BIOLOGICAL SCIENCES ACADEMIC PLAN 2018-2023

Program Overview

The Department of Biological Sciences has 42 faculty, 34 tenured or tenure track; 8 office and 8 technical staff; 127 graduate students (69 MSc, MPM, MPM) or MET, 58 PhD); and 19 postdoctoral fellows and research associates. We have 620 major and honours undergraduate students in three streams, Cells Molecules & Physiology (CMP), Ecology Evolution & Conservation (EEC), and General, and 74 students in two minors, Biology and Toxicology. We have had many successes over the past five years as we strive for excellence as researchers, teachers, and learners (see next section). Looking ahead, we are considering whether a reorganization of life science at SFU would increase the visibility of our research and our programs, reduce overlap with other units, and lead to greater success of the combined research and teaching enterprise of all life sciences at SFU.

Performance Review: Activities in the last five years

Research

Our department has long been recognized for world-class research. Over the past five years researchers have published over 600 papers including in the world’s top journals such as Science, Nature (and affiliates), PNAS, Proceedings B, Biology Letters, and the Trends journals. Grant income has averaged $4 million over the last 5 years, and 92% of faculty members have funding. This value includes funding to members of our teaching stream who are engaged in evidence-based pedagogical research (only 82% of faculty are research stream). Recent funding highlights include five faculty with NSERC accelerator supplements (Dulvy, Mooers, Moore, Novales-Flamarique, Williams); a new Tier 1 CRC to Crespi; a renewal of Gries’ Industrial Research Chair with a new sponsor; a renewal of the Centre for Wildlife Ecology agreement with Environment Canada (24 continuous years of funding); substantial funding from DFO to Kennedy and Marlatt; new international initiatives on salmon science, shark conservation, and renewable energy to Moore, Dulvy, and Palen respectively; and a collaborative RTI (award with match, over a half million) to bring a super high-resolution microscope to SFU. Our researchers have been recognized with numerous awards over this period, including 17 for faculty, 27 for graduate students, and 4 for undergraduates. Award winners are in Appendix A.

Our research is community engaged. Many faculty work directly with stakeholders to ask and answer research questions (e.g. Bigras, Cory, Côté, Dulvy, Elle, Moore, Palen, Reynolds). Stakeholders range from First Nations communities to BC farmers to fishing communities in Mozambique and Madagascar. Over the last two biennial review cycles, faculty reported a total of 97 outreach events to a range of audiences from schoolchildren to knowledge users, illustrating our dedication to sharing our science with the broader community.

We also have linkages with provincial, national, and international partners. These include the Ministries of Agriculture and of Forest, Lands, & Natural Resources; BC Cancer and the BC Centers for Disease Control; the RCMP; The Department of Fisheries and Oceans; Environment & Climate Change Canada; The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the
International Union for the Conservation of Nature (IUCN), the Humboldt Foundation; and others. We serve on advisory boards nationally and internationally to inform science-based policy decisions (e.g. COSEWIC, National Roundtable for Bee Health, Bowie Seamount Marine Protected Area Advisory Board, multiple Endangered Species Recovery Teams). We also partner extensively with industry; in addition to the Gries IRC with Scotts Canada and several Engage Grants, we have had 15 postdocs and graduate students funded through MITACs in the past 5 years.

**Undergraduate program**

We are proud of our award-winning teachers, including 6 faculty and 5 graduate student award winners over the last 5 years, including an SFU Excellence in Teaching Award to Peter Hollmann in 2015 (Appendix A). Our engaged teachers constantly strive to improve and modernize our curriculum (details in Appendix B). Several of our existing courses have had labs re-worked (BISC 101), more active elements added (BISC 102, BISC 202), or changes in contact time and information delivery (BISC 101, BISC 357). We have added new Techniques courses, including Techniques in Ecology and Evolution (BISC 360W), and in collaboration with BPK, we developed and share the delivery of Cell Physiology Lab (BPK 408W). We also added important electives in Sensory Biology, Developmental Neurobiology, and Cell Biology to the Cells, Molecules, & Physiology stream. Additionally, we updated courses and re-activated our minor in Environmental Toxicology.

Our undergraduate stream in Ecology, Evolution & Conservation has been reorganized, both to modernize the content delivered and to accredit the EEC stream with the Association of Professional Biologists. Students who graduate from this stream have automatic entry when they apply for Registered Professional Biologist (in training) status.

We have added important mentorship activities for our undergraduates, including a fall “Map my Degree” workshop that helps students navigate course requirements, and a spring “Career Night” in collaboration with Co-op, Career Services, and the Biology Student Union. We have also completed educational goals development several years before this was required, partially in collaboration with MBB and BPK through the efforts of consultant Laura Hilton, and Kathleen Fitzpatrick will soon begin working towards their assessment as part of her Dewey Fellowship research.

**Graduate program**

We have focused on improving the student experience and progression through the degrees at the graduate level. In addition to raising minimum graduate student salary levels starting in 2013, we have instituted earlier committee meetings for incoming students to assist with their thesis project development, embraced the Degree Audit program, and updated our document on student/Supervisor relationship expectations (now sent to all new students upon acceptance) and our guidelines for external examiners. We have changed the way we accept MET students to build a cohort model and support course planning for the degree, and have increased connections with our postdoctoral researchers. We now have an Essential Cell Biology course to mirror the “core” courses at the ecology end of the spectrum, and are adding a Biostatistics course this year. We also assisted students with their creation and funding of statistics workshops for their peers in the department.
Challenges

We are a founding department at SFU, and have always seen as our mandate all of life science, from molecules to ecosystems. Over recent years structural changes at the University have increased the number of life science units on campus, increasing overlap for us, especially in molecular/cellular biology. With the addition of the BEnv degree overlap is now growing in ecology. Some of our programs appear to be suffering as a result. To recap some important events:

- 2000, the Department of Molecular Biology and Biochemistry (MBB) is formed (formerly an institute spanning BISC and CHEM; 7 faculty moved from BISC to the new MBB department)
- 2005, Faculty of Health Sciences (FHS) forms
- 2009, Faculty of Environment (FENV) forms, Environmental Science (EVSC) moves over
- 2009, transfer of the Department of Biomedical Physiology and Kinesiology (BPK) from the Faculty of Applied Science to the Faculty of Science
- 2017, new BEnv (Bachelor of Environment) degree launched

During the time frame of the last academic plan, we have seen static enrollment in our undergraduate programs at the cell/molecular end of the spectrum. Specifically, in 2013 we had more than 660 intended majors, and of those who had declared a stream affiliation, 112 were in CMP and 34 in EEC. Most recently available data show 620 intended majors, and those who have selected their stream are 82 CMP and 49 EEC (Open stream students, at the two time points, were 30 and 25). We have more faculty than other life science departments, but have the unique problem of needing to offer a broader range of content (from molecules to ecosystems, and the diversity of organisms on earth) than other departments. This requires a broader range of faculty expertise, a fact that has seldom been recognized when faculty renewal decisions are made.

A major challenge for BISC is that as a broad “molecules to ecosystems” department we lose expertise as faculty retire that is essential for both undergraduate and graduate training. Re-focusing our department so our area of coverage is more narrowly defined, like MBB (molecules to cells) and BPK (cells to physiology, exclusively of humans), would help to improve the argument for faculty renewal in areas where we do not overlap with other life science units. A more narrow focus would explicitly allow us to develop unique research strength, which would also help us to build stronger, more unique programs for our students. We could then pursue the opportunity to offer broad “Life Science” programming collaboratively with other units, rather than on our own. By doing so we would improve the ability of the 60% of students in the Faculty of Science interested in Life Science to choose and navigate through their degrees—that is, benefits extend beyond our department.

A second major challenge is the condition of our space. Lack of temperature control, inadequate electricity, leaks, mold, rodents, and other issues negatively impact research productivity, greatly reduce the quality of the student experience, and put us at risk of serious safety concerns. Renovations of space for modern research and teaching are hugely expensive in our space in Shrum because electrical and plumbing are not up to code, and most spaces include asbestos. The university has made a new Life Science Research and Innovation building their top priority, but there is little indication of what the ongoing efforts to secure this building might be.
**Long Term Vision**

We will build a strong life science department with a teaching and research focus that is unique to SFU, and works collaboratively with others in both disciplinary and interdisciplinary endeavors. We will continue to be community engaged and to value and build upon excellence in our programs and in our research.

**Objectives for the next 5 years**

1. **We plan to re-focus our department**, given the current life science landscape at SFU. The Appointments Committee recommends a narrowing of focus from the current “molecules to ecosystems” to a reduced range of life science, similar to the relatively narrow focus of the other life science departments in the Faculty: MBB (largely molecules through cells) and BPK (largely cells through physiology, exclusively of humans). The Appointments Committee recommends the department consider a focus from organismal biology (including physiology) through ecology and evolution. We envision a transition where teaching in the areas of molecular biology, biochemistry, and cell biology would be in collaboration with other departments. Looking further ahead the newly focused department would have the opportunity to build on unique research strengths.

In addition to this larger enterprise, we will explicitly engage with the following challenges and strategic priorities identified by the VPA at the start of the academic planning exercise.

2. **Student Experience** (includes the identified challenges of Student Life, Learning, & Success, Academic Quality/Curriculum, and Engagement): We will continue ongoing efforts to improve the quality of our curricula, and will improve student engagement and student success by redeveloping mentorship programs at both graduate and undergraduate levels. Because the student experience is central to the academic endeavor, this is our main objective over the next 5 years.

3. **Aboriginal Reconciliation**: Consider ways to indigenize aspects of our curriculum, and work with First Nations advisors to improve student participation and experience for both undergraduate and graduate students. Investigate mechanisms to improve inclusion of Aboriginal scholars in Biology.

4. **Dialogue**: Further develop and focus our community-engaged research, and improve our outreach programs. Develop science communication in undergraduate and graduate curricula.

5. **Innovation and Entrepreneurship** (including the identified challenge of Interdisciplinarity): The Life Science Research and Innovation Building is a high priority for SFU, and is crucial for Biological Sciences. The combination of modern facilities and collaborative spaces that foster communication and interdisciplinarity is a requirement to drive innovation. We will explore additional ways to foster innovation and collaboration in our department.

6. **Big Data**: build on our current strength in big data by developing interdisciplinary approaches to problem solving, and by developing the quantitative skills of graduate and undergraduate students.
Detailed Information by Objective

Objective 1. Department Focus

Research: Build critical mass in unique research areas

Our department has always been challenged with the need to include faculty expertise across the entirety of life science, molecules to ecosystems. We are now choosing to commit to supporting fewer and more focused research areas, to improve our research profile within and outside the university. This change in focus will require that some life science teaching be done collaboratively with units outside our own, and we have been building relationships with other units to foster this collaboration. Impacts on our hiring plan are described in the Resources section.

Undergraduate programs: Refocus our stream/major structure; improve/modernize curriculum

Over the next five years we will consider curriculum improvements that will help to focus and differentiate our major. We will consider an over-arching "Life Science" umbrella comprising the three Life Science departments in the Faculty of Science, Biological Sciences, Molecular Biology & Biochemistry, and Biomedical Physiology & Kinesiology. The first two years of undergraduate study are already largely shared with MBB and BPK, but the departments and majors are differentiated after that. Students could choose to remain in a broad and flexible Life Science major, or choose a more specific major within one of the three departments. We expect an improvement in the student experience as we foster greater flexibility and choice for the 60% of students who come to the Faculty of Science specifically to study life sciences. The Life Science structure will also encourage a culture shift where the three departments work more collaboratively on delivering undergraduate programs.

Within Life Science, Biological Sciences will continue to improve our curriculum and to improve student interest in and satisfaction with our programs. We are considering a reorganization of our stream structure, and considering elevating our streams to majors. We also plan to provide more guidance to students interested in particular areas of study; initially these will be recommended courses in areas where our department has unique strength, but we will also consider making some of these recommended course lists into minor or certificate programs.

1) Our Ecology Evolution & Conservation stream was recently re-focused and modernized and now meets the requirements for accreditation for RPBio. We anticipate minor changes as we convert this stream to a major.

2) Our Cells Molecules & Physiology stream has substantial overlap with MBB. We are considering making this single stream into two, more unique majors; Cell & Developmental Biology, which would likely be offered collaboratively using BISC, MBB, and BPK courses and may become a joint major in Life Science; and Environmental Physiology, which captures a different niche than that offered by BPK and could be largely offered with BISC courses.

3) We plan to introduce recommended course lists in Marine Biology and Neurobiology (these could eventually become minors, depending on student demand), and after a much-needed hire will expand our course offerings in our Environmental Toxicology minor.

4) Other recommendations may follow as we continue our work to better define and distinguish our programs from those in other Life Science departments.
Objective 2. Student Experience

Undergraduate programs: Two objectives.

A. Reconsider required courses and the lower division

Students in Life Science actually take very little life science in their first two years. This leads to disillusionment, and a poll completed in 2015 showed that the majority of BISC students don’t find courses in Math and Physics useful for the BISC major, although they found Chemistry and Statistics to be valuable for their degrees. We intend to carefully consider all lower-division requirements moving forward, to determine which courses are really needed by our majors, and to work with other departments to develop a lower number of courses that would better serve the needs of today’s life sciences students. More room in the lower division would allow for two initiatives.

1) For over a decade we have been considering adding a second-year physiology course that is focused on concepts (like homeostasis or transport) and inclusive of all organisms. We have additionally been approached by the EVSC program to develop such a course, as their students need physiology if they are to be accredited for the RPBio. Developing this second year course is high on our priority list (we have it partially developed) and is one of the reasons we are requesting to hire a Lecturer (see Resources).

2) Improve experiential learning and interdisciplinary exposure. First, our second year course (BISC 272, Biological Research) has performed very well; students do both class and group projects and the course ends with a research poster session. We have had some difficulty with scheduling but our course planning group will be working on a way to ensure it is offered annually. The course requires greater TA support than most of our offerings but the department believes this investment supports the student experience in our majors. Second, in collaboration with MBB and BPK we are considering a seminar course similar to SCI 190 but focused on the 60% of Faculty of Science students who want to study Life Science. We envision an opportunity for students to better understand diverse research opportunities, linkages, and crosstalk between the various life science disciplines.

B. Improve mentorship

We need to take a more active role in mentoring students through their programs. We intend to map the curriculum to better identify skills and expected learning outcomes for our students, and bring this information to our popular Map My Degree workshop. Our Biology Day is quite popular, but we are considering how to expand career and graduate school workshops for our majors. We are also considering introducing a more formal peer mentorship program to encourage greater engagement with SFU. Finally, it’s become apparent that our web page is badly out of date and not very user friendly or attractive. We are investigating web design and improvement opportunities.

Graduate programs: Four objectives.

A. Funding should increase.

Recently we increased the required salary incrementally, from $18,000 in 2013 to $21,000 in 2016. Surveys of students suggest that, in the expensive climate of Vancouver, it remains an
incredible struggle for students to make ends meet; when the new minimum wage comes into effect in summer 2018, they will be officially below the poverty line. Approximately 70% of students rated their salary as “poor” or “fair”, and 22 of 58 students who answered our recent survey (45% response rate) have an outside job. The DGSC has been charged with considering another increase in minimum funding for students. In addition, the department will once again explore avenues to reduce or eliminate tuition paid by graduate students. The lack of support for graduate students in BC relative to other provinces like Alberta and Ontario, and the fact that Science graduate students in the US do not, as a rule, pay tuition, is constraining our ability to attract and retain top students.

B. Reduce completion times.

Reductions in NSERC support for MSc students have led to many programs nationally focusing on reducing the length of that degree. In 2012 we instituted some changes to reduce completion times such as an earlier committee meeting (now required in the second semester rather than after a year) to help students complete faster. Unfortunately, completion times are not decreasing (Table 1). Over the next 5 year period we need to both understand why completion times appear to be increasing, and consider additional ways to help our students complete faster.

Table 1. Completion times for MSc and direct entry PhD students for two time periods; numbers of students in each category is indicated.

<table>
<thead>
<tr>
<th>Degree</th>
<th>2013-2015 completions, # semesters (N)</th>
<th>2016-2017 completions, # semesters (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master (MSc, MET, MPM)</td>
<td>8.76 (33)</td>
<td>9.65 (20)</td>
</tr>
<tr>
<td>PhD</td>
<td>18.35 (17)</td>
<td>21.14 (14)</td>
</tr>
</tbody>
</table>

C. Build a stronger community.

Our recent survey shows a dissatisfied and disengaged graduate community. Although 62% have an “excellent” or “very good” relationship with their supervisors, only 33% rank connections with other graduate students as excellent or very good. The majority also question access to courses and the quality of courses. Although graduate students attend various social and intellectual events in the department only a minority (22-35%) rank these as excellent or very good. We have begun to discuss ways to improve the community for our students. We plan to bring back the mentorship program; although it still exists it has low uptake, and in consultation with our Graduate Caucus the department is considering subsidizing mentorship coffee meetings or other ways to bolster the program. We are also considering bringing back the graduate student symposium, where students from each lab present a portion of their work, in short talks (perhaps during our regular seminar series slot). This would help students build their communication skills and help foster community interactions, potentially leading to interdisciplinary interactions across the different research areas of the department. The DGSC will consider making presentations a required portion of the degree. It is essential that faculty members “buy in” and commit to the symposium if this initiative, and other engagement initiatives, are to work.
D. Evaluate all programs.
In response to student interest, we will map the skills/approaches/perspectives in available grad courses to both better communicate what we offer to students and to identify gaps. We plan to empower students to support their own learning to fill gaps, and will explore working collaboratively with other departments and institutions in course delivery. We will also evaluate various performance indicators for each of our degree programs, including time to completion (see B), size of the thesis, where chapters are published, and presentations, awards, and grant funding received.

Objective 3. Aboriginal Reconciliation
Research: Improve inclusion if possible.
Our department has been involved in various initiatives that are aimed at inclusion of aboriginal scholars and at building capacity, such as TAYBL (Training of Aboriginal Youth in Biomedical Labs), tutoring for the Native Education College, outreach to First Nations schools, and SING Canada (Summer Internship for Indigenous Peoples in Genomics). We will explore mechanisms to build on these experiences and to improve inclusion of Aboriginal scholars in our department. These may include the VPA’s bridging program to attract faculty members, earmarking financial support for graduate students and postdocs, increased efforts to recruit graduate students from SFU Aboriginal undergraduates, or other support programs yet to be announced as the university strives to adopt the recommendations of the SFU Aboriginal Reconciliation Council. We can also consider providing additional support for community-engaged research when that research is in collaboration with an indigenous community or includes aboriginal scholars.

Undergraduate programs: Add indigenous content.
We will consider how to add indigenous content to courses. There is some content in BISC 202 (Genetics), and we will consider other appropriate courses such as BISC 102 (General Biology) and BISC 204 (General Ecology). To progress this initiative, given the central philosophy of “Nothing about us without us” of the SFU Aboriginal Reconciliation Council, we would need assistance from the indigenous community. As the Aboriginal Reconciliation effort proceeds at SFU we look forward to participating in this important work over the next 5 years.

Objective 4. Dialogue
Research: Two objectives.
A. Provide support to enhance community-engaged research
We have a number of researchers involved in community-engaged research and in some cases, navigating these external relationships is challenging. We plan to organize a “lessons learned” session so researchers (faculty, postdocs, students) can understand common challenges, and will work with our researchers to better understand how the department and university can support community-engaged research. There is likely great potential to improve how we collaborate with community partners and to increase the proportion of faculty involved in this important work.
B. Improve communication around our research efforts

We have a very strong department that includes excellent science communicators, some of whom have been recognized for their efforts with awards or fellowships related to leadership in communication (Appendix B). We have been disappointed with the communication efforts at the university level, however. At a minimum, the department aims to better communicate through our website the important discoveries and accomplishments of our researchers. We will also consider whether we should build a social media presence separate from that of the university to improve communication of our accomplishments outside the institution.

Graduate and Undergraduate Programs: enhance Science Communication skills

Students have many opportunities to practice diverse communication skills in our courses, including blogs, op-ed pieces, reports to stakeholders, posters, presentations, and scientific journal articles. We will begin by mapping where different skills are developed within our curriculum for each of our undergraduate and graduate programs, and then explore options to provide enriched instruction in communication. We may add courses beyond the new SCI 301 course (Introduction to Science Communication), provide lists of suggested courses where different communication skills are developed, and will consider developing and offering certificate programs in Science Communication that could be taken by either senior undergraduate or graduate students.

Objective 5. Innovation and Entrepreneurship

Research: Foster greater interactions among researchers

Successful grant applications increasingly require teams of researchers and preliminary data. The department will evaluate different models to assist teams in preliminary data collection, including the “Pilot Project” model used by previous Chair Breden. We will first evaluate the successes of those previously funded groups in building longer-term creative relationships, in writing successful applications for funding, and other metrics of impact, and then consider possible ways forward. We will evaluate whether a similar model can be used to build and support interdisciplinary teams, or if different approaches are required.

Undergraduate Programs: Increase opportunities for innovative science

We provide various opportunities for undergraduates to engage with research. At the fourth year level, on average 70 students do a 3 credit research course and 16 complete a 15-credit independent study semester (required for the honours) in a year. The number of 3-credit research students has remained constant, but the ISS is lower than in the previous 5-year period where 20 completed it in a year. This is despite a recent change in requirements so students could complete an honours degree with just 124 credits (compared to 120 for the major; down from 135 credits). In 2014 we added a second-year research course option (BISC 298) and already 32 students have completed this (8/year). Over the past five years, we have had an average of 18 students supported annually with an Undergraduate Student Research Award from either NSERC or the VPR. While these numbers show that our students are engaging with research, we would like to see an increase, especially for honours students. We will do more to communicate honours opportunities and the
benefit of completing an honours degree to our undergraduates, and will investigate ways to support the research costs faculty absorb when they take on students. We are also considering developing new, low enrollment techniques courses that take advantage of research infrastructure, a sort of rotation through different labs that could wind up being an entry into lab projects. We are also considering developing course elements that include community-engaged research.

Graduate Programs: Mentor entrepreneurial activities

The majority of our graduate students have applied aspects to their degrees and some of them have been working to turn their ideas into products. These range from patents on findings that may have commercial applications, to the development of apps to track biodiversity. We will investigate how we can support these initiatives in the department.

Objective 6: Big Data

Research and Graduate Programs: Foster interdisciplinarity

Our faculty and graduate students are already using big data approaches to address questions in bioinformatics, phylogenetics, and to perform large-scale meta-analyses. Our approach is highly interdisciplinary across the life and environmental sciences. To foster further growth in this area, we will organize workshops to build capacity especially in our graduate students. We will also consider ways to collaborate with the big data program at the graduate level.

Undergraduate programs: Integrate Big Data in the curriculum

We currently include some big data approaches in courses, but we could do more to improve the quantitative skills of our undergraduates. We envision training that differs from the bioinformatics/genomics approaches in MBB, and plan to specifically integrate some hands-on activities within our existing curriculum.

Performance Indicators

Research: In addition to the metrics we currently collect on publications, grant funding, awards, and other indicators of success, we will track the success of interdisciplinary funding proposals and our community-engaged research relationships. Plans to improve dialogue around our research successes can be tracked as “hits” on our website and through other media; currently media engagement is not tracked at the department level.

Undergraduate Programs: We will survey undergraduates and alumni at multiple time points during our reorganization process to evaluate student satisfaction. In addition, we will track student engagement with our new majors to evaluate whether they are more attractive than previous streams. We will also evaluate the numbers of students in our mentorship programs and the success of our communications efforts in terms of “hits” on our newly revamped web page.

Graduate Programs: In addition to our planned program evaluation described under Objective 2, we will continue regular surveys of student satisfaction, and will make a greater effort to track student careers after graduation.
Resources:

1. Departmental Focus (and Faculty Renewal)
   Since 2013 and looking ahead to the end of 2018, we have lost 5.5 faculty (Briscoe 0.5), Kermode, Law, Moore, Roitberg, Wilson) and hired three (Barker, M’Gonigle and Marlatt). Marlatt was brought in to support our MET program and toxicology minor after Nicholson retired in 2012; with the Law retirement in 2016 we once again have a gap in toxicology. In the near future, we will gain a special opportunity hire (Hik, an ecologist) who will be a great addition but whose research and teaching expertise are not in an area of “need” based on the retirements listed above. We anticipate that in the next 5 years, we will additionally lose two teaching faculty (Fernando and Sharp) and two evolutionary biologists (Breden and Mathewes).
   The Appointments Committee recommends that we no longer hire research faculty explicitly to teach single courses in our undergraduate curriculum, but instead hire to build research strength, especially in areas where that expertise is unique to our department. As we transition to a more focused identity, our hiring needs will evolve, and so we will need flexibility to determine hiring needs beyond the two positions listed below (we do not at present have a 5-year hiring plan). The Appointments Committee recommends that in addition to building on existing research strength, future hires also aim to maintain expertise in a diversity of organisms.

   Priority 1: Environmental Microbiology (tenure track). Microbiology is a diverse area of inquiry, comprising study of two of three domains of life. Environmental microbiology includes multiple research areas in toxicology, such as: contaminants and microbial biogeochemical cycling, microbial toxins, contaminant effects on microbial ecology, evolution of microbial toxin defense mechanisms, and bioremediation and biodegradation of chemicals by microbes. We envision a hire in this area would be largely unique to biology, would connect to both toxicologists and the remaining microbiologist in our department, and would support popular areas of undergraduate study. Our microbiology course (BISC 303) is offered to 180 students a year, and our two toxicology courses are approaching 130 students a year. It is anticipated that a researcher in this area would also supervise MET students, the main bottleneck to student enrollment in the program.

   Priority 2: Physiology (Lecturer). Study of the physiology of a diverse range of organisms is unique to our department, and clearly differentiates us from BPK. We plan to support this area by hiring of a lecturer to contribute to the development and teaching of a long-awaited second-year physiology course inclusive of animal and plant physiology concepts. Expertise in plant physiology is required, so the individual could additionally teach the third-year Plant Physiology course, and upon the retirement of Fernando, take over the Plant Biology course. They would also contribute to first year teaching in our core program, some of which has recently been done by sessionals.

2. Student Experience
   As part of our effort to re-define and focus the department, we need input from current students and alumni through surveys, focus groups, and market research. We anticipate hiring co-op students to assist with aspects of this endeavor, and could use departmental FIC funds. Some of the higher-level work may involve re-assigning faculty members from teaching assignments to working
specifically on this endeavor. Our plan would be to do this within the constraints of our available teaching resources if possible, but the importance of the endeavor may mean requesting a sessional.

The condition of our space is a major impediment to student satisfaction. We still have three teaching labs in desperate need of renovation; these include B7222, used for BISC 100 (non-majors, avg. enrollment ~200/year), B8206/9210, for BISC 101 (required by all Life Science Majors, ~1000/year) and B8255, used for several techniques and organismal courses (BISC 306, 307, 360W, ~150/year and rising). These spaces have poor lighting, inadequate demonstration/experimentation space, ventilation issues, no storage for student backpacks, and other issues. Such deficiencies can cause a negative impression of Biological Sciences and diminish the impact of the cutting-edge, experiential education happening in the spaces. We anticipate refreshing these spaces will cost ~ $1 million for BISC 101, $330,000 for the BISC 100 space, and $300,000 for the organismal lab space.

3. Aboriginal Reconciliation

We are expecting that there will be a call for funding proposals regarding indigenization of the curriculum, and (hopefully) in support of better inclusion of indigenous scholars. We will wait for the call for proposals rather than ask for resources through this Academic Plan.

4. Dialogue

We recently formed a new “Outreach and Engagement Committee” comprised of faculty, staff, and graduate and undergraduate students to organize events and target communication both internally and externally. Internal audiences would include people outside our department but also our own students; we could improve the student experience by improving communication about e.g. progress through the degree, volunteer opportunities, and career and health advice. External audiences would include government, funding agencies, the general public, the media, and potential students. To support this endeavor, we are considering staff job descriptions in our main office, and whether there is room to re-allocate time within our existing staff complement to web design and other outreach duties, or if we would need to request adding a position. The incumbent would assist with keeping our web page current, with refreshing the design flaws especially on the undergraduate page, and with developing a social media presence. A staff member would provide the continuity that is critical to maintaining consistent messaging as other committee members cycle through.

5. Innovation and Entrepreneurship

We have space concerns that are well known to the university, and the reason why the Life Science Research and Innovation building is such a high priority for SFU. We won’t belabor this issue here, but will note that the design of our current space promotes working in isolation of others and encourages factional rather than collaborative innovation. We need that building!

6. Big Data

We must continue to offer hands-on statistics mini-courses for our graduate students, as these courses are not available elsewhere at the institution. We also anticipate charging a faculty member with mapping where big data approaches are used through the curriculum and developing new activities that can be integrated in key locations in our undergraduate curriculum.
Appendix A, Biological Sciences Major Awards, 2013-2018

Research awards

Faculty (including adjuncts)
1. Professor Isabelle Côté, Murray A. Newman Award, for her significant research in marine conservation, especially of coral reefs and in the context of species invasions, 2018
2. Professor Zamir Punja. Lifetime Achievement Award from the Professional Pest Management Association of British Columbia, for significant and long-term contributions toward the understanding of plant diseases and their management, 2018.
3. Senior Lecturer Kathleen Fitzpatrick, Dewey Fellowship in the investigation of teaching and learning, 2018
4. Professor Gerhard Gries, Gold Medal, Entomological Society of Canada, for outstanding contributions to the field, 2017
5. Professor Carl Lowenberger, R. A. Wardle Medal, Canadian Society of Zoologists, Highest award given for research in parasitology, 2017
6. Professor Gerhard Gries and Research Associate Regine Gries, CW Woodworth Award from the Pacific Branch of the Entomological Society of America, for outstanding accomplishments in entomology over at least the past 10 years, 2017
7. Adjunct Professor Dov Lank and Research Technician Connie Smith, Inaugural Lewis W. Oring Research Award for Lifetime Achievement in Shorebird Science, November 2017
8. Professor Tony Williams, renewal of University Professorship, 2017
9. Professor Bernard Crespi, Sterling Prize in Controversy, 2016
10. Professor Gerhard Gries, Entomological Society of America – Recognition Award in Insect Physiology, Biochemistry, and Toxicology, recognizes and encourages outstanding extension, research, and teaching contributions in urban entomology, 2016
11. Professor Mark Winston, Governor General’s Literary Award for Non-Fiction, For Bee Time: Lessons from the Hive, 2015
12. Associate Professor Jon Moore (at the time, Assistant Professor), Wilburforce Fellowship in Conservation Science, 2015
13. Professor Isabelle Côté, renewal of University Professorship, 2015
14. Adjunct Professor Dave Gillespie, Order of Canada, for his contributions as an entomologist who has worked to reduce the use of pesticides on agricultural products, 2015
15. Professor John Reynolds, 2014 Murray A. Newman Award, for his ground-breaking research contributions focused on salmon and their ecosystems of the central BC coast, 2014
16. Teaching Professor Joan Sharp (at the time, Senior Lecturer), Scholarship of Teaching Fellow with the Science Case Network, Joan was one of just 9 teaching fellows, joining 25 Case Scholars, and the only participant from Canada, 2014
17. Associate Professor Jon Moore (at the time, Assistant Professor), Canadian Journal of Fisheries and Aquatic Sciences Stevenson Lectureship for 2014

Graduate Students and Alumni
1. Danielle Hoefele, Gries lab, SFU’s 3-Minute Thesis Finals and People’s Choice Award, 2018
2. Danielle Hoefele and Asim Renyard, Gries lab, Annual Meeting of the Professional Pest Management Association of BC – First prize best student presentation, 2018
3. Asim Renyard, Gries lab, Annual Meeting of the Entomological Society of Canada: President’s Prize, best presentation on Pheromones, 2017
4. Tamara Babcock, Gries lab, Annual Meeting of the Entomological Society of Canada: President’s Prize, best presentation on Physiology, 2017
5. Kari Zurowski, Cory lab, Annual Meeting of the Entomological Society of Canada: President’s Prize, best presentation on Biological Control, 2017
6. Nicola Smith, Côté lab, selected as top Caribbean PhD student for 2017 Commonwealth Science Conference in Singapore
7. Sean Godwin, Reynolds/Dill labs, Best talk, Canadian Society for Ecology and Evolution, 2017
8. Emily Darling, PhD Alumna, Côté lab, Early Career Award, Canadian Society for Ecology and Evolution, 2017
9. Emily Darling, PhD Alumna, Côté lab, Young Scientist Award, International Society of Reef Studies, 2017
10. Sean Anderson, PhD Alumnus, Dulvy lab, Early Career Award, Canadian Society for Ecology and Evolution, 2017
11. Emily Betz, Punja lab, Joint Meeting, Canadian Phytopathological Society and the Canadian Society for Agronomy. First place, student presentation, 2017
13. Dan Peach, Gries lab, SFU’s 3-Minute Thesis Finalist and People’s Choice Award, 2016
14. Emily Darling, Côté Lab, Banting Post-Doctoral Fellowship, 2016
15. Stephanie Green, Côté Lab, Banting Post-Doctoral Fellowship, 2016
18. Sean Anderson, Dulvy lab, Dean of Grad Studies Convocation Medal, 2015
22. Emily Darling, Côté Lab, David H. Smith Conservation Research Fellowship, 2014
23. Stephanie Green, Côté Lab, David H. Smith Conservation Research Fellowship, 2014
24. Emily Darling, Côté Lab: Governor General’s Gold Medal, at SFU Convocation, June 2013, awarded to grad students who achieve the highest academic standing upon graduation from a master’s or doctoral degree program.
25. Corey T. Watson, PhD, Breeden lab, Dean of Graduate Studies Convocation Medal, 2013.
27. Amanda Kissel, Palen Lab, George Melendez Wright Fellowship, 2013

Undergraduate Students
1. Alexa Nelson, BSc 2015, Governor-General’s Silver Medal for achieving one of the highest cumulative grade point averages at SFU. Performed research with Rintoul on mitochondrial disease in primary human cells, fast tracked to pursue PhD in neuroscience at UBC.
2. Christine Conrad, BSc 2014, Governor-General’s Silver Medal for achieving one of the highest cumulative grade point averages at SFU. Completed an Honours thesis in the Côté lab on
responses of marine organisms to climate change. Currently pursuing an MSc on whale ecology at Dalhousie.

3. SFU interdisciplinary team won first place in Oxford Global Challenge, including BISC undergrad Iman Baharmand, 2017. They presented their research on medical waste and beat 14 teams from 5 continents.

4. Laramie Ferguson won Co-op Student of the Year Award, 2014 awarded by the Association for Cooperative Education (ACE) in BC/Yukon.

**Teaching awards**

**Faculty**

1. Lecturer Megan Barker, Faculty of Science Excellence in Teaching Award, 2017
2. Senior Lecturer Kathleen Fitzpatrick, appointed Dewey Fellow of the Institute for the Study of Teaching and Learning in the Disciplines (ISTLD)
3. Associate Professor Gord Rintoul, Faculty of Science Excellence in Teaching Award, 2015
4. Senior Lecturer Peter Hollmann, SFU Excellence in Teaching Award, 2015
5. Professor Zamir Punja, Faculty of Science Excellence in Teaching Award, 2014
6. Teaching Professor Joan Sharp (at the time, Senior Lecturer), Faculty of Science Excellence in Teaching Award, 2014

**Graduate Students**

1. Heather Coatsworth, Lowenberger lab, Faculty of Science Excellence in Teaching Award – Graduate Student Award, 2017
2. Allison Cornell, Williams lab, Faculty of Science Excellence in Teaching Award – Graduate Student Award, 2016
3. Raime Fronstin, Christians lab, Faculty of Science Excellence in Teaching Award – Graduate Student Award, 2015
4. Jesse Taylor, Hutter lab, Faculty of Science Excellence in Teaching Award – Graduate Student Award, 2014
5. Andrew Wylie, Punja lab, Faculty of Science Excellence in Teaching Award – Graduate Student Award, 2014

**Leadership and Service awards**

**Faculty**

1. Professor Nick Dulvy, SFU Leadership in Sustainability Award, 2017
2. Professor Isabelle Côté, Leopold Leadership Fellowship, 2015
3. Associate Professor Wendy Palen, Leopold Leadership Fellowship, 2015
4. Senior Lecturer Tammy McMullan, the 2014 recipient of the Contech Award for Excellence, from the Professional Pest Management Association of BC

**Staff**

1. Alex Fraser, Head Technician, SFU Staff Achievement Award in the Category of Work Performance, 2015
APPENDIX B. UPDATES AND IMPROVEMENTS TO UNDERGRADUATE CURRICULUM SINCE 2013.

Program changes
2014: Change to Honours requirement from 130 to 124 credits, retaining ISS.
2015: Re-activated Toxicology Minor
2016: New stream structure for EEC, accreditation by the College of Applied Biology
2017: New stream structure for CMP

Course changes: paired when appropriate

General additions
BISC 298 Introduction to Undergraduate Research in Biological Sciences
BISC 371 Special Topics in Biology (Breadth courses)
BISC 373 & BISC 374 Brewing Science (with and without lab)

EEC stream

Additions:                     Deletions:
BISC 360W Techniques in Ecology and Evolution    BISC 404W Plant Ecology
BISC 420 Community Ecology and Macroecology     BISC 304 Animal Ecology
BISC 412 Aquatic Ecology                    BISC 419 Wildlife Biology
BISC 421 Models in Biology (also in CMP stream)

CMP stream

Additions:                     Deletions:
BISC 308 Envtl Toxicology: an Ecological Perspective    BISC 432 Chemical Pesticides & the Envlt
BISC 423 Developmental Neurobiology                     BISC 449 Histology Techniques
BISC 424 Applied Genomics                               BISC 307W Animal Physiology lab
BISC 425 Sensory Biology                                BISC 329 Experimental Techniques
BPK 408W Cell Physiology Lab

Other important milestones

New guidelines for transfer credit (2014-2015)
New residency requirement for transfer students (2016-2017)
New criteria to assess course overlap (2015-2016)
New grading guidelines (2016-2017)
Hosted Articulation meeting (2017)
Map my Degree Workshop, first offered 2016
Updated course descriptions for 3-credit research courses to allow for “research or scientific communication, in an area of biology or biological pedagogy”; guidelines to ensure lab and stream credit are assigned appropriately (2014-2015)