

# Two Year Progress Report

## Physics and Astronomy (BSc)

### January 2016

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#### **1. Aging facilities in the Department of Physics and Astronomy.**

The Physics and Astronomy building is among the oldest buildings on campus and was built 57 years ago. It currently houses 4/5 of staff and faculty offices, undergraduate teaching laboratories and research laboratories. Because of the deteriorating condition, accidents, such as water leakage, have damaged research and office equipment and continue to be a constant threat to experimental research in some faculty laboratories.

As planned in the past years, a partial solution has been achieved. Two teaching laboratories and two staff offices were moved to the new Science Teaching Complex in December 2015. These are showcasing undergraduate labs that service our students and can be used for outreach purposes. The Dean's Office provided a \$240,000 budget for upgrading equipment and fresh new supplies for the two laboratories.

Plans have been made to move some faculty laboratories to the proposed Science-2 building, which will be ready in approximately 3 years. The Physics Building itself, however, remains a challenge to maintain. We have started to plan modernization and maintenance of the Physics building, but currently there is no central funding for renovation projects at this time. Many of these decisions will depend on the new budget scheme.

#### **2. Few women represented among faculty members.**

The reviewers noted that women only comprise 10% of the faculty in the department, well below the number one sees looking at current graduate populations in physics and astronomy in North America.

We are anxious to increase the percentage of women in our faculty. Due to the hiring freeze the timeline for achieving a more respectable ratio is disappointingly long. We will do whatever we can with the few exceptional opportunities that do present themselves to us. In the past two years, we have made a concerted effort to identify strong women candidates and bring them in for interviews. Noted examples are: (i) a woman was selected for the final consideration during a 2014 search for a junior faculty

member in the quantum computing area, (ii) an outstanding female astrophysicist was offered the Distinguished Research Chair in Astrophysics position in 2015 (although she turned down the offer). In 2016 we did make two hires through IQC, one of whom is an outstanding woman. This year we have restarted our searches for the two Distinguished Research Chairs, in Condensed Matter and Astrophysics. Both committees will undergo equity training, with particular focus on addressing unconscious bias. Special attention, at all levels, is being paid to ensure that the strongest possible women candidates appear on the short list.

In the meantime, there is work we can do to make women feel more welcome within a male-dominated department; ultimately this will lead to improved success for hiring women as well. In March 2016 we invited a site visit from the American Physical Society Committee on Women in Physics. We received a thoughtful report with useful recommendations for how to improve the climate within the department, and ultimately address the gender balance. It is a priority to act on as many of these recommendations as possible.

We have been supportive of the student group FemPhys, which runs events aimed at promoting and educating about equity issues. We provide them with newly renovated space within the Physics building, a faculty mentor, and help to advertise and promote their activities. We are proud that the FemPhys cofounders, Emma McKay, Jennifer Reid and Sarah Kaiser, received SWEC's Equity and Inclusivity award in 2016.

Our Department is actively participating in the HeForShe initiative, by developing workshops for grade 7-8 girls, together with Science Outreach. By boosting participation of women in STEM experiences we are directly addressing one of the three pillars of Waterloo's commitment to participate in the Impact 10x10x10 framework. Of course this is just a start.

We have requested to have the women's washroom on the third floor of physics expanded, to address the clear need for a better balance in washroom facilities within the building.

We continue to appreciate the contributions from current female faculty members to our Departmental life. We nominated Melanie Campbell for her 2015 Status of Women Award of Distinction by the Ontario Confederation of University Faculty Association (OCUFA) for her work on improving the position of academic women through organizational, policy and educational leadership. We provide financial support (travel and accommodation) to Donna Strickland for her leadership activities at Canadian Association of Physicists and American Optical Society.

We recognize that the activities described above represent the first small steps that need to be taken to address the serious problem of not only gender imbalance within our department, but also of improving the climate so that all who work and study here feel welcome and comfortable.

**3. Employment data of our undergraduate students, six months to two years after graduation.**

The reviewers noted that there is a lack of employment data of our undergraduate students, six months to two years after graduation.

This data is collected by the Alumni Advancement Office in the Faculty of Science. The office maintains contact with Physics alumni, but they have difficulty receiving information from students after graduation. In 2014 the data received from alumni reveals that 17 % of them are working, 15 % enrolled in professional schools (Medical School, Pharmacy, Optometry, Nursing, Teaching, Respiratory, other), 63 % enrolled in graduate school and 5 % travel. In 2015 the data reveals that 36 % are working, 12 % enrolled in professional schools (Medical School, Pharmacy, Optometry, Nursing, Teaching, Respiratory, other), 44 % enrolled in grad school and 8% are travelling.

Looking at choices former students made when applying to Graduate Schools in Ontario, statistics shows that 52 % apply to University of Waterloo, followed by 15 % University of Toronto, 8 % Western University, 6 % University of Guelph and other.

Moving forward, the Alumni Office will provide information from Physics alumni on a regular, annual basis.

**4. Financial position - budget cuts to the Department.**

The reviewers noted that there were severe budget cuts to the Department.

In keeping with the institution's model for resource allocation, the budget cuts to the Department started in 2002. Cumulatively, a total of \$1,092,972 budget cuts were made to the departmental budget annually. This represents approximately 20% reduction of budget, where the total faculty salary in the Department is used as the basis. Consequently, we no longer have funding to direct towards non-salary operating expenses. We continue to function on an operating deficit.

In the past few years, we have taken some steps to increase funding by expanding undergraduate programs and course offerings. We currently receive short-term funding from the Dean for two Lecturers and one Lab Demonstrator. We are working with the Dean's office for a viable future plan to resolve the Physics budget

deficit problem. Once the new activity-based budget becomes clear, we will take steps to balance the departmental budget versus teaching activities. This may translate into reduction of course offerings.

**5. Launching a quantum information science undergraduate program.**

The reviewers commented on the possibility of launching a quantum information science undergraduate program.

Launching a new program requires careful planning based on a financial feasibility study. The Department, in collaboration with the Institute for Quantum Computing, is interested in creating a quantum information specialization, within the existing Honours Physics Program. The next step will be to discuss this idea among stakeholders, at both Department and Faculty levels, within the next year.

**6. Developing a new program in Computational Physics with Computer Science.**

The reviewers commented on the possibility of developing a new program in Computational Physics with Computer Science.

There was a Computational Science program in the Faculty of Science and Physics was an active partner. Due to weak enrollment, the program was inactivated in 2012. The idea of re-developing a similar program needs to be re-evaluated according to University/Provincial guidelines in creating a new program, also in light of the new activity-based budget scheme. The re-evaluation will take place in the current year.

**7. Cross-listing of graduate courses with undergraduate courses.**

The reviewers suggested the possibility of cross-listing of graduate courses with undergraduate courses. This is an excellent idea that will allow our undergraduate students to have access to our graduate courses, which are at an advanced level. The bottleneck here is avoiding using the same course for two degrees --- BSc and MSc. The Department of Chemistry has figured out a solution to this problem. Within the current academic year, our Department will connect with Chemistry to find out their solution, in order to realize this idea in near future.

**8. Participation of the Department in international exchanges for undergraduates.**

The reviewers commented that there is modest participation of the Department in international exchanges for undergraduates.

The Department is one of the most active players in the Faculty of Science to host the international 2+2 program. The number of Chinese partner universities in the

program has grown to 23. Here is a snapshot of activity in 2015: (i) As a single event, 49 Beijing Jiaotong University (BJTU) students entered into the Materials and Nano Science Program; (ii) about 10 students from other universities entered into regular Physics and Mathematical Physics programs. There are currently 120 foreign universities that have signed exchange agreements with the University of Waterloo. Our undergrad advisors currently promote and will continue to promote these existing opportunities and encourage exchange activities.

**9. “Islanding” of department members, in particular, groups of faculty members are assigned spaces in different buildings.**

The reviewers commented on the current “islanding” of department members, in particular, groups of faculty members are assigned spaces in different buildings.

As explained in the Reply to Report, this was a misunderstanding of the reviewers, perhaps based on their own observations. No complaints have been made to the Department Chair since the establishment of the new building. Some of our Quantum Computing faculty are located in a different building. However, our IQC members actively participate in all aspects of departmental life. Some of them are assigned major departmental service tasks and they are among the best citizens in the department. We do not see that the physical separation has any effects in “islanding” our department.

**10. Comments on “Colloquia are often specialized and do not draw the interest of people outside a given sub-discipline”.**

Moderate colloquium attendance has been a long standing problem in the department. As per the Chair’s decision, the 2015-2016 colloquium series is suspended until a viable new program is designed. We have now re-initiated a 2016-2017 colloquium and seminar series with fewer talks; the idea is to draw more attention to these talks with more advertisement time and preparation.

**11. The reviewers commented on the extensive use of teaching relief for select faculty and believed that this has a negative impact on morale.**

The reviewer's comment is not that the teaching relief in itself is excessive, or a bad thing, but that it *"could have a corrosive effect on morale", if "a significant number of faculty members feel a consequent extra teaching burden with little benefit to them"*.

We are confident that the teaching relief is not excessive in any way. It is normally given to faculty members who have an award (Steacie, Killam etc.) that directly requires it, to CRCs who are given some teaching relief according to Waterloo's usual practice, and to IQC/Perimeter joint hires where multiple positions were leveraged from original Waterloo FTEs. Since we are a successful, research-intensive department, it is natural therefore that we have several faculty on reduced teaching loads.

The normal teaching load of 3 courses per year is indeed heavier than other research-intensive Physics Departments in Canada. However, it is important to note that because of scheduling for the co-op programs, most departments in the Faculty of Science at the University of Waterloo- have a current teaching load of 3 courses per year per faculty member. The presence of faculty on reduced teaching loads has not altered the standard load per faculty in any way. Except for one instance where the individual has self-declared himself as research-inactive, no research-active members have been asked to teach more than 3 courses per year.

We also do not see evidence that a "significant number" of faculty members feel an extra burden, or see that the reward to strong researchers has little benefit to themselves. The reviewers do not say how many, if any, people interviewed felt this way. From our direct interaction with faculty members, it seems clear that our strong research presence is a matter of some pride and that people are happy to reward our strongest researchers with opportunities to grow even stronger. Though certainly not everyone will feel this way, most do.

Nonetheless, the reviewers are correct that teaching relief can have an impact on morale by creating an apparent division between faculty "types". The best solution to this, in our opinion, is not to reduce the amount of teaching relief, but to a) improve communication across the Department, and b) introduce rewards and activities that effectively demonstrate our underlying belief, that good teaching is at least as valuable

as good research. We expect that we have underperformed in these two areas, and that this led to the comments about impact on morale.

This problem has been recognized, but has not yet been tackled head-on. We have recently introduced a Departmental Teaching Award, which is a good start but which requires more visibility. Some good ideas have been proposed by faculty; a particularly attractive one is the reward of good teaching with financial support for research. We have yet to develop a mechanism to implement this.

The other area for improvement is communication across the Department, and this also needs some work. With the change in leadership in the Department, there is an opportunity to change the way we interact and introduce more opportunities for informal interactions.

### Summary and action items

Timeline	Aspect of the program	Reviewers' Comment	P&A Response	Responsibility for Action	Resources Required
2015	Infrastructure	1. Aging facilities in the Department	Transfer some undergrad teaching labs to Science Teaching Complex	Assoc. Chair/Chair/Dean <b>Accomplished.</b>	Funding for lab equipment
2018	Infrastructure	1. Aging facilities in the Department	Acquire new research space in Science Research Complex; Develop a building modernization plan	Chair/Dean <b>Planning</b>	New Science Research Complex; building maintenance/renovation funds
Current	Staffing	2. Low fraction of female faculty	Pay attention to female candidates; invite the University Equity officer to educate the search committees when new positions are available; invite American Physics Association Women in Physics Committee to provide recommendations; take action to improve the climate for underrepresented groups.	Chair <b>Ongoing</b>	Travel and accommodation costs of the APS visit



2015		3. Lack of employment data on B.Sc. graduates	Liaise with Faculty of Science Alumni Officer	Chair <b>Action already taken</b>	None
2015	Financial	4. Severe budget cuts	Introduce new programs and new general courses; Increase number of international students.	Chair/Dean <b>Accomplished</b>	Funding for Lecturers/Demonstrators
2018	Financial	4. Severe budget cuts	Plan per activity-based-budget scheme	Chair/Dean <b>Ongoing</b>	New budget scheme
2018	curriculum	5. Consider Quantum Information science undergrad program	Develop a viable curriculum and a firm business plan.	Chair/Curriculum Committee <b>Ongoing</b>	Minimum
2018	curriculum	6. Consider Computer Science undergrad program	Develop a viable curriculum and a firm business plan.	Chair/Curriculum Committee <b>Partially addressed</b>	Minimum
2018	curriculum	7. Cross-list grad and undergrad courses	Tackle the bottle-neck problem mentioned above	Chair/Curriculum Committee/Graduate Officer <b>Ongoing</b>	Minimum
2015		8. Participation in international exchanges	Actively participate in Chinese 2+2 program	Dean/Chair/Undergraduate Advisors <b>Accomplished</b>	Additional sessionals
2018		8. Expand international exchanges	Encourage through undergrad advising	Dean/Chair/Undergraduate Advisors <b>Ongoing</b>	Minimum

2013		9. Issue of "islanding" in department	Not an issue	<b>Chair Not an issue</b>	none
2015		10. Colloquium participation	Suspended until further planning; new scheme introduced for 2016-2017 year.	<b>Chair Ongoing</b>	Colloquium budget
2013		11. Impact of teaching relief on morale	Though teaching relief is reasonable, address the morale issue by rewarding good teaching activity, and improving communication.	<b>Chair Ongoing</b>	Some: financial rewards for good teaching



**Date of next program review:** \_\_\_\_\_ **2019**  
Date

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**Signatures of Approval:**

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Chair/Director \_\_\_\_\_ Date

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AFIW Administrative Dean/Head (For AFIW programs only) \_\_\_\_\_ Date

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Faculty Dean \_\_\_\_\_ Date

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Associate Vice-President, Academic \_\_\_\_\_ Date  
(For undergraduate and augmented programs)

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Associate Provost, Graduate Studies \_\_\_\_\_ Date  
(For Graduate and augmented programs)