

# UBC Faculty of Science's Response to the External Review Report

December 2011

## Executive Summary

In September 2011, UBC's Faculty of Science underwent a formal external review conducted by Professors Ana Mari Cauce (Dean, Arts and Science, University of Washington), Eugene Fiume (Prof and former Head, Mathematics, University of Toronto), and Greg Taylor (Dean, Science, University of Alberta). Overall, the report submitted by the external review team in November 2011 was very positive, while pointing out specific areas where we might improve. We are delighted with the review team's praise for our innovative, high quality undergraduate education programs, our research program ranking "within the top 20 or 30 in the world - higher in some specific areas", and the "atmosphere of inclusion and openness engendered by leadership at both the Faculty and University level".

The committee ended their report with the seven key recommendations with which we concur. Specifically, the Faculty of Science is committed to:

- involving more faculty members, and their departments, in the recruitment of students and in helping shape strategic priorities;
- improving our advising programs, including developing "*My Learning Plan*";
- reviewing and revising our Skylight program as the Carl Wieman Science Education Initiative winds down to ensure that evidence-based improvements in teaching and student learning continue to be supported;
- reviewing the first-year curriculum and Science One with the goal of exposing more students to the full breadth of opportunities within the Faculty of Science;
- evaluating the size of our M.Sc. and Ph.D. programs and expanding strategic areas with capacity and research funding opportunities;
- re-examining the structure of our interdisciplinary research centres and institutes;
- developing a comprehensive funding plan for infrastructure renewal and development.

Making progress on several major issues will require us to partner effectively with UBC's senior administration and the British Columbia government. These issues include renovating and building new science educational and research facilities, increasing provincial research funding, and developing affordable housing.

In the following sections, we respond to the specific suggestions and concerns raised by the external review team.

## 1. Undergraduate Education and Student Learning

The review team praised our shared commitment to undergraduate learning and highlighted our innovative Carl Wieman Science Education Initiative, our first-year programs (Science One, Coordinated Science, and first-year seminars), our student development program including peer coaching, and our success at preparing students for the global work environment. We are very proud of our efforts to improve undergraduate education and student learning, and are delighted that the review team validated our efforts. With respect to the specific suggestions raised by the review team:

We are currently exploring possible ways, such as differential admissions by which we might recruit more undergraduate students into programs other than life sciences where we have significant capacity. We are particularly interested in raising awareness in scientific fields not taught in high school, such as computer science, earth and ocean sciences, and statistics. Important parts of our strategy include investigating ways by which we might enable more first-year students to explore a wide variety of scientific fields beyond biology, physics, chemistry, and mathematics. Current efforts include our science speakers series in SCIE 113 that engages more than 350 students/year. We plan to develop more such opportunities and explore the possibility of integrating additional science disciplines into Science One.

As recommended by the review team, we are increasing our international student recruitment efforts in countries such as India, in partnership with UBC's International Student Initiative office and with greater involvement of faculty and students in various departments. Success in these endeavors will help us build a diverse class of well-prepared students from around the world. Combined with our efforts to increase Science student participation in international student exchange and international Co-op programs, we seek to support UBC's vision of creating "an exceptional learning environment that fosters global citizenship, advances a civil and sustainable society, and supports outstanding research to serve the people of British Columbia, Canada, and the world".

Two issues raised by the review team are linked to UBC-wide projects that are currently in development – the *My Learning Plan* and *Early Alert* initiatives. *My Learning Plan* is a tool for students designed to help them deliberately explore and utilize various kinds of learning both inside and outside the classroom as they build their own, comprehensive, undergraduate experience. In the current pilot stage, *My Learning Plan* is being used by Science peer coaches with their individual "coachees". The concept originated in the Faculties of Science and Arts and plans are now underway to incorporate it into the experience of all new undergraduates as one part of an integrated system of advising. Note, however, that there are many changes being implemented in the admissions process such that it may be the 2013-2014 academic year before *My Learning Plan* is fully implemented and available for students and advisors. Science is

actively participating in this project and we look forward to strengthening our student – advising staff partnership. The campus-wide *Early Alert* initiative is designed to identify students at risk and to provide them with appropriate, timely academic and counseling support. Science will be part of the first phase of this initiative, which is scheduled to be deployed in Spring 2012 after training early in 2012. The success of *Early Alert* will require the broad participation of our faculty and staff members.

We continue to strive to improve the effectiveness of our undergraduate advising programs. Like other large universities, UBC has complex, overlapping university-, faculty-, and program-level requirements. Effectively advising our students about these intersecting requirements is a considerable challenge. We are committed to supporting the *My Learning Plan* integrated advising initiative and to providing our departmental advisors with effective tools to better advise students on basic academic, career, and personal issues. In the fall of 2011, we introduced a monthly electronic newsletter for advisors in departments to keep them abreast of changes in regulations, new resources, and opportunities for professional development (e.g., training in suicide awareness). In response to concerns raised by our students, the Faculty now concentrates its communications into a single weekly electronic newsletter that is sent to each Science student. Data show that over two-thirds of the students regularly “open” the newsletter and registration for workshops spikes whenever we advertize in the newsletter. Here, too, are opportunities to coordinate better with other UBC offices in order to reduce the total number of communiqués our students receive, and increase the effectiveness of our messages.

In response to concerns about our General Science program, we have developed a new specialization, the Combined Major in Science, with a coherent curriculum aimed at graduating broadly educated, scientifically literate alumni who can both understand the scientific aspects of societal issues and communicate their understanding to others. Students are responding favourably to this program, with increasing numbers of students enrolling in the Combined Major in Science and decreasing numbers enrolling in General Science. This will allow us to focus our attention on providing a better experience for General Science students.

We recognize the importance of strengthening our alumni relationships. An important part of UBC’s “Start an Evolution” campaign is our goal to double the number of Science alumni who engage meaningfully with the Faculty each year. For several years we have run career education events, first faculty-wide and more recently in different departments, with the help of our alumni, but we need to engage even more alumni. Important parts of our strategy include communicating more effectively with our alumni (e.g., ScienceConnect), increasing our tri-mentoring programs (first initiated by Computer Science ten years ago and now serving as a model across UBC), and providing our current students -- tomorrow’s alumni -- with positive and enriching educational experiences.

We agree with the importance of effectively communicating the outcomes of our innovative, evidence-based Carl Wieman Science Education Initiative to both internal and

external constituencies. For the UBC community we are doing this through seminars, workshops, newsletters, and an annual symposium. For external audiences, we are presenting the results of our experiments in the peer-reviewed literature and at national and international conferences (see [www.cwsei.ubc.ca](http://www.cwsei.ubc.ca)). One example is Deslauriers and colleagues who recently described the exciting results of a mini-transformation experiment in a large second-year Physics class in the May 13, 2011 issue of *Science*.

The Faculty's Science Centre for Learning and Teaching (Skylight) works collaboratively with faculty, staff, and students on research projects aimed at overcoming specific challenges with curriculum, pedagogy, and assessment. The newer and larger UBC Carl Wieman Science Education Initiative (CWSEI) seeks to dramatically improve undergraduate science education through evidence-based approaches. CWSEI receives high-level guidance and assistance from the Dean's Office, but directly supervises and funds department-based projects. Over the next three years, CWSEI will wind down and we recognize the importance of effectively planning for this transition. Looking ahead, we envision a single Faculty office focusing on continuous improvement to student learning that combines elements of both Skylight and CWSEI; our Dean's office is currently planning for this transition.

Most of our Science departments have formal graduate TA training programs, which are helping to improve the quality and consistency of our undergraduate education programs. We agree that more can and should be done to ensure that our international graduate students have the necessary teaching and language skills to be effective teachers, including increasing the awareness of existing university programs.

The B.Sc. degree requires 120 credits for a Major and 132 credits for an Honours. Our Honours specializations require more credits to permit a deep and focused investigation of one or two disciplines; most of our Honours specializations culminate in a research-based thesis.

## **2. Graduate Education and Post-Doctoral Training**

We concur with the review team's assessment that our graduate programs are healthy, vibrant, and competitive with other research intensive universities. Similarly, we concur with their assessment that the number of science post-doctoral fellows and research associates is consistent with being a top-rate science Faculty.

While noting that our graduate enrolment has increased significantly in recent years (58% over the past ten years), the review team asserted that the current level of 4.1 graduate students per research professor is lower than some of UBC's significant competitors. The total size of our graduate program depends on several factors, the most important of which is the total amount of funding available to support graduate students (research assistantships, teaching assistantships, scholarships and fellowships). Compared to some Canadian provinces (Ontario, Quebec, and

Alberta), British Columbia's funding of research (e.g., MSHFR) is relatively limited and thus there are fewer opportunities to support graduate students. Increased provincial funding for science research would level the Canada-wide playing field and allow us to compete successfully for more federal research funds. The average number of graduate students per faculty member also varies considerably by discipline. For example, the nature of mathematics and modest funding opportunities results in relatively few Mathematics graduate students per faculty member as compared to disciplines like Chemistry. In several disciplines, lab space is a limiting factor. That being said, one of our strategic goals is to increase the number of Ph.D. students by increasing our success at recruiting students funded by external scholarships and by securing additional research funding. In addition, many Ph.D. graduates pursue careers outside academia and we will be looking at ways to broaden our Ph.D. educational experiences.

The cost of living in Vancouver is very high and this affects the competitiveness of our graduate support packages. The review team suggested that initiatives such as UBC's four-year fellowships and Science's Ph.D. tuition waivers can lead to a situation where students are better funded in the early stages of their career than in the later stages. Most of our departments guarantee funding for graduate students for five years, but we recognize that the net stipend may decrease in year five when the Ph.D. tuition waiver ends. It is very uncommon for a graduate student to lose financial support unless they are not making good progress toward completing their degree. In the review team's assessment, student times to completion appeared similar to other Canadian institutions, but they saw value in encouraging more rapid times to completion. There are a range of views regarding this issue. While most faculty members agree that our graduate students should strive to complete their degree as rapidly as possible, it is equally important that their research is of high quality and that they are competitive for post-doctoral positions and careers in industry. We plan to monitor completion times to ensure that graduate students complete their degrees in a timely manner. Our monitoring efforts will be helped by the Faculty of Graduate Studies' efforts to modernize the student information system so that progress of individual students can be easily tracked.

The external review team raised several issues regarding our post-doctoral scholar program. Many of these concerns (e.g., career development, establishing a PDF community) are being addressed by the newly established Post-doctoral Fellows Office in the Faculty of Graduate Studies, which provides workshops on grant writing, careers, and personal skills as well as providing access to many of the seminars and workshops developed for graduate students. Our Dean's office is working with FoGS to enhance our PDF experiences.

### 3. Research

The external review team validated the high quality of our research efforts, citing our strong tri-council, CFI, and Genome Canada funding, collaborative research leadership, research productivity, international citations, and national and internal science awards.

The review team noted that the “importance of interdisciplinary science is clearly reflected in research activities on campus”, but raised several questions regarding (i) mechanisms to encourage additional interdisciplinary initiatives and (ii) the organizational structure of centres and institutes. With respect to (i), the Faculty of Science provides operational support for NSERC’s interdisciplinary graduate training (CREATE) grants and we are specifically targeting interdisciplinary research in our redeployment of Tier 2 Canada Research Chairs, including joint hires. UBC’s College of Interdisciplinary Studies (CFIS) is currently under review; one possibility being given serious consideration is to focus their mission on incubating new interdisciplinary initiatives. With respect to (ii), the review committee felt that the reporting lines for research centres and institutes were sometimes unclear. We agree that it would be beneficial for us to review our centre and institute organizational structures, as was recently done by UBC’s Faculty of Medicine. Care needs to be taken to acknowledge that there is considerable variation in the missions of our centres and institutes, such that a uniform reporting structure for each may not be desirable. The review committee suggested that centres and institutes should be better connected to the university’s learning and discovery goals, and the centre/institute leadership to departments, the Faculty, and the university. At present, only some research centres (Michael Smith Labs, Life Science Institute) are represented at our monthly Science Heads meetings. In order to improve our connections with Science research centres and improve our communication of Faculty and university goals and initiatives, we are considering expanding every other Heads meeting to include other Science research centre directors (e.g. Biodiversity Research Centre, AMPEL, QMI, ICICS). We are currently exploring the possibility of attaching to the Faculty of Science several science-related interdisciplinary centres currently housed in CFIS (the Fisheries Centre; the Institute for Resources, Environment, and Sustainability; and the Institute for Applied Mathematics). Successfully attaching these interdisciplinary units to Science would strengthen connections with Science’s student learning and research efforts, as well as those of other Faculties, and the former CFIS units would benefit from stronger administrative support.

Many Science professors are housed in interdisciplinary research facilities, such as the Advanced Materials and Process Engineering Laboratories (AMPEL), the Biodiversity Research Centre, and the Life Sciences Institute. As a result, faculty members, graduate students and post-docs in most departments (Botany, CS, EOS, Mathematics, Microbiology & Immunology; Physics & Astronomy; Zoology) are spread among different campus buildings. Although, most faculty members remain relatively well connected to their home departments through meetings and teaching, this can be less true for graduate students and post-docs. We concur with the committee’s recommendation and will work with our Departments to promote faculty members

and trainees remaining connected to their Departments, and to their Department's education and research goals. At the same time, housing faculty from different Departments in interdisciplinary research facilities fosters important connections and research that span traditional disciplinary boundaries.

The external review committee asserted that while the Faculty appeared well positioned to move to higher levels of research, they felt that sufficient emphasis was not being placed on supporting outstanding research as compared to the emphasis we have placed on teaching and student learning initiatives. Specifically, they noted a lack of plans on how to move already good research programs to the next level, including plans to leverage additional outside resources, construct new research facilities, and explore new research areas and new collaborations. Our current efforts include redeploying Tier 2 Canada Research Chairs to support emerging research strengths and interdisciplinary initiatives. We are currently conducting CRC faculty searches in marine microbial biology, geomicrobiology, human microbial ecology, experimental particle physics, chemical sensing, statistical genomics, and probability/partial differential equations. The Faculty also provides modest administrative funding for ongoing and new major research initiatives, such as the Life Sciences Centre, Biodiversity Research Centre, Quantum Matter Institute, and Centre for High-Throughput Biology. The external review team's observations strongly suggest we can and should do more to support emerging and existing research excellence. We will strategize about additional ways to promote and support research excellence, including increasing our efforts to secure more industrial funding through opportunities such as NSERC's Industrial Research Chairs and Collaborative Research and Development grants. Over the past several years, our research initiatives have been generously supported by external benefactors (e.g., Quantum Materials Institute, Centre for Microbial Diversity and Evolution). In our future development efforts, we will continue to emphasize opportunities to support emerging research areas and collaborations. In addition to obtaining funds to support new research facilities and equipment, our development efforts will focus on identifying funding to support research operations and personnel (graduate students, post-doctoral fellows, and research technicians).

#### **4. Community Engagement**

The external review team cited the variety of Faculty of Science community engagement activities ranging from the Beaty Biodiversity Museum and Botanical Garden to department- and student-based outreach activities. They noted that there appeared to be little coordination of these activities. In the past year, at our Faculty Heads and Directors meeting, we discussed the possibility of creating an outreach coordinator position within the Faculty of Science, as exists in several departments. The consensus was that our limited funds would be better deployed in support of student learning and research objectives. Note, the Faculty of Science does provide funds to departments to support their outreach activities.

The external review team cited a need to clearly articulate the role and mandate for the Beaty Biodiversity Museum, and to examine its organizational structure and funding. We concur, while noting that the Beaty Biodiversity Museum first opened in October 2010 and only just completed our first year of operation. The Beaty Biodiversity Museum and Botanical Garden are supported primarily by the Faculty of Science and the Director of Biodiversity Collections is the lead administrator for both venues. Since taking on this role in April 2011, the Director of Biodiversity Collections has increased coordination with other UBC cultural venues, resulting in coordinated opening hours, increased attendance, cross-venue programming, and greater publicity.

We also concur with our need to execute our strategic plan for aboriginal engagement. We have been reviewing the effectiveness of the aboriginal engagement portfolio in the Dean's office and are currently working closely with UBC's First Nations House of Learning to enhance levels of collaboration between our units through a jointly supervised Aboriginal Coordinator position. As a Faculty, we are committed to expanding educational opportunities for Aboriginal youth, and to strengthening our research collaborations with Aboriginal communities.

As noted earlier, we recognize the importance of strengthening our alumni relationships and we have a specific goal of doubling our alumni engagement as part of the UBC campaign. Important parts of our strategy include communicating more effectively with our alumni (e.g., the *ScienceConnect* e-newsletter), increasing our tri-mentoring programs, and providing our current students -- tomorrow's alumni -- with positive and enriching educational experiences.

## **5. People**

The external review committee had very positive things to say about the students, staff, and faculty who make up the Faculty of Science. Based on their discussions, they described the members of our Faculty as committed to learning and discovery, supported by their Faculty and their departments, happy with their work environment, and feeling a strong sense of connection and community. They particularly noted the shared sense of commitment relating to our learning environment. We are extremely pleased with the committee's conclusion that "the Faculty of Science has done an exceptional job becoming a workplace of choice for women faculty." Much of the success we have made in improving the climate for women faculty stems from the Faculty of Science's 2007 Working Climate Assessment. We look forward to seeing the results of UBC's 2011 Workplace Experiences Survey and hope to make similar advances in improving conditions for our staff.

The committee identified high housing costs, availability of child care, and long commute times as significant challenges that affect our ability to recruit and retain students, staff, and faculty. Many other leading research universities face similar challenges, but these issues are particularly acute in Vancouver. We continue to work with UBC's administration and Board of

Governors to develop creative solutions to these challenges, recognizing that UBC's campus land base represents an important opportunity. Recent initiatives, like UBC's new faculty housing assistance plan and the construction of more daycare spaces, have been positive steps, but much more remains to be done.

The committee applauded UBC's new Professor of Teaching position and the well-structured career path for teaching faculty to progress through the ranks from tenure-track Instructors to tenured Senior Instructors and Professors of Teaching. They suggested we consider expanding the job description for teaching faculty to include an expectation of conducting research on teaching and pedagogy. As they note, many of our instructors already conduct such research. However given the range of approaches to teaching innovation in the Faculty, we believe there are many ways to demonstrate excellence in teaching. We do not support *requiring* teaching faculty to conduct research on teaching and pedagogy at this time. Rather we will evaluate the broad spectrum of teaching accomplishments and contributions to teaching innovation carried out by our teaching faculty. In the future, we expect to see increasing science education research in our teaching faculty portfolios.

## **6. Physical Infrastructure**

The external review team acknowledged the excellent recent progress we have made in renewing our physical infrastructure, but points out that challenges remain and we need to develop a comprehensive infrastructure plan with identified funding streams. In addition to renovating or replacing several major buildings, we need to develop plans to meet our future space needs, including identifying additional space to accommodate graduate enrolment growth and the expansion of very successful research programs like quantum materials.

We are currently developing functional plans for each major Science building that requires major renovation or replacement – Mathematics, Physics and Astronomy (Hennings), Biosciences North, Chemistry teaching laboratory wings, and possibly Chem-Phys. The challenge, of course, is to identify substantial funding streams (approximately \$25M to \$50M each) that will allow us to advance one or more of these projects. Recent major building projects have been funded through a successful CFI/BCKDF proposal (Biodiversity Research Centre), federal and provincial Knowledge Infrastructure Programs funds (Biosciences South and West), and donor funding matched by the province (Earth Sciences Building). Together with our UBC partners, we will continue to seek funding opportunities to support our infrastructure plans, but realistically it will be difficult to move major projects forward in these challenging economic times. We also will need to develop plans to maintain CFI-funded infrastructure, and research operations.

## 7. Financial Resources

In the opinion of the external review team, the Faculty of Science's operating funds "are allocated and shepherded carefully and wisely" and they were "impressed by the scale of operation that the Faculty of Science is able to support using these funds". That being said, the committee was not able to fully understand UBC's new budget framework and report having received inconsistent information and perceptions regarding the budget. In our opinion, this confusion results partly from different budgeting systems in place at different universities and partly from different (and evolving) perspectives on UBC's relatively new budget framework at the university, Faculty, and department levels. Perhaps the most important message here is that we must do a better job of explaining UBC's new budget framework and revenue opportunities to our science departments. We are planning a budget retreat for early 2012 with our Department Heads and Administrators to address this issue head on. In addition, we will continue to focus on budget issues at our monthly Heads and Director meetings and at our mid-year and year-end Department reviews with the goal of improving departmental and Faculty budget forecasting and resource deployment.

UBC's new budget framework, now in its second year, allocates revenues to Faculties based primarily on student enrolments. This framework has increased budget transparency and helped highlight the importance of undergraduate education in supporting UBC's operating budget. Recognizing that no budget algorithm could capture all of the budget complexities across the university, each Faculty received a recurring operating grant that set the new budget allocation equal to their historical-incremental budget. For several reasons, Faculties were instructed (correctly in our opinion) *not* to use the new budget framework to distribute funds at the department level. But understandably departments are looking to the new budget framework for opportunities to increase their resources to meet undergraduate and graduate enrolment pressures and to achieve their strategic goals. Unfortunately the reality is that, with the exception of increasing international undergraduate enrolments and external fund-raising, most of the Faculty's revenue streams are fixed at the university and provincial levels. In particular, UBC's operating grant from the Province is based on enrolling a fixed number of domestic undergraduate students (~29,000 FTEs). Thus, any increase in domestic enrolment targets in one Faculty must be balanced by reducing targets in another Faculty; it is a zero-sum game. We do use UBC's new budget framework to inform our Department budget allocation decisions, but recognizing that most of our revenues support tenured and tenure-track faculty salaries, we continue to believe it would be unwise to devolve this framework to the department level.

The review team asserted the need to ensure that quality be rewarded within the new budget framework. This is a tall order for any budget model, particularly for universities where many academic qualities are difficult to quantify and incorporate into a formal algorithm. And financial incentives do not always drive the desired behavior. Nevertheless, our ability to recruit and retain high quality domestic and international students depends on our ability to provide a high quality education, and thus there is a feedback loop in the budget model. In addition, our

modest revenue streams derived from the indirect costs of research and contract overhead depend on our ability to compete successfully for external funds, which in turn depends on our producing quality research and training highly qualified personnel.

The review team noted that Faculties are responsible for funding progress-through-the-ranks (PTR) salary increases when mandatory retirement has been eliminated, but did not see a plan to address this ~\$1M/year obligation. We presented a balanced five-year budget plan in our self-study (See Chapter 10 and Table 10.3) where expected faculty salary increases are projected to be offset by modest (2%) tuition increases and increases in international student enrolment. The university no longer plans to reduce undergraduate enrolments in Science (or other Faculties), so the concerns expressed by the review committee in this regard have been alleviated. For many years, UBC has enrolled significantly more graduate students than our provincial target. From the Faculty perspective, our ability to add an additional Ph.D. student to one of our programs depends on our ability to secure approximately \$25,000 (\$20,000 stipend plus \$5,000 tuition rebate), as well as research costs, which vary widely by area. In the past, we increased graduate student enrolments by increasing our success at securing external research grants and contracts, including NSERC CREATE grants. It is unlikely that our province will provide funding for all UBC graduate students in the near future, so we will continue to focus on growing our research funding and attracting the very best graduate students, a significant number of whom come with externally funded scholarships.

Finally, the committee noted confusion about whether or not the university was seeking to grow the size of the undergraduate student body. The short answer is that we are not seeking to grow the number of domestic undergraduate students beyond our provincial target, but we are striving to grow the number of international undergraduate students. In addition, we are encouraging some science departments to increase the number of students enrolled in their programs to help relieve the pressure on our life science departments where exceptional student demand is straining our capacity to deliver quality educational experiences.

## **8. Leadership and Administration**

We agree with the external review committee's positive assessment of the effectiveness of our Dean's Office team and look forward to continuing to help lead UBC's Faculty of Science.

The committee noted that we have a comprehensive strategic plan with a large number of commitments, goals, and strategies to achieve our goals. They correctly suggest that (i) we prioritize these goals and (ii) couple our priorities to a plan for allocating financial resources. With respect to (i), we note that in the Executive Summary (Chapter 1) of our Self Study document, we present our top priorities for the next two years. With respect to (ii), not all of our strategic goals require additional financial resources, but many do. For several top priorities we

identified and allocated additional financial revenues, but we need to do considerably more work before a comprehensive budget plan is in place to support our strategic plan.

Identifying qualified faculty members who are willing and able to serve as Department Heads is an ongoing challenge, particularly in an era of limited faculty hiring. Financial incentives only go so far and what many Heads desire is more time for their research. We are encouraging our Departments to make greater use of Associate Heads in order to better distribute the administrative workload and to build leadership skills in potential future Heads. We have improved our support for new Heads through UBC's Academic Leadership Development Program (ALDP) and monthly one-on-one meetings with the Dean. It may be beneficial to have potential future department leaders exposed to some components of ALDP. Nevertheless, we expect that recruiting strong Department Heads will continue to be a challenge as it is at many universities.

We agree that significant efficiencies exist in coordinating administrative activities such as administrative IT and stores. At present we plan to achieve efficiencies where opportunities present, such as with the attachment of CFIS units to the Faculty of Science and the co-location of several departments and the Dean's office in the new Earth Science Building.

The concerns raised by the committee in this section regarding UBC's new budget framework have been addressed in the previous section. To summarize, we recognize the need to do a better job of communicating the new budget framework, while focusing on opportunities to increase our revenues by increasing international undergraduate enrolment and increasing our external fund-raising efforts.

## **9. Future Development**

We note that our strategic plan, *Advancing Science*, was approved in 2011, not 2009 as cited by the review committee. The committee noted that many of our goals are not tied to specific metrics. There is room for us to improve our strategic planning in this respect, and we will continue to work on identifying appropriate indicators of success, while recognizing that these can be elusive and many can only be observed over a relatively long time frame. The committee felt they did not receive the information necessary to identify research areas of clear strength and worthy of greater investment, despite the various metrics and areas of research excellence presented in Chapter 5 of our self-study. We agree that building on areas of research strength must be a clear priority and that ironically it is our research profile, more than our innovative, high-quality teaching, that will help us recruit more international undergraduate students.

The reviewers correctly inferred that much of our success in external fund-raising to date has enabled us to improve our physical infrastructure. In the future, our efforts will focus more

on securing funds to support our research and teaching operations, ideally by growing our endowment although this is particularly challenging given the necessarily low payout rates.

We wholeheartedly agree with the committee's observation that emerging sustainability and policy initiatives at UBC have the potential to distinguish the university and the Faculty of Science from its peers. We are very excited about the possible attachment of the Fisheries Center and Institute for Resources, Environment, and Sustainability to the Faculty of Science and we are actively engaged in helping develop UBC's new policy school with an emphasis on science policy.