dean met individually with all Chairs, some Directors and members of a unit
- Discussion at General Faculty meeting on 29 May
- Discussion at All Staff meeting on 6 June
- Release Draft Plan for comment on 6 July
- Request feedback on draft until 22 August
- Committee review feedback from draft plan
- Dean arrange for further consultation on key points
- Release final draft and letters to units in September
- Some proposals will be managerial and be put in place immediately
- More complicated proposals will require creation of Working Groups and the development of relevant reports as identified in the Draft Plan
- Proposals requiring University Governance will go through the prescribed routes