

MEMORANDUM

March 22, 2019

The Faculty of Mathematics endorses the Two Year progress report for Combinatorics and Optimization (MMath/PhD) review.

All recommendations have resulted in a change of procedure within the department, and will be implemented on an ongoing basis.

We are happy with the progress that has been made, and the improvements that have resulted as a result of the review.

Yours sincerely,



Stephen M. Watt
Dean, Faculty of Mathematics



Two-Year Progress Report

Combinatorics and Optimization (MMath/PhD)

July 2019; revised February 2020

Background:

The last review of the Combinatorics and Optimization (C&O) MMath and PhD programs was completed in July 2016. The [Final Assessment Report](#) (FAR) was approved by Senate Graduate and Research Council on October 16, 2017. In the report, the reviewers concluded that C&O is a very high quality graduate program and that the Department is very unique in its constitution and attracts strong researchers and students. In addition, the report found that the graduate programs offered by C&O compare well with programs at Georgia Tech, Carnegie Mellon and MIT. The report did point out a few challenges and offered a number of recommendations.

Progress on Implementation Plan:

1. **Faculty recruitment:** The quality of the Department correlates directly with the quality of its faculty. It is thus very important to always recruit the best possible candidates. The Department has the good practice to keep the search as open as possible in order to attract the top candidate. We indeed encourage that practice. In some research groups it might be appropriate to have a more aggressive search. Therefore we recommend that some of the research groups promote a more active, focused search.

Action Items: The reviewers recommend that the Department promotes a more active, focused search in areas of need. This is C&O's current policy.

Status: ongoing

Details: As stated in the FAR, faculty recruitment has high priority in C&O. Indeed, C&O has in the past been very successful in attracting top candidates. The international competition for top candidates is very strong, and C&O circumnavigates this by advertising broadly. As we pointed out, certain Department members will be asked to help attract applicants in target areas. We recently implemented this strategy successfully: at the time of the report, C&O had openings in Continuous Optimization and in Cryptography. These two areas are notoriously difficult to hire in as demand for graduates here is exceptionally high in industry and in academia. With the help of colleagues in the respective areas we successfully targeted applicants in these two areas and hired two new colleagues in the 2017/18 hiring round. We expect to pursue such targeted hiring strategies in the future.

- 2. Faculty retention:** In most cases the Department views as the loss of some good members as a necessary corollary of the strength of the Department: if you hire the best people, then you expose yourself to poaching by other universities. This probably indeed explains most of the losses. But it would not hurt to also have a proactive view, and try to minimize this issue. To develop a sense of community, it may help to promote increased cross-pollination between the various institutions in the area, for example the Fields Institute.

Action Items: Contact faculty members that left the Department since 2006 and inquire for reasons. In the future determine reasons for leaving prior to the event.

Status: **ongoing**

Details: As the FAR states, faculty members that left C&O since 2006 were contacted, and responses were received. In summary, most faculty members left because they received prestigious positions in their home countries, or they left because of family reasons. Since 2017, only one faculty member left the Department. The Chair interviewed the faculty member prior to his leaving. It was determined that the colleague was leaving because of family reasons. In the future, the Chair will continue to interview colleagues that leave the Department prior to the event.

- 3. Gender balance:** We do not have much more to propose here. It is felt that real changes in the STEM imbalance of genders would require work to be done at a much younger age of development. The Department still has to work as hard as possible to create an appropriate model for increasing diversity among young hires -- but not at the cost of quality.

Action Items: no concrete recommendation was made. The Department will continue to encourage applications from women and minority candidates by advertising in appropriate venues, and by supporting local initiatives enhancing gender balance. The Department will also continue its efforts to encourage female and minority students to join its graduate programs.

Status: **ongoing**

Details: The Department will continue to advertise positions broadly, encouraging applications from women and minority candidates. In our last hiring round, we hired 5 new faculty members, 3 of which are women. One of these female hires is an “exceptional hire”, where, through substantial effort, we succeeded attracting a much lauded female star in combinatorics to our Department. About a third of the graduate students in C&O are women. The Department will continue to work to improve gender balance among its graduate students and faculty members in the future.

4. **Graduate student recruitment:** In the current demographic, there are not enough good domestic recruits to feed the vitality of the Department. This is especially true in mathematics in general, and C&O must turn to international students as well to complement their strength. At the University of Waterloo, the proportion of international graduate students is 38%; in the C&O Department it is 55%. This is not surprising for us and in fact we strongly recommend that the University continue to support this disparity. Reducing the proportion of international students would affect significantly the quality of the Department.

Action items: Fly in the best potential international candidate for a short visit of the University. Send faculty to recruit first hand in strategic areas in the USA (Boston, San Francisco, etc.)

Status: **ongoing**

Details: The Department continues to fly in potential graduate students from the US every year, and will continue to do so. Skype interviews with students, especially from countries outside the USA are also arranged. C&O continues to make offers to students (especially those of exceptional quality) as quickly as possible. C&O continues to encourage faculty to recruit strong students through contact at conferences and workshops. C&O faculty members are active in organizing international workshops and Summer schools, thereby increasing the Department's visibility to potential students.

5. **Graduate student funding:** This might be the greatest challenge of the Department. As mentioned above, it is important for C&O Department to have a higher proportion of international students. But the opportunities to fund such students are much less than domestic students, and the burden then rely on Principal Investigator (PI) grants. In some research groups, NSERC grants are insufficient to support the number of international students. Thus far the Department has been creative in their budget to allow the funding of the best international students in all research groups. It is vital that this practice continue. It is our understanding that the new budget model of the University will serve well the Faculty of Mathematics. We strongly recommend that with the new model a fair proportion of the budget be allocated to the funding of international graduate students. The strong international reputation of the Departments relies on this.

Action items: No recommendation to the Department was made

Status: **ongoing**

Details: Graduate student funding for domestic students was raised from \$26,000 to \$27,000 and for international students from \$38,000 to \$41,000. Funding levels will be reviewed annually.

6. **Communication:** We recommend that the Department work with all interested parties to improve communications issues.

Action items: Spend more time explaining policies and procedures to new students, and to new hires. Add elected graduate student representative to Department meetings. Adapt curriculum of mandatory graduate student seminar to include material on options and rights.

Status: **ongoing**

Details: Students are now actively organizing meetings to discuss concerns among themselves. Students have elected a representative who is now always attending Department meetings. Students have brought forward a number of suggestions in the past two years that were discussed and acted upon by the Department's Graduate Affairs Committee. The meetings of the Graduate Affairs Committee has also on occasion been attended by the graduate student representative for detailed discussions.

7. **Flexibility:** Within reason, the Department should be open to special request of the students. In particular, students should be aware of their options.

Action items: We are already very flexible. Graduate Chair will review options with students in meeting after semester 1. Will include discussion of student options and rights into graduate seminar.

Status: **ongoing**

Details: students continue to submit special requests and petitions for plan adaptations to the graduate affairs committee. If adequate reasons are submitted, these requests are usually approved. The graduate chair reviews rights and options with incoming students in his/her first meetings with them.

8. **Masters' Advising:** For Masters' students, plan one-on-one meetings with the graduate chair shortly after arrival and maybe once again in the course of the year.

Action items: Introduce meetings as suggested.

Status: **ongoing**


Details: The Department continues to organize a graduate student orientation in the Fall term. The Graduate Chair meets with incoming graduate students at the beginning of their first term in Waterloo. It is planned to have the Graduate Chair also meet with incoming students during the second and third terms of their first year.


Updated Implementation Plan

	Recommendations	Proposed Actions	Responsibility for Leading and Resourcing (if applicable) the Actions	Timeline for addressing Recommendations
1.	Faculty recruitment	Continue focused search in areas of need.	Chair	Ongoing
2.	Faculty retention	Continue to interview faculty members who leave the Department.	Chair	Ongoing
3.	Gender balance	Continue to work towards gender balance among faculty and students.	Chair	Ongoing
4.	Graduate student recruitment	Continue to fly in prospective graduate students from the US.	Chair, Graduate Chair	Ongoing
5.	Graduate student funding	Funding to be review annually.	Chair	Complete and to be reviewed annually.
6.	Communication	Continue to engage graduate students in department-wide discussions on policy and procedures.	Chair, Graduate Chair	Ongoing
7.	Flexibility	Continue to inform student of their rights and options.	Chair, Graduate Chair	Ongoing
8.	Masters advising	Continue to have one-on-one meetings with graduate students, especially in their first year on campus.	Graduate Chair	Ongoing

The Department Chair/Director, in consultation with the Dean of the Faculty shall be responsible for monitoring the Implementation Plan.

Date of next program review: _____ 2022-2023
Date

Signatures of Approval:

Chair/Director _____ Date 2019-4-3

AFIW Administrative Dean/Head (For AFIW programs only) _____ Date

Faculty Dean _____ Date 2019-04-03

Note: AFIW programs fall under the Faculty of ARTS; however, the Dean does not have fiscal control nor authority over staffing and administration of the program.

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

August 7, 2019

Associate Vice-President, Graduate Studies and Postdoctoral Affairs _____ Date
(For graduate and augmented programs)