UTQAP Cyclical Review: Final Assessment Report and Implementation Plan

1. Review Summary

Programs Reviewed:	Astronomy & Astrophysics, B.Sc. Hons. (Major, Minor) Astronomy & Physics, B.Sc. Hons. (Specialist) Planetary Science, B.Sc. Hons. (Specialist) Astronomy & Astrophysics, M.Sc., Ph.D.
Units Reviewed:	Department of Astronomy & Astrophysics Canadian Institute for Theoretical Astrophysics Dunlap Institute for Astronomy & Astrophysics
Commissioning Officer:	Dean, Faculty of Arts & Science
Reviewers (Name, Affiliation):	1. Prof. Stefi Baum, Dean, Faculty of Science, University of Manitoba 2. Professor Shantanu Basu, Department of Physics & Astronomy, University of Western Ontario 3. Professor Edmund W. Bertschinger, Massachusetts Institute of Technology
Date of Review Visit:	March 19 – 20, 2018

Previous Review

Date: April 12 – 13, 2010 University review of Department, undergraduate and graduate programs

Summary of Findings and Recommendations

1. Undergraduate Programs

The reviewers observed the following strengths:

- Innovative and creative undergraduate courses and programs
- High student satisfaction with education
- Creative approaches have increased enrollment from non-science Majors in introductory astronomy courses, and additional TAs have helped support the courses

The reviewers identified the following areas of concern:

- No graduate outcomes data

The reviewers made the following recommendations:

- Implement an exit survey for graduating students
- Continue to foster introductory course enrolment growth by appointing a Lecturer to supplement teaching

2. Graduate Programs

The reviewers observed the following strengths:

- Majority of students have a positive view of the program
- Strong cohort of students with broad range of research topics

The reviewers identified the following areas of concern:

- Student recruitment has been a challenge, and disappointing to hear decrease in emphasis on international student recruitment
- Students are concerned with lack of organized strategy for recruitment
- Quality and structure of graduate programs needs urgent attention from a curriculum committee
- Financial support is relatively low compared to other institutions
- Mixed opinions on reduced course work requirements, and whether students still obtain a broad enough foundation
- Graduate students are unsatisfied with courses: teaching, expected background, workload, and differences in difficulty from one course to the next; graduate course staffing come secondary to undergraduate course staffing

- Faculty-led communications need improvement, and first year committees are not providing adequate student advising

The reviewers made the following recommendations:

- Involve more senior graduate students in recruitment efforts and establish a strategic approach to recruitment
- Track the "first choice success rate" to assist with recruitment
- Consider if students should start in the MSc, or whether advisory committee can be strengthened, to ensure students have an adequate foundation
- Ensure all graduate courses are well-organized and well-taught
- Consider reducing the number of faculty on the first year committee, and consider adding a graduate student to the committee

Faculty/Research

The reviewers observed the following strengths:

- High scientific productivity
- Department links with CITA and Dunlap strengthen research profile
- Recognized strengths in extragalactic astronomy and cosmology, star formation, exoplanets, and high-energy astrophysics related to compact objects
- Good research breadth and depth

The reviewers made the following recommendations:

- New Dunlap faculty appointments in instrumentations should be joint appointments with the Department; these appointments can assist with undergraduate and graduate teaching and service responsibilities

Administration

The reviewers observed the following strengths:

- Department is flourishing, and has world-class status in the field; only university in Canada with a department dedicated to astronomy and astrophysics
- Collegial environment, and high morale among faculty, staff, and students
- Librarian is a valuable resource

The reviewers identified the following areas of concern:

- Need for strategic planning in terms of hiring and complement levels of faculty and staff
- Challenges with space and facilities, include the Department library
- Graduate Chair is not always consulted on academic planning and graduate recruitment at UTM and UTSC
- Individual staff workload has increased
- IT-support is in critical need, and stop-gap measures are problematic

- Anxieties around the delay in opening Dunlap and the uncertainly of administrative support for the unit
- Communication challenges between faculty and staff as personnel have moved buildings

The reviewers made the following recommendations:

- New focus in instrumentation should be accompanied by an appropriate testing facility
- A strong physics and astronomy presence should be fostered at UTM and UTSC; consider establishing a separate department on each campus
- Consider additional administrative staff support
- Explore options of sharing technical resources among the Department, CITA, and Dunlap
- Library space might be better utilized for collegial exchanges, given that many resources are available online and hard-copies take substantial space
- Encourage the Dean of the Faculty to maximize profile of Dunlap
- Co-locate the Department, CITA, and Dunlap

Current Review: Documentation and Consultation

Documentation Provided to Reviewers

- Terms of Reference
- Self-Study and Appendices
- Faculty CVs
- DAA External Review 2010 and 2005
- QT Data – ASTSC 2017-2018
- PhD Program Data
- Graduate Calendar
- Undergraduate Calendar
- Course Syllabi: AST425, AST325/326, AST320H1, AST199-LO111, AST1199-LO112, AST210, AST222, AST221, AST101, AST320H1
- UTQAP Visit Itinerary
- QA Library Report
- Students Services Information St. George Campus
- List of all staff DAA, CITA and Dunlap
- MSc and PhD Degree Level Expectations
- Qualifying Exam Question Bank for 2018
  UTQAP Agenda Workshop March 15th, 2017

Consultation Process

The reviewers met with the Dean, Faculty of Arts & Science; the Vice-Dean, Academic Planning and Strategic Initiatives; the Associate Dean, Academic Planning and Undergraduate Issues; the Department Chair, Undergraduate Associate Chair, and Graduate Associate Chair; the Acting Director of CITA; Dunlap Institute faculty; Department faculty; Department teaching faculty and CLTA; Tri-campus graduate faculty: UTM and UTSC; Cognate faculty: Chair, Department of Physics; Postdoctoral Fellows; staff; undergraduate and graduate students.

Current Review: Findings and Recommendations

1. Undergraduate Program

The reviewers observed the following **strengths:**

- Overall quality
  - Strong programs that compare well to international peers
- Curriculum and program delivery
  - Program objectives map onto Faculty degree level expectations and the University Strategic Research Plan
  - Astronomy & Astrophysics Specialist emphasizes topics in astrophysics, and provides a thorough grounding in physics
  - Planetary Science programs offer good breadth of courses
- Innovation
  - Capstone course provides opportunity for hands-on research, and is an effective means for preparing students for a future career in the field
  - Portable planetarium provides interactive learning environment for large astronomy courses, and new staff have been added to provide planetarium and course support
  - Planned creation of new planetarium (in new building) is a positive development that will further assist with instruction and outreach
- Assessment of learning
  - Graded assignments testing quantitative and critical thinking, writing, student presentations, midterms, and final exams, are appropriate for the discipline
- Quality indicators – undergraduate students
  - High quality of entering students, and admitted students seem to be performing well based on CGPA
  - Enrolment in Astronomy & Astrophysics Specialist has more than doubled from 2009-2016
  - Students are mostly happy and satisfied with the program
- Student funding
  - Healthy suite of student awards available and outstanding students are eligible to apply for the NSERC Undergraduate Summer Research Awards

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

- Curriculum and program delivery
    - Recent “hot topics” in astrophysics, exoplanets, and gravitational waves, are not developed in upper level courses
    - High number (14.0 FCE) of required courses in the Astronomy & Astrophysics Specialist, which may serve as a limitation to enrolment; some students reported switching to the Major (or another Major in a different program altogether) due to the high course requirements
    - Enrolment cap on second year Astronomy & Astrophysics course may serve as a barrier for some students interested in entering the Department’s programs
    - Lack of computer programming skills development in curriculum
    - An undergraduate curriculum committee has been formed, they are not yet meeting on a regular basis to address issues such as:
        - Student concerns regarding overlap in year-two and year-three courses
        - Timing of midterm exams at cognate units being; exams are scheduled too close to the Departments own midterms
        - Only one experiential learning course
    - Varying opinions on new workshop (*Environment from an Indigenous Perspective*) and course (*Indigenous Astronomy*) regarding efficacy of creating a “non-scientific” course
- Accessibility and diversity
    - Building is not accessible, making it difficult for some students to meet with professors and attend classes
- Assessment of learning
    - Enrolment growth has created challenges to providing optimal feedback in some courses
- Quality indicators – undergraduate students
    - Only marginal enrolment in the Planetary Science programs
    - Lack of recruitment efforts to students in first year
    - Student completion rates and employment outcomes data not available
    - Not much student interaction with the undergraduate Chair

The reviewers made the following **recommendations**:

- Curriculum and program delivery
    - Department is encouraged to further develop upper level curriculum in the areas of astronomy, exoplanets, and gravitational waves
    - Consider if reducing the Astronomy & Astrophysics Specialist requirements would is appropriate
    - Explore computer science course offerings that support programming and coding development, and seek ways to improve student advising in these areas and overall
    - Ensure the undergraduate curriculum committee meets on a regular basis, and:
        - Undertakes an annual curriculum mapping exercise
        - Consults with cognate units regarding midterm exam timing
        - Considers the balance of classroom versus experiential learning courses

- Accessibility and diversity
    - While new building should address accessibility concerns, in the interim a working group should be formed to address student access issues
- Assessment of learning
    - Additional TAs may mitigate issues with student feedback
- Student engagement, experience and program support services
- Quality indicators – undergraduate students
    - Work to maintain Astronomy & Astrophysics enrolment numbers, and consider if recruitment efforts should focus on continued growth in this area and should be extended to students in year one
    - Ensure resources for the Planetary Science program are drawn from existing resources used by the Astronomy & Astrophysics programs
    - Start collecting completion and employment outcome data

2. Graduate Program

The reviewers observed the following strengths:

- Overall quality
    - Strong overall quality of graduate programs
- Objectives
    - Program objectives are consistent with the overall Faculty and University level learning objectives; Department is doing a good job of navigating program objectives with institutional objectives
- Admissions requirements
    - Appropriate admission standards that are serving the Department well
- Curriculum and program delivery
    - PhD students complete two projects at the beginning of their program with two different supervisors; this method seems to a good opportunity for incoming students to make an informed selection of a permanent supervisor, and students report being satisfied with this approach
- Innovation
    - Variety of research discussion groups that meet regularly, enhancing the quality of the programs
- Assessment of learning
    - Design of qualifying exams seem to be working effectively, and are similar to comparable programs
- Student engagement, experience and program support services
    - Social engagement opportunities through various outreach activities
    - High emphasis on outreach and communication though public tours; Dunlap provides several staff to support communications and outreach activities
- Quality indicators – graduate students
    - Increase in applications to graduate programs from 2008-2015 (applications have approximately doubled), and increase in PhD enrolments
    - Completion rates are consistent with peers

- Graduating student survey results show that nearly all graduates rated the program as excellent or very good
- Good number of graduates obtain tenure-track and other post-secondary employment opportunities
- Morale high among current graduate students

The reviewers identified the following areas of concern:

- Curriculum and program delivery
  - Unclear if any of the 2.0 FCE courses for the direct-entry PhD are required core courses, and if any of the 2.0 FCE can be completed from outside the Department
  - Limited number of courses, especially theory courses given that CITA faculty are not required to teach
  - Difficulty in offering consistent number of courses due to faculty changes
- Accessibility and diversity
  - Building infrastructure poses accessibility concerns, and mental health, diversity, and harassment support claims, are important initiatives to enhance
- Student engagement, experience and program support services
  - Graduate advising may have suffered recently due to frequent changes in Graduate Chair
  - Faculty members at Scarborough and Mississauga are not involved in graduate student training
  - Some students reported that faculty could be more engaged and attend student talks; a recent event was cancelled due to low attendance
- Quality indicators – graduate students
  - Mean time to completion is 6 years, which exceeds allocated funding
  - Current female PhD Astronomy students are planning to leave the field post graduation at a higher rate than males

The reviewers made the following recommendations:

- Curriculum and program delivery
  - Consult with faculty members and graduate students regarding the course requirements and provide clear communication on requirements in all Department materials
    - Form a graduate curriculum committee to consult and address matters related to graduate curriculum
  - Address limited course offerings by:
    - consider offering additional “mini-courses”, ensuring that the Department evaluates whether this is a better option than expanding regular course offerings
    - encouraging postdocs to teach the mini-courses
    - review cognate unit offerings and external partner offerings
- Accessibility and diversity

    - Enhance awareness surrounding accessibility, diversity, mental health and harassment issues, and develop mechanisms to address issues
- Student engagement, experience and program support services
    - Graduate Chair should address student advising issues, and provide more information at student orientation regarding program requirements
    - Involve faculty from all three campuses in graduate student training
- Quality indicators – graduate students
    - Seek ways to decrease mean time to completion
    - Utilize graduate employment outcome data to promote the Department
    - Department should seek ways to show more female role models in faculty and teaching positions

3. Faculty/Research

The reviewers observed the following **strengths**:

- Overall quality
    - Strong research profile, which is attractive and assists with recruitment of students, postdocs, visitors, and new faculty
    - Faculty strengths are a good match for program offerings
- Research
    - Good breadth of research areas
    - Strong in cosmology, galaxy structure and formation, exoplanets and planet formation, and compact object astrophysics, which are highly competitive fields, and the University has done well in recruiting outstanding faculty in the areas even following the loss of some collaborations
    - Scarborough faculty exoplanet group has helped build critical mass of researchers on campus, making it an attractive place to recruit further faculty in the field
    - New faculty have successfully obtain large instrumentation grants that ensures ongoing participation in various collaborative research projects
- Faculty
    - Reviewers were supportive of plans to fill a positions at CITA in gravitational physics positions, especially after the departure of a expert in general relativity and gravitational waves
    - High morale among teaching faculty

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

- Research
    - Heterogeneous mix of faculty research is somewhat confusing to students, postdocs, and new faculty; graduate students reported they were not well informed about when new faculty arrived in 2017
- Faculty
    - Only one faculty member at Mississauga, threatening critical mass on that campus

    - Complement plan provides specific years and areas for hiring faculty, however, suitable applicants may not be available on these timelines
    - Smaller percentage of female faculty members than the percentage of female students; some faculty report that difficulty with spousal hires can lead to increased difficulties in increasing females and diversity
    - Some faculty felt collaboration and communication across the Department had decreased in recent years

The reviewers made the following **recommendations**:

- Faculty
    - Conduct broad faculty searches to optimize hiring outcomes
    - Department, CITA, and Dunlap should utilize best practices for recruiting women, visible minorities, persons with disabilities, and other underrepresented groups, including having representative hiring committees
    - Coordinate all faculty hiring, rather than having independent requests and searches based on unit, and consider possibility of joint hires with other cognate units such as physics, engineering, and computer science

4. Administration

The reviewers observed the following **strengths**:

- Relationships
    - General morale is good among faculty, staff, and students, and overall the Department has fruitful relationships with cognate units
    - Postdocs and younger faculty at UTSC are interactive and help bring the units together
    - 2016 NSSE results show superior campus environment and stronger student-faculty interactions at the Department than compared to other Ontario and Canadian peers
    - Only pure astronomy department in Canada, and combination of Department, CITA, and Dunlap make it one of the strongest concentrations of astronomy and astrophysics in North America
- Organizational and financial structure
    - Dunlap Institute has been successful in obtaining instrumentation funding, and only a few Departments have as much cutting-edge instrumentation
    - Existing human resources are deployed well to support the Department
- International comparators
    - University, more specifically CITA, is a world leader in the field of theoretical astrophysics, especially in the areas of cosmology and fundamental astrophysics
    - Ongoing participation in cosmic microwave experiments, helps maintain the impressive reputation in the field
    - Current President of the Canadian Astronomical Society is Department faculty member, which exemplifies the strength of the Department

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

- Relationships
    - Morale among staff is somewhat lower due to workloads, building accessibility issues, and poor communication between the Department and Dunlap
    - Postdoc morale at the Department is lower than at CITA and Dunlap due to lower stipends and research support, and inability to supervise summer research students due to lack of available funding
    - Communication and collaboration challenges have arisen given the many units at play (the Department, Dunlap, CITA, UTSC, and UTM) and their physical separation
    - Relations between the Department and Dunlap can be challenging due to differences in leadership, mission statement, and funding models
    - Differences at the Department and Dunlap can make it difficult to find a common ground on matters of equity, diversity, and inclusion
- Organizational and financial structure
    - "The current building is not accessible to disabled persons"
    - Staff do not have a private space to meet with students, limiting the support available to students who need a private space to speak freely about their concerns
    - Department seems to have less financial support for research, travel, and postdocs, when compared to CITA and Dunlap, and an updated space would be of great benefit to the Department and University overall

The reviewers made the following **recommendations**:

- Relationships
    - Department is encouraged to remedy stipend differences for postdocs, and to remove the barrier preventing supervision of summer students
    - Find ways to strengthen the sense of community across all collaborating units
    - Emphasize different missions as a strength and ensure there is good coordination and communication where research areas overlap; consider joint fundraising and outreach efforts, and other ways of reducing competition; and immediately coordinate activities of leadership, perhaps by having the Chair and two Directors meeting on a regular basis
    - Prioritize finding shared vision across the Department, Dunlap, and CITA for equity, diversity, and inclusion in order to provide a welcoming environment
    - Consider a unifying structure such as the proposed "School of the Cosmos", which would ensure equity and facilitate growth
- Organizational and financial structure
    - Continue plans for new building development, and consider organizing faculty in new building by research area not necessarily by home unit

UNIVERSITY OF TORONTO
FACULTY OF ARTS & SCIENCE

March 8, 2019

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

Re: UTQAP cyclical review of the Department of Astronomy and Astrophysics

Dear Professor McCahan,

Along with the faculty, staff and students of the Department of Astronomy and Astrophysics, I am pleased with the external reviewers' assessment of the Department and its programs: Astronomy & Astrophysics, B.Sc. Hons. (Major, Minor); Astronomy & Physics, B.Sc. Hons. (Specialist); Planetary Science, B.Sc. Hons. (Specialist); and Astronomy & Astrophysics, M.Sc., Ph.D. The reviewers complimented the Department on the "*strong and successful*" undergraduate and graduate programs.

The quality of this program notwithstanding, as per your letter dated January 21, 2019, the review report raises a number of issues and challenges. I am writing to address the areas of the review report that you identify as key. The response to these items and implementation plan are separated into immediate (six months), medium (one to two years), and longer (three to five years) terms, where appropriate, along with who (Program Coordinator, Department, Dean) will take the lead in each area. The Dean's office has discussed the reviewers' comments through consultation with the Department, including conversations between the Chair and the Vice-Dean, Academic Planning and Strategic Initiatives, the Vice-Dean Graduate, the Vice-Dean Research and Infrastructure, and senior staff within the Dean's office, in order to develop the following implementation plan incorporating the reviewers' recommendations.

The reviewers remarked on the need to support communication and collaboration amongst units and amongst faculty located in different spaces and campuses.

This unit faces challenges with respect to communication and collaboration, given both the physical space (spread across multiple sites), and the complex organizational structure. On the St. George campus, the Department of Astronomy and Astrophysics is located primarily in the Astronomy building with three faculty in the Burton Tower of McLennan and one in a separate High Bay Building attached to the Earth Sciences Building. The Dunlap Institute is in the Astronomy Building; CITA is in the Burton Tower of McLennan. Despite the challenges of working across different locations and organizational units, the development of large integrated astrophysical projects -- with combined theoretical, observational and instrumental interests -- has led to strong overlap of function and internal day-to-day collaboration between members of all units.

Collaboration and communication is also essential to the success of the tri-campus graduate program. The Graduate Chair consults with colleagues at UTM and UTSC to support their planning. The UTQAP review of the undergraduate Chemical and Physical Sciences programs (CPS) at UTM, which includes the Astronomy group, pointed to student demand for astronomy courses and the success of the UTM astronomy strategy of being distinct but an important piece of the overall strength of University of Toronto Astronomy and Astrophysics. The external review of CPS expanded on the value of retaining Astrophysics at UTM. The tri-campus graduate department strongly supports initiatives at UTSC to build a strong and stable research presence on that campus.

The Chair has developed an implementation plan to enhance communication and collaboration. This includes both an effort to address the problems of fragmented physical space, as well as efforts to build community.

Implementation Plan

Immediate term response: In the short term, the Department has made changes in space allocation to cluster students, PDFs and faculty with common interests close by each other. Professional staff and instrumentation labs and students are located in their preferred location of the Astronomy Building basement. A set of linked office reassignments in early 2019 adjusted some inappropriate room assignments and allowed the Chair to provide the final 40 some square meters of lab space to one of the unit's faculty members.

Immediate to medium term response:

Communication in the tri-campus program: The Chair will continue to support ongoing informal interactions with the two suburban campus groups in order to stay in touch with developments. At the same time, the Chair will commence a set of focused formal meetings with UTM and UTSC Astronomy and Astrophysics faculty and their Department Chairs to discuss concerns and opportunities. These meetings will happen annually, in the spring of each year. In addition, the Department will hold a retreat for all graduate faculty in the spring or summer of 2019 to systematically consider all aspects of the graduate program. Topics for discussion will include enrolment trends, funding, program requirements and course offerings, the qualifying exams, supervision, and time-to-completion. The Chair will prepare a report on the retreat, to be circulated within the tri-campus graduate program, including recommendations for improved practice, changes in Department policies, and course revisions.

Communication across the St. George units: At St. George, there are three separate units with partially overlapping but separate mandates and distinct funding: The Department of Astronomy and Astrophysics, CITA, and the Dunlap Institute. Letter agreements have been a successful basis for handling issues of joint interest. For instance, the current planetarium is a teaching tool and is also used for outreach. The Department owns and maintains the planetarium and has staff for its operation. The Department and Dunlap have an agreement that allows the Dunlap Institute to use the planetarium for a wide range of outreach presentations. A Letter Agreement with Dunlap allows the Department to offer enhanced training opportunities for Contractually Limited Teaching Appointees. The Letter Agreement puts in place the funding and responsibilities for initiatives of joint interest in separate mandate areas that are aligned with the overall strategic plan for the Department.

Longer term response: In the longer term, the Faculty is engaged in planning for a new purpose-built Astronomy Building. The Dean's office has initiated the process to select an architect to prepare a conceptual design of the New Astronomy Building. The new building will be a major step to bring everyone into a common, modern space that will have an emphasis on interactive spaces from the outset.

The reviewers also relayed concerns regarding the diversity of the faculty complement and suggested ways to optimize hiring outcomes. They also commented on the need for the units to find common ground regarding diversity, equity and inclusion.

The Department is committed to enhancing diversity in faculty complement and making the Department a welcoming environment for all. Of the four most recent hires in Astronomy and Astrophysics, two are female, two are male.

Currently, CITA has no female faculty, and there are significant efforts underway to bring outstanding women faculty into the Institute (including the potential use of a Canada Excellence Research Chair - CERC – that has been awarded to CITA). While this is a good start, it will be important to hire strong female candidates into junior theoretical astrophysics positions throughout the Astronomy and Astrophysics groups in Toronto.

Implementation Plan:

Immediate term response: In January 2019, the Department invited the American Physical Society's Committee on the Status of Women in Physics (APS CSWP) to undertake an equity and inclusion climate survey of the entire Department. The Department expects to receive the report in the spring of 2019. The unit heads will have an initial assessment of the outcome. The Chair will meet with stakeholder groups to discuss the issues raised in the report.

Diversity in faculty complement is also a priority for the Faculty more generally. In 2017-2018, Arts and Science identified a set of six Faculty Priorities (http://www.artsci.utoronto.ca/faculty-staff/academic-planning) including "Enhancing Equity, Diversity and Inclusion." As part of the Faculty's current Academic Planning exercise, the Dean has formed a new Equity, Diversity and Inclusion Working Group, with representation from faculty, staff, and students. This group has a mandate to explore ways to increase representation from underrepresented groups and enhance opportunities to build diversity and create a more inclusive Faculty environment; this includes a discussion of how to increase the proportion of women (faculty and students) in STEM fields. The Working Group will develop a series of recommendations in a report to be submitted to the Dean in May 2019.

Medium term response: The Chair will set up working groups to address diversity issues raised in the forthcoming ASP CSWP report.

Longer term response: The Department is committed to increasing diversity in the program. The Department will engage in active outreach to under-represented student groups; the proposed planetarium in the new Astronomy building, once complete, will provide the Department with a means of engaging with high school students and fostering an interest in science. The Department will hold a retreat in 2022 to assess progress on diversity.

The reviewers made recommendations to strengthen the undergraduate curriculum and student experience, including ensuring that the curriculum committee meets regularly and enhancing student advising.

An Undergraduate Program Committee was established in 2016-17, chaired by the Undergraduate Associate Chair, with all faculty teaching program courses as members. The committee is open to student membership. The committee meets at the beginning of each semester to review course content.

Implementation Plan:

Immediate to medium term response: Undergraduate Program Committee: The Chair will meet with the Undergraduate Program Committee in April 2019. The Chair will work with this committee to review the full undergraduate curriculum and recommend changes and improvements, as appropriate. In the future, these meetings between the Chair and the Committee will take place annually, at the end of each academic year. Starting in 2019, the Department will commence a curriculum mapping exercise, to more formally review learning outcomes for the program.

Program Advice: As student numbers in the program have grown, capacity for advising became strained. With new staff, however, the Department now has an opportunity to address this issue. More specifically, in the fall of 2018, the Department appointed a new Undergraduate Assistant with experience in advising at the college level. This new staff member is now playing an important role in advising students at all levels in the program.

Medium term response: In the longer term the Department will maintain a consistent series of review and update meetings to encourage and support ongoing innovation in content and teaching methods in all its courses.

With respect to the graduate program, the reviewers encouraged engaging in consultation with faculty and graduate students to clarify program requirements, improve advising, find ways to shorten time to completion, and address challenges in offering a consistent number of graduate courses.

Implementation Plan

Immediate term response:

Advising: Graduate advising has many elements. Students receive important advice on program requirements, funding, and sources of support from the Graduate Program Assistant. (The Program Assistant was recently nominated for an award which was featured in the *Bulletin*.) The Graduate Associate Chair also provides advising for all first-year graduate students and will advise other students as requested. In the second year, the PhD supervisor and the supervision committee become a primary source of academic and career advice. The Chair is available for advice should a student feel that there needs to be another level of advice. The Chair will work with the Graduate Associate Chair to ensure that students are aware of all avenues for academic

advising (Program Assistant, Supervisor, Committee, Graduate Associate Chair, and Chair) early in their studies.

To monitor and guide the overall advising, the Chair will form a committee with the Graduate Associate Chair and the Graduate Administrator. The committee will seek faculty and student input to provide an annual report to the Department on strengths and weaknesses.

Consultation: The unit will work to increase consultation through the Graduate Program Committee. This Committee was established in 2016-17, with the Graduate Associate Chair as the committee chair, and includes active student membership. The Committee has already been involved in addressing a series of complaints with regard to course availability and course content that were the result of three unexpected resignations. The Chair also met privately with a group of students to solicit detailed comments on graduate courses and instructors. The Graduate program Committee and the leadership of the Graduate Associate Chair are key elements to address these issues.

Time to Completion: In addition, the Chair will form a committee to discuss approaches to the time to completion and will be formed with strong student representation. The Faculty's Milestones and Pathways program http://www.artsci.utoronto.ca/graduate/milestones-pathways is a source of advice and support to advance these goals. The Chair will seek funding from this program to support a focused meeting on graduate completion times. The meeting will be prior to a Department retreat to ensure that some developed ideas are presented.

Medium term response: The Graduate Program Committee is required to meet at the start of each teaching term and will have an end of term meeting with the Chair in the spring to assess outcomes, review course outlines, and either make or recommend changes for the following year.

With input from the Graduate Program Committee, there is now a two-year forward plan for the four core graduate courses. Instructors for the current year are published and the courses that will be offered the following year are named, although the instructors are not specified. With the rapid growth in graduate enrolment, all the core courses are currently offered every year.

The Chair, Graduate Associate Chair and Graduate Administrator will have at least one meeting a year to assess graduate advising in general and the performance of the supervision committees. There will be an opportunity for confidential student input prior to the meeting.

The reviewers noted that the current building is not accessible and recommended creating a working group to address student access concerns; they also noted the importance of space where students can speak freely with staff about concerns.

The Department has had multiple consultations with several appropriate offices including, but not limited to, the U of T Accessibility office and the Faculty of Arts and Sciences Infrastructure Planning Office. Unfortunately, accessibility is often problematic in postwar institutional buildings on campus. The Faculty and the Department have been advised that, at present, the latest AODA and building code accessibility standards as it relates to the built environment are only applied to new buildings or extensive renovations. As such, all spaces at U of T meet the accessibility code of the time of construction/renovation.

This issue has been discussed with Facilities and Services; the Faculty has been advised that "the University recognizes that more should be done and will be implementing a new accessibility program to proactively address barriers that exist in our environment. The program structure is currently under development, and will focus on the areas of greatest needs as identified by an accessibility audit and the program/prioritization recommendation of the accessibility committee."

Implementation Plan

Immediate term response:

Accessibility: The Department, together with the Accessibility office, will continue working on a case-by-case basis when a building accessibility request arises. In the short-term, the Department will create a working group to address student access concerns related to accessibility. This group will be composed of two staff members, two students (GASA representatives) and two faculty (Graduate and Undergraduate Associate Chairs) reporting to the Chair.

Private meeting space: All faculty (including visiting scientists) have private offices. All staff members, except for the departmental assistant/undergraduate coordinator, have private offices. The Department has private meeting rooms available for confidential consultation, either individually or in groups.

Medium to longer term response: Replacing the Astronomy building is a priority for the Faculty of Arts and Sciences. On January 9, 2019, the formal Request for Supplier Qualifications (RFSQ) for a new astronomy building was released. A new building will be constructed according to the current standards and will be accessible.

The Dean's office will monitor the implementation of recommendations, with, at minimum, a brief report to the Office of the Vice-Provost, Academic Programs, midway between the year of the site visit and the year of the next site visit. The year of the next review will be the 2025-2026 academic year.

To conclude, we appreciate that the external reviewers identified the Department's strengths and noted a few areas for development. The Department of Astronomy and Astrophysics has already begun to move forward with plans to address the recommendations as presented by the reviewers.

Sincerely,

David Cameron
Dean and Professor of Political Science

cc.
Raymond Carlberg, Chair, Department of Astronomy and Astrophysics
Poppy Lockwood, Vice-Dean, Academic Planning and Strategic Initiatives, Faculty of Arts & Science
Daniella Mallinick, Director, Academic Programs, Planning and Quality Assurance, Office of the Vice-Provost, Academic Programs
Andrea Benoit, Academic Review Officer, Office of the Dean, Faculty of Arts & Science

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

At its meeting on April 2, 2019, the Committee on Academic Policy and Programs (AP&P) concluded that there were no issues to be drawn to the attention of the Agenda Committee but requested a follow up report in one year to address issues relating to post-doctoral fellow morale and community-building across units, notably between the Department and the Dunlap Institute.

4. Institutional Executive Summary

The reviewers praised the faculty's strong research profile, which is attractive and assists with recruitment of students, postdoctoral students, visitors, and new faculty. They also noted students' high graduate student satisfaction and the high quality of entering undergraduate students. The reviewers recommended that the following issues be addressed: supporting communication and collaboration amongst units and amongst faculty located in different spaces and campuses; addressing the diversity of the faculty complement, optimizing hiring outcomes, and finding common ground regarding diversity, equity and inclusion; strengthening the undergraduate curriculum and student experience, including advising; engaging in consultation with faculty and graduate students to clarify program requirements, improve advising, find ways to shorten time to completion, and address challenges in offering a consistent number of graduate courses; and addressing building accessibility and creating a working group to address student access concerns. The Dean's Administrative Response describes the Faculty, 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

The Dean's Office will monitor the implementation and recommendations, with, at minimum, a brief report to the Office of the Vice-Provost, Academic Programs, midway between the year of the site visit and the year of the next site visit. The year of the next review will be the 2025-2026 academic year.

6. Distribution

On May 17, 2019, the Final Assessment Report and Implementation Plan was posted to the Vice-Provost, Academic Programs website, and the link provided by email to the Dean of the Faculty of Arts & Science, the Secretaries of AP&P, Academic Board and Governing Council, and the Ontario Universities Council on Quality Assurance. The Dean provided the link to the Chairs and Directors of the Units.