

## External Review of the Department of Physics and Astronomy

April, 2025

### External Review Committee

Michael Luke, University of Toronto, Committee Chair

Sarah Gallagher, Western University

Bruce Wright, University of Victoria

### Executive Summary

Over the course of the two-day site visit, the Committee had the opportunity to meet broadly with members of the Department, with separate meetings with the faculty members of each of the major research groups in the Department, undergraduate advisors and teaching faculty, the departmental graduate director, technical and administrative staff, and representatives of graduate and undergraduate students. We also toured the undergraduate teaching labs, the Bob Wright telescope, and the Herzberg Astronomy and Astrophysics Research Centre (HAA). A final closing meeting was held to discuss initial findings and recommendations with members of the senior administration. These meetings and tours were extremely useful in familiarizing the Committee with the challenges and successes of the Department. We thank all those who met with us for their time, hospitality and thoughtful discussions.

The Department of Physics and Astronomy is nationally and internationally recognized for its excellence in research, and should be recognized within the University as a tremendous asset. Its traditional research focus on the two pillars of Astronomy and High Energy Physics has allowed it to “punch above its weight” in these fields, while strategic recent hiring in other research areas - particularly Condensed Matter Physics and Medical Physics - has allowed it to support strong research and graduate programs in those areas as well. It has been particularly successful at establishing extensive collaborations with other institutions, notably HAA, TRIUMF and BC Cancer, to further support its research and teaching missions. Aggressive hiring since the last external review and strategic leveraging of external support have ensured the continued viability of many of its research fields. The graduate and undergraduate programs are on the whole well-designed and provide a strong education, and the enthusiastic engagement of the many adjunct faculty in the Department significantly enhances the strength of the Department’s graduate program and research mission. The departmental staff are dedicated and provide essential support for research, teaching and administration. Undergraduates, graduate students, staff and faculty all reported to us an extremely collegial atmosphere in the Department, which should be seen as one of its underlying strengths.

Despite the very strong foundation, the Department is facing some major challenges. A recent unexpected faculty resignation combined with the demographics of the existing group mean that the Astronomy research group is in very serious need of renewal. Departmental services - particularly the electronics and machine shops, as well as support for academic computing - have been severely hit by recent budget cuts and reorganizations, to the point that services critical for both teaching and research are simply not sustainable in the current model. At the undergraduate level, the Department self-study correctly notes the antiquated state of many of its undergraduate teaching laboratories and the need for

capital upgrades. More broadly, while the undergraduate program is of generally high quality, we noted issues related to the coherence of the undergraduate program, pedagogy, integration of labs and lectures and unnecessary bottlenecks in the program that should be addressed. The graduate program is at a competitive disadvantage due to low levels of student financial support, and both students and faculty noted the difficulty in providing the comprehensive suite of graduate courses required by a department of this breadth. Finally, it was our impression that the Department's governance and administrative structure was insufficient for a department of this size and complexity, and that it would benefit from a more formalized structure with Associate Chairs for the graduate and undergraduate portfolios.

## **Recommendations**

1. The electronics and machine shops are essential to both the teaching and research needs of the Department and are critically short-staffed. The Department and University should develop a new cost-recovery and funding model for the electronic and machine shops to ensure their long-term viability.
2. Similarly, the Department's academic computing human resources are no longer adequate for its research and teaching needs, a situation which has become more pronounced with recent changes in the University's IT structure and focus on security concerns. The University should work with the Department to revisit the details of this set-up and come up with a plan to allocate more resources to academic computing to more effectively support the Department's teaching and research missions, and to make better use of the talents of highly skilled IT staff.
3. The Department should continue to make the hiring of an additional faculty member in Astronomy its top academic priority. More broadly, the Department's planning process must ensure the long-term viability of the Astronomy group as a top priority.
4. Renovation of the Department's teaching laboratories should continue, in the context of a broad-based undergraduate curriculum review.
5. The Department should undertake a comprehensive undergraduate curriculum review to address issues including integration of labs and lectures, modernization of the laboratory curriculum, time to completion, course offerings and coherence of both the Astronomy and Physics programs.
6. The Department should develop a model to offer more undergraduate research opportunities, particularly to students outside of the Honours program.
7. The Department should streamline the joint offering of graduate courses with nearby institutions, as well as further encourage the engagement of adjunct faculty in graduate teaching.
8. The University should work with the Department to identify ways to increase the level of graduate student financial support.
9. The Department should consider revising its faculty administrative structure to delegate more authority to Associate Chairs.