Faculty of Mathematics Strategic Plan 2018

Background Information

September, 2017
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About the Faculty of Mathematics

The University of Waterloo's Faculty of Mathematics has the largest concentration of mathematical and computer science talent in the world. Perhaps the best testimony to Waterloo's standing and exceptional reputation is the quality and many achievements of the Faculty's teachers, researchers, alumni, and students. With more than 8,000 undergraduate and graduate students, 240 full-time professors, and 500 courses in mathematics, statistics and computer science, the Faculty is a powerhouse of discovery and innovation.

The Faculty of Mathematics is committed to making important contributions to undergraduate and graduate teaching, research and innovation across the full range of our academic departments (Applied Mathematics, Combinatorics and Optimization, Pure Mathematics, and Statistics and Actuarial Science) and the David R. Cheriton School of Computer Science.

Mathematics offers undergraduate programs in department/school-based specializations as well as a number of interdisciplinary and collaborative programs, some jointly with partner Faculties and with Wilfrid Laurier University. In fall 2016, over 7,200 undergraduate students (23% of the University of Waterloo undergraduate student body) were enrolled in the Faculty of Mathematics. Over 70% of our undergraduate students are registered in co-operative education programs, alternating academic terms with paid work terms during which they gain invaluable experience. Several initiatives encourage undergraduates to engage in research, including research assistantships and the Jessie W.H. Zou Memorial Award for Excellence in Undergraduate Research.

Outstanding students are drawn to our Faculty from across Canada and around the world, with international students forming 37% of the undergraduate student body and 43% of the graduate student body. Over 90% of new first-year undergraduate students in fall 2016 had entering averages of 90% or higher, and our undergraduate teams regularly place high in the North American Putnam Mathematics Competition and in the worldwide ACM computer programming competition.

Over 900 graduate students were enrolled in the Faculty of Mathematics in fall 2016, making up 17% of the total University of Waterloo graduate student body. Of these, 34% were doctoral students. In addition to master’s and doctoral programs in each academic unit, we offer interdisciplinary and course-based professional master’s programs including a fully online Master of Mathematics for Teachers. Graduate students are an essential part of our research program, and our doctoral students have won annual “best thesis in Canada” awards on many occasions.

Our faculty members attracted $15.4 million in research support in 2016/17, including a record high of $5.7 million in NSERC Discovery Grants. An extensive program of research seminars runs continuously in the Faculty, often featuring speakers from industry and institutions around the world. Fourteen faculty members have been awarded Canada Research Chairs, two have received the Killam Prize, two have been awarded Steacie Fellowships, three have been named to the Order of Canada, and 20 have been named Fellows of the Royal Society of Canada. In 2017, the QS World University Rankings by Subject ranked the University of Waterloo #34 in mathematics and #31 in computer science and information systems.

The Faculty is very active in outreach and enrichment programs to promote mathematics and computer science in elementary and secondary schools in Canada and around the world. Coordinated through the
Centre for Education in Mathematics and Computing (CEMC), this outreach includes contests, workshops, school visits, and online resources for students and their teachers. The CEMC aims to increase enjoyment, confidence, and ability in mathematics and computer science among learners and educators in Canada and internationally. As just one example of its reach, more than 200,000 school children in over 50 countries now participate in CEMC contests each year.

The data provided in Appendix A provide more information on select areas of our activity.

Mission
The mission of the Faculty of Mathematics at the University of Waterloo is to:

- Conduct research that has worldwide impact and recognition;
- Provide learning opportunities of unmatched breadth and depth;
- Produce graduates that are in worldwide demand; and
- Increase awareness and excellence of mathematics and computing nationally and globally.

Values
The values that guide our decisions, strategies and actions are:

- Excellence
- Leadership and Impact
- Creativity and Innovation
- Engagement and Integrity

About the Faculty of Mathematics Strategic Plan 2018
The current Faculty of Mathematics strategic plan is nearing its end and Dean of Mathematics Stephen Watt has initiated a broadly consultative, data-informed process to develop the next strategic plan for the Faculty of Mathematics.

The Faculty of Mathematics Strategic Plan 2018 will build on the achievements that have been made over the past five years within the context of our current strategic plan. See Appendix B for highlights of achievements and ongoing initiatives from the Faculty of Mathematics Strategic Plan 2012-2017.

Process and Timelines

Development of the strategic plan will be guided by the Mathematics Strategic Planning Committee (MSPC). See Appendix C for its membership. The committee’s work will be informed by input from our internal and external community members, which will be collected during a broad consultation process in fall 2017, and by data collected about the Faculty from internal and external sources.

A representative group of individuals from across the Faculty will be invited to participate in a planning workshop in December to review the consultation findings and to initiate the development of plan objectives, strategies, and actions. MSPC will work through the winter term to review and refine the
work of the planning workshop participants to finalize content for a draft plan, which will be shared for feedback in June before a final plan is published in July.

Ultimately, the Faculty of Mathematics Strategic Plan 2018 will align with the Faculty’s mission and values and will seek to move the Faculty forward in a focused way on our shared priorities.

Vision
The Faculty’s vision is to be

- A world leader in mathematics, statistics, and computer science.

Draft Key Priorities
The draft key priorities of our strategic plan, which will be subject to review and refinement by our various stakeholder groups this fall, are:

- Research and Graduate Studies (including research at all levels and all graduate programs – not simply the intersection of the two)
- Undergraduate Studies (including academic programs, co-operative education, and online education)
- People (including the recruitment and support of excellent students, faculty, and staff; support may include elements of services, experience, environment, well-being etc.)
- Innovation (including but not limited to entrepreneurship, commercialization, and implementing new methods and processes)

Planning Context
The planning context will largely be defined through the consultation process in fall 2017. Participants will provide insights into the Faculty of Mathematics’ greatest strengths and areas for potential improvement as well as opportunities, risks, and challenges in our internal and external environment that the strategic plan should address.

Elements of our current environment that can be identified at this stage include:

- The University of Waterloo introduced a new budget model in 2017/18.

  Based on a hybrid of activity-based budgeting systems – known as responsibility centre management (RCM) – revenues earned by a Faculty are allocated to that Faculty. Part of that income is returned to create a university fund which is used to support university-wide strategic initiatives and plans; and part in the form of allocated charges equal to each Faculty’s fair share of administrative and facilities costs.

  This strategic planning exercise will support the Faculty of Mathematics in effectively deploying our resources and in maximizing financial opportunities in support of our strategic priorities.

- The provincial government is transitioning to a new funding formula approach for universities beginning in 2017/18.

  Major changes introduced by the revised funding formula include the return to corridor funding and negotiated enrolment plans (away from recent past practice through which almost all
eligible enrolment growth was automatically funded) and the shift to tie more funding to performance metrics.

This return to corridor funding will require Waterloo to more carefully plan and monitor its admission targets, retention rates, and overall enrolment.

- A new Strategic Mandate Agreement (SMA) is under negotiation with the provincial government.

The University of Waterloo is in the process of negotiating its SMA for 2017/18-2019/20 with the government of Ontario. SMAs operationalize Ontario’s Differentiation Policy Framework for Postsecondary Education in Ontario and outline the role of each institution in Ontario’s postsecondary education system and how each institution intends to build on its current strengths and support government priorities. This SMA will include negotiation of factors relevant to revisions to the university funding formula and will define Waterloo’s differentiation priorities.

- The Ontario population of 18-20 year olds is in decline.

Demographic projections for Ontario show the population of 18-20 year olds declining from 2014 to 2021. Population projections for 18-20 year olds in the GTA and Toronto are more favourable than other regions in Ontario; however, the Central region, which includes Waterloo Region, has a less than favourable population projection. The population of 18-20 year olds in the Central region is projected to not return to 2012 levels until 2034.

- The University of Waterloo will be initiating a strategic planning process for the institution.

The Mathematics strategic planning exercise will both establish the next strategic plan for Mathematics and prepare the Faculty’s leadership to provide informed and considered responses to the institutional planning process.
Appendix A

Overview Data

In May, 2017 the Faculty of Mathematics was home to 243 full-time equivalent faculty members and 126 full-time equivalent staff members. Since 2013, both groups have grown by 11%.

Fall 2016 enrolment in Faculty of Mathematics undergraduate degree programs (including half of the students enrolled in both programs we offer jointly with other Waterloo Faculties) was 7,205. That figure increases to 7,413 when students enrolled in our English Language for Academic Success (ELAS) program are included. The Faculty of Mathematics currently accounts for 23% of all undergraduate degree students at the University of Waterloo, and awarded 35% of all the undergraduate mathematics and computer science degrees granted in Ontario in 2015. Since 2007, our undergraduate enrolment has increased by more than 50%.

There were 2,490 women enrolled in undergraduate degree programs in the Faculty of Mathematics in fall 2016, over 1,000 more than a decade prior. Women now represent 34.6% of our total undergraduate enrolment, an increase of over 4.5 percentage points since 2007.
Almost 72% of our undergraduate student body is enrolled in co-operative education. The proportion of students enrolled in co-operative education has grown by almost 2.5 percentage points since 2007. This increase in participation, coupled with overall enrolment increases in the past decade, results in 1,800 more undergraduate students enrolled in co-operative education than in 2007.

As enrolment and participation in co-operative education has grown, so has the need for work term employment opportunities for students in the Faculty of Mathematics. Despite this growth, our students’ work term employment remains extremely strong. In 2015/16, 4,351 co-op work terms were filled by Faculty of Mathematics students, who earned more than $69 million.

In fall 2016, 932 graduate students were enrolled in the Faculty of Mathematics, 400 more than in fall 2007. Over the past decade, total enrolment increased by 43%, PhD enrolment increased by 17%, and enrolment in research master programs increased by 26%. Since 2011, enrolment in professional master programs (defined as those master programs where students are not required to complete a significant research work under the supervision of a faculty member) has almost doubled as new programs have been introduced. Faculty of Mathematics graduate students make up over 17% of the University of Waterloo graduate student body.
The proportion of women in our graduate programs has increased significantly over the past decade. Women made up 33.4% of the graduate student body in fall 2016, an increase of seven percentage points since 2007. As a result of this increase and overall growth in graduate enrolment, the number of women enrolled in Faculty of Mathematics graduate studies reached an all-time high of 311 in fall 2016.

Mathematics researchers earned $15.4 million in research funding in 2016/17. The year prior, we had reached a record high of $18.6 million. When monitoring funding changes over time, a three-year rolling average can be used to mitigate the impact of such year-to-year variations in research funding (often due to changes to funding opportunities, granting agency budgets, and faculty complement). Research funding in the Faculty of Mathematics for the 2014/15 – 2016/17 period is down 1.5% over the previous period and has increased 12.2% over the 2009/10-2011/12 period.

The Natural Sciences and Engineering Research Council of Canada (NSERC)’s Discovery Grant programs are the single largest contributor to our research funding and can be considered an indicator of research quality. Discovery Grant funding to Mathematics researchers reached a record $5.7 million in 2016/17. Over 16% of Individual Discovery Grants to Mathematics researchers in 2016/17 were in the 90th percentile of awards for value, relative to their selection committee.
Appendix B

Strategic Plan 2012-2017: Progress Highlights

PRIORITY AREA 1: RESEARCH AND GRADUATE EDUCATION

A vibrant research environment and enriched graduate student experience

- Numerous excellent faculty hires from top graduate institutions worldwide
- Increased graduate enrolment: +10% over the plan period
- Enhanced graduate recruitment and admissions processes
- New Faculty funding to help faculty members support domestic MMATH and PhD students
- Math Graduate Student Association established

PRIORITY AREA 2: UNDERGRADUATE EDUCATION

Outstanding undergraduate teaching and learning opportunities across all programs

- Excellent progress made – and continuing – to increase online learning opportunities: +140% enrolment in online Faculty of Mathematics courses since 2011/12; Möbius developed; Crowdmark and Piazza introduced
- Plans in progress to expand the Mathematics Undergraduate Office (MUO) to better meet student needs
- Mathematics Teaching Fellow position established
- New two-course communications requirement, with very small course sections for Faculty of Mathematics students, to improve student communications skills
- More extensive leveraging of the NSERC USRA program
- Increased undergraduate enrolment: +15.5% over the plan period

PRIORITY AREA 3: ACADEMIC PROGRAM DEVELOPMENT AND SUPPORT

Offer leading-edge, dynamic academic programs

- New teaching credit structure supports faculty member online course development
- Regular process and schedule followed for program reviews

PRIORITY AREA 4: INTERNAL AND EXTERNAL COMMUNICATIONS AND ENGAGEMENT

Regular, relevant, timely communications and engagement with our communities

- Increased participation in Centre for Education in Mathematics and Computing (CEMC) contests, Problem of the Week, and outreach workshops
- New Communications and Student Liaison Officer staff position to connect with student government
- Increased Math Ambassador Program participation: now several hundred undergraduate volunteers per year
- New alumni e-newsletter (Math e-ties) and increased alumni events and visits
- Increased activities by Women in Math and Women in Computer Science and increased proportion of women students: +3 percentage points over the plan period
- Websites evolved to enable much richer presentation of news and accomplishments
- Awards committees to support nominating faculty and students for awards in some units
PRIORITY AREA 5: INTERNATIONAL STUDENT RECRUITMENT AND SUPPORT
Be a leader in international student education and support
- Significant enhancements to English language competency strategies
- Planned expansion to the MUO is expected to help meet international student support needs
- Recruitment travellers will visit 12 select countries in 2017
- Collaboration between recruitment team and CEMC to expand outreach
- Continuing efforts to diversify the international student body, including additional recruitment support for India

PRIORITY AREA 6: FACULTY INFRASTRUCTURE AND SERVICES
Outstanding services and support in all areas of Faculty activity
- Current spaces refreshed: MC 3rd floor student area; Computer Science undergraduate advising area and graduate office; MC 6th floor with priority lab space for Applied Mathematics; Faculty Colloquium Room for visitors, graduate seminars, and events; Faculty Lounge as collaboration and social space
- Added study spaces to a wide range of locations across the three Mathematics buildings
- Enhanced lecture room podium equipment
- Mandatory training being implemented for all staff: Principles of Leadership, Principles of Inclusivity, Integrity Matters, and Exceptional Service
- All staff job descriptions reviewed at least every five years

PRIORITY AREA 7: ADDITIONAL FUNDING
Ensure appropriate funding to support strategic plan implementation
- $52M raised since 2012: $25M in current and pledged donations; $27.5M in planned gifts
- Major gifts raised for: undergraduate and graduate scholarships; fellowships and Chairs; spaces in Math 3; labs; project and team support
# Appendix C

Mathematics Strategic Planning Committee (MSPC) Membership as of October 1, 2017

<table>
<thead>
<tr>
<th>Title</th>
<th>Name</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dean of Mathematics</td>
<td>Stephen Watt</td>
<td>Chair</td>
</tr>
<tr>
<td>Associate Dean, Admissions and Outreach</td>
<td>Serge D'Alessio</td>
<td>Member</td>
</tr>
<tr>
<td>Associate Dean, Computing</td>
<td>Stephen Vavasis</td>
<td>Member</td>
</tr>
<tr>
<td>Associate Dean, Co-op Studies</td>
<td>Lori Case</td>
<td>Member</td>
</tr>
<tr>
<td>Associate Dean, Graduate Studies</td>
<td>Christiane Lemieux</td>
<td>Member</td>
</tr>
<tr>
<td>Associate Dean, Research</td>
<td>Raouf Boutaba</td>
<td>Member</td>
</tr>
<tr>
<td>Associate Dean, Undergraduate Studies</td>
<td>Francis Poulin</td>
<td>Member</td>
</tr>
<tr>
<td>Chair, Applied Mathematics</td>
<td>Siv Sivaloganathan</td>
<td>Member</td>
</tr>
<tr>
<td>Chair, Combinatorics &amp; Optimization</td>
<td>Jochen Koenemann</td>
<td>Member</td>
</tr>
<tr>
<td>Chair, Pure Mathematics</td>
<td>Kathryn Hare</td>
<td>Member</td>
</tr>
<tr>
<td>Chair, Statistics &amp; Actuarial Science</td>
<td>Stefan Steiner</td>
<td>Member</td>
</tr>
<tr>
<td>Acting Director, Centre for Education in Mathematics and Computing</td>
<td>J.P. Pretti</td>
<td>Member</td>
</tr>
<tr>
<td>Director, Computational Mathematics</td>
<td>Kevin Hare</td>
<td>Member</td>
</tr>
<tr>
<td>Director, David R. Cheriton School of Computer Science</td>
<td>Mark Giesbrecht</td>
<td>Member</td>
</tr>
<tr>
<td>Director, Mathematics Business &amp; Accounting Programs</td>
<td>Ilham Akhundov</td>
<td>Member</td>
</tr>
<tr>
<td>Executive Officer</td>
<td>Jack Rehder</td>
<td>Member</td>
</tr>
<tr>
<td>Mathematics Teaching Fellow</td>
<td>Brian Forrest</td>
<td>Member</td>
</tr>
<tr>
<td>Director, Planning</td>
<td>Martha Foulds</td>
<td>Resource</td>
</tr>
<tr>
<td>Director, Advancement</td>
<td>TBD</td>
<td>Advisor</td>
</tr>
<tr>
<td>Director, Strategic Communications</td>
<td>Jodi Szimanski</td>
<td>Advisor</td>
</tr>
<tr>
<td>Faculty Financial Officer</td>
<td>Udaya Wettasinghe</td>
<td>Advisor</td>
</tr>
</tbody>
</table>

**Past Members (prior to October 1, 2017)**

Amy Aldous, former Director, Communications & Research Alliances
Barry Ferguson, former Assoc. Dean, Co-op Studies
Steve Furino, former Assoc. Dean, Undergraduate Studies
Srinivasan Keshav, former Assoc. Dean, Graduate Studies
Marek Stastna, former Assoc. Dean, Computing
Ingrid Town, former Director, Advancement
Ian VanderBurgh, former Director, CEMC (on sabbatical)