

# UTQAP Cyclical Review: Final Assessment Report and Implementation Plan

## 1 Review Summary

<b>Programs Reviewed:</b>	Biology, BSc (Specialist, Major, Minor) Biology for Health Sciences, BSc (Major) Biomedical Communications, BSc (Minor) Biotechnology, BSc (Specialist) Comparative Physiology, BSc (Specialist) Ecology & Evolution, BSc (Specialist) Molecular Biology, BSc (Specialist) Paleontology, BSc (Major)
<b>Unit Reviewed:</b>	Department of Biology, University of Toronto Mississauga (UTM)
<b>Commissioning Officer:</b>	Angela Lange, Acting Vice-Principal Academic and Dean, UTM
<b>Reviewers (Name, Affiliation):</b>	1. Professor Gregor Fussmann, Chair, Department of Biology, McGill University 2. Professor Eve Marder, Victor and Gwendolyn Beinfield Professor of Neuroscience, Department of Biology, Brandeis University
<b>Date of Review Visit:</b>	October 1 – 2, 2018
<b>Date presented to AP&amp;P:</b>	October 30, 2019

## Previous Review

**Date: November 9-10, 2010**

### Summary of Findings and Recommendations

#### 1. Undergraduate Programs

The reviewers identified the following areas of concern:

- Learning objectives and degree-level expectations not being fully met for most students
- Steep 62.3% increase in student:faculty ratio between 2004-05 and 2009-10
- Large class sizes with limited opportunities for writing exercises
- Limited opportunities for experiential learning due to lab space and equipment limitations

The reviewers made the following recommendations:

- Conduct a comprehensive review and revision of the undergraduate programs to better meet learning objectives and expected outcomes
- Consolidate courses with overlapping goals and/or content

### **Administration**

The reviewers identified the following areas of concern:

- Insufficient space for teaching, research and socializing
- Outdated teaching equipment

The reviewers made the following recommendations:

- Further growth should be limited and/or additional faculty hired

## **Current Review: Documentation and Consultation**

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### **Documentation Provided to Reviewers**

Terms of Reference; Department of Biology Self-Study, 2018; Previous Review Report and Administrative Responses; Department of Biology, Faculty CVs; UTM Degree Level Expectations, 2016; UofT Facts & Figures, 2016; UTM Divisional Academic Plan, 2017; UTM Vision Statement, 2017; UTM Academic Calendar, 2017-2018; UTM Viewbook, 2017-2018; UofT Domestic Viewbook, 2017-2018; Tri-Campus Framework.

### **Consultation Process**

The reviewers met with Acting Vice-Principal, Academic and Dean; Acting Vice-Dean, Teaching & Learning; the Chair of the Department of Biology; the Associate Chairs of the Department of Biology; the Graduate Chairs representing the Institute for Medical Sciences, Ecology and Evolutionary Biology, and Cell & Systems Biology; junior and senior research stream faculty members; teaching stream faculty members; emeritus faculty; contractually limited term appointment instructors; undergraduate students; graduate students; departmental administrative staff; teaching lab technicians.

## **Current Review: Findings and Recommendations**

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### **1. Undergraduate Program**

*Unless otherwise noted, all bulleted comments apply to all programs reviewed.*

**The reviewers observed the following strengths:**

- Objectives

- Department is at the forefront of developing and maintaining a curriculum map that helps to track course level objectives and assessments against program-level learning outcomes and informs about congruence with the DLEs; map is a powerful tool that can help detect shortcomings and gaps in the current curriculum
- Curriculum and program delivery
  - Courses adhere to program-level learning outcomes and modern principles of biology
  - Courses reflect the breadth and knowledge of teaching and tenure stream faculty, with particular strengths in neurobiology, in the biology of unicellular organisms and viruses, climate change, and ecology and evolution
  - Excellent program delivery, despite substantial enrolment increase in the past two years
  - Very strong Major in Biology; the Major in Biology for Health Sciences has been a successful recent addition
  - Significant and positive increase in undergraduate research opportunities in recent years
- Innovation
  - Successful addition of Health Sciences major and planned additional programs in this area
- Student engagement, experience and program support services
  - Undergraduate students are highly engaged, interactive and outspoken and appear largely satisfied with the quality of education they are receiving

The reviewers identified the following **areas of concern**:

- Curriculum and program delivery
  - Course prerequisites are unnecessarily rigid and rigorously enforced by the department
  - Foundational classes are often too large for even the largest classroom
  - Extremely high enrolment, including in many advanced courses
  - Specialist Program in Ecology and Evolution suffers from severe undersubscription
  - Major in Paleontology has sizable enrolment, but low graduation rates
  - Student:faculty ratios remain very high and could potentially act as a deterrent for both prospective students and faculty hires
  - Mapping exercise identifies computational skills as a key element missing in the curriculum, and graduate TAs confirm that many UTM undergraduates lack quantitative and computational skills
- Student engagement, experience and program support services
  - Undergraduate advising may be strained due to large student numbers and limited advising staff; unreasonable expectation placed on limited advising staff to counsel full breadth of disciplines and career paths within department
  - Student concern over rigidity of course requirements and late dismissal from courses where prerequisites are lacking

- Departmental undergraduate student association exclusive, and not connected with or representative of the undergraduate student body

The reviewers made the following **recommendations**:

- Curriculum and program delivery
  - Use curriculum mapping to consider the necessity of all existing courses and explore the possibility of curricular simplification
  - Evaluate long-term sustainability of programs with low enrolment and/or graduation rates
  - Increase laboratory and field courses if possible
  - Increase flexibility of course prerequisites and choice to benefit student experience
  - Increase TA support to offset difficulties caused by large enrolments
  - Consider offering more summer courses as a solution to the issue of high enrolment
  - Continue promoting opportunities for undergraduate research and encourage students to spend longer periods in a single laboratory where their work could result in being part of a publication
  - Use potential future faculty departures as an opportunity for flexible re-evaluation of course offerings
  - Encourage student acquisition of quantitative and computational skills to increase employment prospects of UTM Biology graduates
- Student engagement, experience and program support services
  - Address deficiencies in student advising, alumni tracking and help for students with mental health concerns; consider adding staff capacity
  - Adopt democratic rules of candidacy and appointment to office for the undergraduate student association, to better represent the student body and promote a collegial environment between students and departmental stakeholders
- Quality indicators – alumni
  - Track long-term outcomes of graduates (career paths, graduate education pursued) to help to assess whether the department is providing relevant training to students and to benefit future potential alumni fundraising

## 2. Graduate Program (n/a)

## 3. Faculty/Research

The reviewers observed the following **strengths**:

- Overall quality
  - Faculty dedicated to maintaining and advancing the department's teaching and research missions
- Faculty

- Capable and engaged teaching stream faculty
- Positive consideration of curriculum when making faculty hiring decisions

The reviewers identified the following **areas of concern**:

- Research
  - Challenging to maintain research excellence while supporting the undergraduate teaching mission in the face of high student enrolments and a large number of undergraduate programs
  - Teaching stream faculty lack direct access to their research portals to track grant expenditures
- Faculty
  - Self-identified disciplinary gaps among faculty complement include developmental biology, microbiology, conservation biology, biodiversity and computation and systems analysis

The reviewers made the following **recommendations**:

- Research
  - Grant teaching stream faculty direct access to research portals so that they can plan accordingly
- Faculty
  - Prioritize faculty hiring in the areas of theoretical biology and computation and systems analysis to address disciplinary gaps identified by the department

## 4. Administration

The reviewers observed the following **strengths**:

- Relationships
  - Outstanding administrative staff who are dedicated to the welfare of students and the support of faculty
- Long-range planning and overall assessment
  - Department is benefitting from the leadership and vision of the recently appointed chair
  - Recently renovated teaching and research laboratories are well equipped and maintained
  - Expert technical staff responsible for computing infrastructure for teaching and research

The reviewers identified the following **areas of concern**:

- Relationships
  - Departmental culture and structure on campus inhibits interdisciplinary teaching and research

- Organizational and financial structure
  - Building exists in permanent state of repair with frequent and unpredictable power outages negatively impacting continuity of research and teaching
  - Serious problems with the functionality of key services such as electricity, plumbing and HVAC
- Long-range planning and overall assessment
  - Department has suffered from lack of leadership continuity, with frequent chair turnover in recent years. This has negatively impacted intermediate and long-term strategic planning, curriculum development and morale among department faculty and staff
  - Departmental staff, while excellent, are over-tasked

The reviewers made the following **recommendations**:

- Relationships
  - Encourage interdepartmental interaction to strengthen interdisciplinary exchange with departments such as Chemistry and Psychology
- Organizational and financial structure
  - Encourage steady and consistent leadership to ensure the department's to progression

## 2. Administrative Response & Implementation Plan



UNIVERSITY OF  
**TORONTO**  
MISSISSAUGA

OFFICE OF THE DEAN

October 23, 2019

Professor Susan McCahan  
Vice-Provost, Academic Programs  
Simcoe Hall  
University of Toronto

Dear Professor McCahan:

We are writing to provide an administrative response to the External Review of UTM's Department of Biology, which was held in October of 2018. This Department includes programs in Biology, Biology for Health Sciences, Biomedical Communications, Biotechnology, Comparative Physiology, Ecology & Evolution, Molecular Biology, and Paleontology. Overall, the reviewers found that the Department was providing "a quality education from highly qualified and dedicated teachers that are, in most cases, also world-class researchers." The reviewers commended the Department's innovative approach to teaching and pedagogy, the growth of research opportunities, as well as the strong leadership and committed administrative and technical staff. This is a strong foundation for the Department to build on as they plan for the next five years and beyond.

Below you will find a brief discussion on specific areas raised by the external reviewers followed by an implementation plan identifying action items and timelines. This response was developed in consultation with the Department, through a Town Hall held on September 9, 2019, as well as from a Chair's Administrative Response submitted by Prof. Joel Levine, Chair of Biology. Progress checks and monitoring of the implementation plan will occur through the Chair's Annual Report to the Dean. The next external review of the Department of Biology is scheduled for the 2023-2024 academic year, with a midway report submitted to your Office in 2020-2021.

***The reviewers identified a number of curricular issues and encouraged mapping the curriculum to address gaps and overlaps, identify the best areas for hiring, and create flexibility in sequencing.***

UTM Biology has been a pioneering department in the development of course curriculum maps at the University of Toronto. As the reviewers noted, they are now in a position to leverage their mapping work and apply it at the programmatic level. The department proposes to update their existing programs by identifying program-level expectations, including the skills and knowledge expected of graduates. Faculty within the units are typically best-suited for such work, as they know the material and the programs, and many departments make such projects a significant part of faculty workload assignments. At the Decanal Townhall for the Biology review (held on September 9, 2019), difficulties with access and usability of the departmental

curriculum map were raised, and the possibility of applying for a university grant or fund to develop curriculum mapping software was discussed. Biology was very keen to capitalize on such opportunities to continue to provide leadership and demonstrate innovation in this area. Recognizing this strength and expertise in Biology, the Dean's Office strongly supports these efforts. Departmental planning that is informed by curriculum mapping analysis is discussed below for issues of hiring and program gaps.

***The reviewers noted that certain programs offered by the department have much lower enrolment or completion rates relative to the other offerings, and encouraged consideration of the viability of the Specialist in Ecology and Evolution and the Major in Paleontology.***

While enrolment levels are important, the Dean's Office as well as the Department acknowledge that there are complexities of student desires and career concerns that may be affecting their choices in non-obvious ways. The Dean's Office has encouraged Biology to try to understand why students are, in some cases, enrolling in large numbers in ecology, evolution, and paleontology courses but not the programs themselves; and in other cases, enrolling in the program yet not taking the required courses, and therefore not completing the program. The services of the analysts within the Academic Planning, Policy and Research Unit in the Dean's Office have been offered to help analyze existing data, as noted below, and the department is encouraged to undertake informal and formal surveys of their students around these points. The department is also undertaking a social media project to enhance student knowledge of the curriculum, including the programs noted by the reviewers and the areas they cover. Biology's existing Biocareers Project where ROP students interview alumni about their undergraduate experience may provide some helpful insights for enhancing student awareness of how their degree requirements translate into careers.

***The reviewers encouraged student participation in research and lab experiences, and the expansion of field course offerings.***

Biology offers a relatively large number of intensive experiences in research lab and field projects at present; for example, over 80 ROPs per year as well as a thesis and an internship course. Given the very large number of students enrolled in Biology programs, however, there is simply not capacity to provide these intensive research experiences to all students. To allow more students to gain direct field experience, in addition to increasing the number of field courses offered by UTM faculty, the Department plans to increase student awareness of their existing opportunities through the Ontario Universities Program in Field Biology (OUPFB), which provides students with relatively easy access to a wide range of field courses offered by multiple universities in Ontario.

***The reviewers endorsed the creation of a strategic plan for research, hiring (both faculty and administrative staff), and curriculum for the next five years.***



Biology has indicated that they would like to work with the Office of the Dean to create a long-term plan. They have already begun a long-term plan to address gaps in quantitative and computational biology in their program offerings, faculty expertise, and research efforts. The department emphasizes that this is not simply the addition of a new research focus; quantitative and computational biology permeates many aspects of the discipline and needs to be incorporated into the curriculum and hiring process from this perspective. They are already implementing curriculum changes at multiple levels of instruction and have been approved for a new hire in this field. Their current goal is to ultimately hire a total of five faculty positions with this focus to bolster quantitative approaches from a systems perspective. The Dean's Office will expect to see and assess these requests during the forthcoming annual faculty complement planning cycles. In terms of staff hiring requests, the Director, Strategic Initiatives within the Office of the Dean will be consulted to assist with the normal review process for any staffing requests brought forward by the department.

***The reviewers proposed a number of solutions for the unit and the campus to consider to address the impact of high enrolment, given its impacts on educational quality and potential faculty recruitment.***

The department would also like to work with the Academic Planning, Policy and Research Unit within the Office of the Dean to evaluate various data relating to their student enrolment numbers from different perspectives, including but not limited to, student-faculty ratios overall and by sub-divisions, and potential ways of assessing student interest in various fields beyond simple program enrolment counts.

***The reviewers identified some barriers to research excellence and collaboration and emphasized the importance of access to the research portal and the need to facilitate research.***

Both the department and the Dean's Office see this comment as relating specifically to the problem of Teaching Stream faculty access to the University of Toronto research portal for management of grants received and application for ethics reviews. It is imperative that all permanent faculty be able to manage their grants properly, and the University obviously wishes to see that ethics reviews are held for research conducted by its faculty. We jointly hope that this access issue is solved soon.

***The reviewers recommended urgent action to address building problems, as they impact the teaching and research quality and ability to recruit top faculty.***

The dominant problem facing all Biology faculty and staff, and expected to become a greater problem with new faculty in computational biology, is the constant flux of power in the

building, especially but not only due to construction. Facilities, Management and Planning, under the auspices of the CAO, and together with the Vice-Principal, Research, are assessing a range of models for power backup at the present time. This working committee is scheduled to meet again at the end of this month (September 2019) to determine the optimal strategy for resolution. The department prefers a model for a unit-wide power backup that would provide both uninterrupted and clean power at all times. Although recognizing the high cost of such a solution, department members pointed out the high cost to the university in research and faculty recruitment losses that have been incurred and will continue if power instability in their discipline continues. Depending on the solution that is ultimately implemented, completion of the work can take between a few months to over a year.

***The reviewers encouraged minimizing any further leadership interruptions to facilitate stability within the department.***

The department and the Office of the Dean are in agreement with this recommendation. The Chair is committed to developing a shared vision for the department, and continued regular departmental retreats may be helpful, as well as encouraging and recognizing junior and senior faculty who take on a range of leadership roles within the department.

***Other issues raised by department:***

Biology noted that unfortunately the reviewers did not include any discussion of the role of lab and greenhouse technicians in their assessment of teaching, in spite of the participation of these staff members in the review process. It will be important to include these staff in any assessment of TA and instructor teaching support needs.

Finally, the department would like to note their concerns over the increasing levels of mental health issues affecting students, and in turn their entire community of students, staff and faculty. They appreciate the university's new initiative on mental health and hope the effect on faculty and staff as well as students in the wider university community will also be addressed.

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**Implementation Plan - Department of Biology, UTM**

The Department and the Office of the Dean, in consultation, will undertake the following approaches to enact positive changes:

**Immediate Term (6 months)**

- Identify program learning expectations/objectives for each undergraduate program offered. *[Department]*

- Begin process of identifying assessment methods in core/ foundational courses (including efficacy in measuring student achievement against identified program learning outcomes). *[Department]*
- Investigate funding options and opportunities to improve/ develop curriculum mapping software. Apply for available opportunities, as appropriate. *[Department, with support from the Dean's Office]*
- Begin analysis and assessment of enrolment and completion rate issues in Department (including low enrolment and completion rates in the Ecology & Evolution Specialist and Paleontology Major programs and faculty-student ratios). *[Department, with support from the Academic Planning, Policy & Research unit in the Dean's Office]*
- Launch search for two new faculty hires – one microbial biologist; one systems biologist with advanced computational and theoretical approaches. *[Department, with support from Dean's Office]*
- Submission of draft proposal for specialist program in Biology for Health Sciences to the Dean's Office. *[Department with the assistance of Program & Curriculum Officer, Dean's Office]*
- Continue promotion of Ecology, Evolution, Paleontology, and field courses to students via social media. *[Department]*
- Continue and complete development of Python modules; propose and implement resulting curricular changes to first year courses. *[Department]*
- Request assessment of need for new community development administrative staff member. *[Department, with support from Dean's Office and Human Resources]*
- Finalization of plans by Working Committee to resolve power issues. *[CAO and Vice-Principal Research]*

#### Medium Term (1-2 years)

- Complete process of identifying assessment methods in all courses. *[Department]*
- Identify areas/ courses where assessment methods may require additional review and revision. Develop new assessment methods in identified areas. *[Department]*
- Propose and implement curricular changes, as required, as a result of program learning outcomes and assessments review. *[Department]*
- Propose and implement new computational courses. *[Department]*
- As a result of in-depth analysis of the Ecology & Evolution and Paleontology programs, develop and implement strategies that may better appeal to undergraduates while still allowing for the achievement of program learning outcomes. *[Department, with support of the Dean's Office]*
- From results of previous analysis (above) of faculty-student ratios and other data, develop and implement strategies to manage impact of high enrolment rates within Biology. *[Department, with support of the Dean's Office]*
- If approved through the UTM complement planning process, hire new faculty with an emphasis on systems thinking to strengthen Biology's computational and quantitative work. *[Department, with support from the Dean's Office]*
- Review effectiveness of Python modules in first year courses in preparation for expansion into 200-level courses. *[Department]*

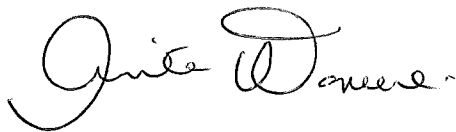
- Propose and implement curricular changes to introduce Python modules into 200-level courses. *[Department]*
- Pending governance approval, implement new specialist program in Biology for Health Sciences. *[Department]*
- Continue student outreach and community building through social media initiatives. This includes promotion of Ecology, Evolution, Paleontology, and field courses and opportunities. *[Department]*
- Completion of backup power system in Biology research wing. *[CAO and Vice-Principal Research]*

Long Term (3-5 years)

- Complete an informal curriculum/ program review to ensure alignment of recent curriculum changes to program learning outcomes. Propose and implement new curricular changes, as appropriate. *[Department]*
- Continue to pursue complement requests related to computational and quantitative hires, as desired. *[Department, with the support from the Dean's Office]*
- Propose and implement curricular changes to introduce advanced Python modules to specialist students, as appropriate. *[Department]*
- Assess effectiveness of new strategies to manage enrolment issues. Propose new strategies, as appropriate. *[Department, with support from the Dean's Office]*
- Continue student outreach and community building through social media initiatives. This includes promotion of Ecology, Evolution, Paleontology, and field courses and opportunities. *[Department]*

Please let me know if you have any questions about this response.

Sincerely,



Amrita Danieri  
Vice-Principal, Academic & Dean



Heather M.-L. Miller  
Vice-Dean, Teaching & Learning

## **3 Committee on Academic Policy & Programs (AP&P) Findings**

The spokesperson for the reading group reported that the summary covered the full review. The group did note that some of the issues in the review, such as the need for more staff and the impact of high student/faculty ratios could have been given more emphasis. The group also requested additional clarification on several points, including the need for new hires in the area of quantitative and computational biology, the suggestion that restrictive course prerequisites be relaxed, and the need for a statistics course. The review had also commented on high enrolment coupled with insufficient TA support.

Professor Levine, Chair of the Department of Biology, noted that five new faculty hires were planned before provincial cutbacks. Currently, two new searches were planned for this year to add to the faculty complement in quantitative and computational biology. In addition, as the need arose to replace faculty, they would be replaced by faculty in quantitative and computational biology or a related field. Turning to the undergraduate course curriculum, Professor Levine noted that the Department was introducing statistics modules in the undergraduate curriculum, which would expose students to the analysis of big data sets. Regarding prerequisite course requirements, Professor Levine noted that, particularly for students taking courses across different departments, addressing this matter would be an inter-departmental task.

Finally, Dean Daniere commented that it was unclear what the reviewers comment about TA support was founded upon. She noted that TA support was readily available and could be increased on an as-needed basis upon the Chair's request.

No follow-up report was requested.

## **4 Institutional Executive Summary**

The reviewers identified the programs' strengths as the faculty's creative approaches to teaching and modern pedagogy; the welcome growth of student research opportunities and increased clarity in courses and syllabi; the strong departmental leadership; and the outstanding administrative and technical staff in the department. The reviewers recommended that the following issues be addressed: mapping the curriculum to address gaps and overlaps, identify the best areas for hiring, and create flexibility in sequencing; considering the viability of the Specialist in Ecology and Evolution and the Major in Paleontology; encouraging student participation in research and lab experiences, and expanding field course offerings; creating a strategic plan for research, hiring (both faculty and staff), and curriculum; addressing the impact of high enrolment on educational quality and potential faculty recruitment; enhancing research excellence and collaboration; taking urgent action to address building problems; minimizing further leadership interruptions to facilitate stability within the department. The Dean's Administrative Response describes the campus, unit and programs' responses to the reviewers' recommendations, including an implementation plan for any changes necessary as a result.

## **5 Monitoring and Date of Next Review**

Progress checks and monitoring of the implementation plan will occur through the Chair's Annual Report to the Dean.

The Dean will provide an interim report to the Vice-Provost, Academic Programs on the status of the implementation plans, due midway between the year of the last and next site visits.

The next review will be commissioned in 2025-26 for a site visit to take place no later than eight years from October 2018.

## **6 Distribution**

On October 26, 2020, the Final Assessment Report and Implementation Plan was posted to the Vice-Provost, Academic Programs website and the link provided by email to the Vice-Principal and Dean of the University of Toronto Mississauga, the Secretaries to AP&P, Academic Board and Governing Council, and the Ontario Universities Council on Quality Assurance. The Dean provided the link to the Chair of the Unit.