

Faculty of Science Strategic Plan 2015-2020

Understand the Past, Shape the Future

Executive Summary

The Faculty of Science Strategic Plan is centred on 10 BHAGs (Big Hairy Audacious Goals) that are intended to 1) advance the Faculty's research, teaching, and administrative agendas, and 2) position the Faculty of Science as a leader in response to the major drivers of change in the post-secondary sector.

Each major recommendation is a BHAG, with targets set high enough to require a concerted five-year (or more) effort to attain the goal. Even achieving major progress towards realizing these goals represents an important advance in the Faculty of Science's position as a national and international leader in research and teaching. All BHAGs are easily measured and progress will be regularly updated on a public web site.

In the following, all numbers reflecting the current status are from October 1, 2014.

Overarching BHAG

1. The ratio of number of undergraduate students (UG) to graduate students (GS) is currently 5.5 to 1 (UG2GS). Within 10 years, the Faculty of Science must bring the UG2GS ratio down to at least 4:1. For this strategic plan, an intermediate objective of a UG2GS ratio of 4.5:1 will be targeted.

Research BHAGs

2. Increase the total number of non-CRC and non-honorary research chairs and professorships by 10, from 26 to 36. These chairs could be leveraged through NSERC, AITF, donations, or other funding sources.
3. Create 10 new spinoff companies (with a 5-year survival rate of at least 75%) and 10 new licensing agreements.

Undergraduate Student Experience BHAGs

4. Increase to 20% (from 5%) the number of Science course sections that integrate new teaching methods such as online learning, blended delivery, active learning, discovery learning, “flipped” classroom learning, technology-enhanced learning, interdisciplinary experiences, experiential learning, and study abroad.
5. Grow the Science Internship Program by 400%. This goal would bring program enrolment up to 250 from its current level of approximately 50.
6. Reduce the number of students in the Required To Withdraw (RTW) category from approximately 6.25% of the total undergraduate population to 4.75%.

Graduate Student BHAGs

7. Increase by 25% to 270 (from 222) the number of graduate students holding major scholarships.
8. Reduce the average completion time for M.Sc. degrees to 2.25 years (from 3.6 years) and Ph.D. degrees to 4.75 years (from 5.75 years).

Community Engagement BHAGs

9. Triple the growth of the summer camps program, from approximately 300 campers to 900.

Administrative and Financial BHAGs

10. Initiate projects that will bring in an additional \$2 million per year of new revenue.

In addition to the above, this plan contains many other beneficial objectives that will enhance the success of the 10 BHAGs.

Success achieving the BHAGs will require a concerted effort by many faculty, staff and students in the Faculty of Science. We will have to come together as a team, to an extent greater than we have ever done before. The philosophy for success is best summed up as:

United we grow.
Divided we status quo.

Introduction

The University of Alberta is at a critical point in its history. Post-secondary education is poised for disruption, and there are forces at play that will lead to major changes in research, teaching, and administration. Some of the changes – including reduced public funding, continued centralization of core services, responsibility-centered budgeting, online education, technology adoption, and

evolving graduate student funding models – are already happening to various degrees. The pace of change will accelerate, and the future will favour the brave and the nimble.

The Faculty of Science will be, in part, a bystander to some of the upheaval that is/will happen. The University of Alberta will make institutional decisions in some of these areas, and in those cases we need to think about how to strategically follow their lead. In other areas, the University will be cautious in its path forward or leave decisions to the discretion of the Faculty. This will provide the Faculty with opportunities to lead at the institutional, provincial, national, and (if we are fortunate) international level.

We do not need a crystal ball to see into the future to know exactly where we need to head. But we have to identify the right direction, start moving in that direction, and be nimble about making course corrections as we learn more. In this new and emerging world, international reputations can be quickly earned by being at the forefront of new developments, or opportunities lost by failing to do so.

While part of the Faculty of Science Strategic Plan involves setting the stage for the future, the majority of the recommendations concern getting our house in order. The Faculty is doing very well by most metrics. However, there are some key areas of concern and the strategic plan is intended to tackle them head on. Strengthening our research, teaching, and administrative functions puts us in a better position to grow our reputation (internally and externally) and reach new heights of excellence.

The University of Alberta's Academic Plan, *Dare to Deliver 2011-2015*,¹ has four cornerstones:

- Talented People,
- Learning, Discovery, and Citizenship,
- Connecting Communities, and
- Transformative Organization and Support.

This Strategic Plan is in alignment with this vision. However, our plan emphasizes the priorities of the Faculty of Science. Many of the objectives in the University's plan, while important and supported by the Faculty, are not on the critical path towards making Science stronger.

Our new Mission Statement is:

*To enrich a vibrant learning environment for the discovery, dissemination, and application of scientific knowledge through teaching and learning, research and creative activity, community involvement, and partnerships.*²

¹ <http://www.provost.ualberta.ca/AcademicPlan.aspx>

² This is a variation on the University of Alberta's mission statement (<http://www.toolkit.ualberta.ca/WhatIsOurPromise/OurVisionMissionMotto.aspx>).

SWOT Analysis

This section gives a succinct self-assessment of the strengths, weaknesses, opportunities and threats for the Faculty of Science.

Strengths

- Home to numerous world-class and nationally-strong research groups
- Excellent undergraduate student population
- Large and talented graduate student population
- Numerous faculty research and teaching awards each year
- Undergraduate students do well on scholarship applications
- Strong teaching evaluations
- Collegial working environment
- One of the largest of the 18 faculties (number of students; operating budget)
- Centennial Centre for Interdisciplinary Science
- Excellent research infrastructure
- Growth in fundraising
- University of Alberta leader in Massive Open Online Courses
- Strong leadership team (including Associate/Assistant Deans and Chairs)
- Excellent working relationship with Central and other Faculties
- Collaborative research that crosses Department and Faculty boundaries

Weaknesses

- Lean administrative support staff across Departments and the Faculty
- Over-enrolled undergraduate program (unfunded students)
- Shrinking graduate population (lack of financial support for students)
- Aging professoriate
- Shrinking professoriate
- Some Departments need significant faculty renewal
- Research funding growth has stagnated
- Unlikely to get significant new government funding
- Volatility of the Canadian dollar
- Expensive housing market
- CCIS backfill plan will take many years to complete
- Psychology has significant space issues
- Chemistry needs major space renovations
- Geographic location
- Live in an “engineering” province
- Low percentage of graduate students holding major scholarships
- Decreasing percentage of Canadians in our graduate programs

Opportunities

- Relatively few academic positions available internationally (discipline dependent) means there are excellent hiring opportunities
- Large cadre of professors retiring in the next 5-10 years
- Financial pressures create environment where there is openness to change
- Invest strategically to sustain and grow areas of world-class research
- Increased attention on teaching and learning innovation
- Still early days for MOOCs; chance to build reputation
- Use of technology to enhance learning
- Engage oil industry
- New University of Alberta president with a new vision
- Responsibility-centered budgeting gives the Faculty more financial control over its destiny

Threats

- Continued financial instability
- Increasing undergraduate admission average will reinforce local “elitist” perception
- Increased graduate student tuition may hurt our ability to recruit excellent graduate students
- National and provincial targeting of money for applied research
- Online education (such as MOOCs) threaten to disrupt post-secondary education
- Aggressive institutions trying to recruit faculty members away from the University of Alberta
- Responsibility Centered Budgeting (RCB) may result in a smaller budget and a change to the educational priorities

Strategic Plan Design Principles

There were numerous considerations that played a factor in creating this plan. The major ones are given here.

Current Trends Impacting Post-secondary Education

- Technology is disrupting post-secondary education. Students are carrying powerful computers around (often called “phones”). They are comfortable with new technology, especially the use of social media.
- The importance of online teaching is growing. Online education has been around for a long time, but the recent introduction of MOOCs (Massive Open Online Courses) has shone a spotlight on opportunities to offer high-quality education to a global audience, potentially altering the nature and delivery of higher education
- Increased interest in online education has led institutions to closely examine their use of in-class and online teaching resources. There is a global push towards new forms of teaching, including blended delivery and experiential learning.

- Enrolment pressures are high. The demand for a Faculty of Science education is increasing from year-to-year, and we do not have the resources to meet the demand.
- Public funding is decreasing (as a percentage of the operating budget). This reduction is forcing Faculties to create new sources of revenue.
- Governments are increasingly enamoured by the possibilities for commercializing research. Education and research benefit the public in the long term, but governments seem to be looking for opportunities to show short-term economic returns as well.
- Research funding is increasingly targeted, especially to areas with perceived economic value. The consequence is that it is getting harder to fund curiosity-driven research.
- “Multi anything” is all the rage: multi-discipline, multi-faculty, multi-institution, multi-country, and so on. In effect, there is a push for collaboration that brings people together from multiple areas of expertise that cross some well-defined (and often artificial) boundaries.
- Responsibility-centered budgeting models have become “popular” in the post-secondary sector, and the University of Alberta will begin moving in this direction in 2015. A responsibility-centered budgeting model will give Faculties more control and responsibility for their financial matters.³

It is easy to discount these trends, and even ignore them. However, it is unlikely that any of them are going to change significantly in the near future. It behoves us to better understand these priorities and view them as opportunities to reshape the Faculty.

Principles Used in Creating this Plan

In formulating this plan, several principles were used to guide the identification and formulation of the strategic objectives.

- Don’t be afraid to take risks. Research (and teaching to a lesser extent) is all about taking risks. We are better off trying bold initiatives with measured risk, knowing some will fail, than always taking the cautious, risk-free approach.
- Don’t be afraid to fail. In part, this point repeats the previous one. However it needs to be stated on its own. Failure is not a negative outcome; it can be used as a learning opportunity to inform future decisions.
- Don’t be afraid to spend money. The old adage “spend money to make money” is true. We have to think long-term, and that may mean having short-term financial implications.
- Be aggressive, especially when it comes to hiring. We should always strive for the best. Period.
- Our core mission is research, teaching, and service. Where it makes sense, we should concentrate our efforts in those areas, and get out of doing ancillary tasks that are better done external to the Faculty.

³ This budgeting model is still in development. However, the basic principle is that the Faculty will be responsible for all its revenue (including tuition) and all its expenses (including salaries). Thus the Faculty assumes most of the responsibility for making its own financial success by increasing revenues or reducing expenses.

- We do science research and science teaching, but we should also be doing research into science teaching.
- Maintain or improve the successful things that we are already doing, such as, great research, impressive teaching evaluations, and excellent service. These things don't happen for free; they require investment, planning, strategic hiring, nurturing, and resource allocation.

Strategic Plan Objectives

This section defines the standards needed for something to become one of the main objectives of this Strategic Plan.

- Goals must add significant value to the Faculty of Science. We will not espouse a vision that pays lip service to ideas for which we have no expectation or interest in making significant progress on.
- Goals should be challenging to achieve (but not impossible). Low-hanging fruit has no place in a strategic plan – these lesser initiatives will happen anyway as a matter of course.
- Goals should be measurable. All goal goals should be on a public web page and be updated as appropriate (annually, if not more often).

Strategic Plan

Priorities are described as Big, Hairy, Audacious Goals (BHAGs). They are meant to be challenging, forcing us as a Faculty to go beyond a “normal” level of effort to achieve them. Achieving a goal would be an impressive result, but even making significant progress will be tremendously beneficial.

Note that some of the initiatives described below are already under way. This plan started being formulated in early 2013, but had to be put on hold because of the budget situation. In some cases, standing still for a year would have been a lost opportunity.

1. Overarching BHAG

For the next five years, one BHAG is overarching in that it nicely ties together many of the goals in this Strategic Plan. Achieving it would put the Faculty on a sound financial footing, and allow it to accelerate its research agenda.

BHAG #1: The ratio of number of undergraduate students (UG) to graduate students (GS) is currently 5.5 to 1 (UG2GS). Within 10 years, the Faculty of Science must bring the UG2GS ratio down to at least 4:1. For this strategic plan, an intermediate objective of a UG2GS ratio of 4.5:1 will be targeted.

Achieving this goal has profound implications for the Faculty of Science, which touches on almost every aspect of the new Strategic Plan. To achieve this goal will require the Faculty to do some or all of the following:

- Decrease the number of undergraduate students (cap admissions at the number for which we receive government funding),
- Increase the graduate student population by attracting more high-quality national and international students,
- Increase the average number of graduate students supervised by each faculty member,
- Increase the size of the professoriate,
- Increase the size of the Faculty, Department, and Student support teams, and
- Increase the amount of funding available to support graduate students.

The impact is obvious and multi-fold: better balance between undergraduate and graduate education, reduction in the average teaching and administrative workload per faculty member, and an increase in research capacity and productivity.

One possible scenario for achieving a 4.5:1 UG2GS ratio would have:

- Undergraduate population decrease from approximately 6,350 to 6,000 (no unfunded students),
- Graduate population increase from approximately 1,150 to 1,350 (without lowering admission standards),
- Average number of students funded per faculty member increases from approximately 4.0 to 4.5 (larger research teams),
- Professoriate increases from 285 to 300 faculty members (assuming 4.5 graduate students per faculty member),
- Annual funding for graduate students (scholarships, teaching assistantships, industry funding, research grants, endowments) increases from \$28 million (approximately an average of \$24,000 per year per student) to \$38 million (\$28,000 per student per year, allowing us to become more competitive nationally).

Success at this BHAG will require a concerted effort over many years of the entire Science Faculty. If one wants to put a price tag on this project, then it represents an approximate increase in the Faculty's budget of \$14 million to the direct (operating) and indirect (student support funds).

Additional considerations to make this BHAG possible include:

- Improve our ability to manage undergraduate enrolment. The current method (admission percentage) is educated guesswork at best; it can lead to significant over and under enrolments. We will work with the Registrar's Office to pilot new enrolment management methods.
- Encourage our own undergraduate students to stay at the University of Alberta to pursue a graduate degree. We have a culture of sending our top students to pursue graduate studies elsewhere. While laudable, it runs counter to what most of our peer institutions are doing.

- Come up with a fair mechanism for distributing graduate support funds that takes into account the differential funding opportunities for researchers.
- Creation of a Science Industrial Advisory Board to build relations with industry and get their advice on strategic directions.

2. Research

Overall research funding coming to the Faculty of Science has flat-lined, and by some metrics is decreasing. This situation is the result of increased competition for grants, smaller average grant sizes, and a decrease in the size of the professoriate. Setting a target of increasing research funding by, say, 25% is not useful given the vagaries of available funding (e.g., achieving the goal may depend on the number of and amount of money available in CFI competitions), and whether we are successful at growing the professoriate. Of course, total dollars coming into Science is not the true measure of research impact; research outcomes are. However growth in research funding will allow the Faculty to enhance our research environment and increase the total funding directed at graduate students.

Both the Federal and Provincial governments want to see more academic work making its way into the market, either through collaborations with industry, the licensing of new products, and the creation of new companies. In Alberta, there are excellent opportunities for engaging industry, most notably in the energy sector. This is an area dominated by the Faculty of Engineering, and the Faculty of Science needs to regain lost ground. We can grow our research capacity by creating new opportunities of interest to industry (such as an energy-related research center) and actively seeking out industrial partnerships. One way of measuring our success with industry is the following:

BHAG #2: Increase the total number of non-CRC and non-honorary research chairs and professorships by 10, from 26 to 36. These chairs could be leveraged through NSERC, AITF, donations, or other funding sources.

Further, greater relevance to the Alberta economy and provincial/federal Government priorities can be demonstrated if research technology can be moved from academia into the marketplace. Although funding for universities is a long-term investment in undergraduate and graduate education, governments still want to see short-term returns. The most visible demonstration of the value of the intellectual capital created by the Faculty of Science faculty, staff, and students is in spinoff companies. These companies create employment, attract investment, and provide economic return to Edmonton and Alberta.

BHAG #3: Create 10 new spinoff companies (with a 5-year survival rate of at least 75%) and 10 new licensing agreements by members of the Faculty of Science.

These two BHAGs will be achieved through a variety of strategies, some of which are:

- For some time now, the Federal and Provincial governments have been moving increasingly towards funding applied research. If we want to be successful in attracting more industry-linked funding then we may need to modify our hiring practices and specifically target researchers that have industry connections and industry-relevant research activity. Adopting such a policy would be a major change in Faculty of Science thinking.
- Create a position with, in part, the responsibility of liaising with industry to help build new ties and create opportunities. This person will connect researchers to potential industry collaborators and inform industry of the opportunities for collaborating with academia. If this proves successful, then consider building an industrial liaison team.
- Create a core facility ‘Sustainability Fund.’ Each year it is a challenge to find the funds to cover research expenses that are best paid for by the faculty than the individual researcher (critical mass). This includes evergreening shared research equipment (e.g., research cluster), supporting shared laboratories (e.g., Animal Services), and paying annual dues (e.g., Bamfield). As well, much of this infrastructure is critically dependent on the highly skilled people who effectively operate/run their infrastructure. We need to define what is a “core” facility, identify the annual costs, and find ways to properly resource these costs.
- There are many talented members of the professoriate who do not yet have major recognition for the excellent work that they do. Create Science Research Fellowships to support non-Chair holders who have an excellent research track record.
- Create a research center that addresses issues raised by the oil and gas industry. All too often research in this sector is thought of as being engineering work. The reality is that there is a large science component, whether it is geology, geosciences, or environmental matters. A science-based research center for the energy sector that creates new knowledge and provides objective data analysis will become a focal point for discussions with government and industry.
- Create incentives for individuals to pursue new research funding opportunities. Science researchers are leaving opportunities on the table by not going after large national grants. The *modus operandi* of research has changed; major research projects of societal interest are being tackled by (large) collaborative, multi-disciplinary teams. However, as the scope of the project and the size of the team increases, so does the competitiveness for the funding and the effort required to prepare a proposal. The Faculty needs to put the appropriate incentives in place to encourage faculty members to “think big”.
- Foster, grow, and streamline our relationship with TEC Edmonton, including creating opportunities for student entrepreneurship (see Undergraduate Student Experience below).
- Ensure that entrepreneurial and industrial activities are recognized and encouraged by FEC.

In addition the Faculty of Science will engage in numerous other initiatives such as:

- Be strategic in hiring, including preserving groups with world-class reputations, investing in emerging research areas before they become “hot”, and building critical mass where needed.
- Increase our efforts in securing faculty, staff, and student awards.
- Streamline the grants/contracts process.

3. Undergraduate Student Experience

The world is changing. Whether you agree or disagree with the “MOOC revolution” (Massive Open Online Courses), there is no denying that this new form of course delivery has had enormous impact by shining the public spotlight on teaching and learning. When else has teaching been the subject of so much media attention?

Student evaluations of teaching in Science are very high (4.5 on a 1 to 5 point scale), but that doesn’t mean we should rest on our laurels. The Faculty of Science wants to be seen as a leader in teaching and learning by exploring and, when appropriate, adopting innovative teaching practices. We have a responsibility to create teaching environments that allow our students to get a high-quality education, one that meets and even exceeds that of our peer institutions. Thus, we need to create an environment that encourages faculty and teaching staff to innovate.

BHAG #4: Increase to 20% (from 5%) the number of Science course sections that integrate new teaching methods such as online learning, blended delivery, active learning, discovery learning, “flipped” classroom learning, technology-enhanced learning, interdisciplinary experiences, experiential learning, and study abroad.

To achieve success here, some of the initiatives we will undertake include:

- Create the position of Associate Dean (Learning & Innovation) to be the driver for change for teaching and learning.
- Re-introduce a Faculty of Science Teaching Innovation Fund for new projects. Use targeted competitions to achieve strategic Faculty goals.
- Be a leader institutionally, provincially, and nationally in the creation and adoption of high-quality MOOCs.
- Continue to develop alternative delivery methods, such as online, blended and other technology-enhanced learning that frees up instructional time and resources for higher-value teaching and learning.
- Create *Science Abroad*, a series of courses that take our students to where the science actually happens, whether it is a Physics course held at the particle accelerator at CERN, Biological Sciences students learning in the jungles of Africa, or Computing Science students visiting technology firms in California’s Silicon Valley. *Science Abroad* can also include courses held in Canada but outside Edmonton, such as in the Arctic or at important palaeontology digs.
- Encourage and adopt student mentorship strategies to enrich a student’s experience with teaching, social interaction, and group work.
- Reinvent Science 100. The course was innovative for its time, but needs to evolve into a model that attracts more students and is less costly to deliver.
- Develop novel educational courses and programming that foster higher-level learning skills in strategic areas.
- Create a teaching professional development unit in the Faculty of Science to provide instructional design, assessment, and technology support for teaching and learning innovation.

- Increase the integration of research into our undergraduate courses.
- The Faculty of Science does research and teaching, but we also need to do research into teaching. Being scientists, the impact of teaching innovation should be measured so that evidence-based decisions can be made.
- Investigate creating M.Sc. and Ph.D. programs in Science Education.
- There are many talented members of the professoriate who do not yet have major recognition for the excellent work that they do in the classroom. Create Science Teaching Fellowships to support non-Chair holders who have an excellent track record in introducing innovative teaching methods.
- Expand Faculty of Science Certificates to emphasize transferable skills and give our students a competitive edge.

As the Faculty of Science moves to engage industry at a greater level than before, we can set the groundwork for this engagement by making industry more aware of the quality of Faculty of Science graduates. The Faculty's Science Internship Program (SIP), formerly the Industrial Internship Program (IIP), places students completing their third year into an 8-16 month position in industry. Unlike engineering co-op programs, an SIP placement is for an extended period of time that allows the company partner to amortize the start-up cost of the hire and enables them to get student(s) involved in more complex, long-term projects. The design of SIP gets very high marks from participating companies.

Unfortunately, in recent years the Science Internship Program has not been a Faculty priority and is in need of a major revitalization. This form of engagement with industry is critical for building bridges and demonstrating the economic relevance of a Science education to Government. Hence, the Faculty must make a major investment in growing the SIP.

BHAG #5: Grow the Science Internship Program by 400%. This growth would bring program enrolment up to 250 from its current level of approximately 50.

Achieving this BHAG requires several initiatives including:

- Appointing an Academic Director for the program.
- Coordinating SIP efforts across the Faculty.
- Adequately resourcing the program (people, software, budget).
- Educating students on the value of the SIP.
- Educating companies on the value of hiring a SIP student.

The transition from high school to university can be challenging for some students. After they start their studies, students can encounter difficulties such as performance-related stress, medical issues, home life pressures, holding down a job, and so on. Many students do not know how to cope with these situations and end up in an unfortunate circumstance where the Faculty asks them to withdraw, which can have a profound effect on their self esteem and future earning power. If the issues affecting a student's performance can be identified early enough, measures can be taken to

improve the chances of a favourable outcome for the student. Student success is in everyone's best interest.

BHAG #6: Reduce the number of students in the Required To Withdraw (RTW) category from approximately 6.25% of the total undergraduate population to 4.75%.

This BHAG can be achieved using a multi-pronged approach that includes:

- Require every first year science student to meet with an advisor during his or her first year (this requirement could be met by a combination of group advising, online advising, and one-on-one meetings).
- Study student data to better predict when students might be heading for trouble, and then be proactive at communicating with them.
- Offer more options for student participation in a course (e.g., flexible schedules, online courses).

In addition there are many other projects that will be initiated in the next five years. These include:

- Investigate a first-year common course for all Science students.
- Investigate a Science (SCI) stream of courses that cross-departmental boundaries (e.g., Science 100).
- Create an experimental studio for innovative teaching methods.
- Give students an E-portfolio to capture non-academic credentials.
- Support and grow the Faculty of Science's participation in the Undergraduate Research Initiative (URI).
- Advocate for the creation of an online degree assessment tool. Such a tool would be invaluable to our students, and it could significantly reduce the number of students requiring assistance from Student Services. Unfortunately, software development costs are high, so creating this tool needs to be an institutional effort or a partnership of interested Faculties.
- Continue to grow our undergraduate international student population from its current 11% to the University's institutional goal of 15%.
- Diversify the number of countries that send a significant number of students to the Faculty of Science.
- Create a student entrepreneur program, partnering with eHUB. This partnership could lead to the creation of a certificate.
- Review all degree programs. A smaller number of programs with greater flexibility could serve students better and allow them to switch between programs more easily as they discover their interests.
- Review the Honours/Specialization/General degree paths to see whether we need all three. This review would include possible expansion of the list of Majors and Minors for both Honours and General programs (at present only a small number of Majors are available to General program students).

- Be proactive about the anticipated government requirement that all programs will need to define a set of outcomes. Engage students (plus parents and future employers) by defining for them what they should know and be able to do when they graduate with a specific degree.

4. Graduate Students

The graduate student program is at the heart of the Faculty of Science's research program. A large part of our success is attributable to attracting the highest-quality students that we can, both nationally and internationally. If we are to achieve the 4.5:1 UG2GS objective, then the Faculty will have to grow the graduate student population. This goal means we must aggressively identify and attract outstanding students to Edmonton. Lowering our admission standard is not an option. The following BHAG is necessary to ensure we improve the quality of the best students we attract. Further, it helps address the financial requirements needed to fund our aggressive growth plan.

BHAG #7: Increase by 25% to 270 (from 222) the number of graduate students holding major scholarships.

This proposal requires all faculty members to assist in recruiting. There is no single strategy that will work. Usually it requires a personal touch, such as making contact with students at a conference or over email. Enhancing our Faculty's national and international reputation facilitates these efforts, as students are more naturally attracted to world-class research groups.

The data is noisy, but the average Faculty of Science thesis-based graduate student tends to spend more time as a student in comparison to students at our peer institutions. It is in everyone's best interest that a student graduates with a high-quality thesis as soon as reasonably possible. In addition, given that the University of Alberta is now using graduate student completion times as a key metric of a Faculty's performance, it behoves us to get serious about addressing this matter.

BHAG #8: Reduce the average completion time for M.Sc. degrees to 2.25 years (from the current 3.6 years) and Ph.D. degrees to 4.75 years (from 5.75 years).

There are several things that can be implemented to facilitate achieving this goal, including:

- Examine course requirements for a graduate degree.
- Enforce timelines for completion of a Ph.D. candidacy exam.
- Enforce annual reviews of graduate student progress and proactively follow up on identified difficulties with the student and/or supervisor.

Obviously it may take years before the impact of these steps show up in the statistics. For now, it is important to put the right processes and incentives in place to achieve the end result, likely beyond the timeline of this Strategic Plan.

In addition to the above, several other initiatives will be undertaken, including:

- Pursue CREATE funding to increase the number of funded graduate positions available.
- Address the problems created by the international student differential fee.
- Support the University of Alberta's proposals to add more professional development for graduate students and post-doctoral fellows.
- Develop key dual degree Ph.D. programs with top international Universities that promote cross training opportunities across disciplines. This will provide and enhance the educational experience of our graduate students.
- Create professional graduate programs in areas of great importance to the province.
- Increase/improve our web presence will help our national and international visibility.

5. Community Engagement

Building ties with the Edmonton and Alberta community enhances our reputation, builds our brand, and attracts new resources to the Faculty. People identifying with the University of Alberta can start at an early age. For example, having K-12 students attend Faculty of Science summer camps not only gives them a wonderful experience, it also helps create a positive impression with their parents.

BHAG #9: Triple the growth of the summer camps program, from approximately 300 campers to 900.

Achieving this goal will involve the following initiatives:

- Increase the number (currently at 13) and diversity (currently almost all Computing Science) of summer camps offered.
- Coordinate the summer camps program across the Faculty.
- Resource the program (people, software, budget) at levels sufficient for it to achieve its goals.

Some other initiatives that will be implemented to increase our community outreach include:

- Create a Faculty of Science advisory board (industry; alumni; others).
- Engage alumni, including holding targeted alumni events (Edmonton, Calgary, Vancouver, Victoria, Silicon Valley).
- Bring Faculty of Science researchers/teachers to local communities, instead of always having them come to CCIS.
- Increase Faculty of Science home page traffic.
- Increase our engagement with the K-12 sector, including teachers and counsellors. Bring more students to campus (e.g., new ideas, such as having grade 12 students experience being a University student for a day), visit them in their schools (e.g., a travelling Science show), create online experiences (e.g., MOOC content delivered in high schools), virtual classes, field schools, games, etc. Engage them.

6. Administrative and Financial

It is a brave new world for the University of Alberta as the institution makes a concerted effort to generate new revenue. The goal is to become more self-sufficient. The University has set a goal for Faculties to have an additional 2% of their revenue come from external (non-government or Central) sources. Sources of revenue include new revenue generating programs (e.g., a professional M.Sc. degree), international student differential fees, indirect costs of research revenue, donations, and external funding for current or new initiatives, as well as any other creative ideas.

BHAG #10: Initiate projects that will bring in an additional \$2 million per year of new revenue.

Science already brings in considerable external dollars, principally from indirect costs of research, donations, and international student differential fees. By targeting an additional \$2 million per year, this BHAG aims to add an additional 2.1% to our operating budget.

The introduction of revenue generation as a priority to the institution represents a major change in mindset. Academics know how to bring in research and teaching grants, but they are not accustomed to thinking about, for example, creating new professional degrees for which a premium price can be charged. This initiative runs counter to the idealist nature of many members of the Faculty of Science and may result in their disinterest. Regardless, this funding is critical for the future of the Faculty, especially given the reality of the new responsibility-centered budgeting model to be adopted in 2015.

One way to generate more revenue is the creation of new programs or morphing of existing ones into revenue generation opportunities. The goal is to have these programs completely self-funded. The revenue coming in (mostly tuition) will have to cover all costs (including faculty and staff salaries, teaching assistants, and administrative overhead). Achieving this objective for a program isolates it from the vagaries of the budget and allows it to grow at its own pace. The Masters of Internetworking Technology (MINT) program has already achieved this level of funding. Proposed candidates for this model include expanding the existing Integrated Petroleum Geosciences (IPG) program, creating a professional M.Sc. degree in Planning, and developing a new M.Sc. in Environmental Innovation.

Another possible source of revenue is offering courses to industry, both online and in person (including Calgary). We already offer these to a small extent, but there are opportunities to significantly expand this effort.

There are many other revenue generation ideas on the table, but one of note is the proposed Summer Science Academy. This intensive program would be offered to first year international undergraduate students. They would come to Edmonton two months prior to the start of their studies and be given instruction in ESL (English as a Second Language), take two Science courses that would count towards a student's degree program, and learn about the University of Alberta,

Edmonton and Canada. If the initiative is successful, we could consider something similar in spirit for international graduate students (along the lines of the successful Science INTEL program from 5-10 years ago).

Other initiatives being considered for improving our business processes include:

- Be early adopters of the University's Electronic Document and Record Management System (EDRMS) as a way to simplify business processes.
- Consider merging Department shops.
- Review the undergraduate and graduate student services functions to see if there are more efficient and effective models for delivery.

Summary

The Strategic Plan 2015-2020 includes 10 BHAGs, each of which has the potential to have a transformational effect on the Faculty of Science. However, there are many other initiatives under way that do not have the profile of a BHAG. Some of them include:

- Aggressively growing the number and value of philanthropic gifts. This goal includes building the marquee SCIFund (Science Creativity and Innovation Fund).
- Continue to make the case to the Government of Alberta for increased funding for Science.
- Celebrate success at every opportunity.
- Address our space needs, including finishing the CCIS backfill, renovate more floors in Chemistry, and solve Psychology's space crunch.
- Continue to be a team player in the University of Alberta community.
- Build bridges institutionally, provincially, nationally and internationally.
- Support all forms of excellence.
- Increase the level of diversity in the professoriate.

Everything in this plan is achievable. It is simply a matter of bringing the approximately 517 faculty and staff in the Faculty of Science together as a team, working towards the common goal of making this Faculty a better and more exciting place to do research, teaching, and service.

United we grow.
Divided we status quo.

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- Participants of the Faculty of Science town hall meetings.

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- The Associate and Assistant Deans.
- The Department Chairs.