



UNIVERSITY OF TORONTO  
FACULTY OF APPLIED SCIENCE & ENGINEERING

# Annual Report 2012

Performance  
Indicators



### **Pictured on the front cover:**

Thanks to generous gifts from Pierre Lassonde and Goldcorp Inc., in November 2011, we officially opened the renovated Lassonde Mining Building. The project was also made possible by Knowledge and Infrastructure Project funding from the federal government, matched provincial funds, and the Faculty of Applied Science & Engineering. The transformation of the building converted the previously unused attic into collaborative design studios and teaching spaces and added a rooftop meeting room. The new space, called the Goldcorp Mining Innovation Suite, provides 100 workstations for students to complete design projects. The building is home to the Lassonde Institute of Mining, an interdisciplinary research centre focused on a spectrum of mining activities, including mineral resource identification, mine planning, excavation, as well as extraction and processing.

# Message from the Dean

I am pleased to present our fourth annual report of performance indicators, which includes a wealth of metrics and statistics to assess our progress in pursuit of our Academic Plan goals and academic excellence. The data presented provides a comparison over the last 10 years and against some of our peer institutions. It also highlights initiatives and programs developed over the past year.

In October 2011, after a two-year comprehensive consultation process, Faculty Council approved our Academic Plan. The Plan sets out our priorities along with our ambitious, yet achievable, goals until 2016. We have made strides in our international efforts and global reach, continued to make progress towards goals in both the undergraduate and graduate areas, enhanced our focus on collaborative and multidisciplinary initiatives, addressed issues around space and infrastructure, strengthened our financial position, and built momentum for the launch of our philanthropic Boundless Campaign. Selected highlights are presented on pages 2 to 5. We will continue to report annually on the progress made towards achieving our Academic Plan goals through Faculty Council and in our Annual Report.

The Faculty's position on the Academic Ranking of World Universities moved up to number 13, with revised methodology for universities outside of the U.S. that more accurately reflect the differences in research funding. We also continue to place as the top Canadian Engineering School in all international rankings.

Our increasing international reputation has impacted several areas of our Faculty, as evidenced by the highest historical entrance average of incoming undergraduates at 91.3 per cent (fall 2012), and the higher percentages of graduate, female and international students, taking us that much closer to achieving our diversity and graduate education goals.

Our concerted emphasis on cross-Faculty and multidisciplinary collaboration is demonstrated through recently launched initiatives such as: the Engineering Business minor and certificates in Global Engineering and Mineral Resources; the University of Toronto Institute for Multidisciplinary Design & Innovation, led by our new NSERC Chair in Multidisciplinary Engineering Design; and, projects supported by the Dean's Strategic Fund — from the Centre for Research in Advanced Neural Implant Applications to co-supervised graduate students in Space Robotics Control. Our commitment to this approach is further strengthened by the creation of our new Faculty Research Leader Award to acknowledge contributions to major research activities that are collaborative and multidisciplinary.

As we continue working towards our Academic Plan goals, I am proud of the remarkable accomplishments we have achieved together in 2011–2012. I thank you for your many contributions and welcome your input.



**Cristina Amon**, Dean

# Faculty Leadership, 2011–2012

**Dean**

Cristina Amon

**Vice-Dean, Graduate Studies**

Chris Damaren

**Vice-Dean, Research**

Stewart Aitchison

**Vice-Dean, Undergraduate**

Susan McCahan

**Associate Dean, Cross-Disciplinary Programs**

Bryan Karney

**Chair, First Year**

Kim Pressnail

**Director, University of Toronto  
Institute for Aerospace Studies**

David Zingg

**Director, Institute of Biomaterials  
& Biomedical Engineering**

Paul Santerre

**Chair, Department of Chemical Engineering  
& Applied Chemistry**

Grant Allen

**Chair, Department of Civil Engineering**

Brenda McCabe

**Chair, The Edward S. Rogers Sr. Department of  
Electrical & Computer Engineering**

Farid Najm

**Chair, Division of Engineering Science**

Mark Kortschot

**Chair, Department of Mechanical  
& Industrial Engineering**

Jean Zu

**Chair, Department of Materials  
Science & Engineering**

Jun Nogami

**Chief Financial Officer**

Brian Coates

**Executive Director, Advancement**

Jim Dawson

**Executive Director, Communications  
& Public Affairs**

Madelyn Herschorn

**Faculty Registrar**

Barbara McCann

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# Academic Plan: Selected Highlights

This past year, Faculty Council approved our Academic Plan, which outlines our priorities and goals over the next five years. These goals provide the framework to strengthen our research, teaching, student experience, global reputation and infrastructure, and to continue our pursuit of excellence.

This section summarizes the progress we have made in 2011–2012 towards achieving our goals. Each section begins with a brief overview followed by key highlights for the year.

A copy of the full Academic Plan is available for download on our website:  
[www.engineering.utoronto.ca/About/deans\\_office/Task\\_Forces\\_Reports.htm](http://www.engineering.utoronto.ca/About/deans_office/Task_Forces_Reports.htm)

## Positioning

U of T Engineering endeavours to be, and be seen as, a leader among the world's very best engineering schools. To share the Faculty's message and stories about our educational and research mission and achievements with diverse audiences, we have established goals in areas such as: strengthening key messages; increasing the quality of our storytelling; using new media and technology; and, increasing the Faculty's presence and visibility on social media platforms.

## Progress Highlights

- Increased our focus on storytelling and use of social media and multimedia.
- Grew media exposure through stories like the Reinvent the Toilet Challenge, low-cost organic light-emitting diodes (OLEDs), and breakthroughs in solar cell technology.
- Revamped print materials for our undergraduate and graduate recruitment activities.
- Revitalized our online presence for alumni, prospective students at the undergraduate and graduate levels and The Edward S. Rogers Sr. Department of Electrical & Computer Engineering. Further online efforts are underway for the Engineering Career Centre and Centre for Sustainable Energy.

## Culture of Excellence

Our commitment to excellence is measured against our goals of achieving our mission; increasing diversity; enriching the student experience; supporting the development of our faculty and staff; strengthening our governance processes; and, deepening alumni involvement.

### Progress Highlights

- Continued towards our goal of increasing female representation with a first-year undergraduate class comprised of 25.5 per cent women in 2012.
- Created our first Girls' Leadership in Engineering Experience (GLEE) recruitment event in spring 2012 where 82 per cent of attendees accepted their offers of admission; 36 per cent of whom did so after the event. We will hold a similar event in 2013.
- Approved the Clinical Engineering PhD under the new U of T Quality Assurance Process (UTQAP), approved a new program proposal — Master of Engineering in Cities Engineering and Management — and underwent Civil Engineering's external review under UTQAP.
- Scored higher with our students than both the University of Toronto and U15 schools on collaborative learning and classroom engagement in the most recent National Survey of Student Engagement (NSSE).
- Garnered 20 major awards in 2011–2012, including five AAAS Fellowships, four Royal Society of Canada Fellowships, one NAE Fellowship, three EIC Fellowships, the Vivek Goel Faculty Citizenship Award for the third consecutive year, and the President's Teaching Award.
- Produced our fourth annual report of performance indicators with data that demonstrates our progress over the past decade.

## Educating Future Engineers

We create in-class and co-curricular learning experiences that enable our students to graduate with core competencies and thrive as future engineers and professionals. Our goals include: continuing to assess our programs and curricula to ensure we remain relevant and visionary; integrating professional competencies into curricula; increasing flexibility in undergraduate curriculum; supporting opportunities for self-directed learning and participation in extracurricular activities; attracting diverse, outstanding students; reducing dwell time for MASc and PhD students; developing vibrant MEng courses; and, increasing graduate student enrolment to 2,000 by 2015 while reducing undergraduate enrolment to 4,000.

### Progress Highlights

- Attracted 12.7 per cent more international applicants and 10.7 per cent more female applicants to our undergraduate programs in 2012. Overall, applications rose by 6.5 per cent to 9,330.
- Welcomed a strong incoming first-year undergraduate class; the overall entrance average of Ontario secondary school students rose to 91.3 per cent in 2012 from 90.4 per cent in 2011.
- Increased undergraduate yield on offers of admission to 38 per cent in 2011 from 36 per cent in 2010, and improved selectivity to 36 per cent in 2011 from 42 per cent in 2010.
- Moved closer to achieving our goal of 2,000 graduate students by 2015 with a population of 1,842 (10.4 per cent higher than in 2010–2011). International students account for 19.3 per cent of our graduate students and 43 per cent of our master's students (full-time equivalent) are in the MEng program (the goal is 50 per cent).
- Attracted 11 per cent more applicants to our PhD, MASc, MEng and MHSc programs in 2011–2012.
- Implemented a new undergraduate scholarship strategy to attract top students; this will be assessed in the coming year to determine effectiveness.
- Approved the Faculty's graduate attributes in spring 2012 and implemented a curriculum mapping process.
- Launched the successful undergraduate Engineering Business minor in fall 2011; due to popularity, two core courses were offered in the summer to meet demand.
- Approved the Robotics & Mechatronics minor, Mineral Resources certificate and a new Engineering Science Major in Biomedical Systems Engineering.
- Introduced four graduate certificates in 2011 (Energy Studies, Healthcare Engineering, Computational Mechanics in Design, Robotics & Mechatronics), the MIE flex-time PhD program and added five courses to our Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) certificate.

## Student Experience

We will enhance the co-curricular and extracurricular experiences of our students through research, internships, international student exchanges, and summer and professional work opportunities. We will also continue to strengthen our teaching effectiveness, infrastructure, communications, counselling, as well as academic and personal support systems.

### Progress Highlights

- Established The Entrepreneurship Hatchery to foster entrepreneurial spirit among our undergraduates.
- Approved the new evaluation framework for undergraduate courses through Faculty Council; the Teaching Methods and Resources Committee will work on piloting the framework this year.
- Broadened experiential learning opportunities abroad including the Cross-Cultural Capstone Design Program with Peking University, Structured Exchange Pathways, Professional Experience Year internships, summer research opportunities, and teaching at IIT Bombay and in Ethiopia.
- Delivered 19 guest lectures in leadership to undergraduate courses introducing fundamental concepts to nearly 2,000 students.
- Created the role of Associate Director, Student Experience and Learning Development to initiate and support enhancements to the student experience in consultation with student leaders and faculty.
- Enabled students in organizations and clubs — such as the Undergraduate Engineering Research Day (UnERD) committee and The Next 36 — to build skills in teamwork, effective meeting facilitation, personal leadership styles, interpersonal competence and team vision development through the Institute for Leadership Education in Engineering (ILead).
- Engaged students through an e-newsletter, Registrar's Twitter account, digital signage and Town Hall gatherings.
- Piloted two portable tabletop labs for MSE101 and APS104.
- Enhanced the student experience through proactive use of technology. Examples include capturing more lectures on video, developing select online courses, implementing an anonymous midterm course evaluation system and installing print kiosks to accommodate wireless printing from mobile devices.
- Evaluated current course scheduling tools and recommended replacement for 2013–2014.

## Research Foci

We continue to advance engineering research excellence and innovation, further strengthening our research community. Our goals include: creating and supporting research centres around strategic themes; increasing Tri-Council and other funding sources, as well as the number of Canadian Research Chairs, Industrial Research Chairs and Endowed Chairs; supporting junior faculty and emerging research leaders; raising awareness and promoting our research contributions; expanding our partnerships with industry; and, increasing our leadership in the research community.

### Progress Highlights

- Secured two NSERC Industrial Research Chairs, one NSERC Chair in Multidisciplinary Engineering Design and two Chalmers Junior Chairs in Design.
- Increased research funding by 24 per cent from the previous year to an unprecedented \$77.9 million. We continue to increase our Tri-Council funding, which boosts our allocation of Canada Research Chairs.
- Received major research funding in 2011–2012; most notably \$14.4 million from the Ontario Research Fund for projects on a range of topics from smart infrastructure to clean water.
- Launched two EDU-Ds: Institute for Multidisciplinary Design & Innovation and Centre for Research in Sustainable Aviation.
- Received and made investments in areas of research on resilient infrastructure, water issues, sustainable energy and the NSERC Strategic Network in Smart Applications on Virtual Infrastructure (SAVI).
- Established the Research Leader Award in 2012 to recognize and reward leadership in major interdisciplinary research projects, industrial partnerships and multiple investigator initiatives.

## Outreach, Collaboration & Influence

Our outreach, collaboration and influence activities enable us to strengthen our ability to recruit top scholars and academically strong students. These activities also help to attract professional staff that support engineering knowledge generation, cultivate and sustain relationships with alumni, donors and volunteers who contribute to the Faculty, and enhance the reputation of our Faculty. Our goals include assessing our pre-university activities and developing and solidifying relationships with other faculties, industry partners, alumni and peer institutions across Canada and the world.

### Progress Highlights

- Created the role of Director, Corporate Partnerships to build and strengthen relationships with industry partners.
- Increased our participation in accreditation visits and external reviews in Canada (e.g., University of Waterloo, University of British Columbia, McMaster University, McGill University, Ryerson University, Carleton University) and abroad (e.g., Germany, Singapore, Sweden, U.S.).
- Achieved leadership positions — through our faculty members — of president or past president at organizations such as the Engineering Institute of Canada, Canadian Academy of Engineering, and Canadian Society of Mechanical Engineering.
- Developed Licensing International Engineers into the Profession (LIEP), a bridging program for internationally educated engineers in collaboration with the School of Continuing Studies.
- Engaged alumni in various student events such as orientation, matriculation, Girls' Leadership in Engineering Experience (GLEE) and the You're Next Career Fair Executive.
- Established a San Francisco-Bay Area Alumni Chapter in 2012 and increased activities in Asia where we expect an alumni chapter to emerge soon.
- Launched our \$200-million Boundless Campaign in September 2012.

## Resource Allocation

Adequate resources are an integral part of achieving the goals outlined in our Academic Plan. Enhancing and creating efficiencies in academic time, physical space, administrative and technical staff, and budgets are key to the process that must, at all times, support our academic goals.

### Progress Highlights

- Increased revenues by 10 per cent to \$159.1 million in 2011–2012.
- Expanded space functionality by creating the Student Services Centre for MIE, remodelling the SF1105 lecture theatre and the IBBME undergraduate bioengineering teaching lab.
- Upgraded and created new space, adding more than 2,000 net assignable square metres (NASMs) and spending more than \$30 million in three key spaces: Lassonde Mining Building attic; BioZone; and, UTIAS Microsatellite Science and Technology Centre.
- Conducted two space audits in key areas — student club and study space, and meeting rooms — with a third planned for undergraduate labs in fall 2012.
- Began planning and fundraising for our new building, the Centre for Engineering Innovation & Entrepreneurship.
- Reduced the median time to graduation for PhD students from 5.3 to 5.0 years in 2011–2012, moving us closer to our goal of reducing dwell time within the province's funding eligibility.

## Comparison of U of T Engineering with Ontario and Canada, 2011–2012

The following table compares U of T Engineering metrics against those of engineering Faculties in Ontario and Canada for 2011–2012. Within Canada, we awarded 7.8 per cent of all undergraduate engineering degrees and 10.7 per cent of all engineering PhD degrees in 2011.

While our provincial and national percentage of faculty members remains relatively low, our internationally renowned scholars have garnered the single largest portion of Natural Sciences and Engineering Research Council (NSERC) engineering funding, and received almost half of the major awards granted to Ontario institutions, and more than 26 per cent of those awarded to Canadian engineering schools in 2011–2012.

|                                      | U of T<br>Engineering | Ontario  | U of T<br>% of<br>Ontario | Canada   | U of T<br>% of<br>Canada |
|--------------------------------------|-----------------------|----------|---------------------------|----------|--------------------------|
| <b>Undergraduate</b>                 |                       |          |                           |          |                          |
| Enrolment (FTE)                      | 4,386                 | 29,459   | 14.9%                     | 68,846   | 6.4%                     |
| Degrees Awarded                      | 893                   | 4,957    | 18.0%                     | 11,389   | 7.8%                     |
| <b>Masters (MEng, MAsC and MHSc)</b> |                       |          |                           |          |                          |
| Enrolment (FTE)                      | 811                   | 4,491    | 18.1%                     | 12,057   | 6.7%                     |
| Degrees Awarded                      | 401                   | 2,173    | 18.5%                     | 4,384    | 9.1%                     |
| <b>Doctoral (PhD)</b>                |                       |          |                           |          |                          |
| Enrolment (FTE)                      | 703                   | 2,957    | 23.8%                     | 7,913    | 8.9%                     |
| Degrees Awarded                      | 106                   | 463      | 22.9%                     | 989      | 10.7%                    |
| <b>Faculty</b>                       |                       |          |                           |          |                          |
| Tenured and Tenure-Stream            | 216                   | 1,477    | 14.6%                     | 3,500    | 6.2%                     |
| <b>Major Awards</b>                  |                       |          |                           |          |                          |
| Major Awards Received                | 17                    | 35       | 48.6%                     | 64       | 26.6%                    |
| <b>Research Funding</b>              |                       |          |                           |          |                          |
| NSERC Funding for Engineering        | \$29.9M               | \$123.6M | 24.2%                     | \$330.7M | 9.0%                     |

**Note:** Unlike the data contained in the rest of this report, enrolment (Full-Time Equivalent, or FTE) and degrees awarded statistics are based on the 2011 calendar year and come from Engineers Canada ([www.engineerscanada.ca](http://www.engineerscanada.ca)). Faculty data (tenured and tenure-stream) are based on November 2011 counts by Engineers Canada. Major awards and research funding statistics are based on the 2011–2012 grant year (April 2011 to March 2012).

# Comparison of U of T Engineering with St. George Campus and University of Toronto, 2011–2012

The table below compares U of T Engineering with the rest of the University of Toronto based on key metrics for 2011–2012. Since our activities are concentrated on the St. George campus, we also present our relative metrics where possible.

|                                      | U of T<br>Engineering | St. George<br>Campus | Engineering<br>% of Campus |  | University<br>of Toronto | Engineering<br>% of U of T |
|--------------------------------------|-----------------------|----------------------|----------------------------|--|--------------------------|----------------------------|
| <b>Student Enrolment</b>             |                       |                      |                            |  |                          |                            |
| Undergraduate                        | 5,090                 | 36,954               | 13.8%                      |  | 58,998                   | 8.6%                       |
| Professional Masters (MEng and MHSc) | 529                   | 5,791                | 9.1%                       |  | 6,147                    | 8.6%                       |
| Research Masters (MAsc)              | 580                   | 2,747                | 21.2%                      |  | 2,828                    | 20.5%                      |
| Doctoral (PhD)                       | 733                   | 5,563                | 13.2%                      |  | 5,812                    | 12.6%                      |
| All Students                         | 6,932                 | 51,055               | 13.6%                      |  | 73,785                   | 9.4%                       |
| <b>Degrees Awarded</b>               |                       |                      |                            |  |                          |                            |
| Undergraduate                        | 961                   | 7,870                | 12.2%                      |  | 11,931                   | 8.1%                       |
| Professional Masters (MEng and MHSc) | 195                   | 2,464                | 7.9%                       |  | 2,656                    | 7.3%                       |
| Research Masters (MAsc)              | 215                   | 1,254                | 17.1%                      |  | 1,301                    | 16.5%                      |
| Doctoral (PhD)                       | 109                   | 791                  | 13.8%                      |  | 817                      | 13.3%                      |
| Total Degrees                        | 1,480                 | 12,379               | 12.0%                      |  | 16,705                   | 8.9%                       |
| <b>Faculty and Staff</b>             |                       |                      |                            |  |                          |                            |
| Professoriate                        | 234                   |                      |                            |  | 2,716                    | 8.6%                       |
| Administrative and Technical Staff   | 278                   |                      |                            |  | 5,958                    | 4.7%                       |
| <b>Research Funding</b>              |                       |                      |                            |  |                          |                            |
| Sponsored-Research Funding           | \$77.8M               |                      |                            |  | \$424.7M                 | 18.3%                      |
| Industry Research Funding            | \$6.7M                |                      |                            |  | \$15.6M                  | 42.9%                      |
| <b>Space</b>                         |                       |                      |                            |  |                          |                            |
| Space (NASMs)                        | 62,122                | 626,380              | 9.9%                       |  | 796,766                  | 7.8%                       |
| <b>Revenue</b>                       |                       |                      |                            |  |                          |                            |
| Total University-Wide Costs          | \$50.8M               |                      |                            |  | \$425.4M                 | 11.9%                      |
| Total Revenue                        | \$163.1M              |                      |                            |  | \$1,462.7M               | 11.2%                      |

**Note:** Student enrolment is shown as of November 1, 2011. Degrees awarded are based on the 2011–2012 academic year. Professoriate includes tenured, tenure-stream and teaching-stream faculty members. Administrative and technical staff include full- and part-time staff. Research funding is based on the 2010–2011 grant year (April to March). Space is measured in Net Assignable Square Metres (NASMs). Revenue is based on the 2011–2012 U of T fiscal year (May to April).

# 1 Undergraduate Studies

U of T Engineering continues to attract exceptional students from across the country and the world as we have become the university of choice for many top high school graduates in Ontario and beyond. The academic quality of the 2011 first-year class has achieved new records with an entering average of 90.4 per cent, up from the prior year's 89.2 per cent. With applications up 10 per cent over 2010 — the largest number of applications ever — we were able to choose strong and well-rounded students, based not only on academic performance, but also on their essays and extracurricular involvement. The strength of our students is further enriched by the diversity and perspectives added to our classrooms by international students, who made up nearly one quarter of our first-year class.

The high calibre of our students continues to be recognized both inside and outside the classroom. For example, when The Next 36 — a national search of exceptional post-secondary entrepreneurs — launched in 2010, six of the 36 were from U of T Engineering. Given the national scope of the competition, it was even more rewarding to see that number rise to eight the following year.

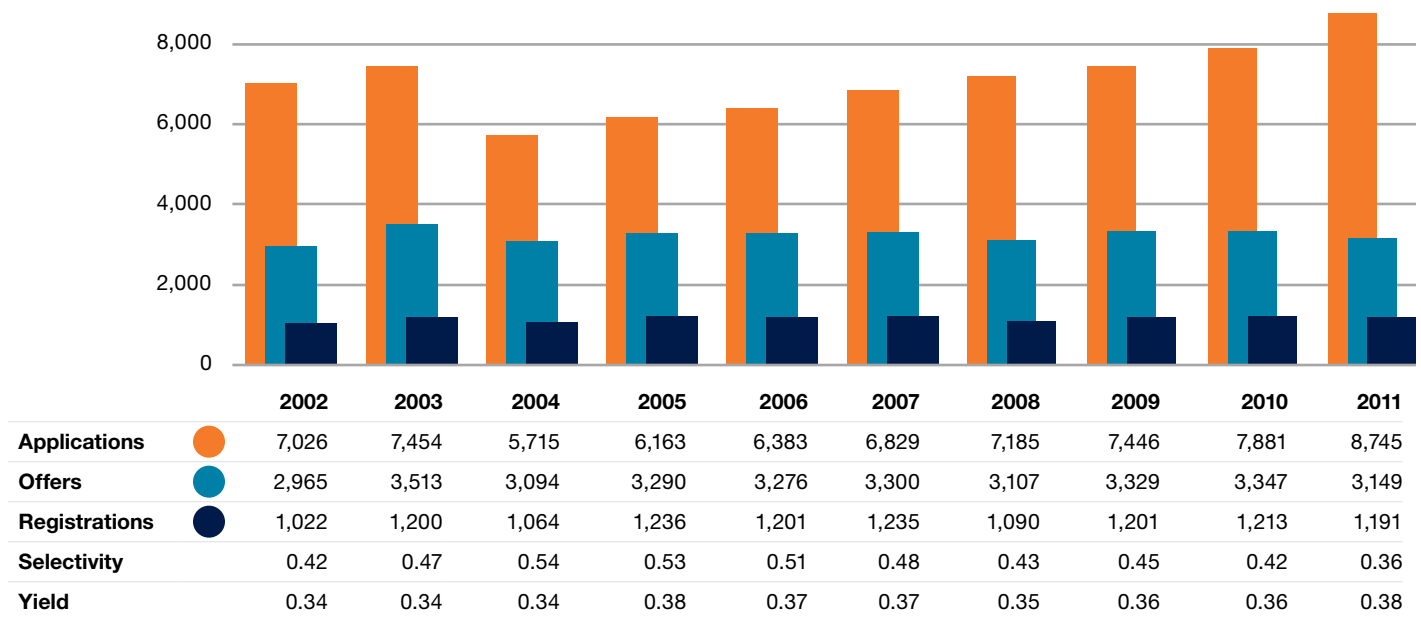
We continue to provide students with an increasing range of opportunities — both academic and co-curricular — to nurture their interests, build their experience and help them stand out after graduation. A growing number of our students are electing to add cross-disciplinary programming to their main area of study through an increasingly diverse selection of Engineering minors and certificates. Students are also taking advantage of opportunities to acquire valuable professional experience outside of the classroom. In 2011–2012, 20 per cent more of our students chose to engage in summer research than in the previous year, and 56 per cent of our third-year students opted to take part in the Professional Experience Year (PEY) program — a significant number of which took place abroad.

Our focus on student experience, and the connections between student life and the engineering curriculum, will be further strengthened through the newly created position of Associate Director, Student Experience and Teaching Development, who will work with both students and faculty in these areas.

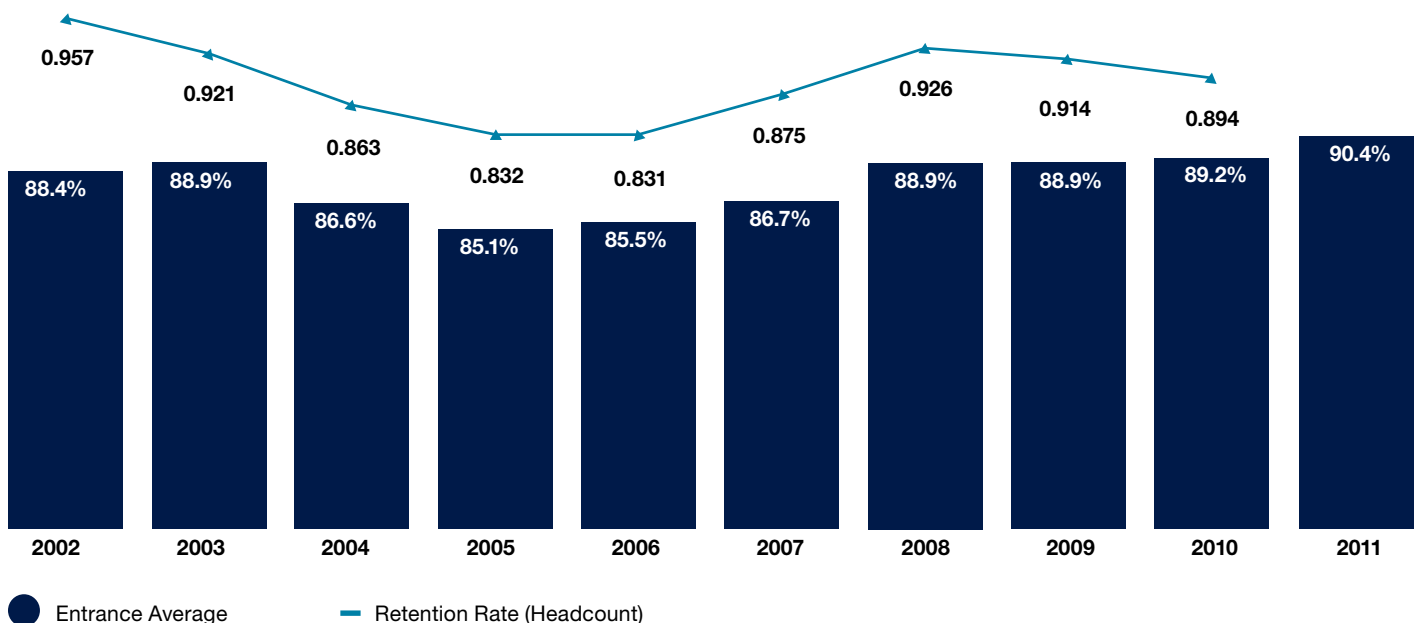
## Undergraduate Admissions and First-Year Students

The increasing number of applications to U of T Engineering — with an 11-per-cent jump between 2010 and 2011 — is enhancing our ability to be more selective about offers of admission. Our selectivity for the 2011 admission cycle was a record 0.36. More applicants than ever are particularly keen on pursuing their engineering studies with U of T; 45 per cent of applicants in 2011 identified us as their first choice. Registrations of 1,191 students were over our target of 1,130, with approximately one out of every seven applicants becoming a registered student. We will continue our efforts to decrease our undergraduate population, as outlined in the Academic Plan, as we move toward a 60:40 ratio of undergraduate to graduate students.

**Figure 1.1 Applications, Offers, Registrations, Selectivity and Yield of First-Year Undergraduates, 2002 to 2011**



**Figure 1.2 Ontario Secondary School Averages of Incoming First-Year Undergraduates and Retention Rate Between First and Second Year, 2002 to 2011**



**Note 1.1:** Student counts are shown as of November 1. Applications and offers are for the fall admission cycle.

Selectivity = Offers ÷ Applications; the proportion of applicants who were offered admission. Yield = Registrations ÷ Offers.

**Note 1.2:** Entrance Average is calculated based on Ontario Secondary School students. Retention Rate is based on November 1 enrolment.

Our recruitment efforts and visits around the world provided us with an opportunity to forge closer relationships with top students at every stage of the applicant cycle. We held information sessions in Vancouver, Calgary and Surrey, as well as Turkey, India, Singapore, Malaysia and the U.A.E. Leveraging our time in Vancouver, we also participated in two special events to connect with guidance counsellors and families of students in grades 9 to 11. The family session was very well attended, attracting approximately 120 attendees.

We also took our recruitment activities online in 2011. To continue the conversation with applicants after they applied but before receiving an admissions decision, we hosted interactive online chat sessions for students around the world, enabling them to ask questions and talk to helpful staff, students and faculty. For the first time, we held a Skype presentation for an audience in Belgrade, Serbia, as part of a special entrance scholarship initiative made possible by Hatch Ltd. Read more about this partnership in the Advancement chapter.

The overall entrance average for incoming students in 2011 was a record high of 90.4 per cent. Receiving the largest pool of qualified applicants in our Faculty's history made it possible to extend offers of admission to some of the strongest students in the country.

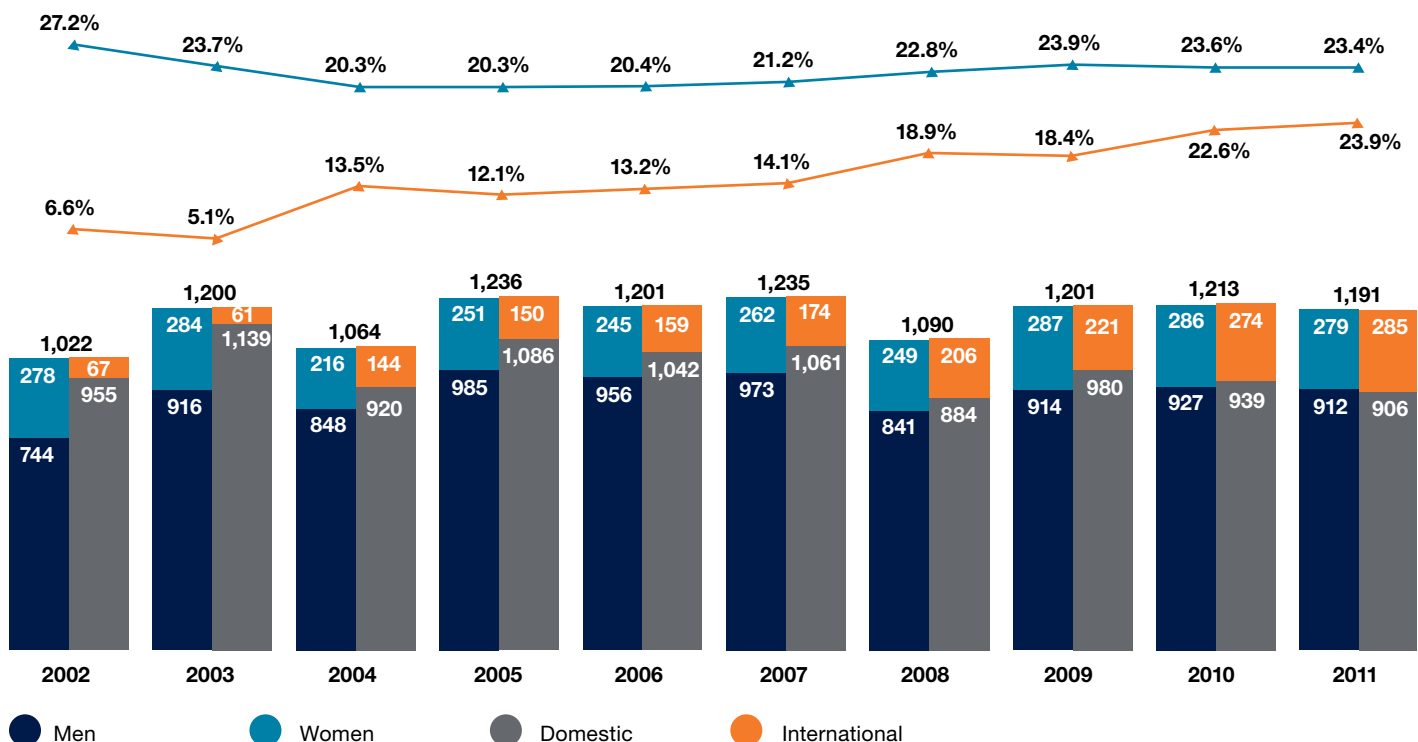
As a testament to our recruitment efforts and global reputation, more international applicants than ever before

joined us as first-year students in 2011, and accounted for nearly a quarter of the first-year cohort. Our new international students came to us from 56 countries, with the majority from Asia. Particularly impressive was the number of domestic students applying from abroad; there were 92 registered in 2011, up from seven in 2006.

Students outside of Canada also joined our Faculty through the new International Foundation Program (IFP), which provides a one-year academic opportunity for qualified international students applying to U of T Engineering who did not meet the English proficiency requirements for regular admission. While living on campus, IFP students complete two courses that expose them to engineering design through discussion, teamwork and written assignments. The program has proved to be a positive springboard for these students to confidently take up their remaining engineering studies.

While the percentage of female students in first year has remained steady, we are increasing our efforts to raise the number through initiatives like the Girls' Leadership in Engineering Experience (GLEE). Through GLEE, female students receiving offers for 2012 were invited to explore the U of T Engineering community first-hand in May, meeting with some of the women in the Faculty who are at the forefront of engineering leadership and innovation.

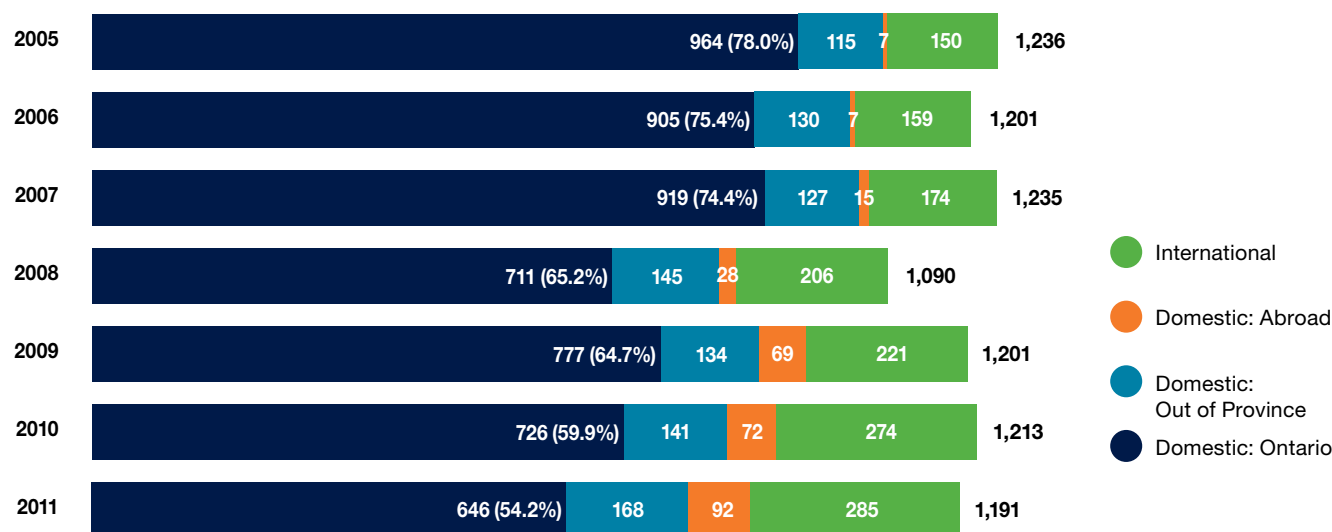
**Figure 1.3 Incoming First-Year Undergraduates with Percentage of Women and International Students, 2002 to 2011**



**Note 1.3:** Student counts are shown as of November 1.

The number of international students has been steadily increasing in the last seven years. As Canada's top-ranked engineering school, we continue to attract a growing number of out-of-province students. Six years ago, 78 per cent of our students were from Ontario. In 2011, the number moved to 54.2 per cent. The three non-Ontario groups combined represented 45.8 per cent of the first-year students enrolled in 2011. Creating such a diverse cohort enables students to share ideas, learn from each other and work across cultures, enhancing the experience for everyone.

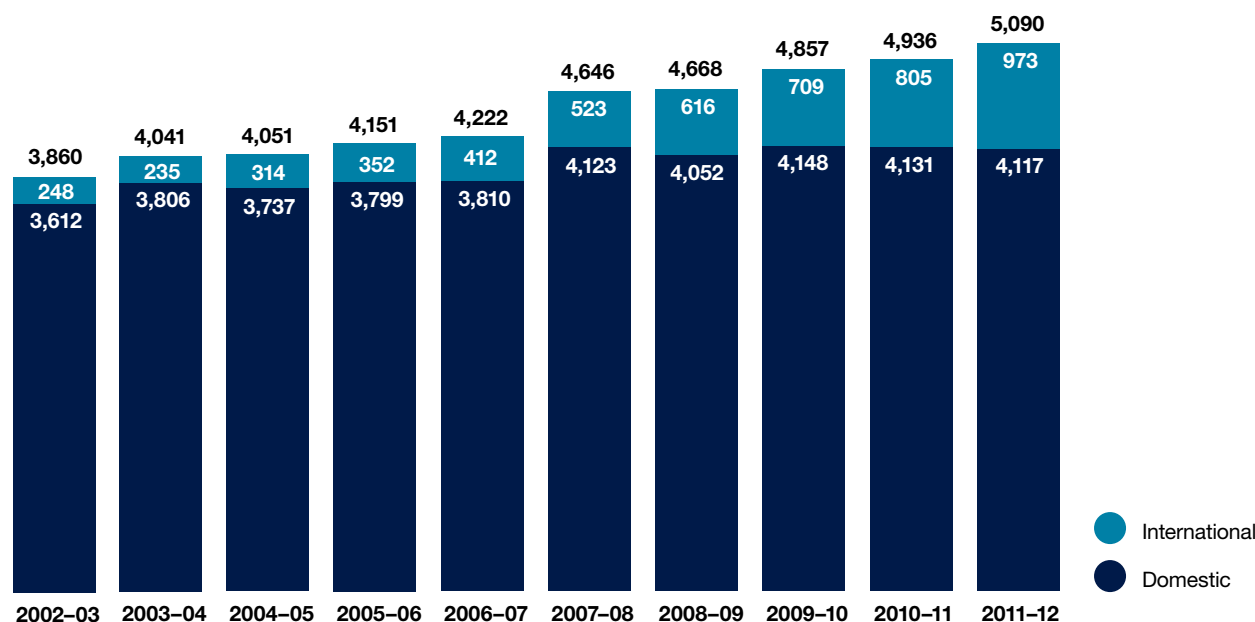
**Figure 1.4 Incoming First-Year Domestic and International Undergraduates, 2005 to 2011**



## Undergraduate Enrolment

The total number of students enrolled in undergraduate programs grew marginally in 2011 as per our goal in the Academic Plan to reduce undergraduate enrolment over the next four years. Ultimately, we aim to maintain an undergraduate population where one in every four is an international student. Shown in Figure 1.5, our international student group, including domestic students from abroad, grew in size by 20.9 per cent between 2010 and 2011.

**Figure 1.5 International and Domestic Undergraduate Enrolment, 2002–2003 to 2011–2012**



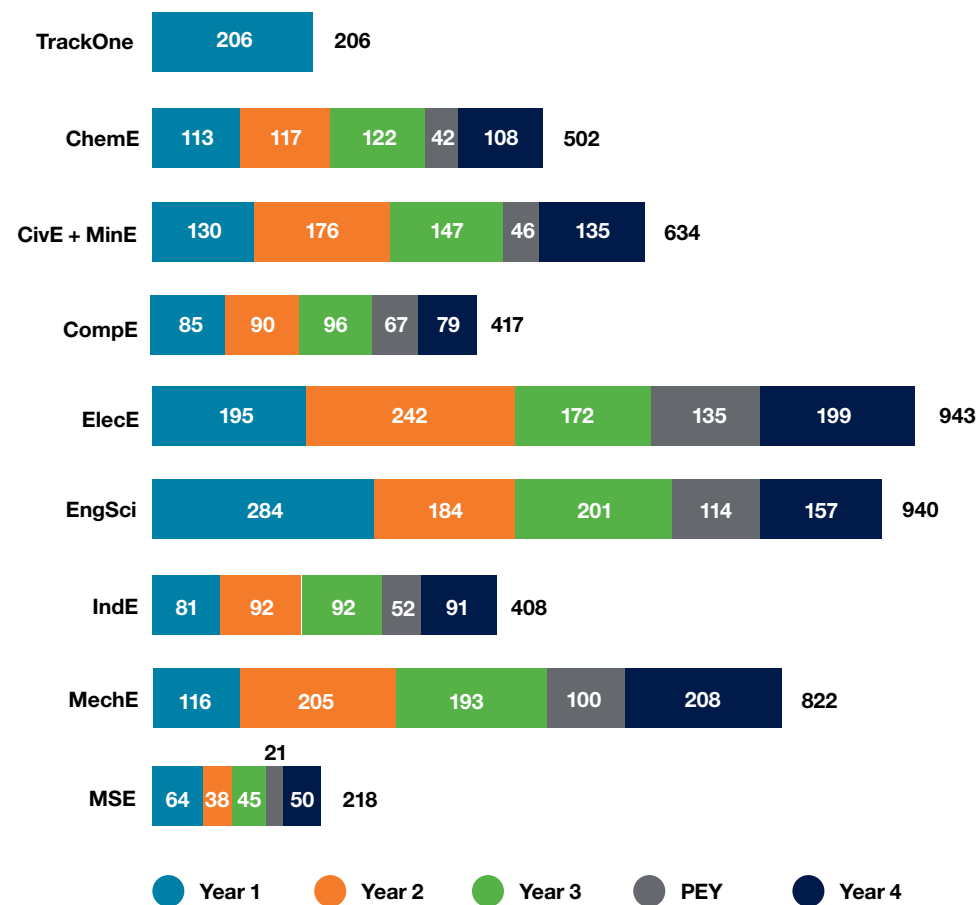
**Note 1.4:** Domestic students are defined as Citizens or Permanent Residents of Canada. Student counts are shown as of November 1.

**Note 1.5:** Includes full- and part-time students and those on PEY internship. Does not include students with special (non-degree) status. Student counts are shown as of November 1.

Student participation in Professional Experience Year (PEY) internships increased in most academic areas. The total number of PEY students in 2011–2012 was up by 4.7 per cent over the previous year.

EngSci students have the opportunity to pursue one of eight majors. Enrolment in the Mathematics, Statistics & Finance major, which started in 2010–2011, grew by 35.5 per cent in 2011–2012. The last intake of students into the Manufacturing Systems major took place in 2008.

Figure 1.6 Undergraduates by Program, Year of Study and Professional Experience Year, 2011–2012

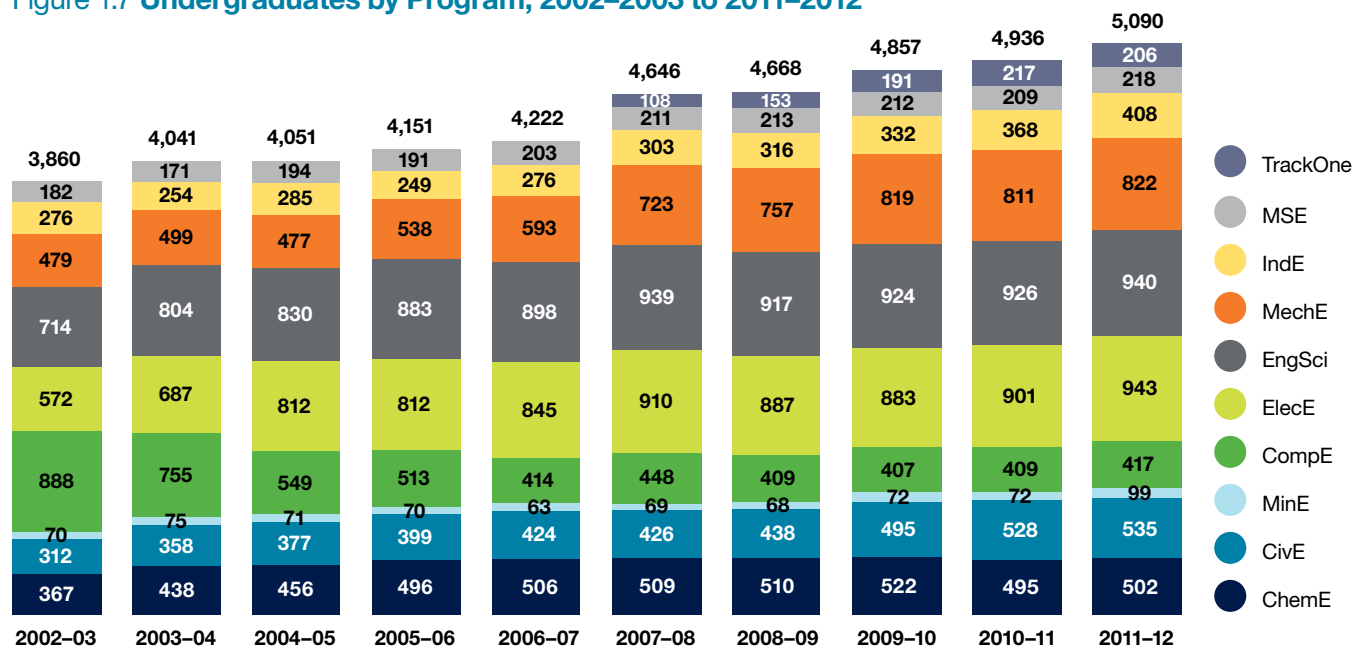


| Engineering Science Majors          | Enrolment |
|-------------------------------------|-----------|
| Aerospace Engineering               | 54        |
| Biomedical Engineering              | 54        |
| Electrical & Computer Engineering   | 93        |
| Energy Systems                      | 50        |
| Infrastructure Engineering          | 39        |
| Manufacturing Systems               | 1         |
| Mathematics, Statistics and Finance | 42        |
| Nanoengineering                     | 8         |
| Physics                             | 17        |
| Total                               | 358       |

**Note 1.6:** The Electrical & Computer Engineering major for EngSci students includes those enrolled in the separate Electrical Engineering and Computer Engineering majors that are now combined. The Manufacturing major has been phased out, but has one student who is completing fourth year.

All academic areas saw growth in 2011–2012 total enrolments, with the largest increases in Mineral Engineering (38 per cent) and Industrial Engineering (11 per cent). Enrolment in TrackOne, our general first year in Engineering, has now leveled off after steady growth since it started five years ago.

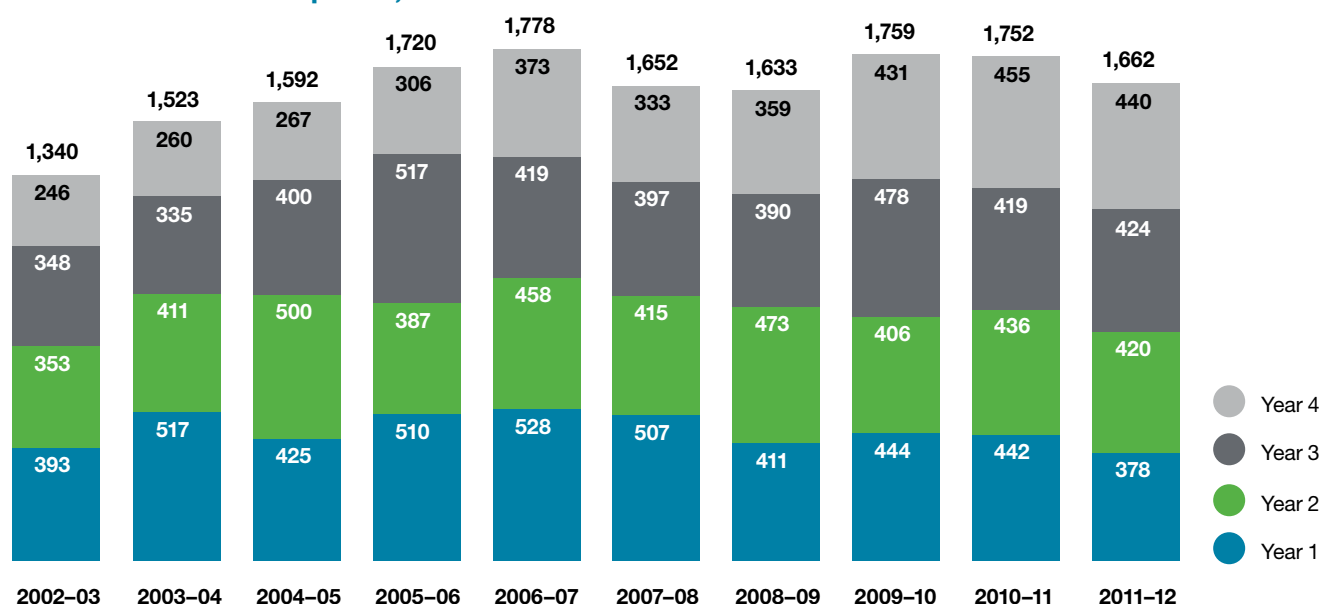
Figure 1.7 Undergraduates by Program, 2002–2003 to 2011–2012



## Undergraduate Funding

Funding to support students in need comes from a variety of sources, ranging from University-wide programs like UTAPS (University of Toronto Advanced Planning for Students) to generous individual donors. While the number of students requiring financial assistance in the last decade has fluctuated, Figure 1.8a shows a slight decrease in the total number of students receiving awards over the last three years. This is the result of our growing population of international undergraduates – who are generally not eligible for need-based awards – and a corresponding decline in domestic students (see Figures 1.4 and 1.5). The amounts shown here do not include merit-based awards, or funding received from OSAP (Ontario Student Assistance Program) or from other provinces.

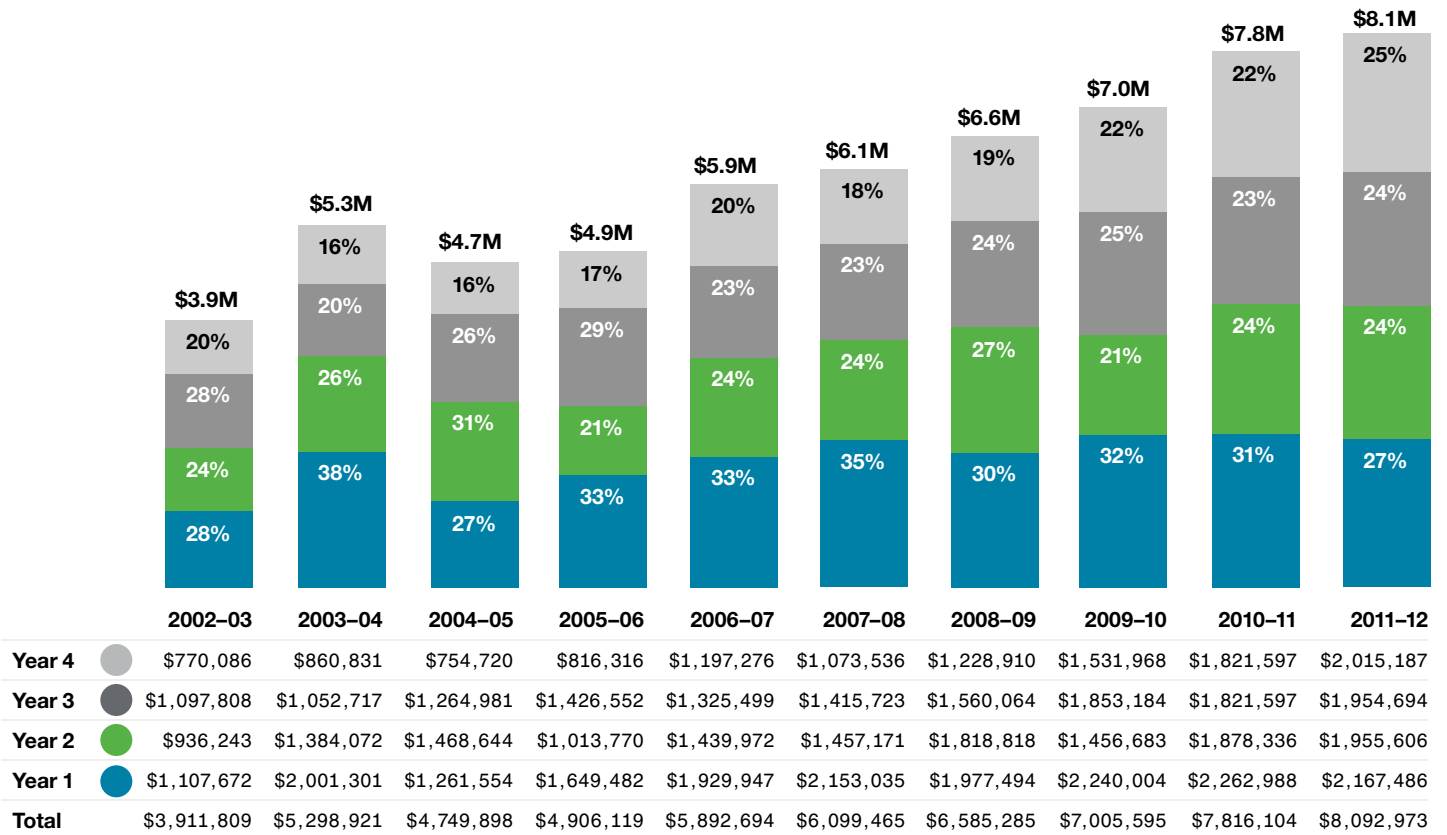
Figure 1.8a Number of Awards Received by Cohort with Total Number of Undergraduate Need-Based Award Recipients, 2002–2003 to 2011–2012



Note 1.7: Student counts are shown as of November 1.

Shown in Figure 1.8b, the total value of all awards has been continuously increasing, nearly doubling in the last six years. The distribution of funding across all years of study continues to exemplify our commitment to support undergraduates throughout their studies. These important awards enable students who demonstrate financial need to concentrate on completing their world-class education.

**Figure 1.8b Total Value of Undergraduate Need-Based Awards and Percentage Distributed by Year of Study, 2002–2003 to 2011–2012**



**Note 1.8a and 1.8b:** Data reported by academic year (September to August).

## Degrees Awarded

Two types of degrees are awarded to U of T undergraduate engineers: Bachelor of Applied Science (BASc) and Bachelor of Applied Science in Engineering Science (BASc EngSci) with convocation occurring in November, March and June each academic year. The length of time taken by students to complete their programs is influenced by their decision to take a PEY internship. They also have the flexibility to make choices to complete their program requirements earlier or later than the standard four years. The number of

undergraduate degrees awarded in 2011–2012 was up nearly 7 per cent over the previous year.

Overall, one out of every 100 North American engineering graduates last year came from our Faculty. The higher percentage of graduates in EngSci and MSE is due to the fact these engineering sectors are available at fewer universities on the continent.

Figure 1.9a Undergraduate Degrees Awarded by Program, 2002–2003 to 2011–2012

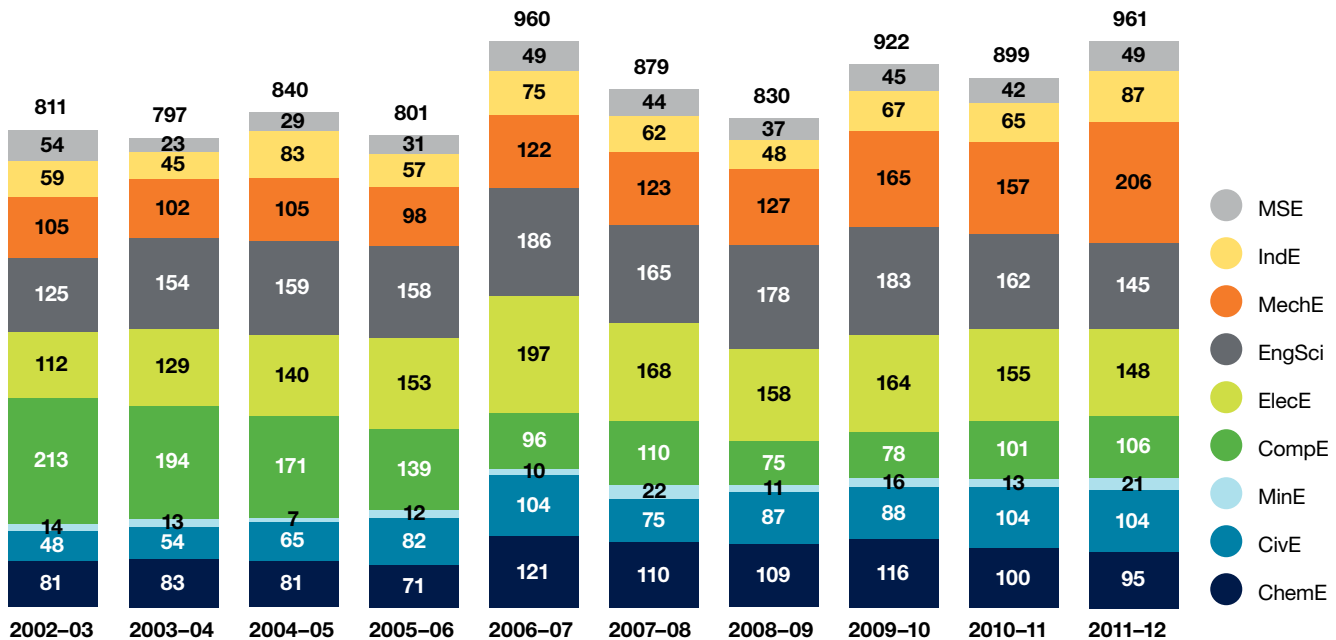
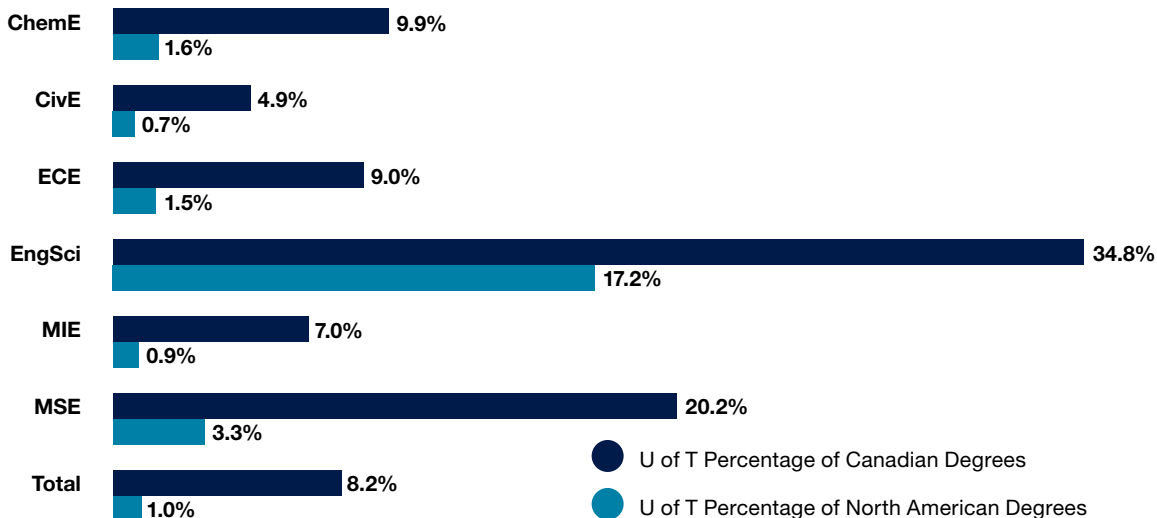


Figure 1.9b U of T Engineering Degrees Awarded by Academic Area Compared with Canadian and North American Degree Totals, 2010



**Note 1.9a:** Data reported by academic year (September to August).

**Note 1.9b:** Data sourced from reports produced by Engineers Canada and the American Society of Engineering Educators. Total percentages represent all engineering degrees awarded in North America, including those in fields that are not specifically identified at U of T.

## Student-Faculty Ratios

The 11 new faculty members hired in 2011–2012 helped us to hold the line on undergraduate-faculty ratios in the face of growing enrolments. Figure 1.10b shows the number of undergraduates registered in each of the five departments relative to the number of teaching faculty in that department. The ‘Faculty Total’ is higher because it includes all students in Engineering Science and TrackOne. The overall ratio also incorporates faculty members from UTIAS and IBBME, who make significant teaching contributions to the Engineering Science program.

Figure 1.10a Undergraduate and Graduate Full-Time Equivalent Student-Faculty Ratios, 2002–2003 to 2011–2012

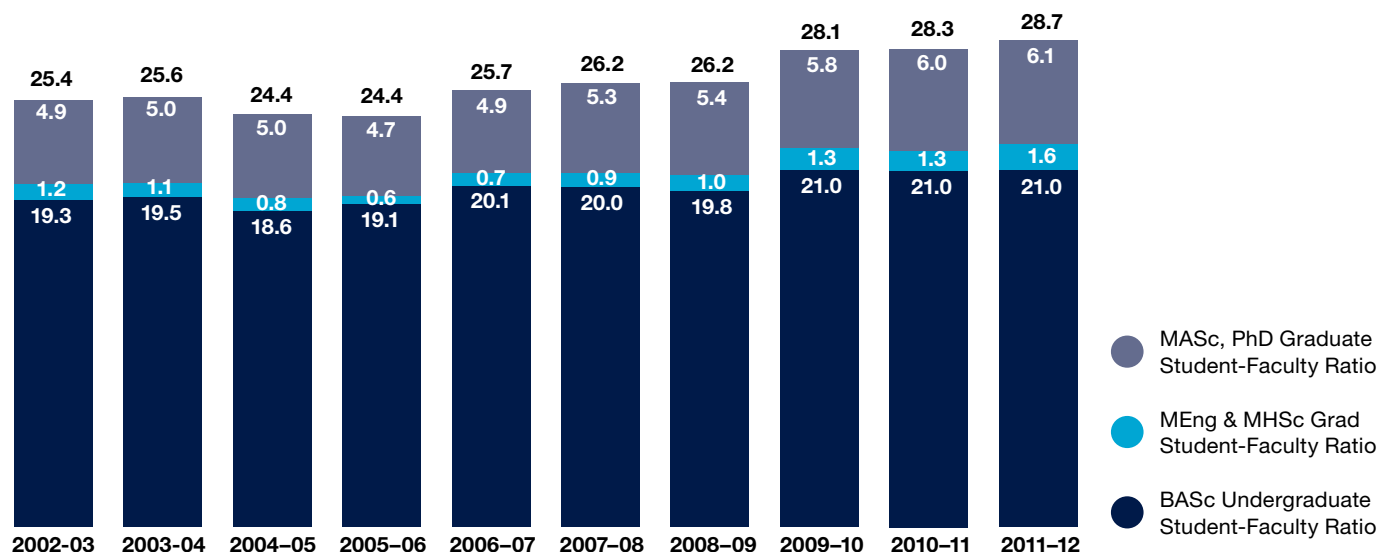
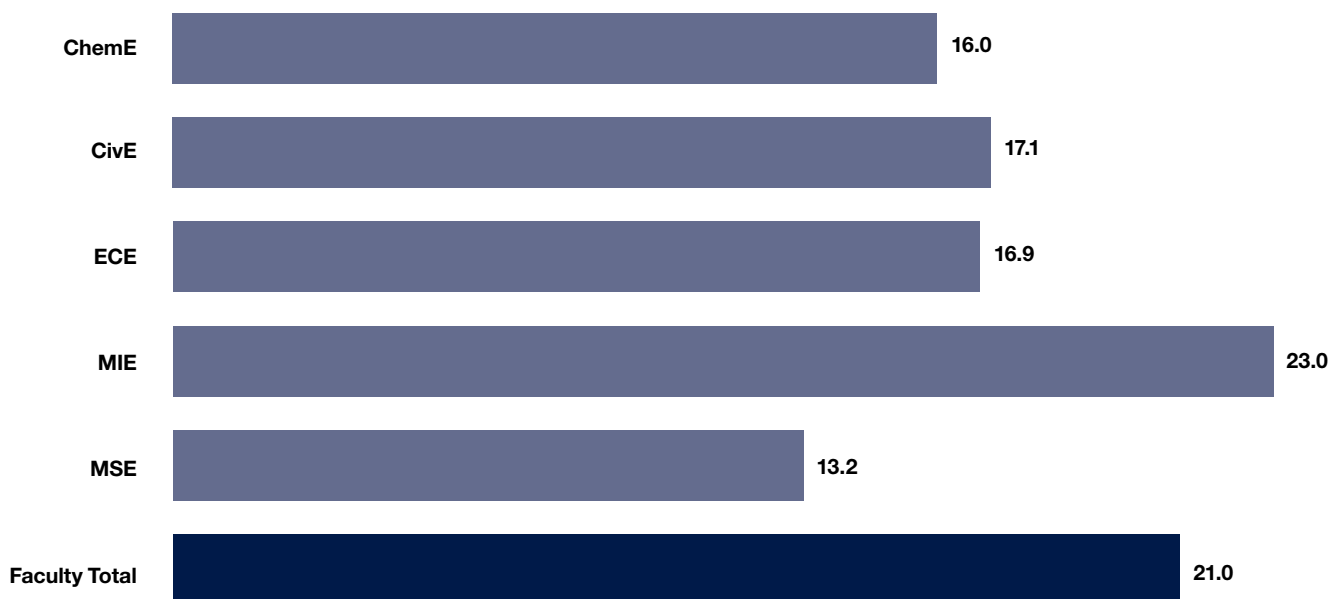


Figure 1.10b Undergraduate Student-Faculty Ratios by Academic Area, 2011–2012



**Note 1.10a and 1.10b:** Student enrolment (headcounts) is based on November 1 data. Students with special status and those on PEY are not included in these ratio calculations. No adjustment has been made for departmental contributions to shared first-year curriculum, Engineering Science or cross-Faculty minors. FTE faculty counts are taken from the 2012–2013 budget calculation, based on data from the 2011–2012 academic year, and include tenured or tenure-stream faculty and lecturers or teaching-stream faculty.

## Improving the Undergraduate Learning Experience

In spring 2012, the Faculty launched the ‘Your Feedback Matters’ awareness campaign to encourage undergraduates to evaluate their courses at the end of the term. Student feedback plays an important role in shaping teaching approaches, and while response rates tend to fluctuate each year (with the number of responses dropping at the end of the winter term), it is our hope that by offering the evaluation survey online in the future, response rates will be higher than the typical 50-to-65-per-cent range.

The questions on the current course evaluation — 28 in all — are based on a maximum score of seven. Figure 1.11 summarizes the results of Question #16 that asks students for their overall rating of their instructor as a teacher. The Faculty average has held steady for the past four years. The 5.52 rating in 2011–2012 from first-year students was the highest for this question in the seven years the evaluation has been used.

To further encourage that engagement, an instructional technology conference in May 2011 gave experts and multidisciplinary educators a forum to share innovative classroom technology with about 260 professors and lecturers. New teaching tools included Web 2.0, virtual online teaching methods, audience response systems, tablet computers and more.

U of T Engineering is also integrating a continuous curriculum improvement process based on learning outcomes. Introduced by the Canadian Engineering Accreditation Board (CEAB), the system involves setting learning objectives for courses and programs, then measuring how well graduating engineers meet the stated outcomes, based on 12 attributes. The graduate attributes include design, problem analysis and the application of ethics in engineering work.

Figure 1.11 Undergraduate Course Teaching Evaluations by Academic Area, 2005–2006 to 2011–2012

|                        | 2005–06     | 2006–07     | 2007–08     | 2008–09     | 2009–10     | 2010–11     | 2011–12     |
|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>First Year</b>      | 5.21        | 5.30        | 5.23        | 5.41        | 5.33        | 5.43        | 5.52        |
| <b>UTIAS</b>           | 5.51        | 5.46        | 5.50        | 5.39        | 5.57        | 5.58        | 5.72        |
| <b>ChemE</b>           | 5.23        | 5.33        | 5.33        | 5.32        | 5.45        | 5.51        | 5.27        |
| <b>CivE &amp; MinE</b> | 5.47        | 5.40        | 5.36        | 5.46        | 5.33        | 5.29        | 5.19        |
| <b>ECE</b>             | 5.46        | 5.44        | 5.67        | 5.57        | 5.69        | 5.73        | 5.71        |
| <b>MIE</b>             | 5.28        | 5.23        | 5.33        | 5.42        | 5.39        | 5.42        | 5.19        |
| <b>MSE</b>             | 4.98        | 5.15        | 5.21        | 5.36        | 5.42        | 5.39        | 5.36        |
| <b>Other</b>           | 5.08        | 5.15        | 5.39        | 5.54        | 5.54        | 5.26        | 5.43        |
| <b>Faculty Average</b> | <b>5.28</b> | <b>5.32</b> | <b>5.38</b> | <b>5.44</b> | <b>5.46</b> | <b>5.47</b> | <b>5.42</b> |

**Note 1.11:** ‘First Year’ includes courses from all departments. Departmental evaluation results are based only on courses taken by second-, third- and fourth-year students. Each department’s results include any courses taught by that department specifically for the EngSci program. ‘Other’ includes upper-year courses with the following designations: APS, BME, MAT, PHY, CSC, STA and HPS, as well as EngSci option seminars, capstone courses and theses.

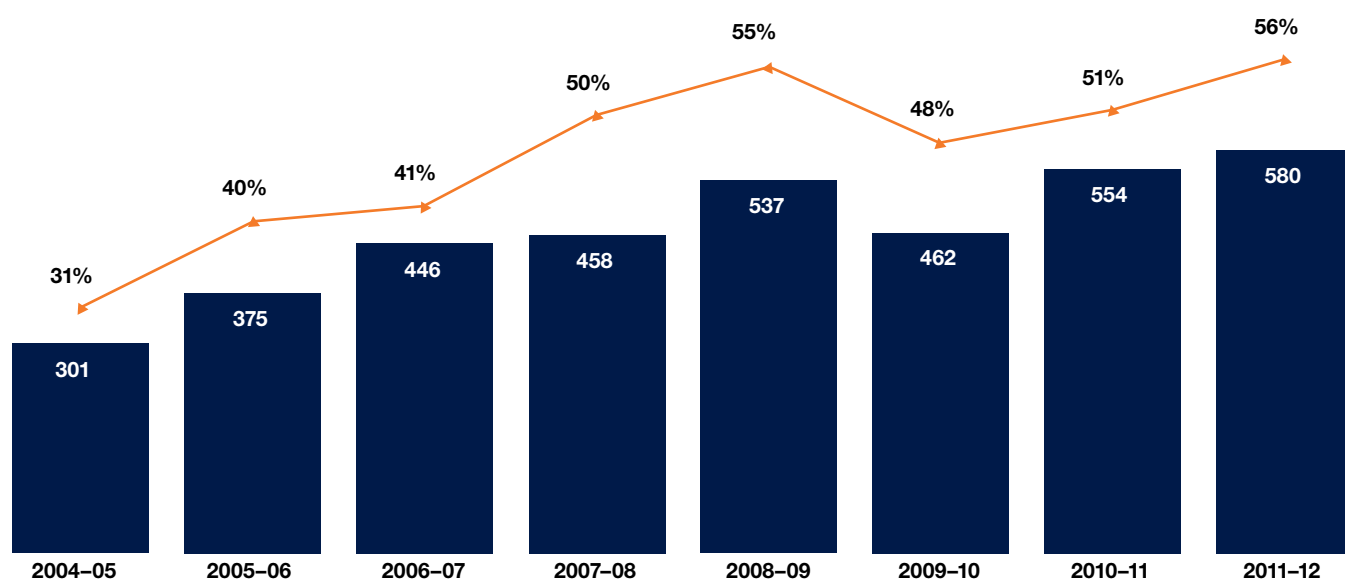
## Engineering Career Centre

Since 2004–2005, the number of students choosing to include a Professional Experience Year (PEY) internship as part of their education has more than doubled with more than half (56 per cent) of our third-year students in 2011–2012 participating in a work placement. That number is even more impressive considering the negative impact of the recession in 2009. We have now rebounded and moved beyond the numbers we saw just prior to the downturn.

Students have the opportunity to gain hands-on experience working as engineering professionals for 12 to 16 months after their second or third year of study. The vast majority of experiences are with Canadian organizations, such as

Ontario Power Authority, BMO Financial Group, Diavik Diamond Mine and international corporations with extensive operations in Canada, such as AMD and Pratt & Whitney. The global recession in many parts of the world, plus the typically smaller salary paid in developing countries, has had an impact on the number of international placements. However, the number of international PEY internships rose in the past year as more companies abroad employed our students and as more students appreciated the value in gaining experience abroad. International PEY postings for 2012–2013 included Belgium, Bermuda, China, Finland, Singapore, Switzerland and the United States.

**Figure 1.12a PEY Internship Placements for Engineering Undergraduates with Percentage Participation from Previous Third-Year Class, 2004–2005 to 2011–2012**



**Figure 1.12b Canadian and International PEY Internship Placements for Engineering Undergraduates, 2004–2005 to 2011–2012**

|         | Canadian Placements | International Placements |
|---------|---------------------|--------------------------|
| 2004–05 | 275                 | 26                       |
| 2005–06 | 348                 | 27                       |
| 2006–07 | 423                 | 23                       |
| 2007–08 | 427                 | 31                       |
| 2008–09 | 490                 | 47                       |
| 2009–10 | 426                 | 36                       |
| 2010–11 | 530                 | 24                       |
| 2011–12 | 547                 | 33                       |

**Note 1.12a and 1.12b:** The number of PEY placements reported here exceeds the number of students on PEY as reported in Figure 1.6 due to those who started their placements and did not complete them.

## Summer Research Opportunities

Shown in Figure 1.13a, the number of students taking advantage of summer research opportunities was up by 19.8 per cent in 2011–2012. Many of these students gained experience in labs on campus; however, the biggest growth — a 66.7-per-cent increase over 2010–2011 — was in the number of students who worked on research projects abroad.

Our students can also take part in a year-round exchange program, which the Faculty plans to actively promote to current students in 2012–2013. The Structured Exchange Pathways program helps students to take courses at partner universities around the world.

Figure 1.13a Undergraduate Participation in Summer Research Opportunities, 2009–2010 to 2011–2012

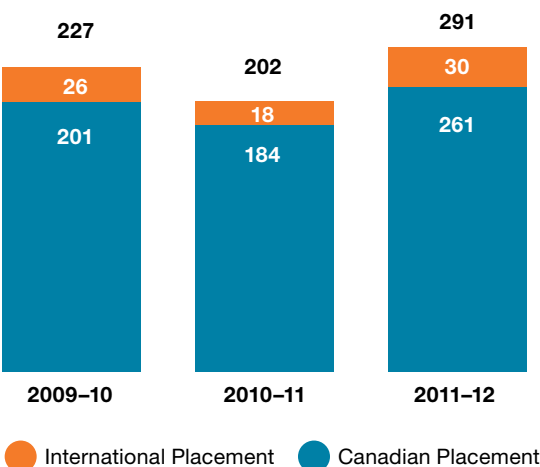


Figure 1.13b Undergraduate Participation in Summer Research Opportunities, 2011–2012

| Research Participation: | Canadian | International | Total |
|-------------------------|----------|---------------|-------|
| ChemE                   | 38       | 5             | 43    |
| CivE & MinE             | 28       | 1             | 29    |
| ECE                     | 61       | 0             | 61    |
| EngSci                  | 42       | 22            | 64    |
| MIE                     | 75       | 2             | 77    |
| MSE                     | 17       | 0             | 117   |
| Total                   | 261      | 30            | 291   |

**Note 1.13a and 1.13b:** Of the 291 students listed, 16 undergraduates were hosted by UTIAS and 22 were hosted by IBBME. All international research opportunities were coordinated by the University's Centre for International Exchange.

## Pre-University Engineering Outreach

The goal of our Engineering Student Outreach Office is to foster engineering interests of pre-university students — with a particular focus on increasing the involvement of women and other under-represented groups.

In addition to encouraging students in grades 4 to 12 to explore their interests in Science, Technology, Engineering and Math (STEM), these programs also help to attract qualified high school students interested in applying to undergraduate studies in our Faculty. For example, of the more than 400 top students who took part in DEEP Summer Academy in July 2011, 29 per cent were female and one out of every five was an international participant. In the same year, several DEEP students applied for admission to U of T Engineering and ultimately accepted their offers, starting as first-year students in the fall.

DEEP Summer Academy instructors are alumni and Engineering graduate students who have advanced subject matter expertise and a demonstrated passion for teaching. They developed their leadership skills by providing DEEP counsellors — Engineering undergraduates — with advanced learning opportunities.

By serving as role models, our undergraduate and graduate students help stimulate interest among elementary and high school students to consider engineering careers. Nearly 5,700 young people took part in our programs in 2011–2012 (see Appendix B).

New outreach initiatives for 2011–2012 included:

**RobotX:** An invigorating and hands-on initiative that immerses high school students in a four-day robotics program, RobotX exposes students to complex engineering and mechatronics principles while building bots. The program culminates in an all-out battle.

**In-School Workshops:** Our undergraduates teach workshops in STEM in middle-school classrooms for grades 4 to 8. These workshops complement and expand on Ontario science curriculum.

**Engineering Family Program:** This initiative invites program participants and their parents to attend a research showcase featuring instructors who teach in our outreach programs. In November 2011, for example, two DEEP Summer Academy instructors (PhD candidates in our Faculty) led the group through an in-depth discussion of their bioengineering research.

# Student Clubs and Teams

Participation in activities outside the classroom expands the breadth and initiative of our engineering graduates, something our alumni clearly recognize, as demonstrated by their generous support of our many clubs and teams on campus (see Appendix A for a complete list). The Advancement chapter in this report expands on the ways in which alumni contribute to U of T Engineering. The clubs and teams listed below made the news for achievements in 2011–2012.

## Undergraduate Engineering Research Day (UnERD)

- Gave students a chance to present their research and learn from summer research done by their peers, which was shared through 31 podium talks and 78 poster presentations
- 32 faculty judges evaluated the many summer research projects presented, the largest number in six years
- Projects ranged from enzyme penetration and activity dynamics within wood cells to a web browser extension for secure information sharing on Facebook

## Blue Sky Solar Racing Team

- Built Azure, a solar-powered racing car that is the most recent of six generations of cars developed by U of T students
- Competed in the World Solar Challenge, a 3,000-kilometre race from Darwin to Adelaide, Australia, involving 37 teams from 22 countries
- Placed 24th in the event, the second fastest Canadian entry

## Wharton Undergraduate Consulting Competition

- Placed second at the international consulting competition, outperforming teams from Harvard, University of Pennsylvania, New York University and Rutgers
- Teams solved a global financial service firm's regulatory and operational deficiencies, while increasing annual revenues 60 per cent by 2015

## U of T Engineering Kompetition (UTEK)

- Celebrated the 10th annual UTEK with the highest participation rate ever: 250 students
- Senior teams (third- and fourth-year students) were required to build an autonomous rescue robot that used sound, touch and light sensors to collect items and return them to their starting point, while junior teams (first- and second-year students) created devices that could sort a mixed stream of recyclables into different piles without human help

## Ontario Engineering Competition

- U of T Engineering students hosted the 33rd annual competition for 230 engineering students from across the province
- Two of our teams won third place in the Engineering Communication and Innovative Design categories
- A Civil Engineering entrant also won the Social Awareness award for a green building design

## Spark Design Team

- Through a combination of workshops and challenges, Spark students blend their creativity, engineering knowledge and design acumen into interesting projects
- Developed LED (Laser Emitting Diodes) tiles that were displayed in the lobby of the Galbraith building and a giant walk-on piano in the Bahen Centre
- Featured on the Discovery Channel's daily science information program, Daily Planet, where undergraduates successfully built a 2.5-metre Eiffel Tower out of playing cards

## Women in Science and Engineering (WISE)

- The WISE chapter has expanded in 10 years from five annual events to weekly activities, with an average annual budget of \$800 in 2002 that has grown to \$15,000 this year
- Boasts a 25-member executive team leading 500 women students

## Human-Powered Vehicle Team

- A bike, named Vortex, was constructed by a team of undergraduate and graduate engineering students
- Placed third overall at the 2011 World Human-Powered Speed Challenge, held in Battle Mountain, Nevada
- U of T's four drivers reached speeds exceeding 97 km/h, with the top speed being 117 km/h

## 2 Graduate Studies

More than 1,800 exceptional students from around the world pursued graduate studies in 2011–2012 at U of T Engineering — an increase of 10 per cent over last year that moves us steadily towards our goal of 2,000 graduate students by 2015. Benefiting from collaborations with world-class researchers and scholars, our MEng, MHSc, MASc and PhD students are graduating with the skills, knowledge and networks to make an impact in their area of specialty.

A growing number of graduate students are seeking our MEng program. Its appeal is partly the result of the expanded flexibility and breadth represented by new course and certificate opportunities. MEng certificates, in particular, are helping students reinforce specific interests or explore additional areas to expand their credentials. In 2011–2012, we introduced four new graduate certificates (Energy Studies, Healthcare Engineering, Computational Mechanics in Design, and Robotics & Mechatronics) and developed the flex-time PhD option for students in Mechanical & Industrial Engineering. The new Clinical Engineering PhD program received its first cohort of students in fall 2011, and we welcomed our first Graduate International Foundation Program students in fall 2012.

In 2011–2012, we saw a 5.5-per-cent increase over the previous year in registered PhD students, as well as increased application numbers across all of our graduate programs. These are welcome trends as we work toward recruiting more top PhD students into our Faculty.

We are also enriching the experience of our graduate students with new opportunities to apply their knowledge and skills in industry. Graduate students interested in adding a paid internship to their learning will benefit from the new Graduate Enterprise Internship Program, funded by the Federal Development Agency for Southern Ontario (FedDev Ontario). This initiative, launched in 2012 and administered by the Engineering Career Centre, will support up to 300 six-month internships in small and medium-sized enterprises.

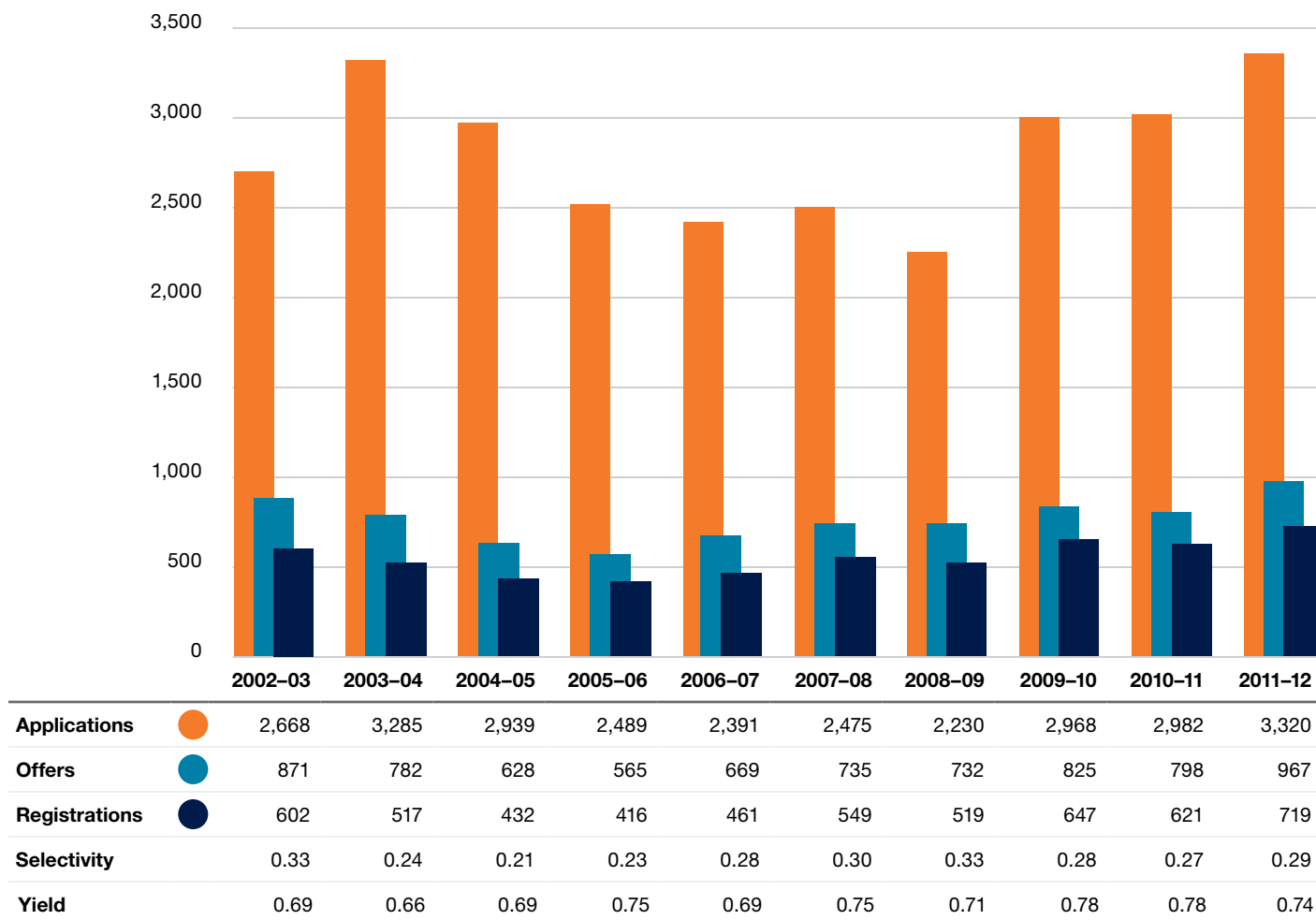
## Graduate Student Admissions

Applications to our graduate programs rose in 2011–2012 to a record 10-year high. The 20.6-per-cent growth in students applying for our MEng program (see Figure 2.1b) contributed to the 11.3-per-cent increase in graduate student applications overall since 2010–2011. This upswing follows the Faculty's goal to generate more interest in the MEng degree, a one-year program aimed at developing the skills and knowledge of engineering professionals. During the same period, MASc and PhD applicants were also up by 5.9 per cent and 11.7 per cent, respectively.

The larger pool of applicants in 2011–2012 made it possible for us to extend more offers than ever before — up 21.2 per cent over the previous year. In turn, that contributed to the increase of our registration count by nearly 15.8 per cent, with the number of registered MEng students rising to an impressive 42.9 per cent over our 2010–2011 count.

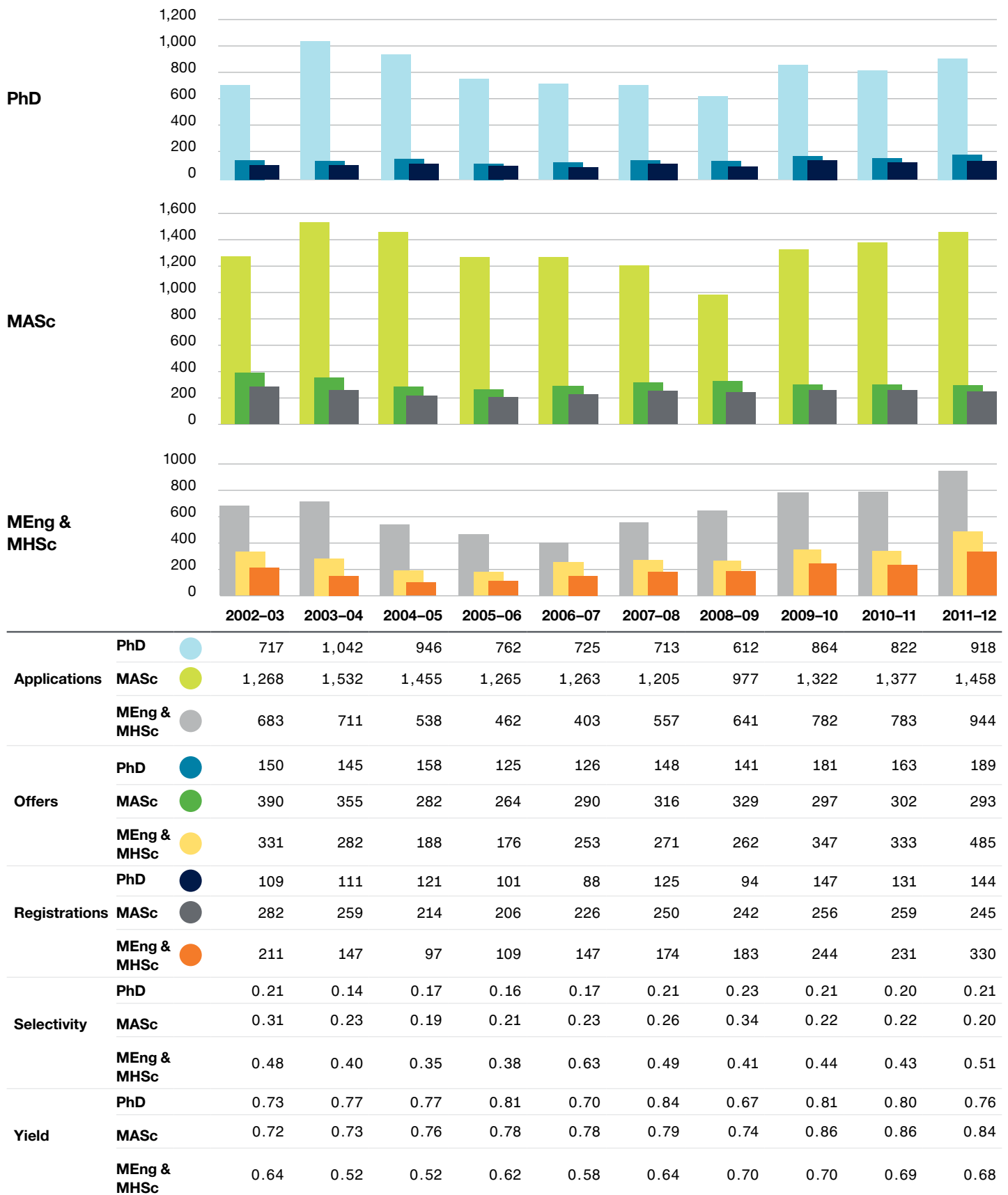
Three-quarters of those who received offers in 2011–2012 followed up by registering, confirming that students recognize the strength and calibre of a U of T Engineering graduate degree.

**Figure 2.1a Applications, Offers, Registrations, Selectivity and Yield of Graduate Students, 2002–2003 to 2011–2012**



**Note 2.1a:** Student counts are shown as of November 1. Applications and offers represent a full-year admission cycle. Selectivity = Offers ÷ Applications; the proportion of applicants who were offered admission. Yield = Registrations ÷ Offers; the proportion of students who accept our offers.

**Figure 2.1b Applications, Offers, Registrations, Selectivity and Yield of Graduate Students by Degree Type, 2002–2003 to 2011–2012**



**Note 2.1b:** Student counts are shown as of November 1. Applications and offers represent a full-year admission cycle.  
Selectivity = Offers ÷ Applications; Yield = Registrations ÷ Offers.

## Graduate Student Enrolment

The total number of students in our graduate programs in 2011–2012 represented the largest one-year upward surge we have experienced in the last 10 years: an increase of 10.4 per cent, bringing our total enrolment to 1,842. This increase represents one-third more MEng students and 5.5 per cent more PhD students than in 2010–2011. Growth in the past five years is consistent with our goal of increasing the number of graduate students to 2,000 by 2015.

The number of international students and women (see Figure 2.2b) in our graduate programs is at an all-time high. With more women pursuing undergraduate and masters programs in engineering, we are seeing their numbers grow in doctoral studies. Ten years ago, about one in every six doctoral students was female, while in 2011–2012 that ratio grew to one out of every four.

Figure 2.2a International and Domestic Graduate Students by Degree Type, 2002–2003 to 2011–2012

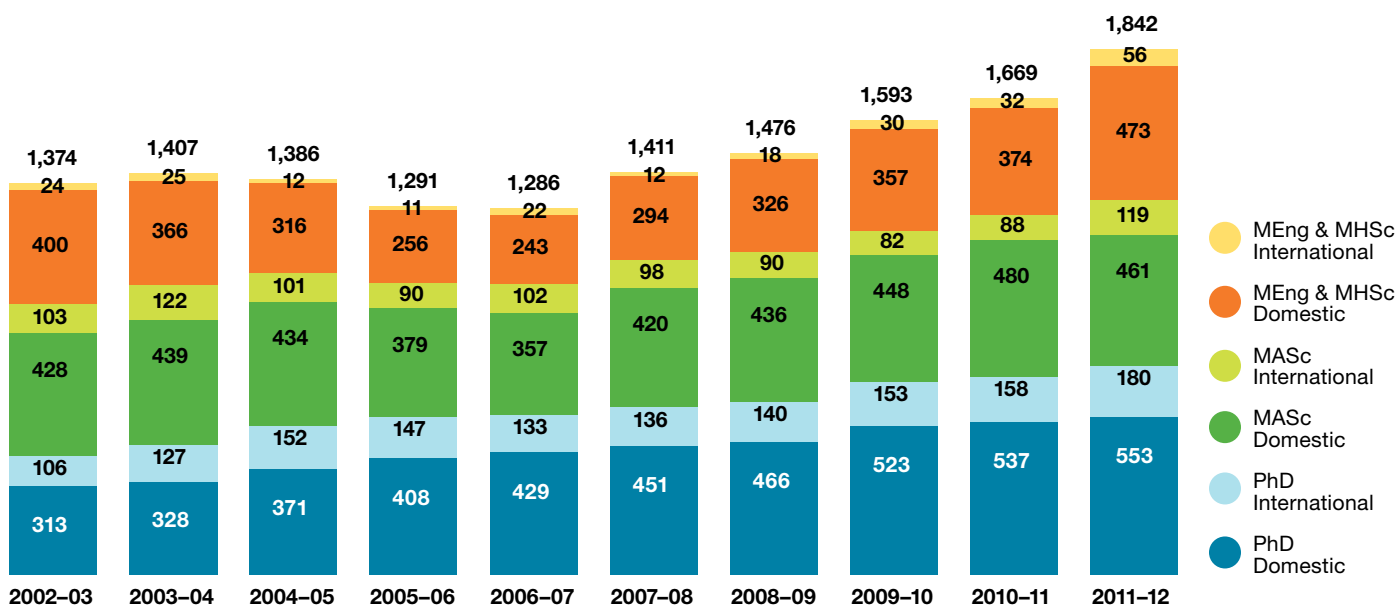
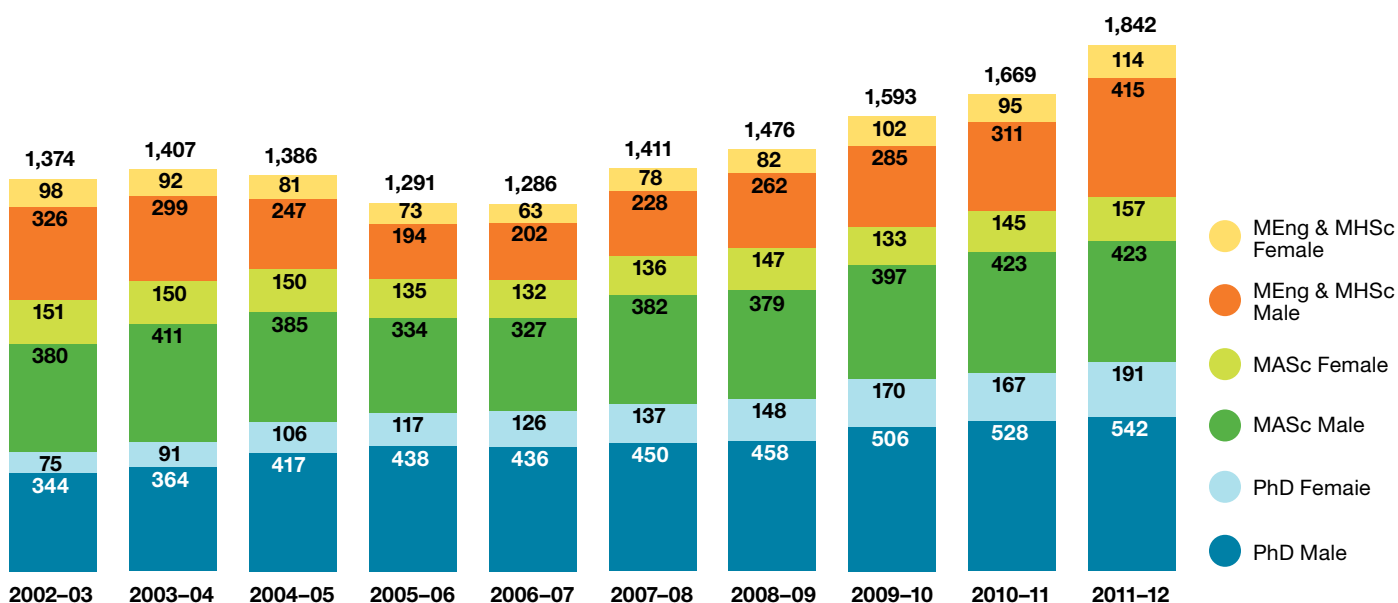


Figure 2.2b Graduate Students by Degree Type and Gender, 2002–2003 to 2011–2012



**Note 2.2a:** Student counts are shown as of November 1.

**Note 2.2b:** Student counts are shown as of November 1. EFTE is calculated on a 12-month basis (e.g., May to April).

Full-time equivalent (FTE) expresses the total number of students based on a full-time course load. For example, two part-time students with a 50-per-cent course load each would count as two in the headcount, but equal one FTE. The Faculty's headcount of graduate students in the past decade has increased 34 per cent, while FTE has grown by 40 per cent.

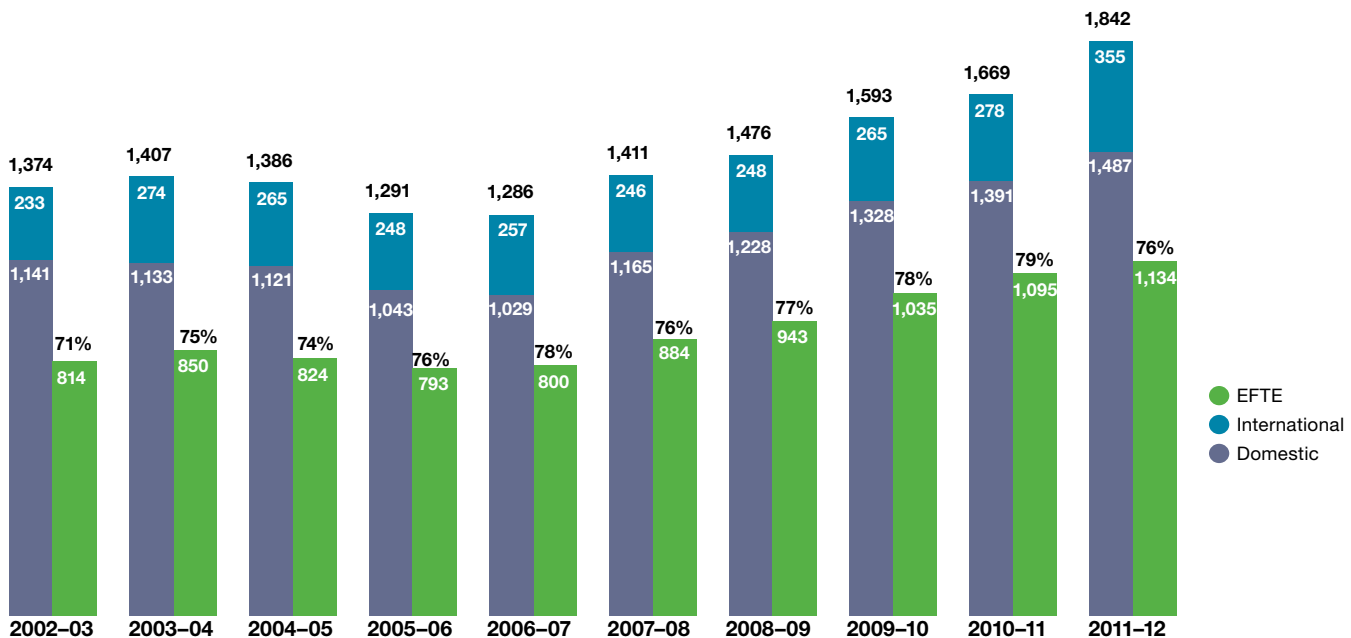
**Figure 2.2c Enrolment by Full-Time Equivalent (FTE) and Headcount (HC) by Academic Area, 2002–2003 to 2011–2012**

|         |     | UTIAS | IBBME | ChemE | CivE  | ECE   | MIE   | MSE  | Total   |
|---------|-----|-------|-------|-------|-------|-------|-------|------|---------|
| 2002–03 | FTE | 84.2  | 22.0  | 148.3 | 196.1 | 358.0 | 313.2 | 68.8 | 1,190.6 |
|         | HC  | 87    | 22    | 156   | 236   | 421   | 379   | 73   | 1,374   |
| 2003–04 | FTE | 89.9  | 48.0  | 159.4 | 184.2 | 383.6 | 228.5 | 77.0 | 1,230.6 |
|         | HC  | 92    | 48    | 165   | 222   | 441   | 355   | 84   | 1,407   |
| 2004–05 | FTE | 97.0  | 57.0  | 164.7 | 157.5 | 381.7 | 287.3 | 77.0 | 1,222.2 |
|         | HC  | 97    | 57    | 171   | 189   | 430   | 358   | 84   | 1,386   |
| 2005–06 | FTE | 85.3  | 52.0  | 142.1 | 150.4 | 380.5 | 278.8 | 71.1 | 1,160.2 |
|         | HC  | 86    | 52    | 147   | 170   | 428   | 332   | 76   | 1,291   |
| 2006–07 | FTE | 79.6  | 75.0  | 138.5 | 160.3 | 407.3 | 238.8 | 67.5 | 1,167.0 |
|         | HC  | 81    | 75    | 142   | 182   | 457   | 278   | 71   | 1,286   |
| 2007–08 | FTE | 105.0 | 115.0 | 150.0 | 183.3 | 438.1 | 227.3 | 71.2 | 1,289.9 |
|         | HC  | 105   | 115   | 157   | 212   | 478   | 270   | 74   | 1,411   |
| 2008–09 | FTE | 122.9 | 140.0 | 167.8 | 184.0 | 415.4 | 237.1 | 82.8 | 1,350.0 |
|         | HC  | 125   | 140   | 179   | 219   | 442   | 284   | 87   | 1,476   |
| 2009–10 | FTE | 130.6 | 153.0 | 209.1 | 200.2 | 421.5 | 284.3 | 70.4 | 1,469.1 |
|         | HC  | 132   | 153   | 221   | 238   | 453   | 320   | 76   | 1,593   |
| 2010–11 | FTE | 140.9 | 168.0 | 195.4 | 212.6 | 403.0 | 339.2 | 68.2 | 1,527.6 |
|         | HC  | 143   | 168   | 208   | 256   | 431   | 391   | 72   | 1,669   |
| 2011–12 | FTE | 143.2 | 199.0 | 202.3 | 229.8 | 437.7 | 382.6 | 68.2 | 1,662.8 |
|         | HC  | 146   | 199   | 217   | 276   | 479   | 454   | 71   | 1,842   |

**Note 2.2c:** Student counts are shown as of November 1.

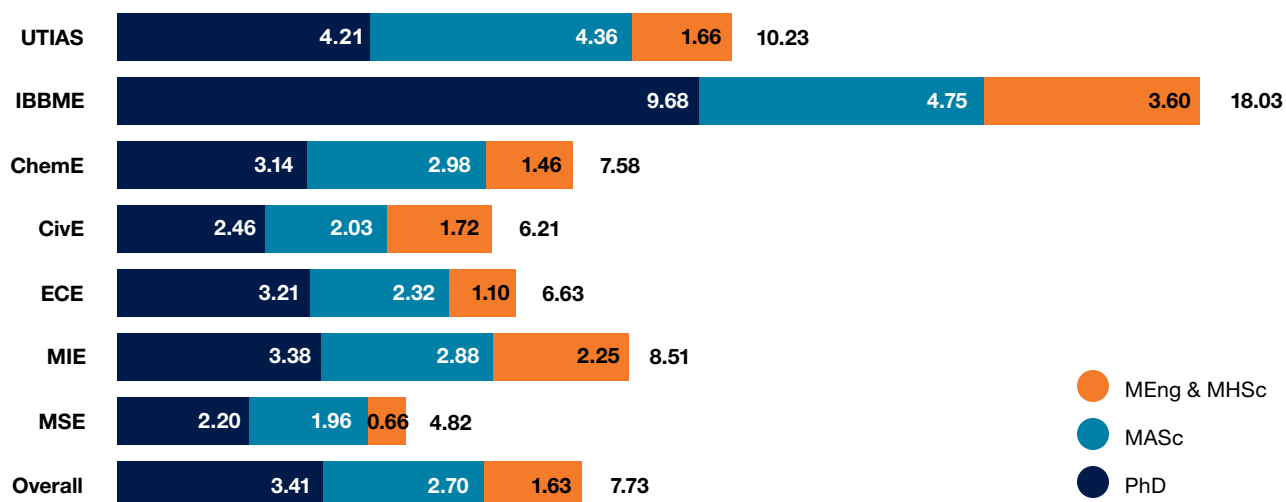
The number of international graduate students grew by 20 per cent in the past year. Government funding guidelines define the number of years for which domestic students in each degree stream are eligible for grant funding. The proportion of our domestic students who are eligible (expressed as eligible full-time equivalent or EFTE) decreased slightly in 2011–2012, affected by factors such as the length of time students take to complete their degrees and the number of part-time MEng students.

**Figure 2.2d Graduate Students: International, Domestic and Eligible Full-Time Equivalent (EFTE), 2002–2003 to 2011–2012**



The number of students per faculty member is calculated by dividing the number of full-time equivalent (FTE) graduate students in each academic unit by the number of tenure-stream faculty. Figure 2.3 does not fully capture the interdisciplinary, collaborative, cross-faculty characteristics that are a strength of a U of T Engineering graduate education. For example, IBBME draws on faculty from Medicine and Dentistry, as well as Engineering.

**Figure 2.3 Full-Time Equivalent (FTE) Graduate Student-Faculty Ratios by Academic Area and Degree Type, 2011–2012**



**Note 2.2c:** Student counts are shown as of November 1.

**Note 2.3:** Data reported by academic year (September to August).

## Graduate Student Funding

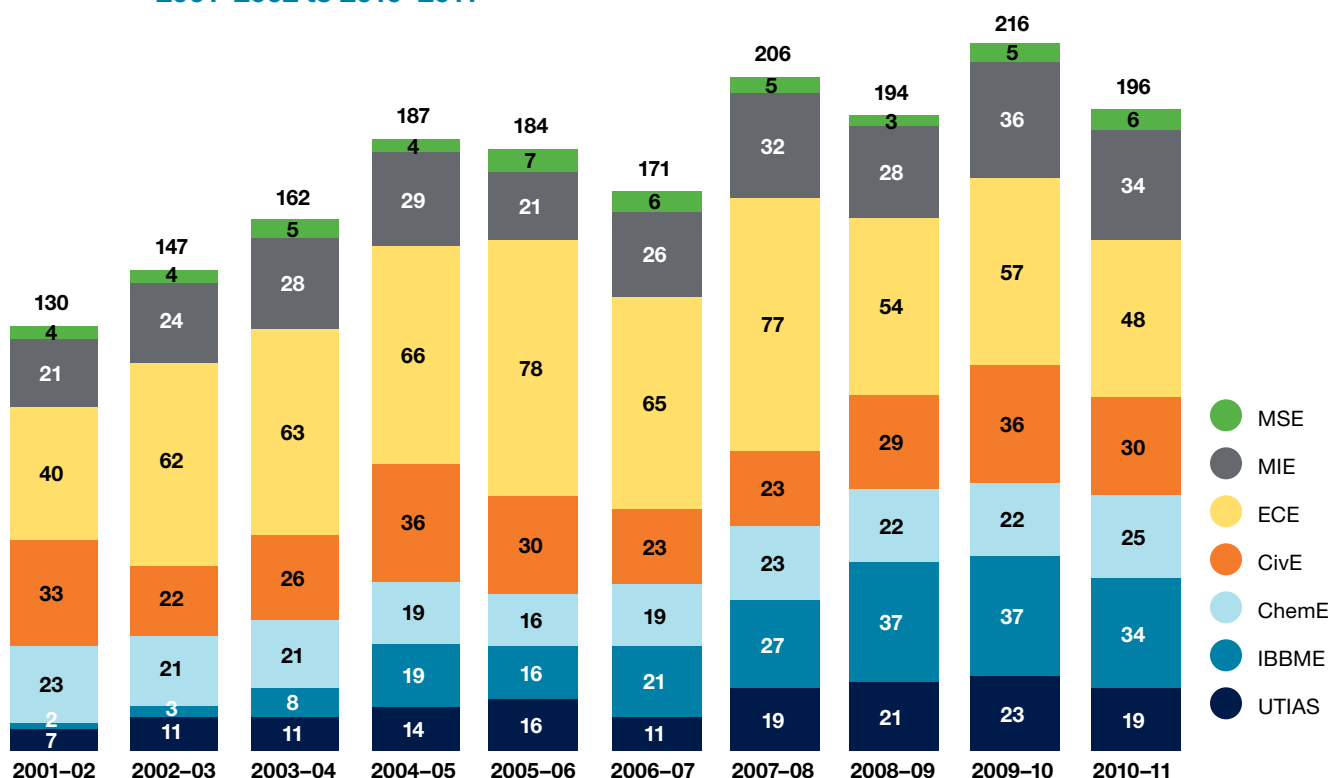
The amount of total scholarship funding grew by nearly 4 per cent in 2010–2011, even though the number of graduate students receiving awards slightly decreased (Figure 2.4b). It reflects the trend towards higher scholarships per student from our traditional agencies: the Natural Sciences and Engineering Research Council (NSERC) and the Ontario Graduate Scholarship (OGS) program. Eligibility for funding is restricted to domestic doctoral-stream students.

Funding from external and other sources (excluding NSERC and OGS) represents approximately 4 per cent of the total and includes scholarships awarded by the Canadian Institutes of Health Research (CIHR), the Social Sciences and Humanities Research Council (SSHRC), other foundations, industry sources, and U of T fellowships and grants.

Figure 2.4a External Graduate Student Scholarships by Source, 2001–2002 to 2010–2011

|         | NSERC       | OGS         | External–Other | Total       |
|---------|-------------|-------------|----------------|-------------|
| 2001–02 | \$1,965,512 | \$776,859   | \$52,440       | \$2,794,811 |
| 2002–03 | \$2,260,280 | \$1,328,342 | \$14,705       | \$3,603,327 |
| 2003–04 | \$2,764,450 | \$1,479,994 | \$56,240       | \$4,300,684 |
| 2004–05 | \$3,221,367 | \$1,161,671 | \$77,334       | \$4,460,372 |
| 2005–06 | \$3,400,236 | \$1,106,665 | \$23,500       | \$4,530,401 |
| 2006–07 | \$3,228,150 | \$1,088,332 | \$31,100       | \$4,347,582 |
| 2007–08 | \$3,827,494 | \$930,000   | \$68,167       | \$4,825,661 |
| 2008–09 | \$3,737,157 | \$868,332   | \$111,770      | \$4,717,259 |
| 2009–10 | \$4,255,856 | \$838,334   | \$226,563      | \$5,320,753 |
| 2010–11 | \$4,267,783 | \$1,050,011 | \$213,519      | \$5,531,313 |

Figure 2.4b Number of NSERC Graduate Student Scholarship Recipients by Academic Area, 2001–2002 to 2010–2011



**Note 2.4a:** “External–Other” includes awards from the Canadian Institutes of Health Research and the Social Sciences and Humanities Research Council, as well as foundations and industry sources. Data reported by academic year (September to August).

**Note 2.4b:** Data reported by academic year (September to August).

Figure 2.5a Graduate Student Funding by Category, 2002–2003 to 2011–2012

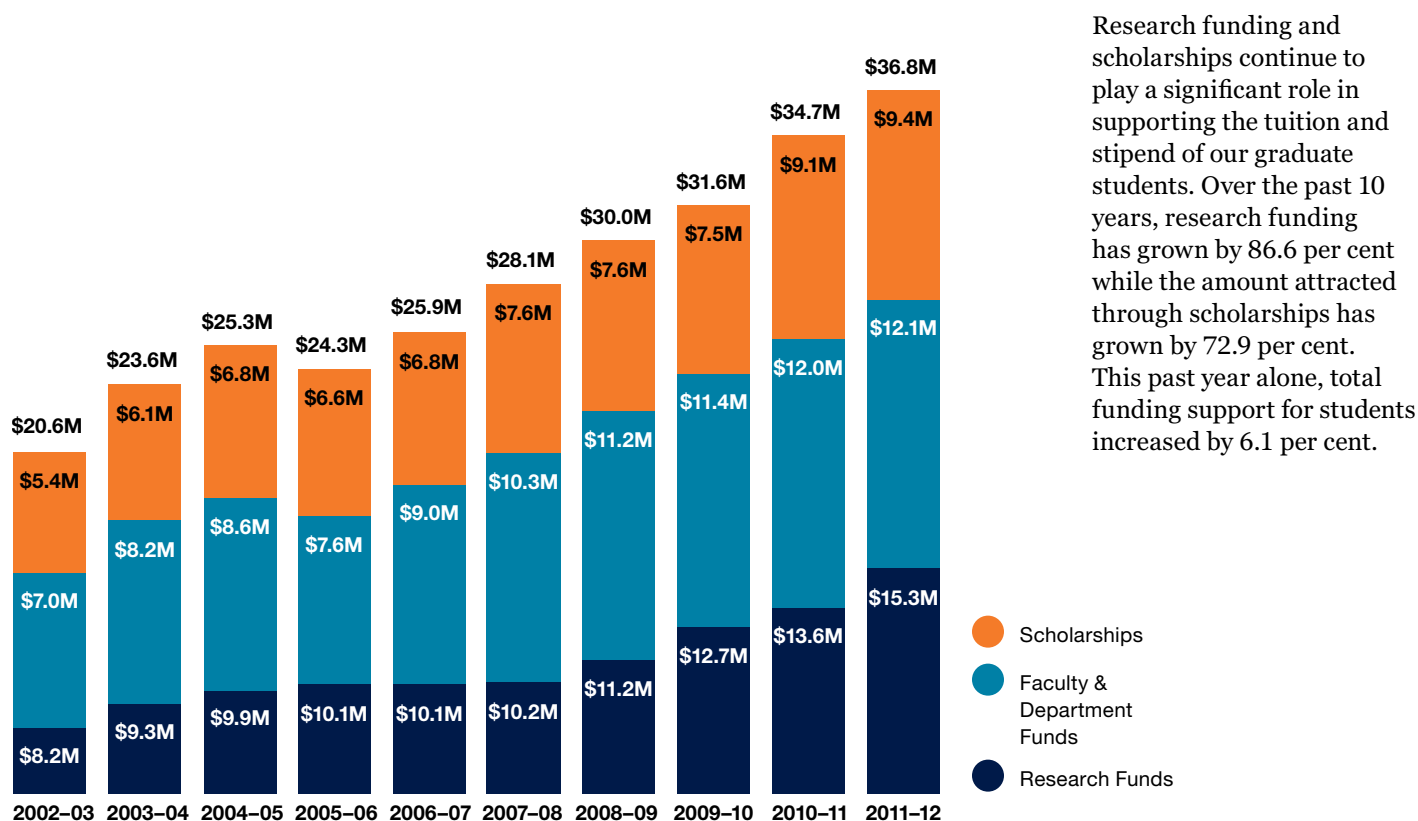
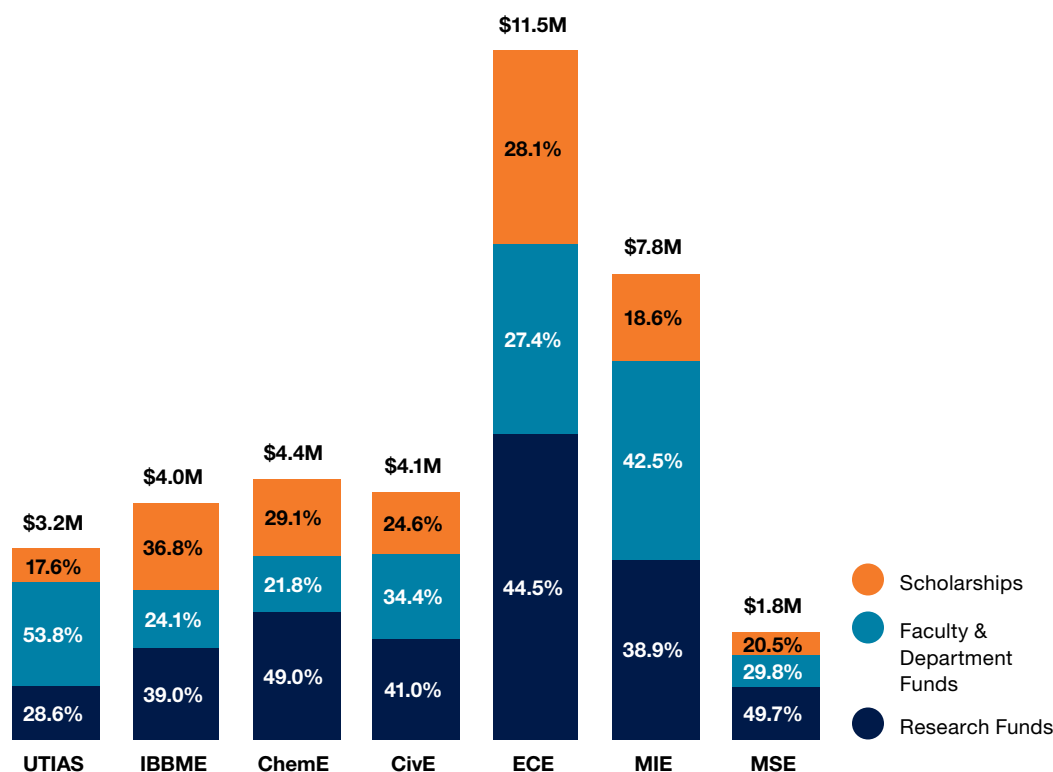


Figure 2.5b Graduate Student Funding by Category and Academic Area, 2011–2012



**Note 2.5a and 2.5b:** Data are shown by fiscal year (May to April). For example, 2011–2012 represents the funding cycle starting in May 2011 and ending in April 2012.

## Graduate Studies Completion

The fast-track option for qualified MASc students near the end of their first year makes it possible to complete a doctoral degree in a shorter period of time. Each academic unit has its own process for exercising the option. In some cases, students apply to fast track, and in others, eligible students who demonstrate potential are approached by faculty and asked to consider the possibility. In the past year, ECE made changes to its fast-track and actively promoted it, resulting in a significant increase in candidates.

**Figure 2.6 Number of Students Fast-Tracked from MASc to PhD by Academic Area, 2006–2007 to 2010–2011**

| Fast-tracked during | 2006–07   | 2007–08   | 2008–09   | 2009–10   | 2010–11   |
|---------------------|-----------|-----------|-----------|-----------|-----------|
| Most began PhD in   | Fall 2007 | Fall 2008 | Fall 2009 | Fall 2010 | Fall 2011 |
| UTIAS               | 1         | 2         | 8         | 6         | 5         |
| IBBME               | 2         | 8         | 9         | 8         | 7         |
| ChemE               | 7         | 4         | 9         | 8         | 5         |
| CivE                | 5         | 4         | 4         | 3         | 4         |
| ECE                 | 2         | 2         | 1         | 1         | 6         |
| MIE                 | 3         | 8         | 9         | 4         | 6         |
| MSE                 | 2         | 2         | 4         | 2         | 2         |
| <b>Total</b>        | <b>22</b> | <b>30</b> | <b>44</b> | <b>32</b> | <b>35</b> |

Time to graduation represents the length of time between a student's initial enrolment in a graduate program and meeting all the requirements for graduation. The data used for this year's report is calculated using a more sophisticated algorithm, providing more precise median values than in past reports. MASc and full-time MEng students usually complete their program requirements in an established time frame of two years and one year, respectively. On average, doctoral students take five years to complete their PhD.

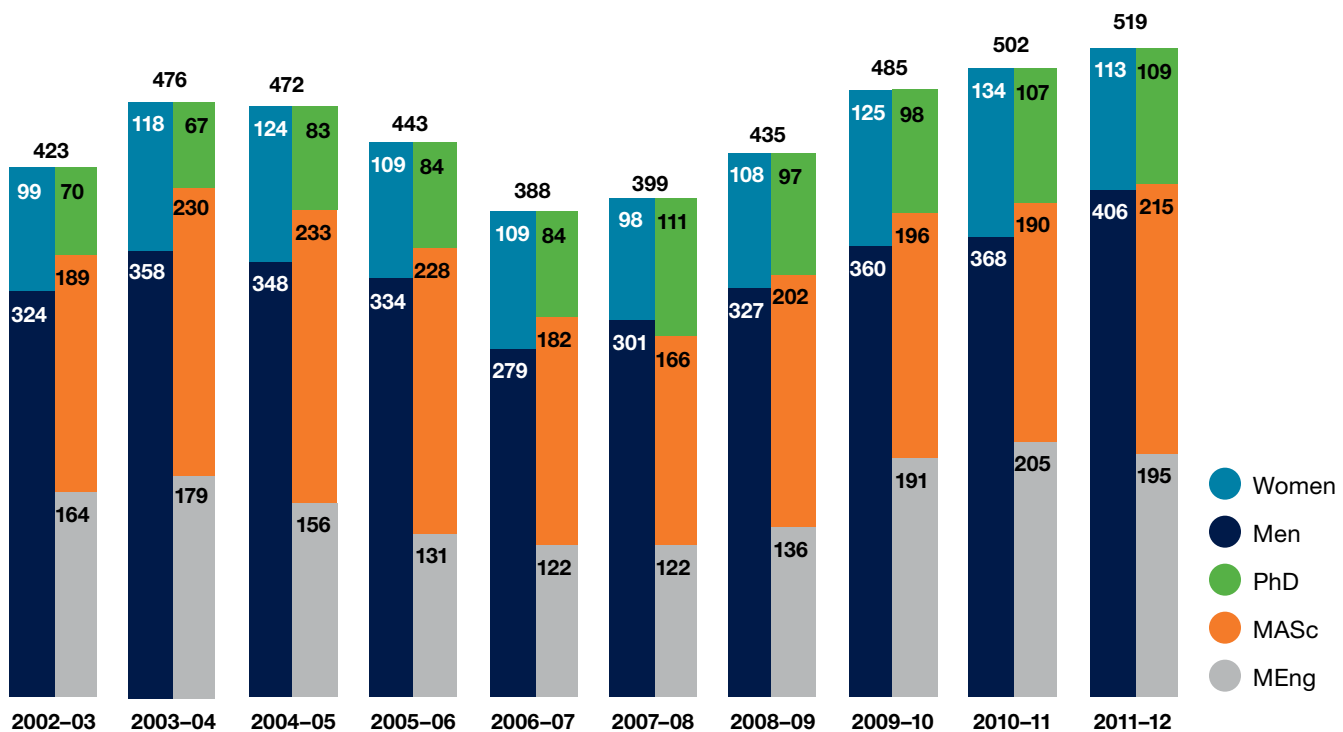
**Figure 2.7 Time to Graduation for PhD, MASc, MEng and MHSc Graduate Students, 2002–2003 to 2011–2012**

|                  | 2002–03 | 2003–04 | 2004–05 | 2005–06 | 2006–07 | 2007–08 | 2008–09 | 2009–10 | 2010–11 | 2011–12 |
|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| PhD              | 5.0     | 5.0     | 5.0     | 4.3     | 5.0     | 4.7     | 4.7     | 4.7     | 5.3     | 5.0     |
| MASc             | 2.0     | 2.0     | 2.0     | 2.0     | 2.0     | 2.0     | 2.0     | 2.0     | 2.0     | 2.0     |
| MEng & MHSc (FT) | 1.3     | 1.0     | 1.0     | 1.3     | 1.0     | 1.0     | 1.0     | 1.0     | 1.0     | 1.0     |
| MEng & MHSc (PT) | 1.8     | 2.0     | 2.0     | 2.3     | 2.0     | 2.0     | 2.3     | 2.3     | 2.3     | 2.0     |

**Note 2.6 and 2.7:** Data reported by academic year (September to August).

The 519 degrees awarded in 2011–2012 were the most yet awarded by U of T Engineering — an increase of 3.4 per cent over the previous year. The number of post-graduate degrees bestowed in the past six years has grown by 33.8 per cent, a figure that will likely continue to improve, given the increased enrolment of graduate students in the past few years.

**Figure 2.8 Graduate Degrees Awarded by Degree Type and Gender, 2002–2003 to 2011–2012**



## Graduate Studies Initiatives

### Flexible PhD Option for MIE

The new flexible PhD option for MIE students, starting in September 2012, will make it possible for qualified, motivated engineers who are employed full-time in an industrial R&D setting to pursue a PhD while working. The flex-time route to a PhD not only accommodates the needs of the doctoral student, but also helps the Faculty strengthen relationships and knowledge transfer with industry partners conducting world-class research. The result is a three-way collaboration among students, industry and MIE professors.

### Clinical Engineering PhD Concentration

In 2011–2012, IBBME welcomed our first cohort of students into the new Clinical Engineering PhD concentration. The program prepares students to meet the increasing demand for clinical engineers through coursework, research in a clinical health care environment and co-supervision by engineering and health science faculty. The program includes an option to allow current IBBME MHSc students to transfer into the PhD program's concentration.

### Graduate Enterprise Internship Program

Hundreds of graduate students and recent graduates interested in paid internships with small and medium-sized Ontario enterprises will benefit from the Graduate Enterprise Internship (GEI) program, created in 2012 by the Federal Development Agency for Southern Ontario. FedDev Ontario provides funding for post-secondary institutions and not-for-profit organizations to arrange internships and mentorships for graduate students and recent graduates. The GEI program is expected to make it possible for up to 300 six-month internships for U of T Engineering graduate students.

**Note 2.8:** Data reported by academic year (September to August).

## Expanded MEng Opportunities

Currently, U of T Engineering offers seven MEng certificates, available to all graduate students unless otherwise indicated:

- Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) — see Figure 2.9 for details on the number of certificates awarded
- Engineering & Public Policy (EPP)
- Engineering & Globalization
- Robotics & Mechatronics
- Computational Mechanics in Design (MIE only)
- Energy Studies (MIE only)
- Healthcare Engineering (MIE only)

In addition to the certificates available to MEng candidates in MIE, students can obtain an MEng in Design and Manufacturing through the Advanced Design and Manufacturing Institute — a U of T-McMaster-Queen's-Western partnership. As well, employees of Magna International Inc. have the opportunity to pursue a specialized MEng through the Stronach Centre for Innovation (see Figure 2.10 for program enrolment details).

As part of our collaboration with the New York City Center for Urban Science and Progress initiative, we are developing a cutting-edge professional Master of Engineering in Cities Engineering and Management (MEngCEM) program. MEngCEM will attract students from a variety of disciplines who are interested in the sustainable growth and development of large urban areas. For more on CUSP, please see the International Initiatives chapter.

**Figure 2.9 ELITE Certificates Awarded, 2008–2009 to 2011–2012**

|              | 2008–09  | 2009–10   | 2010–11   | 2011–12   |
|--------------|----------|-----------|-----------|-----------|
| <b>AeroE</b> |          | 1         | 1         |           |
| <b>ChemE</b> |          | 1         | 14        | 12        |
| <b>CivE</b>  | 2        | 7         | 13        | 19        |
| <b>ECE</b>   | 1        | 3         | 4         | 3         |
| <b>MIE</b>   |          | 7         | 17        | 19        |
| <b>MSE</b>   |          |           | 1         | 2         |
| <b>Total</b> | <b>3</b> | <b>19</b> | <b>50</b> | <b>55</b> |

Following the leap in ELITE certificates awarded in 2010–2011, the numbers grew again in 2011–2012 by another 10 per cent. There were 898 students enrolled in 20 ELITE courses — a 37-per-cent enrolment increase.

**Figure 2.10 MEng, SCFI Program Enrolment, Fall 2008 to Winter 2012**

|                    | Enrolment |
|--------------------|-----------|
| <b>Fall 2008</b>   | 9         |
| <b>Fall 2009</b>   | 8         |
| <b>Winter 2010</b> | 12        |
| <b>Fall 2010</b>   | 30        |
| <b>Winter 2011</b> | 33        |
| <b>Fall 2011</b>   | 28        |
| <b>Winter 2012</b> | 30        |

Since fall 2010, the Stronach Centre for Innovation Magna program for MEng students has maintained a steady enrolment of about 30 students. Students in this program pursue a major technical project in addition to completing a range of courses.

Eighteen new MEng courses were launched across the Faculty's academic units in 2011–2012. They join the growing selection of courses, specializations and certificates available to graduate students pursuing the MEng designation.

### **ChemE**

- Hydrometallurgy, Theory and Practice looks at the use of water-based solutions to recover metals from ores and recycled materials
- Environmental Auditing provides an overview of environmental management and the impact of legislation, protection and certification on the auditing process
- Technical Aspects of Environmental Regulations examines the nature of adverse effects on water, air, waste and contaminated sites, then applying scientific resolutions to meet compliance
- Air Dispersion Modelling focuses on the use and limitations of screening and advanced air dispersion models, which are mathematical computer simulations to determine if air pollutants are dispersed in the atmosphere
- Six Sigma for Chemical Processes explores the Six Sigma (DMAIC) project execution methodology employed across business and industry

### **UTIAS**

- Introduction to Modern Flow Control explores the development, methods and concepts of flow control
- Advanced Fluid Mechanics includes an in-depth look at the study of liquids, gases and plasmas, and the forces on them
- Advanced Aerospace Structures is an introduction to stress, strain and material component laws, as well as optimizing structural design
- State Estimation for Aerospace Vehicles develops an understanding of the position, orientation, velocity and other states of a vehicle, whether operated by a driver or done remotely

### **ECE**

- Technical Management of Modern IC Design examines the management and layout behind designing large integrated circuits
- Service Provider Networks covers networking concepts from a service provider's perspective
- Introduction to Cloud Computing explores the technological concepts, interfaces and models that make cloud computing possible

### **MSE**

- Forensic Engineering uses a mock courtroom trial and other strategies to give students an understanding of scientific and engineering investigation methods

### **ELITE**

- Advanced Project Management builds on the basic Project Management course by delving into change management, troubled projects, premature termination and advanced skills for project managers
- Social Entrepreneurship is for students interested in starting a business venture that advances the social or environmental good
- Financial Management for Engineers looks at classical equity valuation methods, capital budgeting and investment analysis, and the role of dividend policy
- Engineering and Sustainable Development ties sustainable development issues, like climate change, to contemporary engineering practice
- International Business for Engineers is targeted at potential entrepreneurs interested in going global. It looks at foreign markets and managing the dynamics of global competition

# 3 Research

U of T Engineering faculty and students carry out path-breaking research on the world stage. Our research in applied science and engineering is part of a global effort, fostered by international collaborations, to advance scientific understanding and its application to solve human problems. The challenges include meeting the energy needs of future generations, breaking down the barriers of geography and disciplines to connect individuals, and accelerating and refining medical diagnosis and treatment. By partnering with existing companies, and creating new ones, we are translating our advances into innovations, products and services.

Our research is distinguished by the creative collaborations we forge with industry, government and other educators. Whether it involves exploring ways to help Canadians share digital information quickly and easily or teaming up with international companies and universities to tackle the challenges facing large cities, our researchers are deeply engaged in profound labwork and fieldwork that makes a difference. It is multidisciplinary teamwork that is adding quality and strength to the research we do.

The lengthy list of companies partnering with U of T Engineering researchers is a testament to our increasing collaboration with organizations finding ways to benefit society and meet market needs. Magna and General Motors of Canada are two of many automotive companies participating in research to develop a stronger Canadian automotive sector. A growing number of industrial partners are also adding their financial support to the funding we already receive from NSERC and other government agencies. The contribution from industry is nearly four times what was in 2001–2002.

Research funding received by U of T Engineering has experienced impressive growth in recent years, increasing 44 per cent from 2008–2009 to 2010–2011, while the infrastructure funding that supports our research activity has more than quadrupled in the same period. Our annual share of NSERC funding also grew in 2011–2012, providing a strong foundation of support for research and collaboration.

## Selected Research Highlights for 2011–2012

### UTIAS CREATEs Environmentally Sustainable Aviation Program

With the help of a \$1.65-million six-year grant from NSERC's CREATE (Collaborative Research and Training Experience) program, a team of UTIAS professors – in collaboration with professors from other parts of the Faculty and University – will develop the next generation of aerospace engineers to take on the challenge of ensuring the industry is environmentally sustainable. Building on U of T's reputation for research into ways to reduce aviation's carbon footprint, the new Environmentally Sustainable Aviation certificate program will train more than 130 undergraduate and graduate students. They will learn about aerodynamics to reduce drag on airplanes, study lightweight options in aircraft construction and examine biofuel options.

The new program joins four other CREATE programs at U of T Engineering: Nanoscience & Nanotechnology; Academic Rehabilitation Engineering; Microfluidic Application & Training in Cardiovascular Health; and, Distributed Generation for Remote Communities.

### Shedding New Light on Neural Imaging Research

This past year, Professor Ofer Levi (IBBME) and his research team developed a cost-effective neural imaging system that will enable researchers to make much more complex maps of the brain using cutting-edge illumination technology. Currently, researchers often require several different imaging techniques to fully map brain functions, making research and treatment of these conditions expensive and inefficient. The team's agile system uses Vertical Cavity Surface Emitting Lasers, allowing the operator to map different parts of the brain simultaneously with greater precision and in much less time. Next, they plan to adapt the technology to a portable model.

### RCI Examines How Structures Can Expect the Unexpected

The Centre for the Resilience of Critical Infrastructure (RCI), launched in September 2011, is looking into the ability of buildings and utilities to withstand the onslaught of a disaster, whether it is a natural calamity or a terrorist threat. Today's society needs structures that are resilient enough to withstand such pressures — the kinds of pressures never anticipated by traditional procedures of engineering design. RCI, based in Civil Engineering, is bringing together expertise in research and practice in academia, government and industry. It will be expanding the dialogue on infrastructure resilience through workshops and presentations.

### Water Consortium Integrates Market-Driven Technologies

Researchers at eight Ontario universities, along with industry and government partners, received \$19.58 million from the federal government's FedDev Ontario agency to look at ways to improve access to clean, safe drinking water, and develop appropriate treatments for community waste water. Six U of T Engineering researchers, including members of the Drinking Water Research Group, are participating. The Southern Ontario Water Consortium project plans to build a research development and testing system for new water technologies — a 'superlab' for research into treating water and waste water.

### SAVI Network: Advancing Canada's Digital Economy Strategy

Based at U of T, the NSERC Strategic Network in Smart Applications on Virtual Infrastructure (SAVI) has been created with the help of a \$5-million five-year grant to cultivate innovative digital application platforms. The new network is supported by nearly 20 industry and public sector partners, including IBM Canada, MTS Allstream, Telus, Ericsson Canada and Cisco, which will provide \$3.5 million over five years. It will create new job opportunities in the computing and communications sectors and allow Canadians to share digital information quickly and easily. Five U of T Engineering postdoctoral fellows each year and nearly 50 graduate students will support the network's efforts. SAVI is the Faculty's second NSERC Strategic Networks grant, the first being for research into innovative plastic materials and manufacturing processes.

## U of T In the Driver's Seat With New Auto Research Projects

Research into building cars out of trees and plants is just one of six initiatives supported by a \$3.3-million grant from the federal government. Coordinated by the AUTO21 Network of Centres of Excellence, projects involving U of T Engineering researchers include: exploring new training strategies to help drivers operate vehicles in more fuel-efficient ways; using lightweight recyclable plastics to reduce the cost of materials needed to manufacture cars; investigating the particulate emissions from biofuels such as ethanol; and assessing the life cycles of emerging automotive technologies. The projects are further supported by contributions from Canada's automotive sector, including automakers, parts manufacturers and material suppliers.

## ChemE Biomass Project Assists Pulp and Paper Operations

A ChemE research team is looking at the potential of biomass to help pulp and paper mills achieve stringent environmental regulations and improve waste management. It is doing it with the help of a four-year \$1.8-million Collaborative Research and Development (CRD) grant from NSERC and sponsorship worth about \$2 million from 10 industrial partners in the pulp and paper, boiler and chemical supplier sectors. Led by Professor Honghi Tran (ChemE), the Frank Dottori Chair in Pulp and Paper Engineering and Director of the University of Toronto Pulp & Paper Centre, the group is exploring the drying, combustion and ash properties of biomass.

## Most Efficient OLED on Plastic Developed in MSE

Can visual displays occur on paper-thin plastics that can be bent or even folded? Research by an MSE team suggests they can. The team created the first high-efficiency organic light-emitting diode (OLED) on plastic; a flexible, less costly alternative to traditional OLED manufacturing which currently relies on rigid glass. Professor Zheng-Hong Lu (MSE), Canada Research Chair in Organic Optoelectronics, is leading the team developing the portable, pliable OLEDs that create high contrast with low energy. Read more about the reach of this story in the Communications chapter.

## Nine New Chairs Appointed; Two Renewed

In 2011–2012, nine U of T engineers secured new research chair appointments while another two were renewed. The chairs will support collaborative research and innovation that will benefit Canada and the world. They are:

- Robert Andrews (CivE), renewed NSERC Industrial Research Chair in Drinking Water Research
- Kamran Behdinan (MIE), NSERC Chair in Multidisciplinary Engineering Design
- Vaughn Betz (ECE), NSERC/Altera Industrial Research Chair in Programmable Silicon
- Warren Chan (IBBME), renewed Canada Research Chair in Biotechnology
- Constantin Christopoulos (CivE), Canada Research Chair in Seismic Resilience of Infrastructure
- Axel Guenther (MIE), Wallace G. Chalmers Chair of Engineering Design
- Ron Hofmann (CivE), NSERC Associate Industrial Research Chair in Drinking Water
- Greg A. Jamieson (MIE), Clarice Chalmers Chair of Engineering Design
- Joyce Poon (ECE), Canada Research Chair in Integrated Photonic Devices
- Milica Radisic (IBBME, ChemE), Canada Research Chair in Functional Cardiovascular Tissue Engineering
- Sam Sampath (UTIAS), NSERC/P&WC Industrial Research Chair in Aviation Gas Turbine Combustion/Emissions Research and Design System Optimization

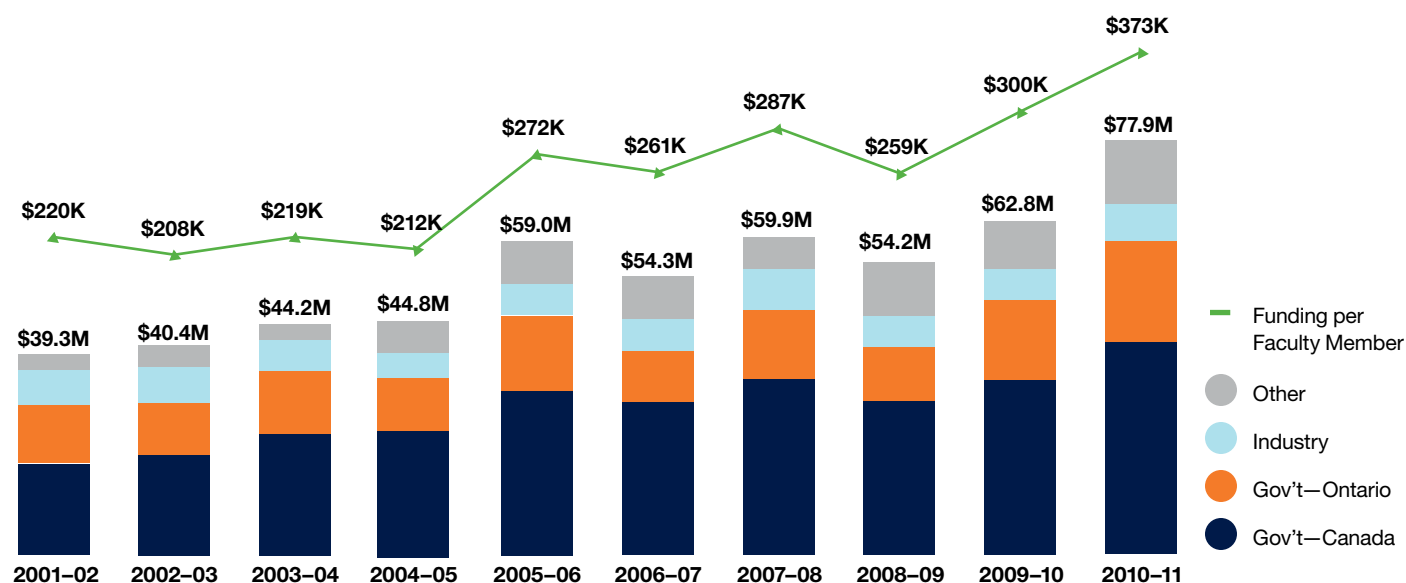
A complete list of our growing roster of research chairs can be found in Appendix C.

## Research Funding and Partnerships

The research dollars granted to U of T Engineering in the past two years have grown by 44 per cent and now represent an annual average of nearly \$373,000 per faculty member. Figure 3.1a updates the 2010–2011 amount to show all funds for that year — almost \$8 million more than indicated in the 2011 Annual Report. That brings the total to \$77.9 million. In future reports, the focus will be on the most recent year for which we have complete information. The total amounts for a few of the earlier years have changed slightly to reflect the impact of multi-year research awards.

An accounting of research funding for each academic area can be found in Appendix D. The Research Chairs for 2011–2012 are listed in Appendix C.

**Figure 3.1a Research Funding by Year and Source and Funding per Faculty Member, 2001–2002 to 2010–2011**



|         | Funding per Faculty Member | Gov't–Canada | Gov't–Ontario | Industry    | Other        | Total        |
|---------|----------------------------|--------------|---------------|-------------|--------------|--------------|
| 2001–02 | \$219,631                  | \$17,515,248 | \$11,053,520  | \$7,214,347 | \$3,530,862  | \$39,313,977 |
| 2002–03 | \$208,288                  | \$19,207,450 | \$9,689,776   | \$7,370,641 | \$4,139,958  | \$40,407,825 |
| 2003–04 | \$218,999                  | \$23,560,768 | \$11,751,992  | \$5,978,724 | \$2,946,339  | \$44,237,823 |
| 2004–05 | \$211,521                  | \$23,891,248 | \$9,517,838   | \$5,430,287 | \$6,003,160  | \$44,842,533 |
| 2005–06 | \$272,109                  | \$31,462,560 | \$13,587,423  | \$5,771,219 | \$8,226,467  | \$59,047,669 |
| 2006–07 | \$260,956                  | \$28,615,932 | \$10,730,967  | \$6,499,117 | \$8,432,879  | \$54,278,895 |
| 2007–08 | \$286,527                  | \$32,670,019 | \$13,160,225  | \$7,928,921 | \$6,124,969  | \$59,884,134 |
| 2008–09 | \$259,317                  | \$28,811,533 | \$9,647,230   | \$6,031,749 | \$9,706,819  | \$54,197,331 |
| 2009–10 | \$300,318                  | \$33,145,346 | \$14,913,377  | \$5,695,565 | \$9,012,110  | \$62,766,398 |
| 2010–11 | \$372,933                  | \$39,692,137 | \$19,272,259  | \$6,726,826 | \$12,251,741 | \$77,942,963 |

**Note 3.1a:** Data is current as of August 23, 2012 and is based on grant years (April to March). For example, 2010–2011 represents the granting cycle starting in April 2010 and ending in March 2011. “Gov’t–Canada” represents funding from the Tri-Council (CIHR, NSERC, SSHRC), Canada Foundation for Innovation, Canada Research Chairs and National Centres of Excellence. “Gov’t–Ontario” denotes funds from the Ministry of Research and Innovation, Ontario Research Fund and Ontario Centres of Excellence. “Industry” partners are listed later in this chapter. “Other” includes research foundations, not-for-profit organizations, hospitals and other universities. Past Annual Reports included current-year funding totals that were incomplete because reporting continued beyond the publication date. In last year’s report, for example, research funding for 2010–2011 came to \$70.7 million; but funds continued coming in after the report was released, raising the total amount to \$77.9 million. For that reason, we have opted to defer 2011–2012 research funding numbers to our next report when we will have an accurate amount to compare with earlier years.

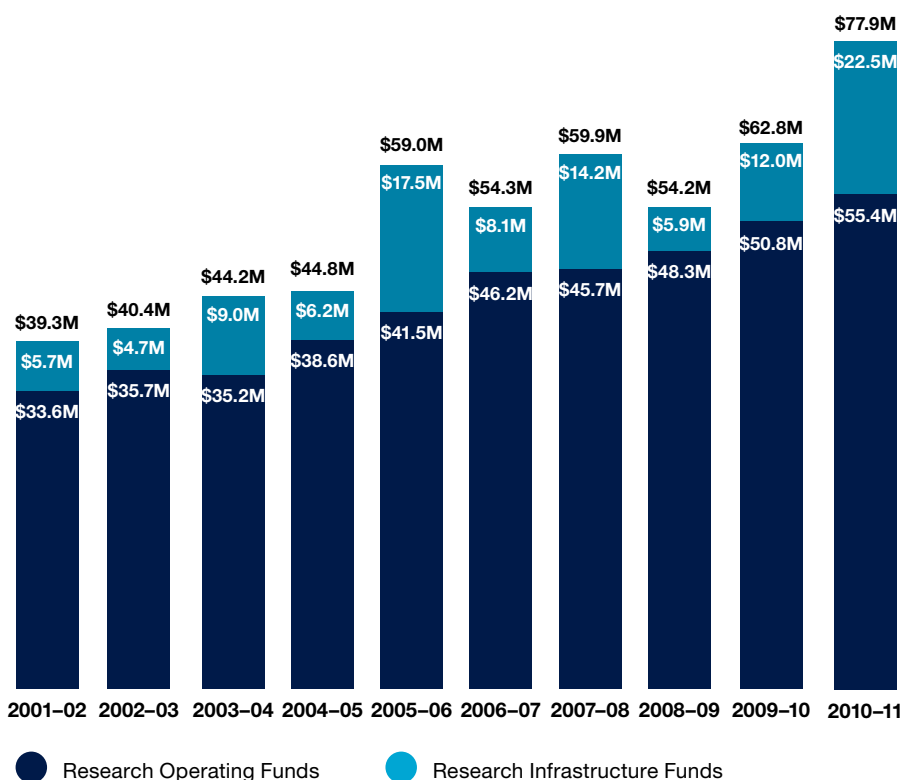
While operating and infrastructure spending are closely intertwined in almost any research initiative, the data represented here are based on a number of key funding programs that are specifically aimed at supporting research infrastructure. At the national level, these include the Canada Foundation for Innovation (except the CFI Career Award) and NSERC's Research Tools & Instruments program for faculty. At the provincial level they include the Ontario Innovation Trust and the Ontario Research Fund—Research Infrastructure.

Research infrastructure funds to support research activity have more than doubled in each of the past two years, and represent almost 30 per cent of research funding for 2010–2011. The increase is the result of our major infrastructure projects, such as Phase II of BioZone, the Microsatellite Science and Technology Centre, and the Centre for Industrial Applications of Microcellular Plastic. To learn more about these and other infrastructure projects, please see the Space chapter.

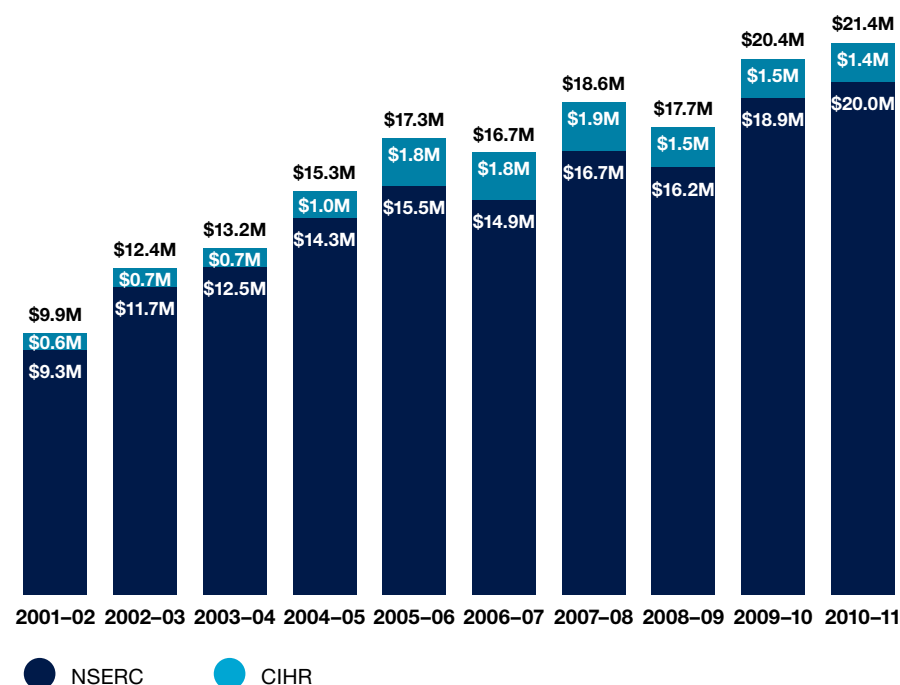
Tri-Council funding from the federal government has more than doubled in the past decade, with grants from NSERC (Natural Sciences and Engineering Research Council) representing 93 per cent of the total in 2010–2011. NSERC funding increased by \$1 million between 2009–2010 and 2010–2011.

The remaining grants have come from CIHR (Canadian Institutes of Health Research), while a much smaller amount — not reflected in the graph — came from the SSHRC (Social Sciences and Humanities Research Council).

**Figure 3.1b Breakdown of Research Infrastructure Funding vs. Research Operating Funding, 2001–2002 to 2010–2011**



**Figure 3.1c Canadian Institutes of Health Research (CIHR) and Natural Sciences and Engineering Research Council (NSERC) Funding, 2001–2002 to 2010–2011**

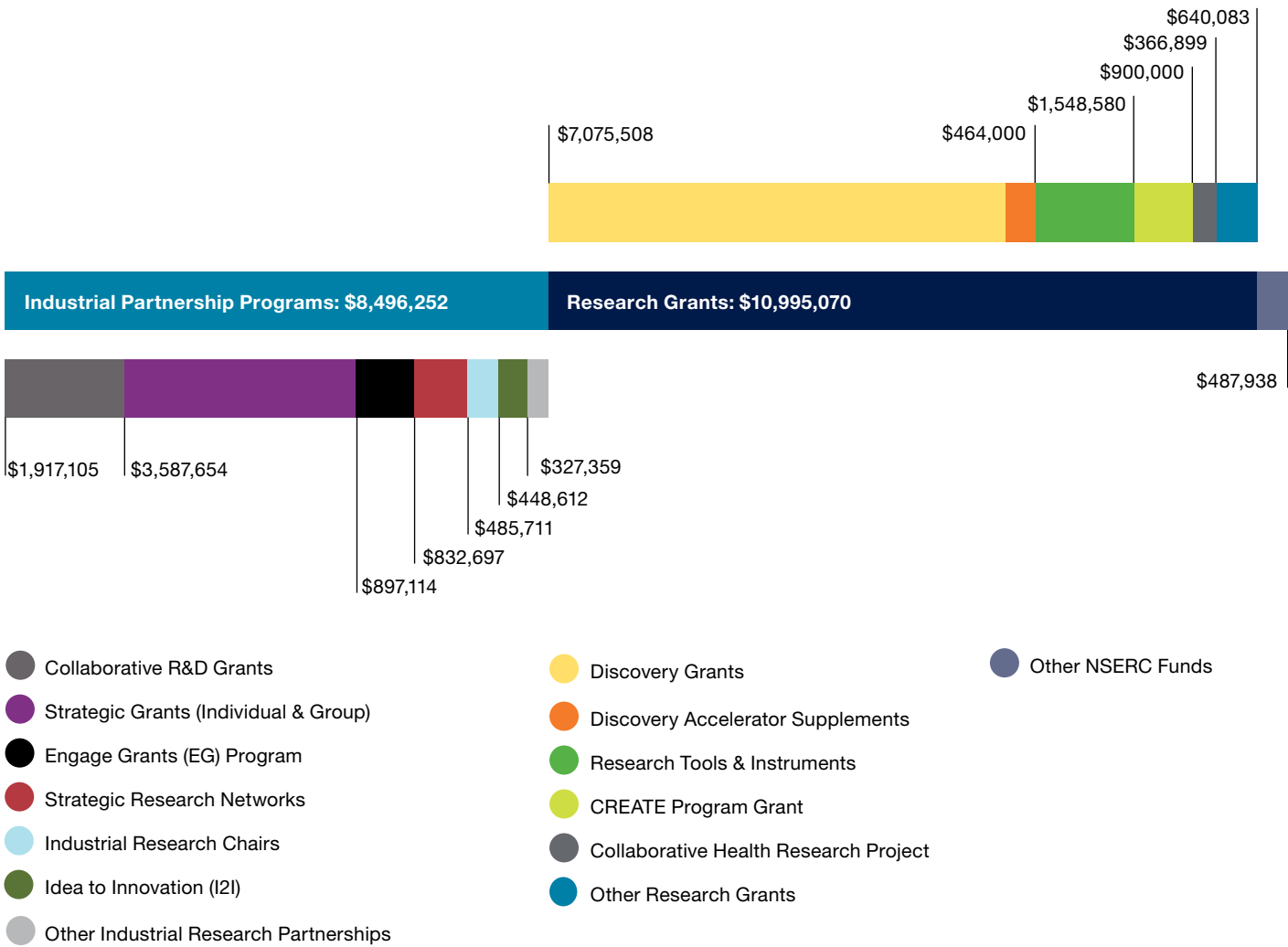


**Note 3.1b:** Funding is based on the grant year that runs from April to March.

**Note 3.1c:** Tri-Council refers to the three main federal government research funding agencies: Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council (NSERC), and Social Sciences and Humanities Research Council (SSHRC). The grant year runs from April to March.

The NSERC funding we received for industrial partnership programs grew by 11 per cent between 2009–2010 and 2010–2011. To capture more fully the activity in this collaborative area, we added the following graphs to this year’s Annual Report: NSERC Industrial Partnership Funding by Program (Figure 3.2b) and Industrial Partnerships as a Proportion of Total NSERC Funding (Figure 3.2c).

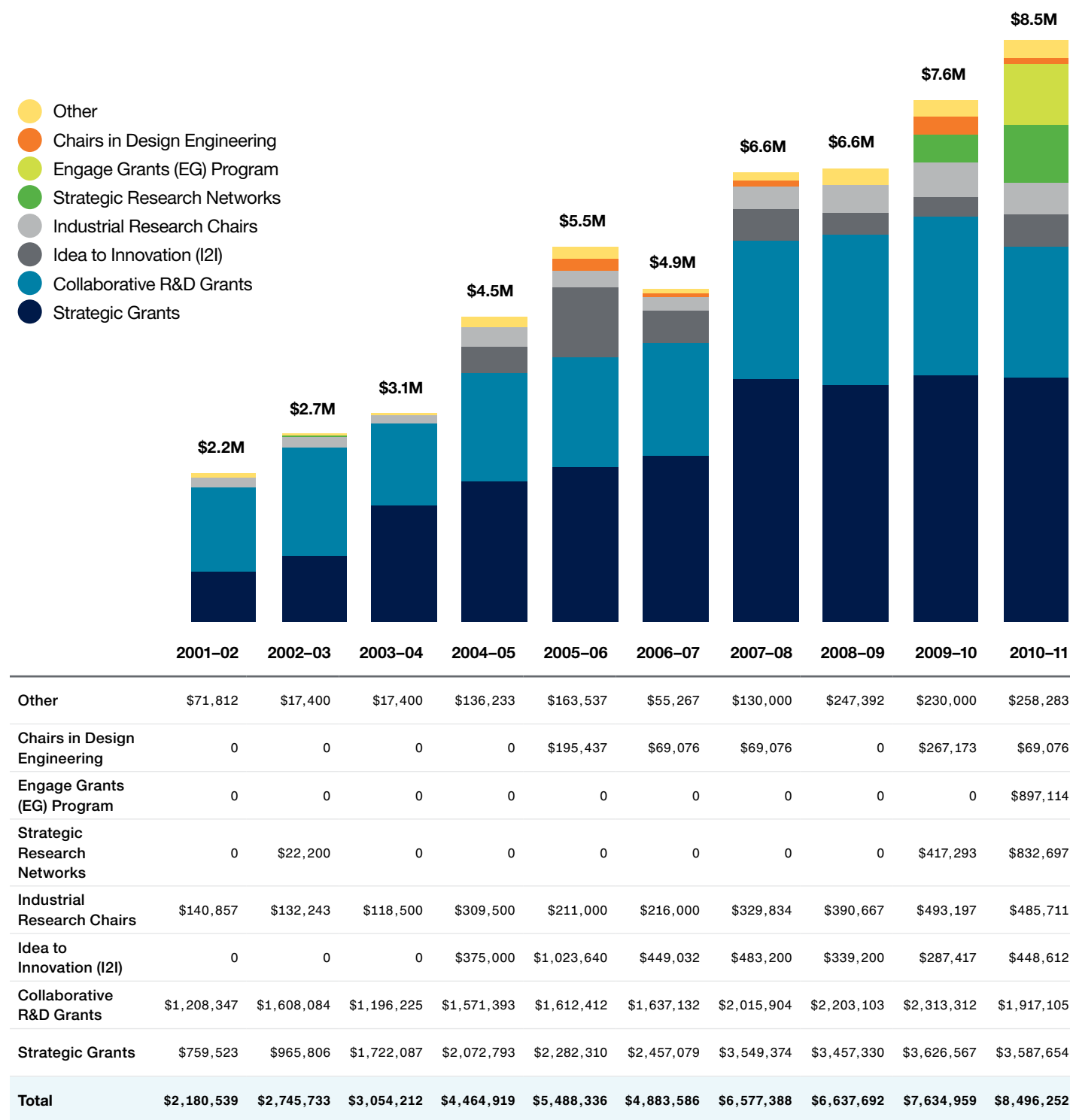
Figure 3.2a Natural Sciences and Engineering Research Council (NSERC) Funding, 2010–2011



**Note 3.2a:** Funding shown for 2010–2011 grant year (April to March)

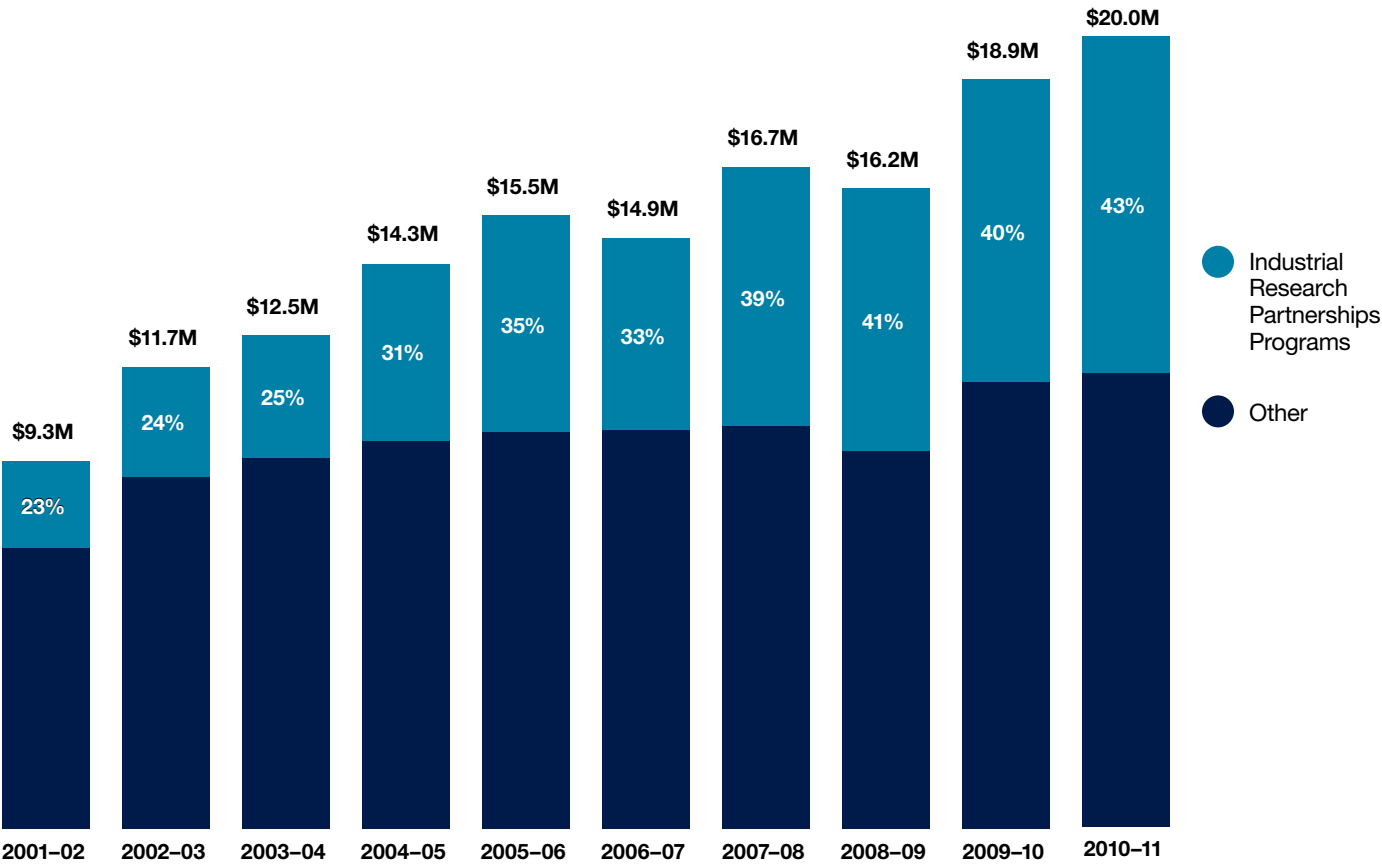
Industry partnership funding (Figure 3.2b) has increased by 3.8 times in the past decade, accounting for 43 per cent of our total NSERC funds by 2010–2011. The largest area of increase has been through Strategic Research Network grants that support students and industry engaged in large, multidisciplinary projects in targeted areas. These grants have almost doubled since 2009–2010, while another NSERC initiative, Idea to Innovation, saw funding grow by 56 per cent in the same one-year period. Idea to Innovation helps to accelerate the transfer of promising university technology from the post-secondary sector to a Canadian company. Examples of creativity can be found in the Invention Disclosure table (Figure 3.4).

**Figure 3.2b NSERC Industrial Partnership Funding by Program, 2001–2002 to 2010–2011**



The largest portion of regular research grants in 2010–2011 came through the Discovery program that provides support for long-term research. The newer CREATE (Collaborative Research and Training Experience) program was particularly welcome. The initiative stimulates innovative training programs for highly qualified students and postdoctoral fellows. Recent U of T Engineering projects that have benefited from CREATE include Distributed Generation for Remote Communities that is exploring renewable energy alternatives for remote Aboriginal communities, and the Environmentally Sustainable Aviation initiative to reduce the carbon impact of aircraft.

Figure 3.2c Industrial Partnerships as a Proportion of Total NSERC Funding, 2001–2002 to 2010–2011

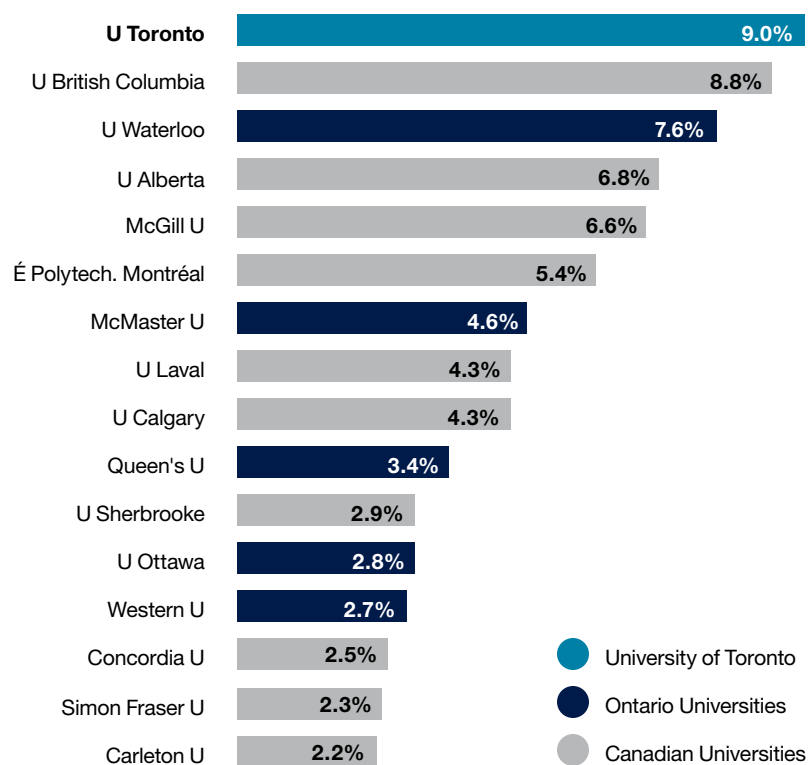


**Figure 3.2d Industrial Partnerships, 2011–2012**

- AbitibiBowater
- Advanced Measurement & Analysis Group, Inc.
- Advanced Micro Devices, Inc.
- AEG Power Solutions
- Alberta-Pacific Forest Industries Inc.
- Altera Corporation
- Andec Manufacturing Ltd.
- ANDRITZ Oy
- AUG Signals Ltd.
- Automotive Fuel Cell Cooperation
- AV Nackawic
- The Babcock & Wilcox Company
- Bank of Montreal
- Barrick Gold Corp.
- Bell Canada
- BIOX Corp.
- BMO Financial Group
- Boise Inc.
- Bombardier Inc.
- Brican Inc.
- Broadcom Corp.
- Calgon Carbon Corp.
- Campbell Soup Company
- Carinthia Tech Institute
- Carter Holt Harvey Pulp and Paper
- Celulose Nipo-Brasileira
- Cesaroni
- Clyde-Bergemann, Inc.
- COM DEV Canada
- Daishowa-Marubeni International Ltd.
- Dana Canada Corp.
- Digital Predictive Systems Inc.
- DMI-Peace River Pulp Division
- DTE PetCoke
- Eastman Kodak Company
- Eco-Tec Inc.
- Eldorado Brasil
- Enbridge Gas Distribution Inc.
- Engineering Services Inc.
- ERCO Worldwide
- Exar Corp.
- Facca Inc.
- Fibria
- FPIInnovations
- Fuji Electric Holdings Co.
- Fuji Electric Systems Co., Ltd.
- Fujitsu Laboratories Ltd.
- Gennum Corp.
- Geosyntec Consultants
- GM Canada
- GMA Cover Corp.
- Google Inc.
- Greater Toronto Airports Authority
- Hatch Ltd.
- Hitachi High-Technologies Corp.
- Hokuetsu Paper Mills Ltd.
- Holcim (Canada) Inc.
- IBM Canada
- Inco Technical Services Ltd.
- Inmet Mining Corp.
- Integran Technologies, Inc.
- Integrity Testing
- Intel Corp.
- InteraXon, Inc.
- International Paper Company
- Ionics Mass Spectrometry Group, Inc.
- Irving Pulp & Paper Ltd.
- ISTP Canada Inc.
- IVG Fiber Ltd.
- Jammbco
- Johnson & Johnson
- Kiln Flame Systems Ltd.
- Klabin
- KQS
- MacDonald, Dettwiler and Associates
- MAHLE Filter Systems Canada
- Mark IV Industries Corp.
- Marksman Cellject Inc.
- MaRS Innovation
- MeadWestvaco
- Messier-Dowty Inc.
- Metso Power
- Mitsubishi Electric Research Laboratories
- Morgan Solar Inc.
- Morrison Hershfield
- NEO Material Technologies (acquired by MolyCorp in Feb. 2012)
- Nippon Paper Group Inc.
- Nippon Steel Corp.
- Noranda-Falconbridge
- Northwest Mettech Corp.
- Novelis Inc.
- Nuclear Waste Management Organization
- NXP Semiconductors Netherlands
- Oji Paper Co. Ltd.
- OLI Systems Inc.
- Ontario Power Authority
- Ornge
- Pratt & Whitney Canada
- Process Research ORTECH Inc.
- Quanser
- Quillsoft Ltd.
- Quorum Technologies Inc.
- Rambus
- RBC Financial Group
- Redline Communications
- Research in Motion Ltd.
- Rican
- Robert Bosch Corporation
- Rolls Royce Canada
- Sandvik Canada
- Sanofi Pasteur Ltd.
- Saudi Basic Industries Corp.
- Schlumberger Canada Ltd.
- Semiconductor Research Corp.
- Shell Canada
- Shock Bauteile GmbH
- Siltech Corporation
- Silver Creek Pharmaceuticals
- SiREM Laboratories
- Solana Networks
- SolarGrid Energy Inc.
- Stantec Inc.
- Stora Enso
- Suzano
- Svensk Kärnbränslehantering Ab
- Syncrude Canada
- Taiwan Semiconductor Manufacturing
- TD Canada Trust
- Teck Resources Ltd.
- Tembec Inc.
- Tenova Goodfellow
- Tolko Industries Ltd.
- Toronto Electric
- Toronto Waterfront Revitalization Corp.
- Total American Services
- TOYO Aluminium K.K.
- Trojan Technologies Inc.
- Vale
- Vicicog
- Wuzhong Instrument
- Xerox
- Xilinx Inc.
- Xogen Technologies Inc.
- Xstrata Nickel
- Zellstoff Celgar

**Note 3.2d:** The companies above come from a combination of the U of T Research Information Systems (RIS) for the 2011–2012 fiscal year and those reported by our departments, divisions and institutes.

**Figure 3.3a Canadian Peer Universities vs. University of Toronto Share of NSERC Funding for Engineering, Cumulative Five-Year Share, 2007–2008 to 2011–2012**



**Figure 3.3b U of T Annual Share of NSERC Funding in Engineering, 2002–2003 to 2011–2012**

|         |      |
|---------|------|
| 2002-03 | 9.0% |
| 2003-04 | 8.2% |
| 2004-05 | 8.9% |
| 2005-06 | 9.1% |
| 2006-07 | 9.0% |
| 2007-08 | 9.2% |
| 2008-09 | 8.5% |
| 2009-10 | 9.4% |
| 2010-11 | 8.8% |
| 2011-12 | 9.3% |

Among peer institutions, U of T remains Canada's leader in attracting NSERC research grants in Engineering with a five-year average share of 9 per cent. The Faculty's share tends to fluctuate slightly from year to year, and rebounded in 2011–2012 to nearly match the record 9.4 per cent of 2009–2010.

**Figure 3.4a Engineering Invention Disclosures by Academic Area, 2007–2008 to 2011–2012**

Four out of every 10 invention disclosures filed in 2011–2012 at U of T originated with our Faculty's researchers. One-third of the Faculty's 69.3 new disclosures were filed by ECE, while MIE represented nearly another third of the total.

The Innovations & Partnerships Office requires all U of T inventors to disclose and file their inventions. In the majority of filings, the inventor and the University jointly own the rights to the invention. The commercialization of inventions often results in the creation of spin-off companies. In 2011–2012 two new companies — Kinetica Dynamics Inc. and Ojito Inc. — joined the list of more than 100 Faculty spin-offs since 1970 (see Appendix E for the complete list).

Cross-faculty collaborations mean that some of the disclosures are shared by more than one academic area, resulting in disclosure totals that include fractions.

|                                | 2007-08      | 2008-09      | 2009-10      | 2010-11      | 2011-12      | 5-Yr Total   |
|--------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| UTIAS                          | 0.5          | 1.0          | 1.0          | 1.0          | 1.0          | 4.5          |
| IBBME                          | 11.9         | 8.7          | 7.0          | 9.3          | 13.3         | 50.2         |
| ChemE                          | 6.4          | 2.8          | 6.5          | 13.2         | 5.8          | 34.8         |
| CivE                           | 1.2          | 1.0          | 0.5          | 6.4          | 3.2          | 12.2         |
| ECE                            | 38.5         | 34.1         | 29.8         | 42.2         | 23.0         | 167.5        |
| EngSci                         | 0.3          | 0.0          | 0.0          | 0.0          | 0.0          | 0.3          |
| MIE                            | 23.0         | 8.7          | 6.7          | 14.1         | 20.5         | 73.0         |
| MSE                            | 5.4          | 2.5          | 1.9          | 4.0          | 2.5          | 16.3         |
| <b>Annual Total</b>            | <b>87.1</b>  | <b>58.8</b>  | <b>53.4</b>  | <b>90.2</b>  | <b>69.3</b>  | <b>358.8</b> |
| <b>University Annual Total</b> | <b>159.0</b> | <b>150.0</b> | <b>136.0</b> | <b>196.0</b> | <b>159.0</b> | <b>800.0</b> |
| <b>Engineering Percentage</b>  | <b>55%</b>   | <b>39%</b>   | <b>39%</b>   | <b>46%</b>   | <b>44%</b>   | <b>45%</b>   |

**Note 3.3a and 3.3b:** Data are from the NSERC advanced search website and are shown by NSERC's fiscal year (April to March).

Figure 3.4b U of T Invention Disclosures by Faculty, 2011–2012

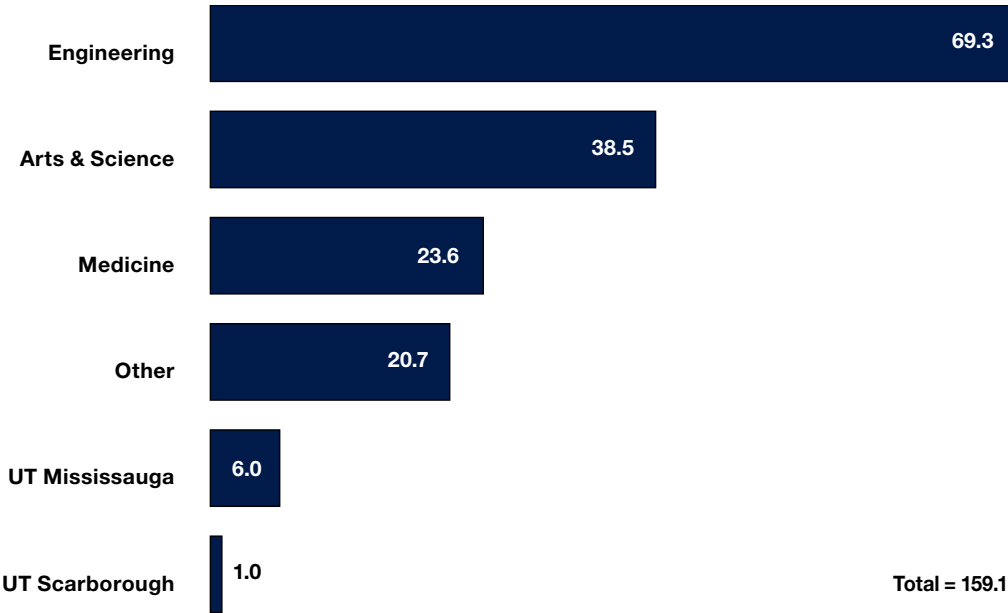
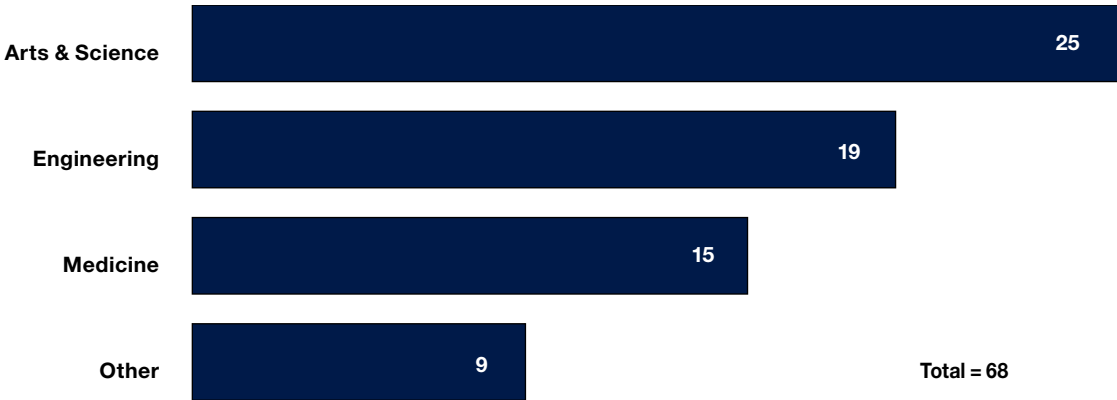


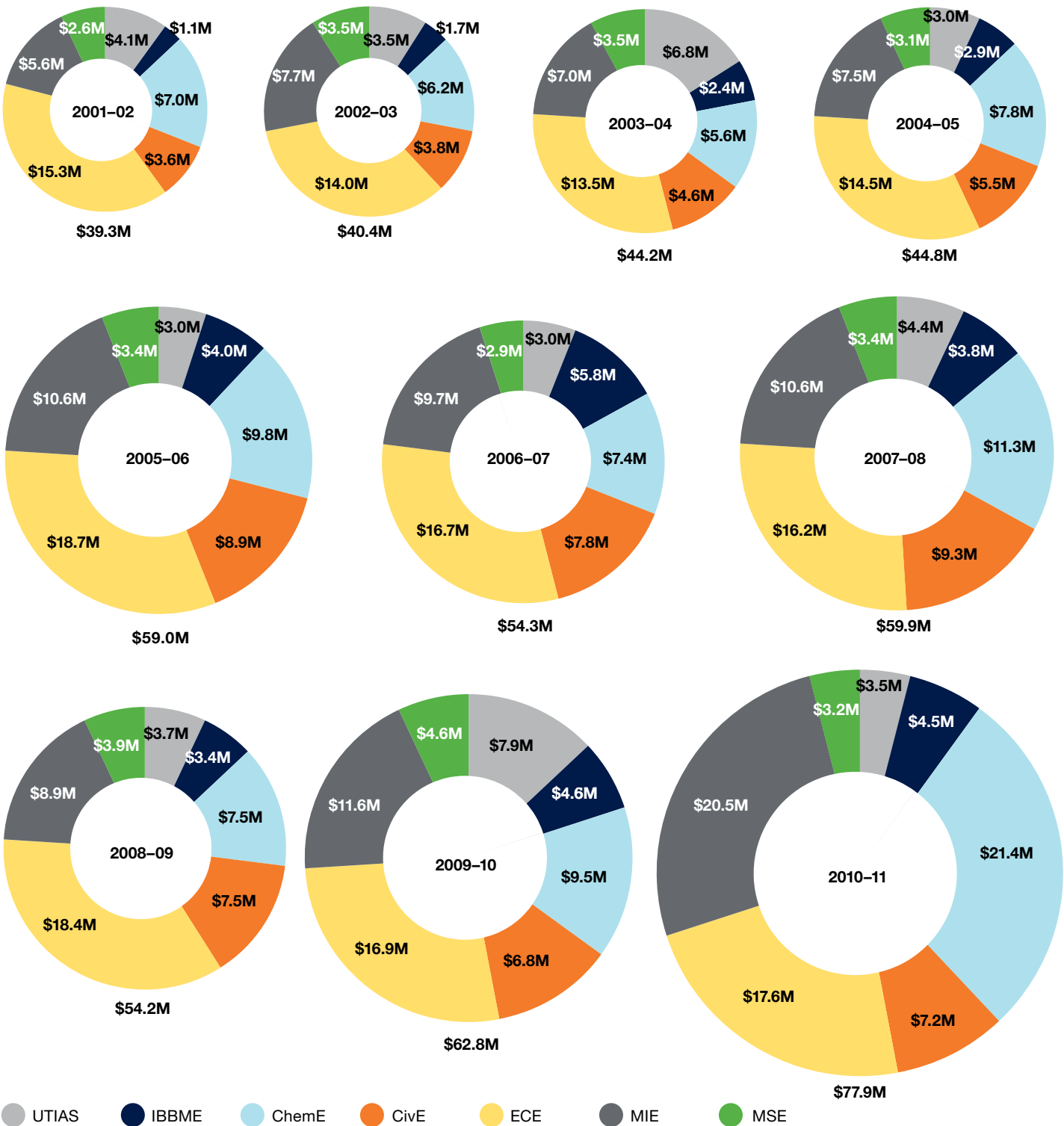
Figure 3.4c U of T Patent Applications by Faculty, 2011–2012



**Note 3.4a, 3.4b and 3.4c:** Data are reported by fiscal year (May to April) based on all disclosures to which Engineering faculty contributed, with fractional numbers in cases where multiple inventors were involved. In Figures 3.4b and 3.4c, “Other” refers to remaining academic faculties at the University of Toronto not already addressed in the figures.

The impressive growth in research funding in 2010–2011 has dramatically expanded the size of the last pie chart on this page. Research activity contributing to growth in ChemE included the official launch of BioZone, while MIE benefited from the microcellular and nanocellular group’s research on developing innovative plastics. Work and forums in microfluidics have had a positive effect on both MIE and ChemE funding.

Figure 3.5 Distribution of Research Funding by Academic Area, 2001–2002 to 2010–2011



**Note 3.5:** The research funding attributed to IBBME for 2010–2011 represents 55 per cent of the total funding received by core professors in the Institute. Because of IBBME’s cross-disciplinary structure, many of its faculty have their research funding processed through the Medicine or Dentistry faculties. The figure above shows only the funding that comes through U of T Engineering and is presented by grant year (April to March).

# 4 Cross-Faculty Education and Research

Our collaborative approach and synergism between research and education makes U of T Engineering more than a hub of knowledge; it is a centre for cross-pollination. Students, faculty, industry partners and the research community have an impressive array of ways to pursue innovation beyond the traditional boundaries within U of T Engineering.

Some of our newest institutes, centres and labs are bringing people together in exciting ways. For instance, the recently launched Institute for Multidisciplinary Design & Innovation teams up students and industry partners together on projects that typically require a collaborative, cross-disciplinary approach. Another new collaborative initiative is the Mobile Applications Lab, which encourages students and researchers from the entire U of T community to develop and test new apps for mobile devices.

We have created more options and flexibility for our students to pursue knowledge in complementary areas of study. In September 2011, we launched the Engineering Business minor to allow students to explore the intersection of engineering and business. We also created opportunities for cross-disciplinary study through the Robotics & Mechatronics minor, a Mineral Resources certificate and an Engineering Science major in Biomedical Systems Engineering. In 2011–2012, nearly 750 undergraduates were enrolled across our five minors. The numbers demonstrate the value our students see in enhancing their academic experience through cross-disciplinary studies.

Adding to the wealth of existing cross-Faculty opportunities, we launched The Entrepreneurship Hatchery in 2011. This undergraduate co-curricular initiative aims to instil a technical and entrepreneurial spirit in our students while serving as a forum to develop an idea into a business model with the support of experienced mentors. The Hatchery complements other entrepreneurially focused programs within our Faculty, including the undergraduate certificate, MEng courses, a seminar series and a set of DEEP Summer Academy courses for high school students.

## Selected Cross-Faculty Education and Research Initiatives

Across our departments, divisions and institutes, we are setting interdisciplinary research priorities and creating cross-Faculty educational opportunities that support our overall excellence — not only as a centre of engineering innovation, but one where students receive an unparalleled education.

Taking a cross-disciplinary and collaborative approach to innovation has resulted in award-winning outcomes. For instance, a team of four ECE and MIE students created an inexpensive device that can diagnose malaria in one hour simply by using clean blood work. Their hard work earned them an international James Dyson Award for their Automated Parasite Detection System.

Below are three of our newest hubs for cross-disciplinary education and research. Together, they will enhance the opportunities for collaboration and exploration among our students and faculty.

### University of Toronto Institute for Multidisciplinary Design & Innovation

Launched within MIE in January 2012, the University of Toronto Institute for Multidisciplinary Design & Innovation (UT-IMDI) teams students with clients to work on design and development challenges facing industry. A senior engineer in the client's organization and a faculty member supervise the specially designed projects, running primarily from May to August. Projects are open to all U of T Engineering undergraduates, with plans to expand the program to include MEng students.

Led by Professor Kamran Behdinan (MIE) — who was appointed NSERC Chair in Multidisciplinary Engineering Design in 2012 — UT-IMDI's emphasis is on the multidisciplinary nature of design and evolving technology. For students, it builds on design experience already gained through their coursework, including the capstone design course. UT-IMDI projects bring together design initiatives from across the Faculty, encouraging collaboration and innovation on both national and international scales. Projects also help our students and faculty forge even stronger links within industry.

### Mobile Applications Lab

Apps have become our doorway to the digital world and the newly created Mobile Applications Lab (APL) in ECE is providing an opportunity for students and researchers across the University to come together to develop new intelligent applications. Led by ECE Professors Parham Aarabi and Jonathan Rose, APL features a number of dedicated stations that are being used to explore, simulate and test apps that can be developed for the mobile market.

Successful apps coming out of APL include an object-tracking app that locks on a targeted object, and an ad-resizing app that changes an advertisement's proportions to fit in any position on any device. Any U of T graduate student interested in working in a collaborative environment to develop apps can also pursue the Creative Applications for Mobile Devices course (ECE 1778). The project-based course brings together two engineering programmers with a non-programming content expert to create a unique application that can be used on a cellphone or other mobile device.

### Centre for Sustainable Energy

Through collaborative research, the Centre for Sustainable Energy (CSE) is advancing the development of cleaner, more efficient energy alternatives that reduce environmental impact. The centre comprises researchers — including graduate students, post-doctoral researchers and more than 50 faculty — who work with industry and government partners.

CSE also has a critical function in the University, connecting energy researchers across disciplines and becoming the go-to resource for energy research activities on campus. In May 2011, the centre united members of industry and academe at its first Energy Showcase to discuss current sustainable energy practices.

# Collaborative Milestones

## IBBME Celebrates 50 Years

Now in its 50th year, IBBME's cross-disciplinary nature is the very reason for its history of success. In May 2012, our Faculty along with the Faculties of Dentistry and Medicine signed a document that re-affirms IBBME's unique position as a tri-faculty extra-departmental unit (EDU) at U of T—and as a world-renowned research institute. The document, a Memorandum of Understanding, outlines the role and share of responsibility that IBBME and its partner faculties will take on in the years to come. The memorandum demonstrates a commitment to move toward a future of innovation in the field.

Collaboration extends far beyond the University's walls for IBBME, including healthcare institutions and hospitals within the medical community. Its core faculty has grown to 35 members and more than 55 cross-appointments across five different faculties. IBBME has also seen steady growth in the number of graduate students over the past decade. In addition, IBBME launched two major collaborative efforts: the Centre for the Commercialization of Regenerative Medicine (CCRM) and the Centre for Research in Advanced Neural Implant Applications (CRANIA). The Institute also took a leadership role in the establishment of TECHNIA, a University Hospital Network and University of Toronto initiative, to establish resources for accelerating the commercialization of medical innovation.

## Leaders of Tomorrow: 10 Years of Engineering Leadership

For a decade, the Engineering Leaders of Tomorrow (LOT) program has been the hub for leadership development at U of T Engineering. Created as a comprehensive leadership opportunity for ChemE summer research students in 2002, LOT was the first program of its kind in Canada. Today, it offers a range of leadership courses, workshops and guest lectures to all students across the Faculty.

As engineering professionals take on a growing number of leadership roles in the boardroom and in the field, LOT fosters the development of critical thinking skills to help our students thrive as leaders. Students over the past 10 years have had a chance to develop important professional skills to complement their studies.

Building on the success of LOT, the Institute for Leadership Education in Engineering (ILead) opened in 2010 to grow program development and delivery, expand research in leadership pedagogy, and build a community of practice in engineering leadership education.

# Undergraduate Engineering Minors and Certificates

Interdisciplinary minors and certificates are an excellent way for students to stretch their educational strength beyond the boundaries of their main areas of study. While minors focus on collaborative, interdisciplinary explorations through a series of six half-courses, certificates provide a similar, less-intensive experience through three half-courses. This past year, our Faculty offered the following five minors and four certificates to undergraduates:

## Minors

- Bioengineering
- Engineering Business (new for 2011)
- Environmental Engineering
- Mechatronics & Robotics (new for 2011)
- Sustainable Energy

## Certificates

- Engineering Business (new for 2011)
- Entrepreneurship
- Global Engineering
- Preventative Engineering & Social Development

In 2011–2012, there was a 46-per-cent increase in the number of undergraduates enrolled in minors (see Figure 4.1). A large part of the boost came from the new Engineering Business minor; it attracted so much interest that our Faculty chose to offer some of its courses in the summer. In this collaboration with the Rotman School of Management, students take Engineering Economics and three core courses in Foundations of Accounting and Finance, Markets and Competitive Strategy, and People Management and Organizational Behaviour. To complete the requirements of the minor, students also complete two additional courses from a list of electives ranging from Technology and Prosperity to Entrepreneurship and Small Business. The minor, which was offered for the first time in fall 2011, is open to all U of T Engineering undergraduates except those in the Engineering Science Math, Statistics & Finance major. Fall 2011 also marked the launch of the Engineering Business certificate.

The Mechatronics & Robotics minor—the second new minor offered for the first time in September 2011—is a partnership involving ECE, MIE, UTIAS and IBBME, and grew out of the Institute of Robotics & Mechatronics (IRM) that was created in 2010. Students look at robotic and mechatronic technologies that can be used to develop viable consumer products. This minor is open to all Engineering undergraduates.

In spring 2012, the Faculty approved a new Mineral Resources certificate to begin in September 2012. Undergraduates from areas outside of the Lassonde Mineral Engineering program will now have the chance to learn about opportunities in the mining industry. They will complete three courses covering resource industries, surface mining and underground mining.

Figure 4.1 Undergraduate Enrolment in Engineering Minors, 2007–2008 to 2011–2012

|                                                      | 2007–08 | 2008–09 | 2009–10 | 2010–11 | 2011–12 |
|------------------------------------------------------|---------|---------|---------|---------|---------|
| Bioengineering                                       | 111     | 138     | 195     | 168     | 145     |
| Engineering Business                                 |         |         |         |         | 313     |
| Environmental Engineering<br>(Collaborative Program) | (95)    | (74)    | 135     | 105     | 79      |
| Robotics & Mechatronics                              |         |         |         |         | 36      |
| Sustainable Energy                                   |         |         | 198     | 241     | 176     |
| Total Enrolment                                      | 206     | 212     | 528     | 514     | 749     |

# Engineering Entrepreneurship

## MEng ELITE Certificate

The power behind a technical education that is fortified by an understanding of management is the rationale behind the certificate in Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) available to MEng students across our Faculty. Whether running their own businesses or taking on leadership roles in larger enterprises, students get to tailor their curriculum of four half-courses to focus on entrepreneurship, leadership, innovation, business or related topics. The breadth of material and flexibility of the courses make the certificate equally attractive to current students, alumni and other working professionals. In 2011–2012, our Faculty added five new ELITE courses to the roster including International Business for Engineers and Engineering Sustainable Development.

## Undergraduate Entrepreneurship Certificate

U of T Engineering undergraduates with an interest in running their own businesses can choose to take two half-course electives for the Entrepreneurship certificate. The first course provides an overview of small businesses, while the second examines business management skills. Rounding out the three-course certificate is a class in engineering economics.

## The Entrepreneurship Hatchery

The Entrepreneurship Hatchery — which launched in the last academic year — provides tools and resources for teams of our students to develop their entrepreneurial spirit and their creative ideas in a collaborative and supportive environment. As a co-curricular program, The Entrepreneurship Hatchery helps students — through a three-stage process — define value propositions, create a business model and develop a prototype. This happens through the support of faculty, mentors and a prototype fund. The program includes an idea marketplace, guest lectures and connections to possible funding sources.

## Engineering Entrepreneurship Series

Students interested in learning about engineering businesses and entrepreneurship heard from nine entrepreneurs in 2011–2012 who shared their professional success as part of the Engineering Entrepreneurship Series. Organized by ECE, the series is open to all U of T students. The lectures give seasoned entrepreneurs and recent graduates a chance to tell their stories about nurturing a culture to make their own companies happen. The entrepreneurship series has been running for eight years.

## myPatent Seminar

Organized by ECE's Leaders of Tomorrow group, the myPatent seminar, held in March 2012, examined the strategies and processes involved in taking ideas beyond the lab into the marketplace. The event, which included a presentation by Ontario's Minister of Training, Colleges and Universities, Glen Murray, was the vision of Hadi Aladdin (ECE 1T2), a busy entrepreneur who serves as an ECE Leaders of Tomorrow mentor. He wanted students to benefit from a "concentrated dose of practical advice" from entrepreneurs with experience to share.

## DEEP Summer Academy MBA

The Master of Business Administration stream at the DEEP Summer Academy offers high school students courses that look at entrepreneurial basics, project management and operations management. Even before embarking on a post-secondary education in engineering, the participants are discovering the many relationships between engineering and business.

# 5 Awards and Honours

In the five years that our formal awards nominations process has been in place, we have led Canadian engineering Faculties by a wide margin in receiving honours and awards. In 2011, we garnered more than 25 per cent of the major provincial, national and international awards received by engineering professors in Canada; almost three times the number of any other Canadian engineering school. This success is the result of the excellence of our staff, faculty and alumni, as well as the efforts of the Faculty Committee on Nominations for Honours and Awards, departmental awards committees, and a staff person dedicated solely to nominations.

This past year, we continued to raise our profile among the country's most prestigious engineering organizations. In 2011, four of our professors were inducted into the Royal Society of Canada, representing 50 per cent of all the inductees in the Applied Science and Engineering Division, despite accounting for only 5.5 per cent of engineering professors in Canada. As well, we received top national research awards such as the NSERC John C. Polanyi Prize. On an international level, five faculty were elected as Fellows of the American Association for the Advancement of Science, more than any other engineering school in Canada or the U.S.

The University of Toronto celebrated the contributions of our faculty and the calibre of our programs. For the third time, one of our faculty members received the Vivek Goel Faculty Citizenship Award – an honour that has only been awarded three times at U of T. In addition, the Division of Engineering Science was recognized with the Northrop Frye Award for excellence in linking teaching and research.

Our staff members were also honoured by the University for their contributions and achievements. As an example, our Staff Awards Committee received an Excellence Through Innovation award for its work in creating our staff awards program, now in its third year. These staff awards, as well as our teaching awards, were recently presented at our fifth annual Celebrating Engineering Excellence reception, attended by approximately 160 faculty and staff. To recognize leadership in major partnerships with industry, interdisciplinary research projects and multiple investigative initiatives, we established the Research Leader Award. It will be presented for the first time at next year's reception.

## Selected Awards Received by Faculty Members and Alumni, 2011–2012

Our Faculty continues to be recognized with prestigious international, national and provincial awards and honours, which is an indication of excellence in research, education and service to the profession.

### International

#### American Association for the Advancement of Science

##### *Fellow*

Sanjeev Chandra (MIE)  
Andrew Goldenberg (MIE)  
Chul Park (MIE)  
Michael Sefton (ChemE, IBBME)  
Paul Young (CivE)

#### American Institute for Medical and Biological Engineering

##### *Fellow*

Milos Popovic (IBBME)

#### American Physical Society

##### *Joseph F. Keithley Award for Advances in Measurement Science*

Andreas Mandelis (MIE)

#### American Psychological Association (Engineering Psychology Division)

##### *Franklin V. Taylor Award*

John Senders (MIE)

#### American Society of Civil Engineers

##### *Shorridge Hardesty Award*

Jeffrey Packer (CivE)

#### American Society of Mechanical Engineers

##### *Fellow*

Sanjeev Chandra (MIE)  
David Steinman (MIE, IBBME)  
*Heat Transfer Memorial Award*  
Javad Mostaghimi (MIE)

#### American Society of Mechanical Engineers and Society of Manufacturing Engineers

##### *M. Eugene Merchant Manufacturing Medal*

Chul Park (MIE)

#### British Society of Rheology

##### *Gold Medal*

David James (MIE)

#### European Society for Experimental Mechanics

##### *Robert Hooke Award*

Shaker Meguid (MIE)

#### Human Factors and Ergonomics Society

##### *Jack A. Kraft Innovator Award*

John Senders (MIE)

#### Institute of Electrical and Electronics Engineers

##### *Fellow*

Konstantinos Plataniotis (ECE)  
Elvino Sousa (ECE)

#### Society for Biomaterials

##### *Clemson Award for Contributions to the Literature*

Molly Shoichet (ChemE, IBBME)

#### Society of Women Engineers

##### *Achievement Award*

Cristina Amon (MIE)

#### Time Magazine

##### *100 Most Influential*

##### *People in the World*

Donald Sadoway  
(EngSci 7T2, MSE MASc 7T3, PhD 7T7)

#### U.S. Government

##### *President's Early Career Award for Scientists and Engineers*

Ali Khademhosseini  
(ChemE 9T9, MASc 0T1)

### National

#### Black Business and Professional Association

##### *Harry Jerome Young Entrepreneur Award*

Andrew Forde (MSE 1T1)

#### Canadian Academy of Engineering

##### *Fellow*

Grant Allen (ChemE)  
Jan Carr (ElecE 6T8)  
Michael Carter (MIE)  
Ömer Gülder (UTIAS)  
David Johns (ECE)  
Jeffrey Packer (CivE)  
Shamim Sheikh (CivE)  
Ravi Seethapathy (ElecE MEng 8T6)  
Molly Shoichet (ChemE, IBBME)

#### Canadian Association of Physicists/ National Optics Institute

##### *Medal for Outstanding Achievement in Applied Photonics*

Andreas Mandelis (MIE)

#### Canadian Institute of Mining, Metallurgy and Petroleum

##### *Fellow*

Torstein Utigard (MSE)

#### Canadian Society for Chemical Engineering

##### *R.S. Jane Memorial Award*

Michael Sefton (ChemE, IBBME)

##### *Syncrude Canada Innovation Award*

Edgar Acosta (ChemE)

#### Canadian Society for Civil Engineering

##### *Whitman Wright Medal*

Frank Vecchio (CivE)

#### The Canadian Society of Mechanical Engineering

##### *C.N. Downing Award*

Chul Park (MIE)

##### *Fellow*

David Sinton (MIE)  
Pierre Sullivan (MIE)  
Murray Thomson (MIE)  
*Robert W. Angus Medal*  
Jean Zu (MIE)

## National (Continued)

### Corporate Knights

#### *Clean50*

Brenda McCabe (CivE)  
Kim Pressnail (CivE)  
Ted Sargent (ECE)

### Engineering Institute of Canada

#### *Fellow*

Dimitrios Hatzinakos (ECE)  
Brent Sleep (CivE)  
Murray Thomson (MIE)

#### *Julian C. Smith Medal*

Javad Mostaghimi (MIE)

#### *K.Y. Lo Medal*

Phillip (Rocky) Simmons  
(ChemE 6T4, MASC 6T5, PhD 6T9)

### Engineers Canada

#### *Meritorious Service Award for Community Service*

Anna Dunets-Wills (CivE 7T6)

#### *Student Gold Medal*

Saksham Uppal (EngSci 1T2)

#### *Young Engineer Achievement Award*

Milica Radisic (IBBME, ChemE)

### Government of Canada

#### *Order of Canada*

Thomas Jenkins (ElecE MASC 8T5)  
Jeffrey Skoll (ElecE 8T7)

### Health Technology Exchange

#### *Morris (Mickey) Milner Award*

Geoffrey Fernie (IBBME)

### National Sciences and Engineering Research Council

#### *John C. Polanyi Award*

Brendan Frey (ECE)

### Minerva Canada

#### *Education Award of Honour*

Graeme Norval (ChemE)

### Royal Society of Canada

#### *Fellow*

Cristina Amon (MIE)  
Michael Collins (CivE)  
Chul Park (MIE)  
Peter Stangeby (UTIAS)

### Sandford Fleming Foundation

#### *Wighton Fellowship*

Scott Ramsay (MSE)

## Provincial

### Ontario Water Works Association

#### *George Warren Fuller Award*

Susan Andrews (CivE)

### Professional Engineers Ontario and Ontario Society of Professional Engineers (Ontario Professional Engineers Awards)

#### *Engineering Excellence Medal*

George Nowak (CivE 7T3)

#### *Gold Medal*

Bert Wasmund (ChemE PhD 6T6)

#### *Management Medal*

John Bianchini (ChemE 8T5)

#### *Research and Development Medal*

Doug Hooton (CivE)

Shaker Meguid (MIE)

#### *Young Engineer Medal*

Goldie Nejat (MIE)

### YWCA Toronto

#### *Woman of Distinction Award*

Anne Sado (IndE 7T7)

## University of Toronto

### Arbor Awards

Ronald Factor (IndE 7T0)

Richard Gleasure

(ChemE 8T4, MASC 8T6)

Michael Hantzsch (CivE 8T1)

William Kirkpatrick (EngBus 5T3)

Elias Kyriacou (ChemE 7T6)

Alvin Mok (EngSci 0T3)

Gino Palumbo

(MMS 8T3, MASC 8T5, PhD 8T9)

Alexander Pathy (ChemE 5T5)

John Starkey (MinE 6T1)

### Honorary Degrees

Pierre Rivard (MechE MEng 9T4)

Phillip (Rocky) Simmons

(ChemE 6T4, MASC 6T5, PhD 6T9)

### Connaught Innovation Award

Stewart Aitchison (ECE)

Tim Bender (ChemE)

Constantin Christopoulos (CivE)

Milos Popovic (IBBME)

Molly Shoichet (ChemE, IBBME)

Yu Sun (MIE)

Shahrokh Valaee (ECE)

### Inventor of the Year Awards

#### *Biomedical and Life Sciences Category*

Stewart Aitchison (ECE)

Peter Zandstra (IBBME)

#### *Engineering and Physical Sciences Category*

Aleksandar Prodic (ECE)

#### *Information and Communication, Technology, Social Sciences and Humanities Category*

Tom Chau (IBBME)

Dimitrios Hatzinakos (ECE)

### Northrop Frye Award Departmental/ Divisional Category

Division of Engineering Science

### President's Teaching Award

Jim Wallace (MIE)

### Vivek Goel Faculty Citizenship Award

Michael Charles (ChemE)

**Note:** The international, national, provincial and University of Toronto awards listed above include honours received between July 2011 and June 2012.

**Figure 5.1 Summary of Major International, National and Provincial Awards and Honours, 2002–2003 to 2011–2012**

|                                       | 2002–03  | 2003–04   | 2004–05  | 2005–06   | 2006–07   | 2007–08   | 2008–09   | 2009–10   | 2010–11   | 2011–12   |
|---------------------------------------|----------|-----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>International</b>                  |          |           |          |           |           |           |           |           |           |           |
| AAAS Fellowship*                      |          |           |          | 1         | 1         | 2         | 4         | 4         | 6         | 5         |
| Guggenheim Fellowship*                |          |           | 1        |           |           | 1         |           |           |           |           |
| MIT Top 35 Under 35                   |          |           |          | 1         |           |           | 1         |           |           |           |
| NAE Fellowship*                       |          |           |          | 1         | 1         |           |           |           | 1         | 1         |
| <b>National</b>                       |          |           |          |           |           |           |           |           |           |           |
| 3M Teaching Fellowship*               |          |           |          |           |           | 1         |           |           |           |           |
| Alan Blizzard Award                   |          |           |          |           |           | 1         |           |           |           |           |
| Canada's Top 40 Under 40              |          | 1         |          |           | 2         | 2         | 2         |           |           |           |
| CAE Fellowship (Faculty)              |          |           |          | 3         | 2         | 1         | 3         | 9         | 8         | 1         |
| CAE Fellowship (Alumni)**             | 2        | 5         | 1        | 1         | 5         | 3         | 8         | 4         | 7         | 9         |
| EIC Awards                            |          |           |          |           |           |           |           |           | 1         | 1         |
| EIC Fellowship                        |          |           | 1        |           | 2         | 2         | 3         | 4         | 3         | 3         |
| Killam Research Fellowship*           |          |           |          |           |           |           | 2         |           | 2         |           |
| Killam Prize*                         |          | 1         |          |           |           |           | 1         |           |           |           |
| Royal Society of Canada Fellowship*   |          | 2         |          | 1         | 1         | 1         | 1         | 1         | 2         | 4         |
| Steacie Fellowship*                   |          | 2         | 1        | 1         |           |           |           | 1         |           |           |
| Synergy Award for Innovation          |          |           | 1        | 1         | 1         |           |           | 1         |           |           |
| <b>Provincial</b>                     |          |           |          |           |           |           |           |           |           |           |
| Ontario Professional Engineers Awards | 1        | 1         | 1        | 4         | 2         | 3         | 5         | 5         | 5         | 5         |
| <b>Total</b>                          | <b>3</b> | <b>12</b> | <b>6</b> | <b>14</b> | <b>17</b> | <b>17</b> | <b>30</b> | <b>29</b> | <b>35</b> | <b>29</b> |

**Note 5.1:** (\*) Denotes U of T performance indicator. Data are shown by calendar year (January to December). Includes faculty award recipients only except for (\*\*), which reflects alumni recipients only. To read descriptions of the awards and honours listed above, please see Appendix F.

Figure 5.2a Number of Major Awards Received by U of T Engineering Compared to other Canadian Engineering Faculties, 2011–2012

More than a quarter of all major international and national engineering awards received by Canadian faculty in engineering schools went to our professors in 2011–2012.

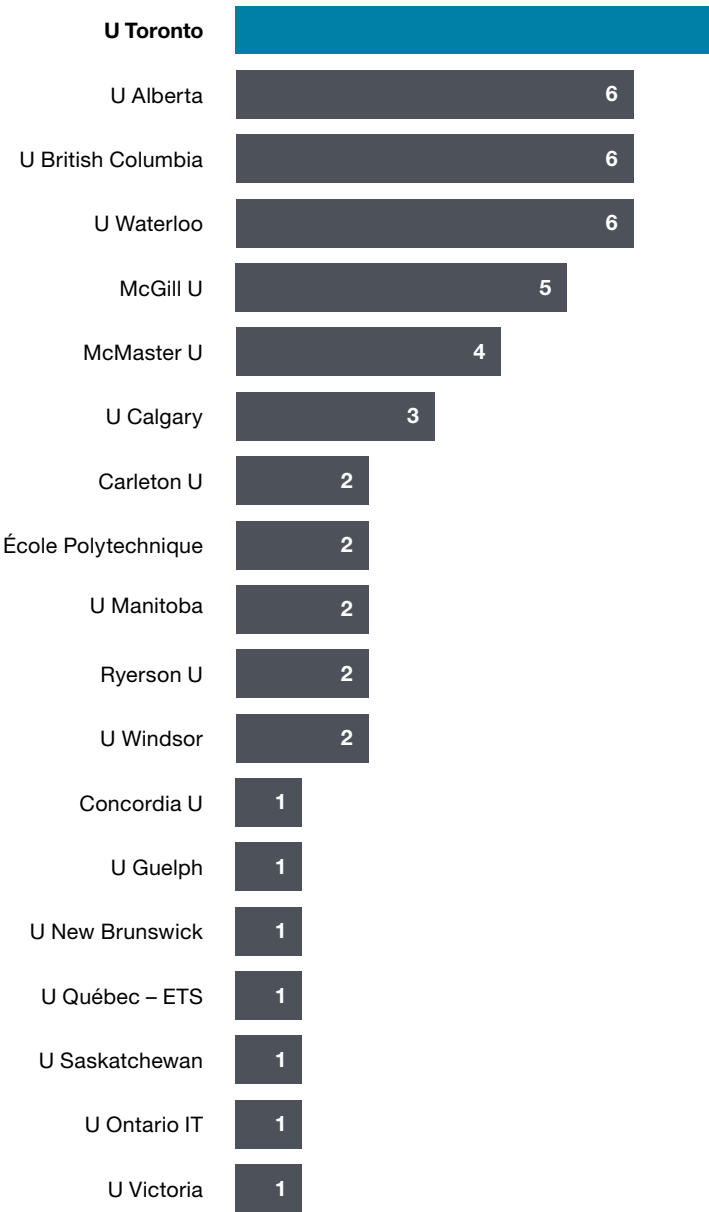
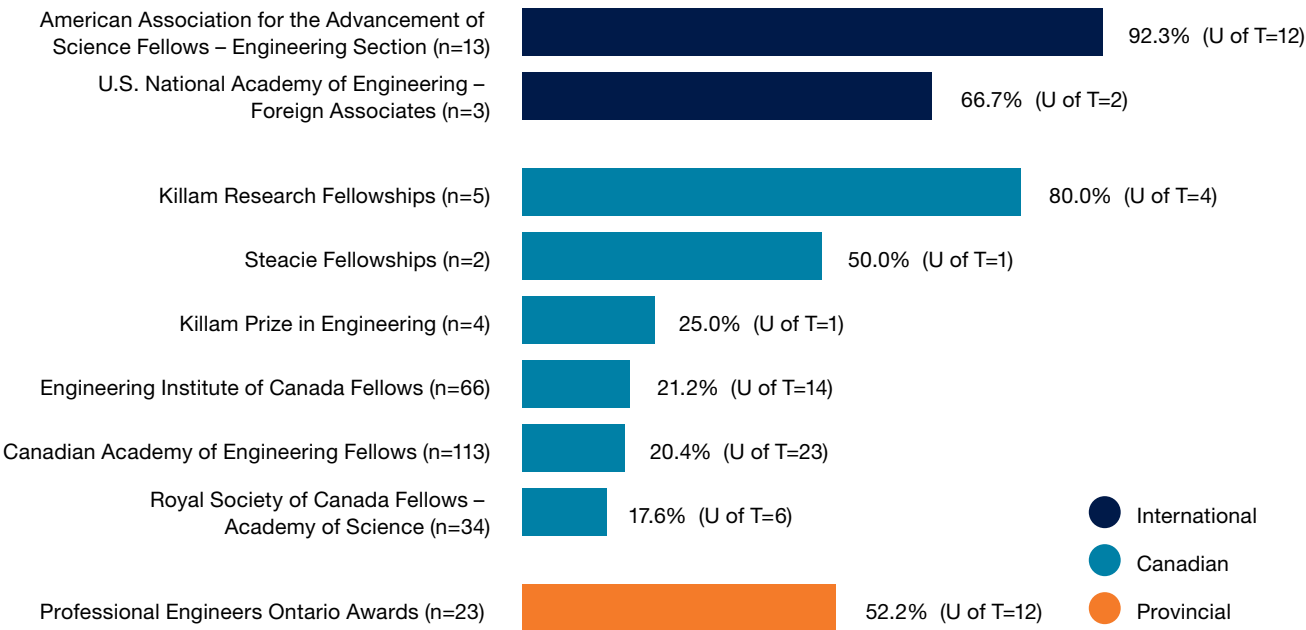


Figure 5.2b Percentages of Engineering Faculty and Total Major Awards Received in Canadian Engineering Faculties

|                        | Percent of Total<br>FTE Engineering<br>Faculty in Canada<br>(2010) | Percent of<br>Total Major<br>Awards<br>Received by<br>Engineering<br>Faculties |
|------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|
| U Toronto              | 5.5%                                                               | 26.6%                                                                          |
| U Alberta              | 4.6%                                                               | 9.4%                                                                           |
| U British<br>Columbia  | 4.0%                                                               | 9.4%                                                                           |
| U Waterloo             | 5.8%                                                               | 9.4%                                                                           |
| McGill U               | 3.1%                                                               | 7.8%                                                                           |
| McMaster U             | 3.2%                                                               | 6.3%                                                                           |
| U Calgary              | 3.4%                                                               | 4.7%                                                                           |
| Carleton U             | 3.3%                                                               | 3.1%                                                                           |
| École<br>Polytechnique | 8.5%                                                               | 3.1%                                                                           |
| U Manitoba             | 1.8%                                                               | 3.1%                                                                           |
| Ryerson U              | 3.6%                                                               | 3.1%                                                                           |
| U Windsor              | 1.6%                                                               | 3.1%                                                                           |
| Concordia U            | 3.9%                                                               | 1.6%                                                                           |
| U Guelph               | 0.8%                                                               | 1.6%                                                                           |
| U New Brunswick        | 1.6%                                                               | 1.6%                                                                           |
| U Québec – ETS         | 5.1%                                                               | 1.6%                                                                           |
| U Saskatchewan         | 2.0%                                                               | 1.6%                                                                           |
| U Ontario IT           | 1.1%                                                               | 1.6%                                                                           |
| U Victoria             | 1.2%                                                               | 1.6%                                                                           |

**Note 5.2a and 5.2b:** The following major awards are included: International – AAAS Fellowship (Engineering Section), MIT Top 35 Under 35, NAE Foreign Associate; National – Canada’s Top 40 Under 40, CAE Fellowship, EIC Awards, EIC Fellowship, Engineers Canada Awards, Killam Prize (Engineering), Royal Society of Canada Fellowship (Engineering/Physical Sciences), Steacie Fellowship, Synergy Awards for Innovation. For a list of Canadian universities that have accredited engineering programs, please visit [www.engineerscanada.ca/files/w\\_engineering\\_schools.pdf](http://www.engineerscanada.ca/files/w_engineering_schools.pdf)

Figure 5.3 Number of Awards Received by U of T Engineering Faculty Compared to other Canadian Engineering Faculties, 2007 to 2011



## Selected Awards Received by Staff, 2011–2012

### International

**Council for Advancement and Support of Education**  
*District II Accolades Awards, Silver: Newsletters Category*  
Liz Do (Engineering Strategic Communications)

### National

**Association of Registrars of the Universities and Colleges of Canada**  
*Outstanding Achievement Award*  
Barbara McCann (Office of the Registrar)

### University of Toronto

**Excellence Through Innovation Awards**  
Renzo Basset (CivE)  
Linda Espeut (ECE)  
Carolyn Farrell (Office of the Dean)  
Brenda Fung (MIE)  
Catherine Gagne (Office of the Dean)  
Bruno Korst (ECE)  
Karen Lewis (Human Resources)  
Pauline Martini (ChemE)  
Steve Miszuk (Office of the Dean)  
Lisa Simpson-Camilleri (Office of the Dean)  
Joe Wong (ECE)

**Note 5.3:** Data are shown by calendar year (January to December) and include faculty award recipients only.  
**Note:** The University of Toronto awards listed above include honours received between July 2011 and June 2012.

# University of Toronto Engineering Faculty Awards, 2002–2003 to 2011–2012

## Agnes Kaneko Citizenship Award

Presented to staff who have served with distinction and made contributions to the Faculty's mission above and beyond their job descriptions over a long period of time. The award was established in memory of a dedicated staff member in the Department of Civil Engineering.

2011–12: Giovanni Buzzeo (CivE)  
2010–11: John MacDonald (CivE)  
2009–10: Joe Baptista (MIE)  
2008–09: Renzo Basset (CivE)  
2007–08: Linda Espeut (ECE)  
2006–07: Brenda Fung (MIE)  
2005–06: Peter Leesti (CivE)  
2004–05: Sandra Walker (EngSci)  
2004–05: Yvonne MacNeil (IBBME)  
2003–04: Kelly Chan (ECE)  
2002–03: Bob Manson (ECF)

## Early Career Teaching Award

Presented in recognition of teaching excellence early in a career.

2011–12: Micah Stickel (ECE)  
2010–11: Sean Hum (ECE)  
2009–10: Glenn Hibbard (MSE)  
2008–09: Craig Simmons (MIE, IBBME)  
2007–08: Hani Naguib (MIE)  
2006–07: Wei Yu (ECE)  
2005–06: Ali Sheikholeslami (ECE)  
2004–05: Evan Bentz (CivE)  
2003–04: Paul Gauvreau (CivE)  
2002–03: Parham Aarabi (ECE)

## Emerging Leader Award

Presented to staff who lead by example in their dedication to the Faculty's mission. Recipients are held in high regard by colleagues and demonstrate the potential to assume a more senior leadership role within the Faculty.

2011–12: Harpreet Dhariwal (Office of the Dean)  
2010–11: Ryan Mendell (MIE)  
2009–10: Helen Bright (Office of the Registrar)

## Faculty Teaching Award

The highest teaching tribute awarded by the Faculty.

2011–12: Jonathan Rose (ECE)  
2010–11: Jim Wallace (MIE)  
2009–10: Ali Sheikholeslami (ECE)  
2008–09: John Carter (ECE)  
2007–08: Tarek Abdelrahman (ECE)  
2006–07: Raviraj Adve (ECE)  
2005–06: Frank Kschischang (ECE)  
2004–05: Ross Ethier (MIE)  
2003–04: Kim Pressnail (CivE)  
2003–04: Z.G. Vranesic (ECE)  
2002–03: David Kuhn (ChemE)

## Influential Leader Award

Presented to staff who demonstrate exemplary support for the Faculty's education and research endeavours. Recipients inspire others to realize their potential through their significant and sustained contributions.

2011–12: Austra Ozolins (ECE)  
2010–11: Nelly Pietropaolo (CivE)  
2009–10: Arlene Smith (ChemE)

## Innovation Award

Presented to staff who, individually or as a team, address a problem creatively by developing a new technology or making significant improvements to an existing system or method.

2011–12: Jay Li (ECE)  
2010–11: Bruno Korst (ECE); Steve Miszuk (Office of the Dean); Joe Wong (ECE)  
2009–10: Joan Chen (ChemE); Pauline Martini (ChemE); Liam Mitchell (ChemE); Deborah Peart (ChemE)

## Quality of Student Experience Award

Presented to staff who have made significant improvements to the quality of the student experience.

2011–12: Shannon Osborne (MIE)  
2010–11: Lesley Mak (Office of the Registrar)  
2009–10: Annie Simpson (ILead)  
2009–10: Pierina Filippone (Office of the Registrar)

## Teaching Assistant Award

Recognizes the excellence of a teaching assistant.

2011–12: Drew Cheung (CivE)  
2010–11: Bernie Fitzpatrick (UTIAS)

# Engineering Alumni Association Awards, 2011–2012

## L.E. (Ted) Jones Award of Distinction

Inspired by the contributions of Professor Emeritus L.E. (Ted) Jones, this award honours an alumnus/alumna for his or her support and dedication to U of T Engineering and its arts community.

Wayne Choi (IndE 1T1)

## 7T6 Early Career Award

Presented to an alumnus/alumna 10 years after graduation who is distinguished in the profession and community.

Dwayne R. Shirley (MSE 0T1, MASc 0T3, PhD 0T9)

## 2T5 Mid-Career Achievement Award

Presented to an alumnus/alumna 25 years after graduation who has earned respect within the profession and broader community, attained significant achievement and exhibits promise of further contributions.

J. Nicola Caccavella (CivE 8T6, MASc 8T9)

## Malcolm F. McGrath Alumni Achievement Award

Named in honour of Malcolm McGrath on his retirement as Assistant Dean — Alumni Liaison, this award recognizes contributions of personal service to the Faculty, University or to the community.

Davis Tien Doan (CivE 0T7)  
John Voss (ChemE 8T2)

## Engineering Alumni Hall of Distinction Award

The Hall of Distinction is an assembly of extraordinary alumni, selected by their peers for their lifelong accomplishments. These are graduates who have ultimately defined what is most exemplary in the engineering profession.

Michael Anthony Butt (CivE 6T3)  
Lloyd Alexander McCoomb (CivE 6T8, PhD 8T2)  
Denis Mitchell (CivE 6T9, MASc 7T1, PhD 7T4)  
Doug Reeve (ChemE MASc 6T9, PhD 7T1)  
James (Ted) Robertson (MechE 7T1, MEng 7T7)  
Francis Shen (EngSci 8T1, AeroE MASc 8T3)  
Tony Shen (EngSci 8T0)

## Engineering Alumni Medal

As the highest honour awarded by the Engineering Alumni Association, this award is presented to an alumnus/alumna who has demonstrated superior accomplishment and serves as an outstanding role model for students.

Kenneth Carless (K.C.) Smith (EngPhys 5T4, ElecE MASc 5T6)

# 6 World Recognition by Rankings

Among engineering schools around the world, our Faculty has retained its position as the top Canadian engineering school in all international rankings. In 2011, we also ranked highest in nearly every engineering discipline breakout.

U of T Engineering stands as the top Canadian school in all five QS subject categories — Chemical Engineering; Civil & Structural Engineering; Computer Science & Information Systems; Electrical Engineering; and Mechanical, Aeronautical & Manufacturing Engineering.

We fared particularly well in the 2012 Academic Ranking of World Universities (ARWU) in Engineering/Technology and Computer Sciences. For the sixth consecutive year, U of T Engineering was identified as the premier engineering school in Canada, and our international ranking at 13 represented a jump of six positions over the results published in our last annual report.

We also moved up in the Higher Education Evaluation & Accreditation Council of Taiwan (HEEACT) Performance Ranking of Engineering Papers, from 31st to 26th spot in 2011. That is 48 rankings ahead of the next strongest Canadian engineering school in the publishing field.

With a 166-per-cent increase in citations in 2006–2010 compared with 2003–2007, the Faculty moved up two positions to seventh in North America in the Association of American Universities' (AAU) indexed citations rankings. Our publication count went up 62 per cent over the same period, putting us in eighth position on the continent among public universities. U of T Engineering remains the top Canadian university for total publication and citation activity as well as citations per faculty and citations per publication.

Standings captured by the various international ranking organizations portray the high quality and reputation of our Faculty's academics, alumni and students. For us, they also provide insights into disciplinary trends — as well as influence our ability in the future to attract the brightest students, educators and scholars.

# Comprehensive University Rankings

Figure 6.1 Times Higher Education-Thomson Reuters World University Rankings, Top 50 Universities for Engineering and Information Technology, 2011

The Times Higher Education (THE)-Thomson Reuters World University Rankings uses 13 performance indicators in five categories to measure universities globally. The categories, with their weightings, are:

- Citations (32.5%)
- Teaching (30%)
- Research (30%)
- International mix: staff & students (5%)
- Industry income; innovation (2.5%)

Our Faculty is ranked as Canada's top engineering school and the only one nationally in the top 20 in the Engineering and Information Technology category. In its second report since a realignment of the rankings, THE places U of T Engineering 18th, while the University of British Columbia is the second Canadian engineering school, ranked 33rd. McGill and Waterloo also made the top 50 rankings.

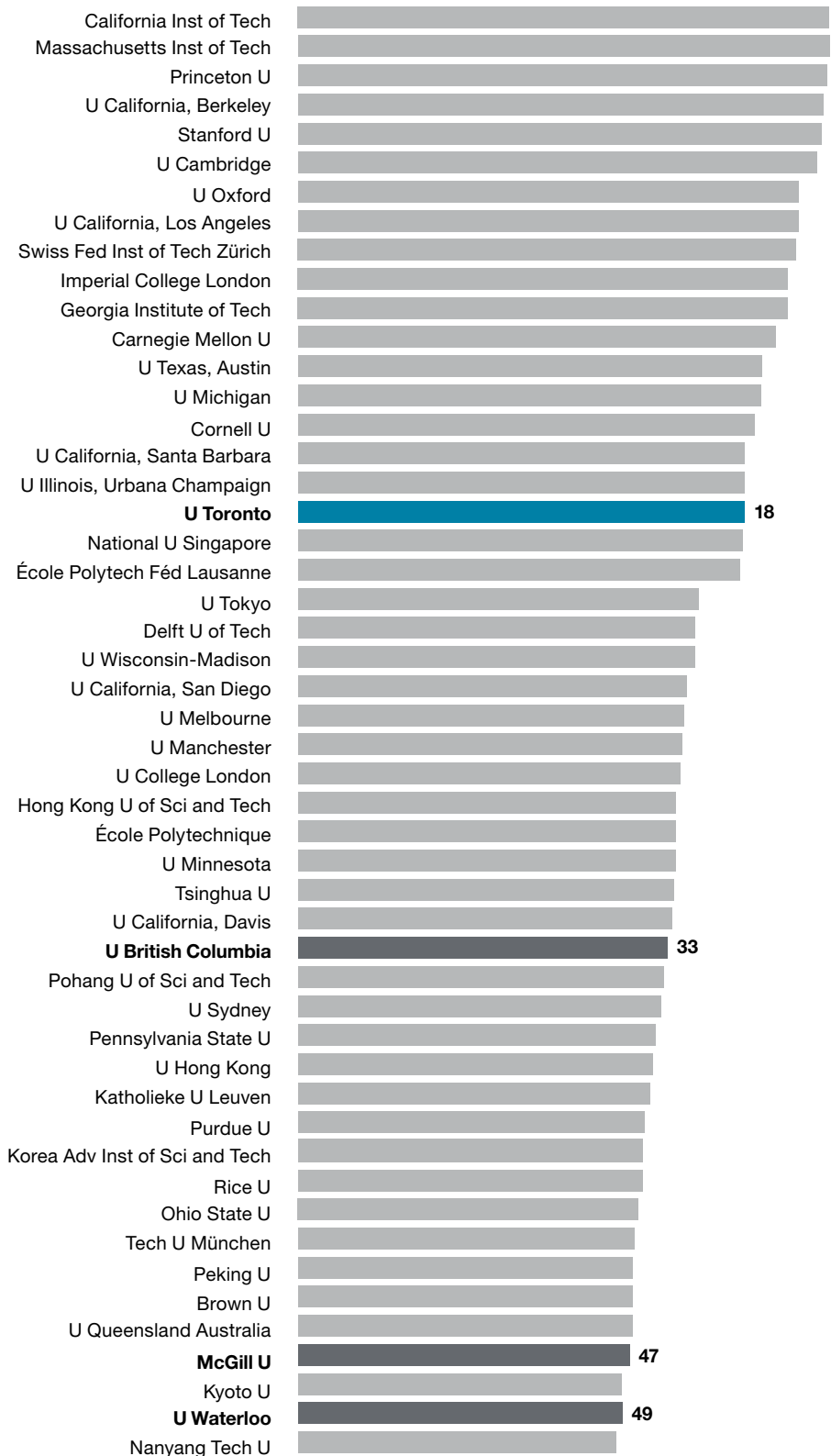
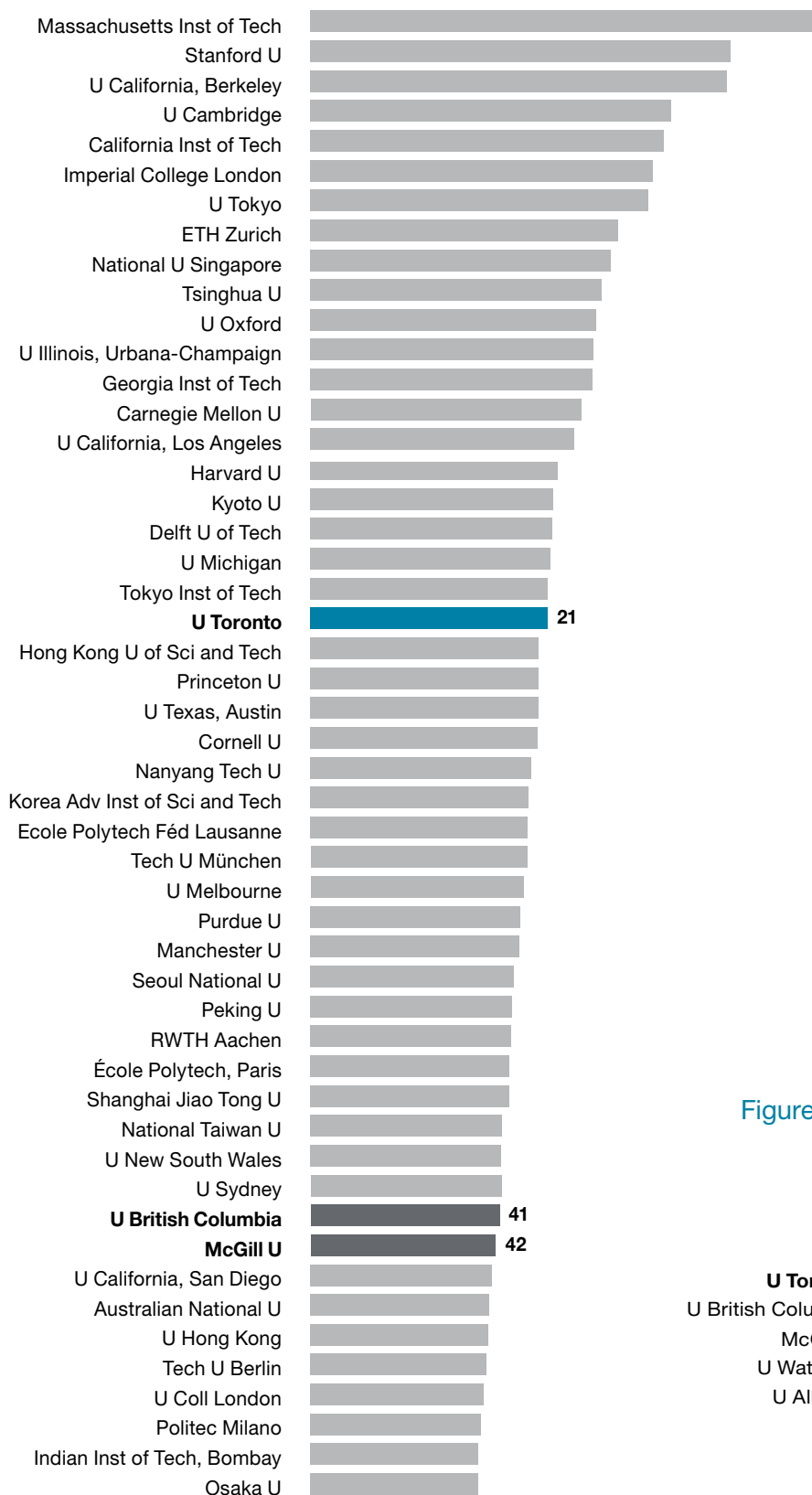


Figure 6.2a **QS World University Rankings and U.S. News & World Report World's Best Colleges and Universities, Top 50 Universities for Engineering and Information Technology, 2011**



The QS (Quacquarelli Symonds) World Rankings draw on six criteria:

- Academic Review (40%)
- Citations Per Faculty (20%)
- Student-Faculty Ratio (20%)
- Employer Review (10%)
- Percentage of International Faculty (5%)
- Percentage of International Students (5%)

Canadian universities faced formidable competition from international universities in the 2011 rankings. Since 2010, one Canadian engineering school slipped off the top 50 list while the remaining three – Toronto, British Columbia and McGill – moved down in the standings. U of T Engineering remains the top Canadian school and sits in the 21st position internationally. The results were published in *U.S. News & World Report's* World's Best Colleges and Universities, Top 50 Universities for Engineering and Information Technology in September 2011.

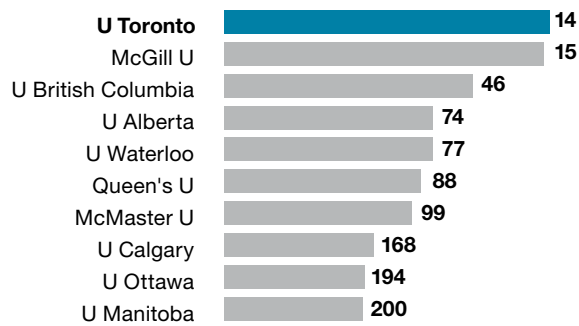
Shown in Figure 6.2c on the following page, U of T once again tops the Canadian university breakout list in all five branches of engineering and information technology.

Figure 6.2b **Canadian U15 in Top 100 from QS World University Rankings for Engineering and Information Technology**

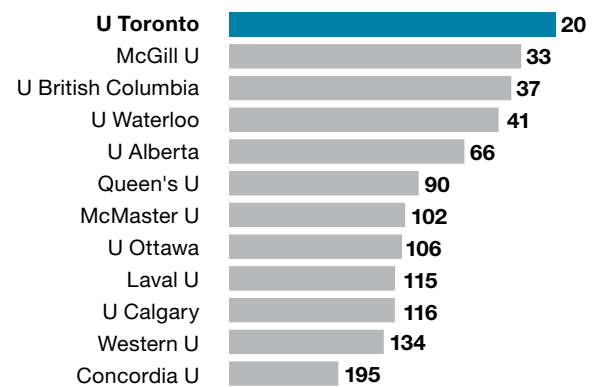


Figure 6.2c Canadian Universities in QS World Ranking by Discipline for Engineering and Information Technology, 2011

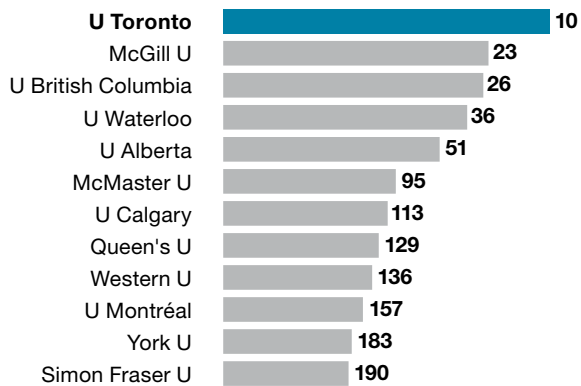
### Chemical Engineering



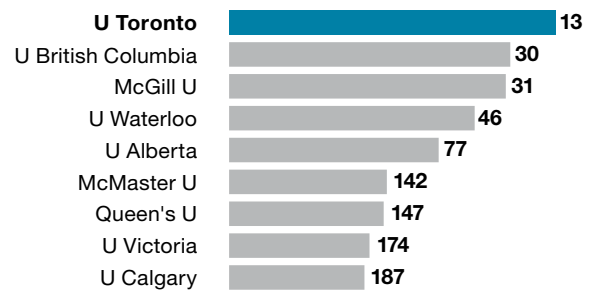
### Civil & Structural Engineering



### Computer Science & Information Systems



### Electrical Engineering



### Mechanical, Aeronautical & Manufacturing Engineering

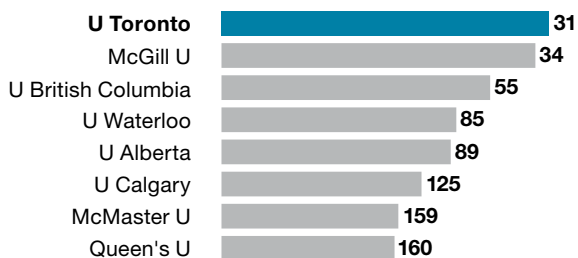
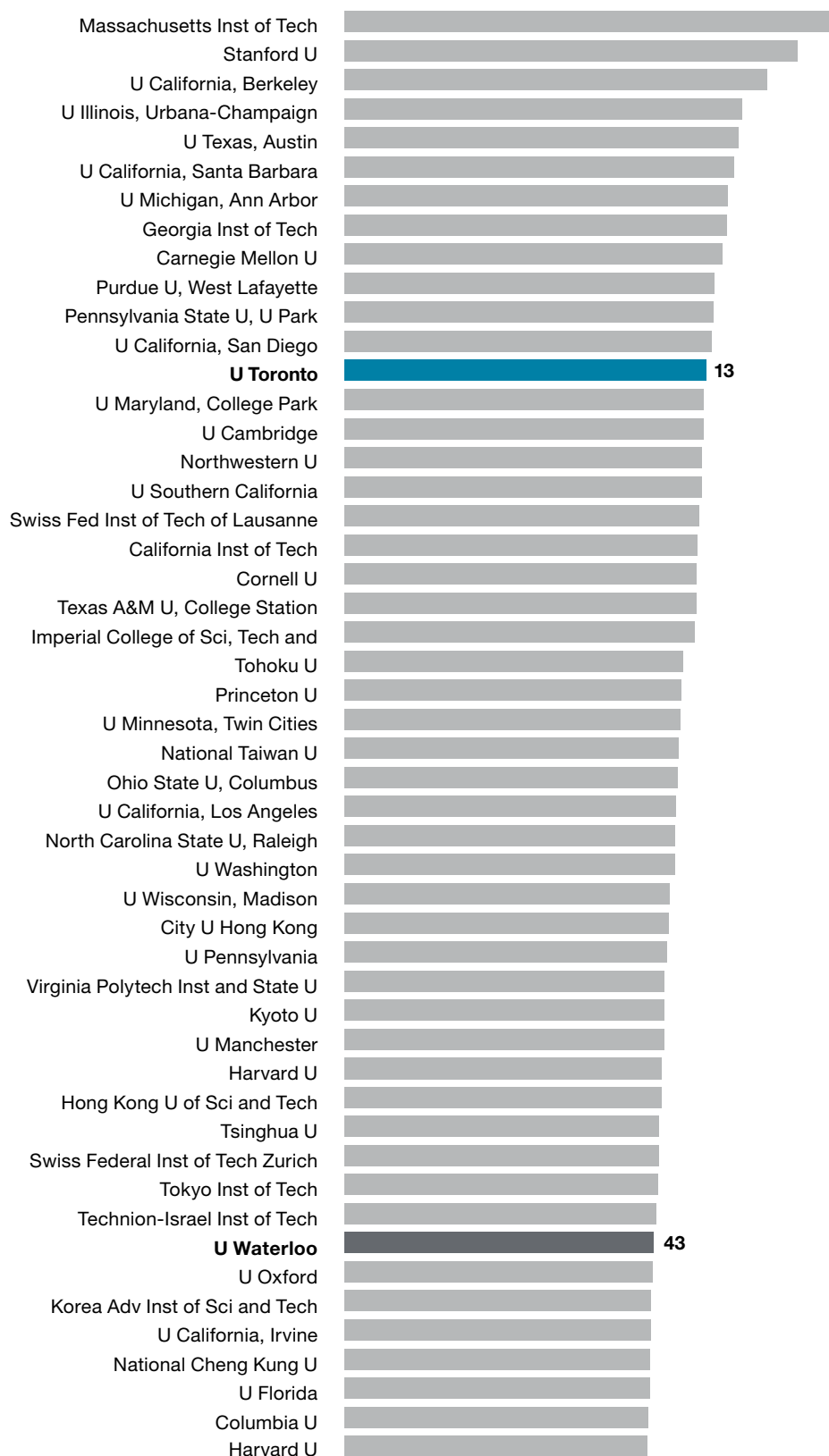


Figure 6.3a **Shanghai Jiao Tong Academic Ranking of World Universities (ARWU),  
Top 50 Universities for Engineering/Technology and Computer Sciences, 2012**



The Shanghai Jiao Tong Academic Ranking of World Universities (ARWU) is a highly regarded ranking of research universities around the world based on internationally comparable third-party data. For 2012, the methodology used to rank non-U.S. schools in the Engineering/Technology and Computer Sciences ranking was revised to permit a more accurate comparison. The rankings are based on three indicators (see Figure 6.3c for the scoring analysis):

- Highly cited research (HiCi)
- Published articles (PUB)
- Percentage of articles published in the top 20 per cent of journals in the field (TOP)

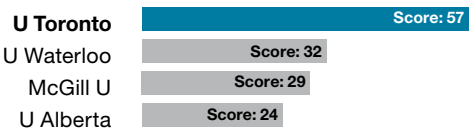
U of T was the top Canadian university in each of these categories and 13th in the world – up from 19th in last year's Annual Report. We are one of two Canadian engineering school in the ARWU Top 50.

Figure 6.3b Canadian Universities in Top 100 from ARWU for Engineering/Technology and Computer Sciences, 2012



Figure 6.3c Scoring Analysis of Canadian Universities in Top 100 from ARWU for Engineering/Technology and Computer Sciences, 2012

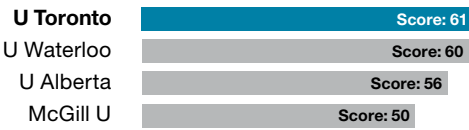
Scoring on Highly Cited Research (HiCi) Indicator



Scoring on Articles in Top Journals (TOP) Indicator



Scoring on Published Articles (PUB) Indicator



**Note 6.3c:** The highest-scoring school is assigned a score of 100 by ARWU, with other schools being calculated as a percentage of the top total score.

## Rankings Based on Publications and Citations

The Higher Education Evaluation & Accreditation Council of Taiwan (HEEACT) ranking is based on eight weighted criteria:

- measurement of the quantity and quality of research in the past two years (20%)
- number of highly cited papers in the past 11 years (15%)
- number of articles in high-impact journals in the past year (15%)
- number of articles published in the past 11 years (10%)
- number of articles published in the current year (10%)
- number of citations in the past 11 years (10%)
- number of citations in the past two years (10%)
- average number of citations per year in the past 11 years (10%)

Our Faculty rose five positions in the HEEACT Performance Ranking of Engineering Papers, placing it 26th internationally.

In HEEACT's breakout of five engineering disciplines (Figure 6.4b), four at U of T were the top in Canada, while Chemical Engineering moved from third to second position in 2011.

Figure 6.4a Higher Education Evaluation & Accreditation Council of Taiwan (HEEACT) Performance Ranking of Engineering Papers for World Universities, 2011

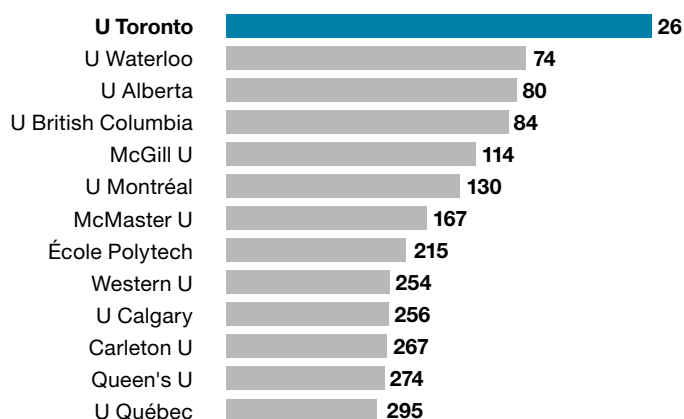
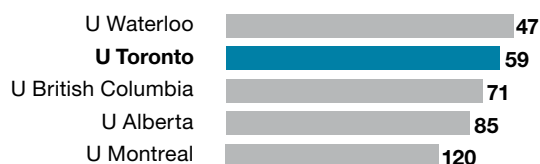


Figure 6.4b Canadian Universities in HEEACT Performance Ranking By Discipline, 2011

### Chemical Engineering



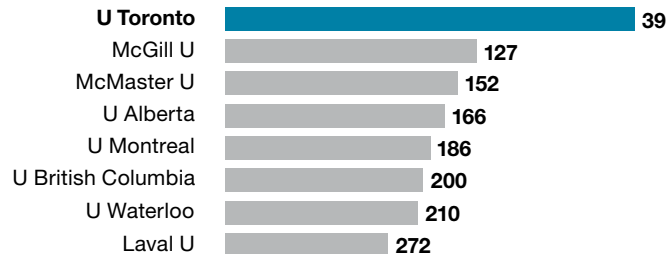
### Civil Engineering



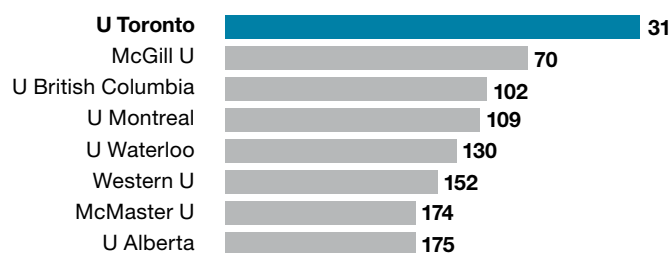
### Electrical Engineering



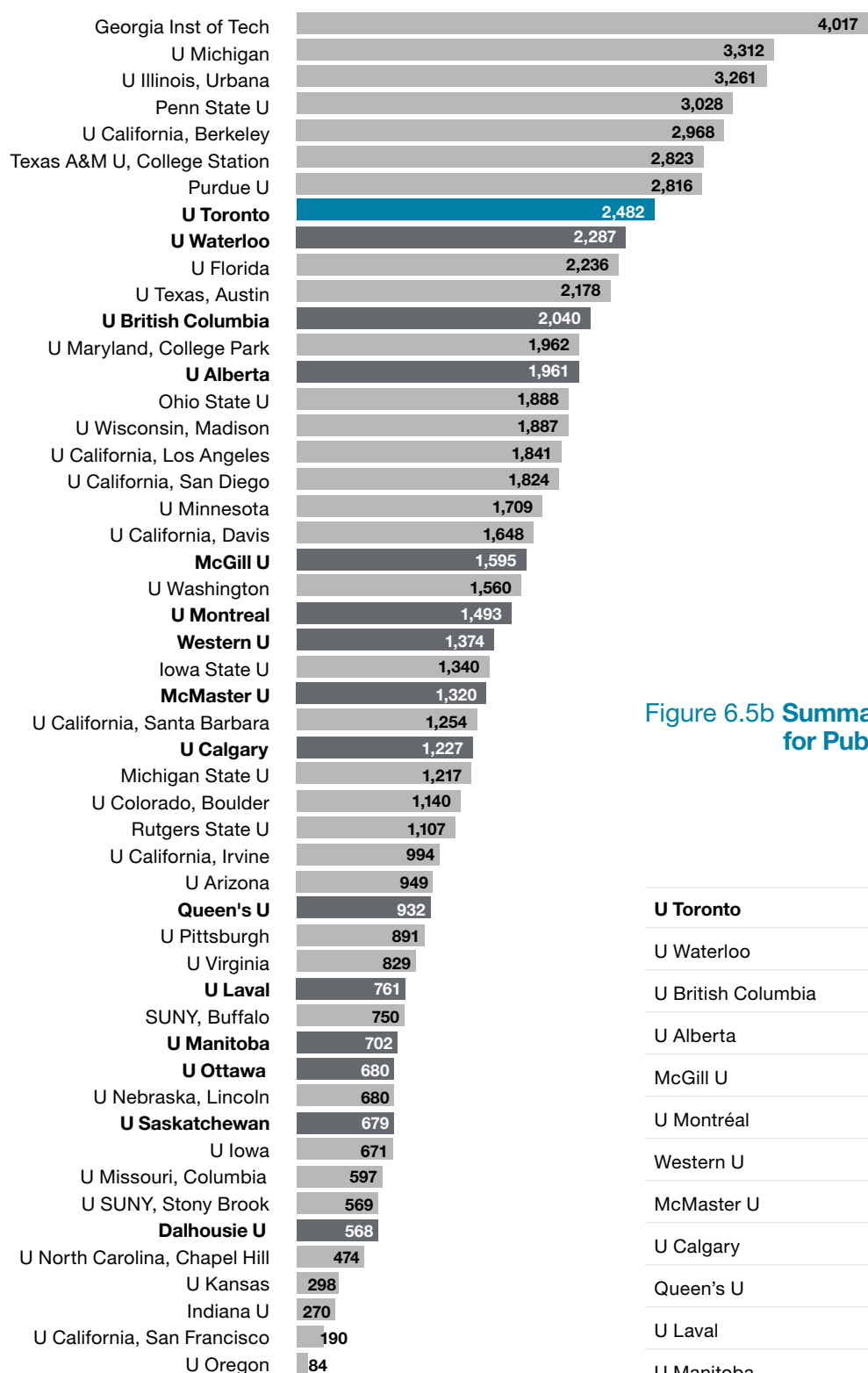
### Materials Science



### Mechanical Engineering



**Figure 6.5a Number of Engineering Publications Indexed by Thomson Reuters Association of American Universities (AAU) Public and Canadian Peer Institutions, 2006 to 2010**



The AAU index measures research output, as well as productivity and intensity based on publication counts. U15 refers to the group of 15 leading research-intensive universities in Canada.

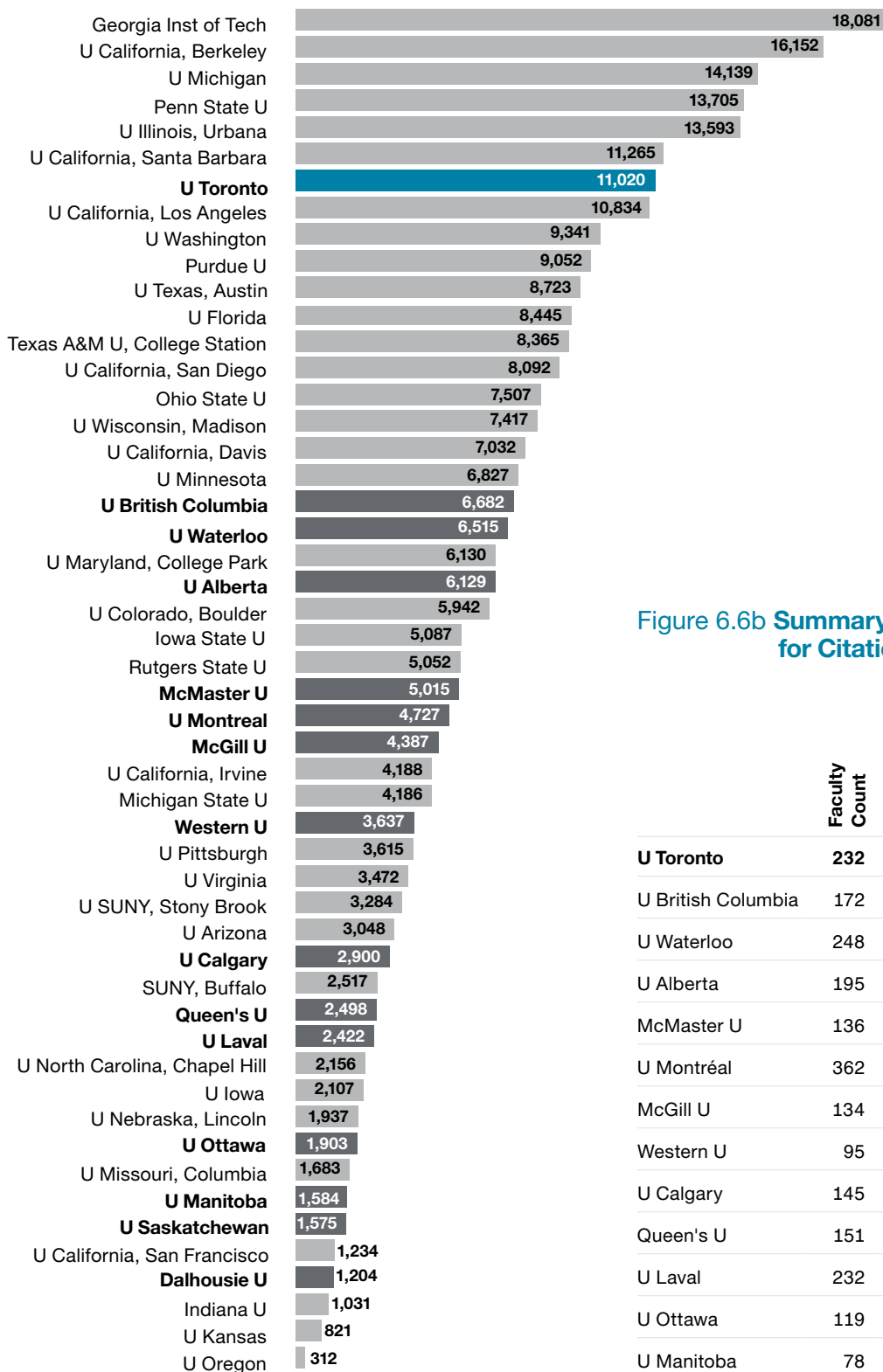
U of T Engineering remained the top Canadian university for publication counts between 2006 and 2010 (2,482 papers indexed), putting us in the top 10 North American universities for publishing activity. The indexed number represents a 62-per-cent increase in publications compared to three years ago when we first began reporting our publications based on the AAU report for 2003 to 2007. On a per-faculty basis, our publication numbers moved us up one position to third among our Canadian peer universities.

**Figure 6.5b Summary of U15 Bibliometrics for Publications**

|                    | Faculty Count | Publications | Publications per Faculty | Rank on Pub per Faculty |
|--------------------|---------------|--------------|--------------------------|-------------------------|
| <b>U Toronto</b>   | <b>232</b>    | <b>2,482</b> | <b>10.7</b>              | <b>4</b>                |
| U Waterloo         | 248           | 2,287        | 9.2                      | 7                       |
| U British Columbia | 172           | 2,040        | 11.9                     | 3                       |
| U Alberta          | 195           | 1,961        | 10.1                     | 5                       |
| McGill U           | 134           | 1,595        | 11.9                     | 2                       |
| U Montréal         | 362           | 1,493        | 4.1                      | 14                      |
| Western U          | 95            | 1,374        | 14.5                     | 1                       |
| McMaster U         | 136           | 1,320        | 9.7                      | 6                       |
| U Calgary          | 145           | 1,227        | 8.5                      | 9                       |
| Queen's U          | 151           | 932          | 6.2                      | 12                      |
| U Laval            | 232           | 761          | 3.3                      | 15                      |
| U Manitoba         | 78            | 702          | 9.1                      | 8                       |
| U Ottawa           | 119           | 680          | 5.7                      | 13                      |
| U Saskatchewan     | 84            | 679          | 8.1                      | 10                      |
| Dalhousie U        | 90            | 568          | 6.3                      | 11                      |

**Note 6.5b:** Faculty counts for analysis of U15 publications per faculty member are from the Engineers Canada 2010 Resources Report. Western U faculty count corrected based on 2011 data.

**Figure 6.6a Number of Engineering Citations Indexed by Thomson Reuters Association of American Universities (AAU) Public and Canadian Peer Institutions, 2006 to 2010**



Citation counts in the AAU index are based on the total number of papers cited over a five-year period, as well as the intensity of those indexed.

U of T Engineering's indexed citations between 2006 and 2010 increased by an impressive 166 per cent since we began reporting three years ago (2003 to 2007 AAU report), moving the Faculty up to become the seventh most cited public institution in North America. We remain the top Canadian university for citations per faculty and citations per publication.

**Figure 6.6b Summary of U15 Bibliometrics for Citations**

|                    | Faculty Count | Citations | Citations per Faculty | Rank on Citations per Faculty | Citations per Publication | Rank on Citations per Publication |
|--------------------|---------------|-----------|-----------------------|-------------------------------|---------------------------|-----------------------------------|
| <b>U Toronto</b>   | 232           | 11,020    | 47.5                  | 1                             | 4.4                       | 1                                 |
| U British Columbia | 172           | 6,682     | 38.8                  | 2                             | 3.3                       | 3                                 |
| U Waterloo         | 248           | 6,515     | 26.2                  | 7                             | 2.8                       | 7                                 |
| U Alberta          | 195           | 6,129     | 31.4                  | 6                             | 3.1                       | 6                                 |
| McMaster U         | 136           | 5,015     | 37.0                  | 4                             | 3.8                       | 2                                 |
| U Montréal         | 362           | 4,727     | 13.1                  | 14                            | 3.2                       | 5                                 |
| McGill U           | 134           | 4,387     | 32.7                  | 5                             | 2.8                       | 9                                 |
| Western U          | 95            | 3,637     | 38.3                  | 3                             | 2.6                       | 11                                |
| U Calgary          | 145           | 2,900     | 20.0                  | 9                             | 2.4                       | 12                                |
| Queen's U          | 151           | 2,498     | 16.6                  | 11                            | 2.7                       | 10                                |
| U Laval            | 232           | 2,422     | 10.4                  | 15                            | 3.2                       | 4                                 |
| U Ottawa           | 119           | 1,903     | 16.0                  | 12                            | 2.8                       | 8                                 |
| U Manitoba         | 78            | 1,584     | 20.4                  | 8                             | 2.3                       | 14                                |
| U Saskatchewan     | 84            | 1,575     | 18.7                  | 10                            | 2.3                       | 13                                |
| Dalhousie U        | 90            | 1,204     | 13.5                  | 13                            | 2.1                       | 15                                |

**Note 6.6b:** Faculty counts for analysis of U15 publications per faculty member are from the Engineers Canada 2010 Resources Report. Western U faculty count corrected based on 2011 data.

A more detailed version of the publication and citation data provided by Thomson Reuters allows us to compare our research productivity and impact with peer institutions at the level of specific departments or research focus areas. In addition to the many first-ranked results among our Canadian peers, U of T Engineering stands out in several key areas among North American institutions. Our expertise and impact in environmental engineering placed us first in citations and third in publications among all North American universities, both public and private. In the field of biomedical engineering U of T ranked second in publications among all North American peers, and among public universities stood first in publications and fourth in citations.

**Figure 6.7 U of T Engineering Rankings and Counts for Publications and Citations by Subject Field Among Canadian and Association of American Universities (AAU) Peer Institutions, 2006 to 2010**

| Field                                      | Canadian Peers (U15) |      | North American Peers Public (N=50) |      | North American Peers All (N=75) |      | Pub. Count | Cit. Count |
|--------------------------------------------|----------------------|------|------------------------------------|------|---------------------------------|------|------------|------------|
|                                            | Pub.                 | Cit. | Pub.                               | Cit. | Pub.                            | Cit. |            |            |
| <b>Engineering &amp; Materials Science</b> | 1                    | 1    | 8                                  | 7    | 9                               | 11   | 2,482      | 11,020     |
| <b>Engineering</b>                         | 2                    | 1    | 10                                 | 8    | 12                              | 11   | 1,739      | 5,603      |
| – Aerospace                                | 2                    | 1    | 11                                 | 13   | 14                              | 16   | 63         | 92         |
| – Biomedical                               | 1                    | 1    | 1                                  | 4    | 2                               | 7    | 425        | 2,072      |
| – Chemical                                 | 8                    | 8    | 18                                 | 22   | 19                              | 27   | 177        | 642        |
| – Civil                                    | 3                    | 2    | 13                                 | 10   | 13                              | 10   | 202        | 471        |
| – Electrical & Electronic                  | 2                    | 1    | 8                                  | 6    | 10                              | 9    | 832        | 3,196      |
| – Environmental                            | 2                    | 1    | 3                                  | 1    | 3                               | 1    | 197        | 2,375      |
| – Industrial                               | 3                    | 4    | 8                                  | 12   | 9                               | 13   | 79         | 179        |
| – Manufacturing                            | 3                    | 2    | 11                                 | 9    | 12                              | 10   | 69         | 176        |
| – Mechanical                               | 4                    | 2    | 15                                 | 11   | 17                              | 14   | 160        | 449        |
| – Multidisciplinary                        | 2                    | 1    | 15                                 | 18   | 18                              | 25   | 82         | 298        |
| <b>Materials Science</b>                   | 1                    | 1    | 5                                  | 9    | 7                               | 13   | 743        | 5,417      |
| – Biomaterials                             | 1                    | 1    | 1                                  | 5    | 3                               | 7    | 145        | 951        |
| – Coatings & Films                         | 2                    | 4    | 7                                  | 12   | 8                               | 14   | 72         | 267        |
| – Composites                               | 1                    | 1    | 3                                  | 2    | 3                               | 3    | 52         | 208        |
| – Multidisciplinary                        | 1                    | 1    | 9                                  | 10   | 12                              | 16   | 656        | 6,315      |
| – Paper & Wood                             | 3                    | 3    | 3                                  | 4    | 3                               | 4    | 82         | 112        |

**Note 6.7:** All data are from University Science Indicators 2010 Edition published by Thomson Reuters. The overall rankings for Engineering and Materials Science are based on the Standard database and the subject-specific results are calculated using the Deluxe database. Fields in which U of T publication counts were lower than 50 are not shown here. North American peer institutions include the AAU, U15 and the University of California at San Francisco.

# 7 Advancement

The past year has been an active and fruitful one for the Faculty's Advancement efforts. We tripled the total amount of money raised over the previous year to \$16.6 million, expanded our alumni programming and began building momentum for the launch of our Boundless Campaign in September 2012.

Philanthropic giving at all levels increased significantly. The final quarter of the year witnessed outstanding activity as we garnered early support for the planned new building, the Centre for Engineering Innovation & Entrepreneurship, yielding \$5.5 million in investments during the week following Governing Council approval and building excitement for the project among volunteers. In annual giving — an important source of expendable, discretionary funds — the amount raised through gifts of \$1,000 and above has increased nearly 50 per cent over the previous year.

2011–2012 was also an important year for alumni relations. Our Bay Area alumni launched a new chapter in February with events that drew nearly 100 attendees. Work also began to recruit volunteers throughout Asia-Pacific to strengthen our rapidly growing Skule community in China, Hong Kong, Taiwan, South Korea and Singapore. Dean's receptions in Singapore, Hong Kong and Beijing were well attended and enthusiastically received. In collaboration with the Engineering Alumni Association, we began the process of evaluating our alumni communications and programming to ensure meaningful engagement opportunities for all stakeholders.

The Faculty's Campaign Executive began its work under the exceptional leadership of George Myhal (IndE 7T8). Initial meetings focused on defining and validating the Boundless Campaign's priorities and objectives. Our campaign launch event in September 2012 was an afternoon of engineering innovation featuring faculty lectures, industry and alumni panels, and student exhibits.

# Philanthropic Fundraising

The role of private philanthropy in Canadian higher education will play an increasingly important role in the 21st century. The ability of U of T Engineering faculty and students to distinguish themselves on the global stage is directly tied to the generous support we receive from alumni, parents and friends. Their gifts (as shown in Figure 7.1c) foster research and innovation, student success, infrastructure upgrades and a number of initiatives to enhance the student experience.

The launch of our Faculty’s Boundless Campaign provides an important opportunity to create a significant and sustained increase in private funding for U of T Engineering that will help to propel us into the very top ranks of engineering schools, allowing us to stand on equal footing with significantly wealthier schools. Illustrated in Figure 7.1b, we nearly tripled the funds raised in 2011–2012 over the previous year, building good momentum as we move into our campaign.

During the next five years, fundraising efforts will focus on areas of particular strategic importance to the Faculty’s global pre-eminence: the construction of the Centre for Engineering Innovation & Entrepreneurship; significantly strengthening our ability to attract top students from around the world; and solidifying support for research and teaching through the creation of additional endowed chairs.

Figure 7.1a Advancement Results, 2011–2012

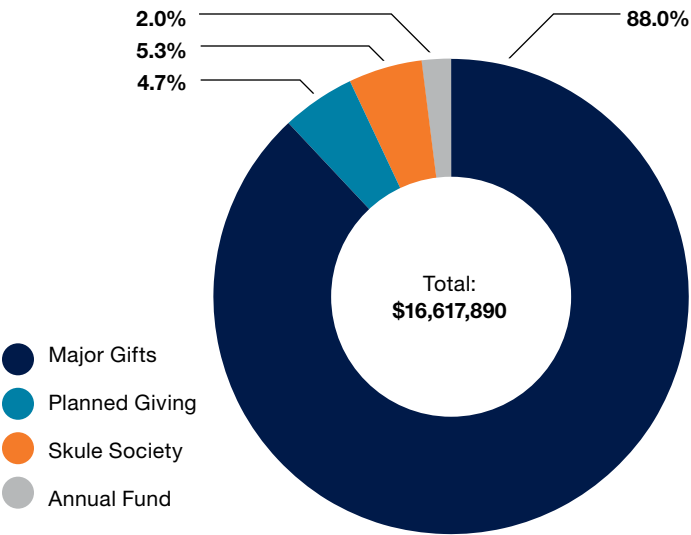


Figure 7.1b Philanthropic Support, 2007–2008 to 2011–2012

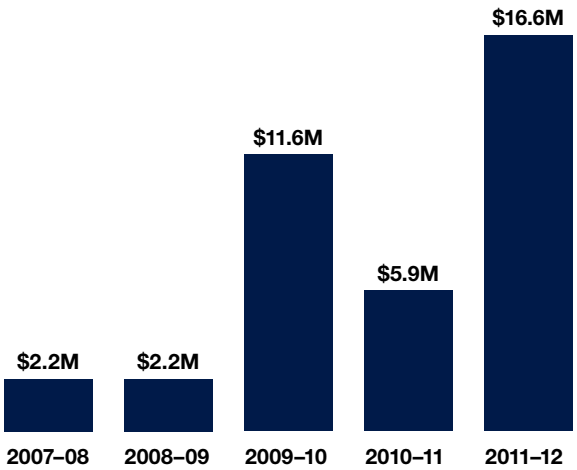
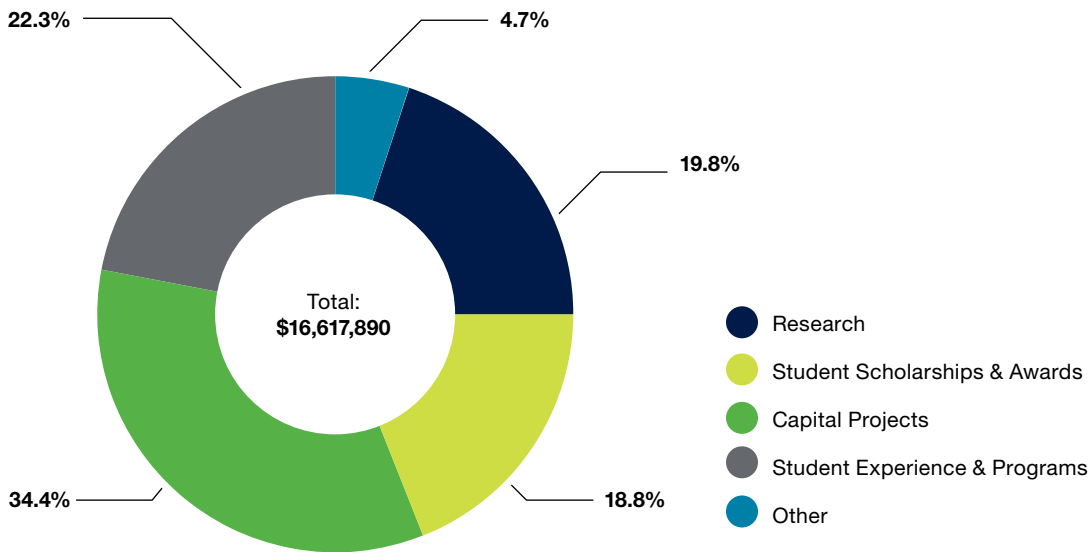


Figure 7.1c Gift Designations, 2011–2012



Note 7.1a, 7.1b and 7.1c: Data are shown by fiscal year (i.e., May to April).

# Initiatives and Projects for 2011–2012

## Campaign Executive

Engineering's Campaign Executive has begun the important work of determining the framework for the Faculty's \$200-million goal in the University's Boundless Campaign. Chaired by George Myhal (IndE 7T8), the campaign team includes Paul Cadario (CivE 7T3), Bill Daniel (MinE 4T7, PhD 8T0), Claire Kennedy (ChemE 8T9), Anthony Lacavera (CompE 9T7), Dusty Miklas (CivE 5T3), Frank Milligan (MechE 4T8), Greg Osadetz (IndE 7T8), Gerrard Schmid (MASc AeroE 9T2), Francis Shen (EngSci 8T1, MAsc AeroE 8T3), Richard Venn (EngSci 7T3), and John Weber (MechE 7T9).

## Lassonde Mining Building & Goldcorp Innovation Suite

The renovated Lassonde Mining Building — complete with the new Goldcorp Innovation Suite on the fourth and fifth floors — was officially dedicated on November 28, 2011. It was a chance for University leadership, government officials, mining business leaders, alumni, students and friends to celebrate the generous gifts of Franco-Nevada Chairman Dr. Pierre Lassonde, and Goldcorp Corporation. The upgraded building is home to the Lassonde Institute of Mining, an interdisciplinary research institute embracing a wide variety of mining activities. The Goldcorp Suite provides much-needed student design workstations, teaching spaces, graduate student offices, a conference room and highly attractive public space that has already become a favoured venue for Faculty events.

## Alumni Relations Program Review

Sparked by the entrepreneurial spirit of the Engineering Alumni Executive, a diverse group of stakeholders including alumni and staff began the process of re-imagining how the Faculty can best engage alumni through expanded mentorship opportunities, improved communication tools (including social media) and meaningful programming. Among the results of the group's work is a set of campaign goals that will measure alumni engagement in ways beyond financial commitment.

## San Francisco-Bay Area Alumni Chapter

Through the power of social networking, a diverse group of Bay Area alumni launched our first international alumni chapter with a powerful inaugural event in Mountain View. The February receptions in Mountain View and San Francisco were attended by close to 100 alumni, the Dean and other faculty members. The chapter, which has already followed up with another event held in May 2012, has groups on both LinkedIn and Facebook.

## Asia-Pacific Volunteer Engagement

As our alumni population increases across Asia, it is imperative that we create a strong community from Singapore to Seoul. An emerging group of volunteers in countries across the continent are taking the lead in connecting alumni to each other and back to U of T Engineering. We anticipate the launch of new chapters in the coming year.

## Centre for Engineering Innovation & Entrepreneurship

The single most important initiative begun during the past year is planning for the Faculty's first new building in more than 10 years. The Centre for Engineering Innovation & Entrepreneurship will be a landmark facility representing the research, collaboration and teaching values of our Faculty. The facility will feature innovative, multifunctional teaching spaces and interactive design facilities for students, and will house the administrative nerve centres of 10 established and emerging multidisciplinary initiatives within the Faculty, such as the Centre for Sustainable Energy and the Centre for Global Engineering. By creating a common space for engineers from different disciplines, it will stimulate innovative, interdisciplinary and entrepreneurial thinking. Early commitments have provided vital momentum for the project. The coming years will see broader outreach to the Engineering community.

# Alumni Relations Activities

Figure 7.2 Contactable Alumni by Academic Area, 2011–2012

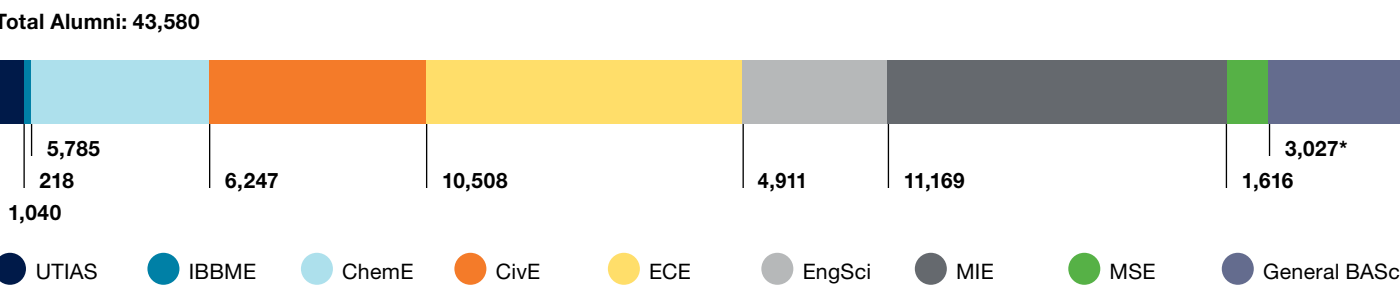
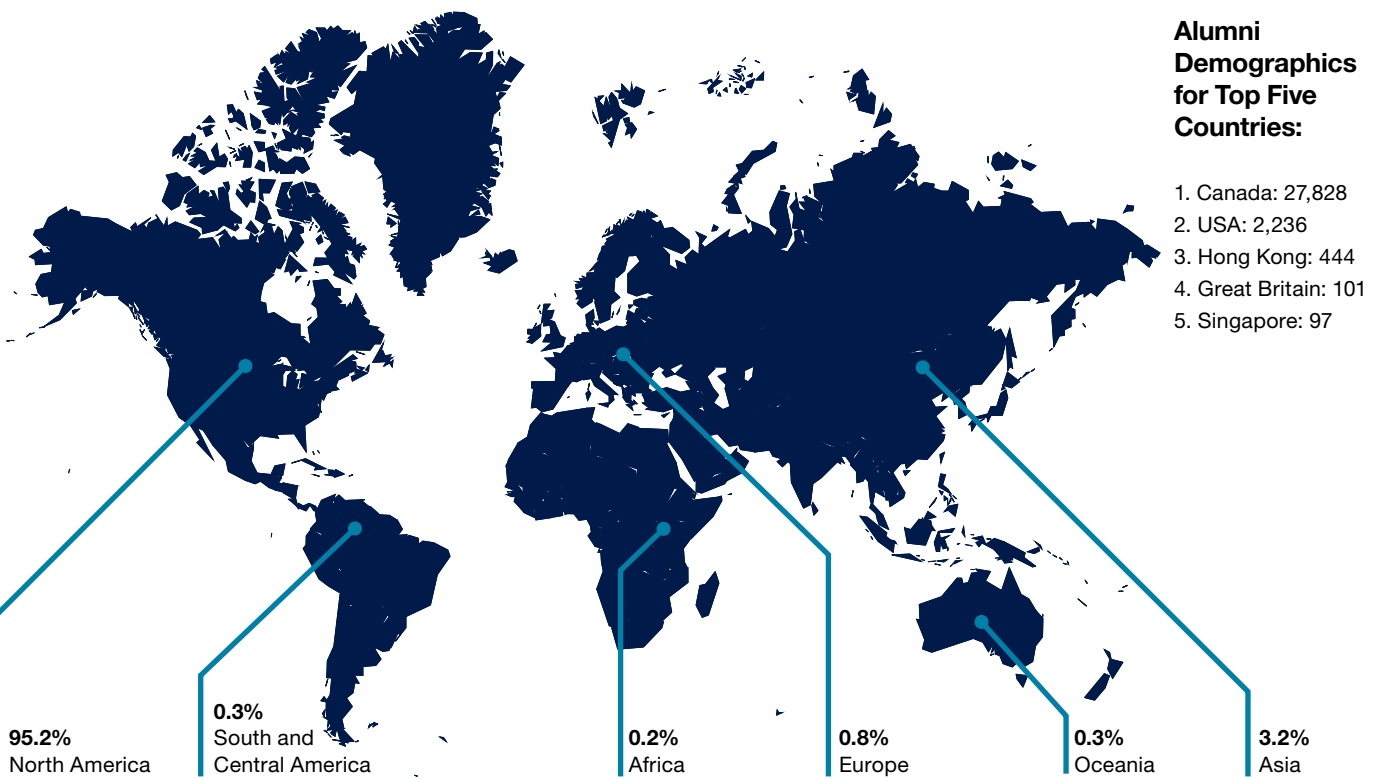


Figure 7.3 Geographic Location of Contactable Alumni, 2011–2012



**Note 7.2:** Includes alumni of graduate and undergraduate programs. (\*) General BASc refers to alumni whose degrees do not link to an existing department, division or institute. The total number of 43,580 represents the number of unique alumni, including those with multiple department affiliations. Therefore, the total is less than the sum of the numbers reported for each academic area.

**Note 7.3:** This figure plots the current location of our alumni — both graduate and undergraduate — for which we have contact information.

**Figure 7.4 Alumni Events, 2011–2012**

| Event Name                                 | Event Date         |
|--------------------------------------------|--------------------|
| EngSci Alumni Dinner                       | April 20, 2012     |
| Biz Skule Spring Lecture                   | April 18, 2012     |
| MIE Alumni Dinner                          | April 13, 2012     |
| MMS/MSE Winegard Visiting Lectureship      | March 22, 2012     |
| ChemE Annual Alumni Dinner                 | March 16, 2012     |
| Skule Mentorship Program Closing Reception | March 14, 2012     |
| Mountain View Skule Alumni Reception       | February 22, 2012  |
| San Francisco Skule Alumni Reception       | February 21, 2012  |
| Moment Valentine's Ball - Skule Orchestra  | February 10, 2012  |
| CivE and MinE Alumni Dinner                | February 10, 2012  |
| Biz Skule Private Equity Panel             | February 8, 2012   |
| Lassonde Mining Building Opening           | November 28, 2011  |
| MIE Ace the Interview                      | November 22, 2011  |
| Beijing Skule Alumni Reception             | November 20, 2011  |
| Hong Kong Skule Alumni Reception           | November 18, 2011  |
| Singapore Skule Alumni Reception           | November 17, 2011  |
| Calgary Skule Alumni Chapter Event         | November 14, 2011  |
| EAA Annual Awards Dinner                   | November 2, 2011   |
| IBBME Alumni and Awards Banquet            | October 26, 2011   |
| Skule Mentorship Program Event             | October 20, 2011   |
| MSE Industry Day                           | October 6, 2011    |
| Calgary Skule Networking Night Reception   | October 4, 2011    |
| KAUST Reception and Dinner                 | September 29, 2011 |
| Biz Skule Fall Lecture                     | September 28, 2011 |
| IndE 50th Anniversary Gala Dinner          | September 24, 2011 |
| IndE 50th Anniversary Symposium            | September 24, 2011 |
| CivE Survey Camp Reunion                   | September 17, 2011 |
| Calgary Send Off Event                     | June 20, 2011      |
| ChemE Scholars & Leaders Reception         | June 10, 2011      |
| UTIAS Industry-Alumni-Student Event        | June 9, 2011       |
| Engineering Volunteer Recognition Event    | June 8, 2011       |
| Engineering Spring Reunion                 | May 27–28, 2011    |
| ChemE Spring Reunion Alumni Lunch          | May 28, 2011       |
| CivE Spring Reunion Alumni Lunch           | May 28, 2011       |
| ECE Spring Reunion Lunch                   | May 28, 2011       |
| EngSci Spring Reunion Lunch                | May 28, 2011       |
| MIE Spring Reunion Lunch                   | May 28, 2011       |
| MMS/MSE Spring Reunion Lunch               | May 28, 2011       |
| Spring Reunion Skule Kids Workshops        | May 28, 2011       |
| ECE Alumni Networking & Lecture Event      | May 3, 2011        |

Our Faculty continued to increase the number and variety of opportunities for engagement with and among alumni in 2011–2012. Apart from an expanded Biz Skule line-up in the Greater Toronto Area, we also hosted events in Calgary; San Francisco and Mountain View, California; Singapore; Hong Kong; and Beijing. We are enhancing more of our alumni events by inviting faculty members to speak about the world-class research that distinguishes U of T Engineering from other schools. As a way of demonstrating the positive impact of annual fund giving, Spring Reunion included demonstrations by student clubs, such as the Human-Powered Vehicle Team.

Looking ahead, we will continue to create more opportunities for alumni to network, and to interact with faculty and students.

**Note 7.4:** The Skule Kids Workshops were attended by children and grandchildren of alumni during Spring Reunion 2011.

## Gift Highlights for 2011–2012

In 2011–2012, our Faculty received initial gifts for the new Centre for Engineering Innovation & Entrepreneurship, along with significant investments in student aid and important research funding for the Centre for Resilience of Critical Infrastructure. Some gift highlights from the past year include:

### George Myhal, \$5M

George Myhal (IndE 7T8), a Senior Managing Partner for Brookfield Asset Management, has given back to the University of Toronto in many ways since graduating from the Industrial Engineering program in 1978. A long-time Governor of the University, Myhal has served on a variety of Governing Council boards and committees, was vice-chair of Engineering's component of U of T's groundbreaking billion-dollar Great Minds campaign, and is Chair of the Engineering Campaign Executive for the Boundless Campaign.

In the weeks following Governing Council's approval of the site for the new Centre for Engineering Innovation & Entrepreneurship, Myhal made a \$5-million leadership commitment in support of its construction. The building will be home to a number of the Faculty's cross-disciplinary centres and institutes, and will provide vital interactive instructional space, with a strong focus on the integration of design into the curriculum.

### Paul Cadario, \$1M

During his September 2011 matriculation lecture to the Faculty's first-year students, Paul Cadario (CivE 7T3) asked students born outside Canada to raise their hands. The large number of hands raised did not come as a surprise to Cadario, a World Bank veteran and long-time U of T volunteer leader. His many University roles include an appointment as Distinguished Senior Fellow in Global Innovation in our Faculty and at the Munk School of Global Affairs. In a reflection of his dual interests in engineering and international affairs, Cadario has made a generous commitment of \$1 million to our Centre for Global Engineering (CGEN), which brings creative, sustainable solutions to bear on challenges in developing nations. Cadario's gift brings support for CGEN graduate students and will help to build a future home for CGEN in the new Centre for Engineering Innovation & Entrepreneurship.

### Explora Research Fund, \$1.2M

At the forefront of security technologies development and testing, Explora Security Ltd. is leading threat analysis and risk reduction for some of the most dangerous environments around the world. To help develop the world's next generation of experts in these areas, Explora has made a commitment of \$1.2 million in support of research and teaching within the Centre for the Resilience of Critical Infrastructure (RCI) in the Department of Civil Engineering. Explora's partnership with RCI will enable researchers to develop innovative ways to protect vulnerable populations against explosives, as well as catastrophic climactic events like earthquakes and typhoons. This gift will help equip our engineering graduates to make considerable headway in the ever-evolving field of security technologies.

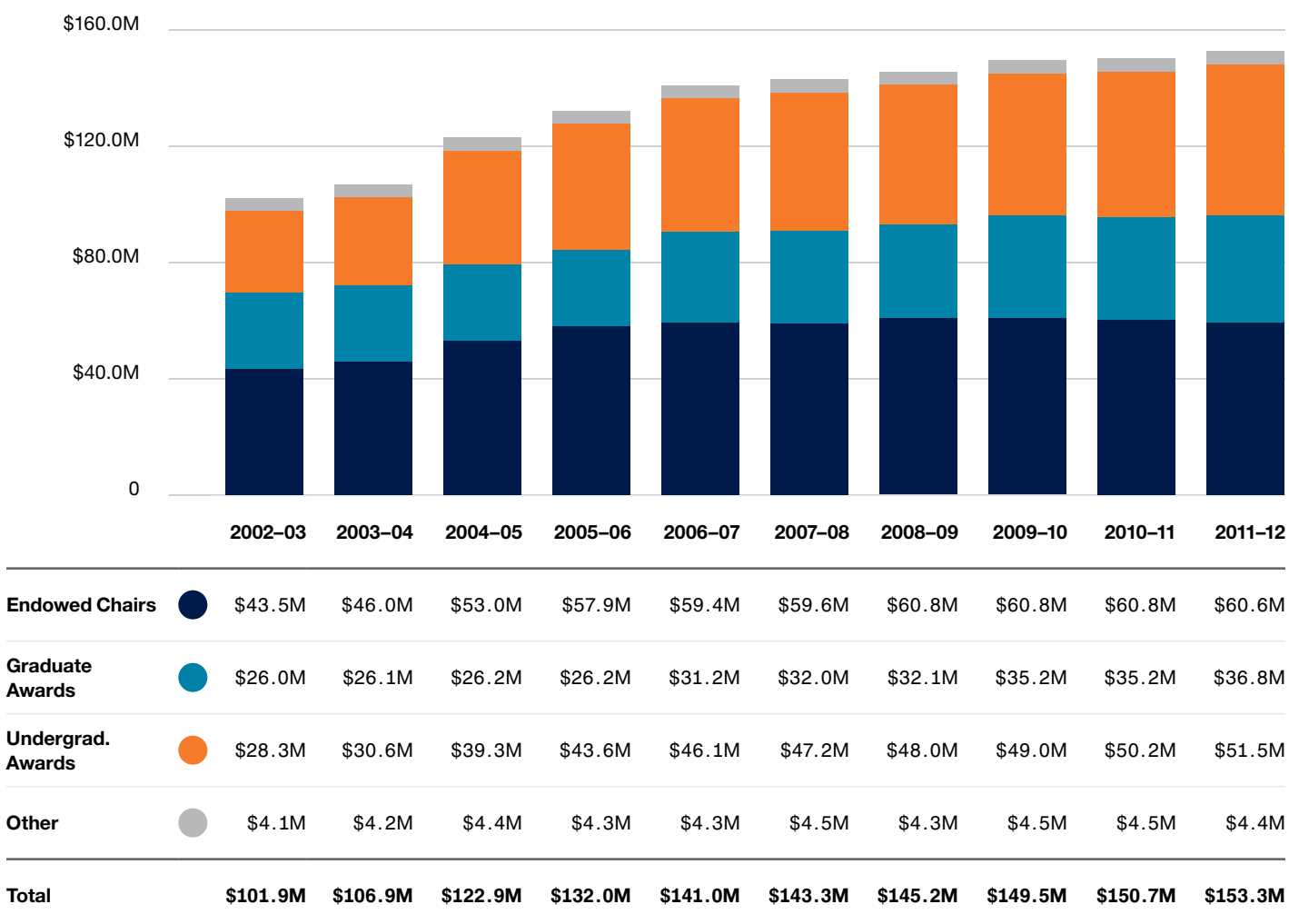
### Hatch Ltd., \$860K

In September 2012, the first of four successful graduates of the Mathematical Gymnasium school in Belgrade began studies at U of T Engineering. This was made possible through a gift of \$860,000 from Hatch Ltd. It represents the latest of numerous scholarships offered by the global engineering firm to students from the countries in which it operates. Hatch Entrance Scholarships make it possible for students from the award-winning Serbian high school that specializes in university-level math and physics to attend U of T. The awards cover tuition, school supplies, accommodations and travel. Hatch will also provide opportunities for some of the scholarship winners to spend their school breaks working at the firm, with the hope that some may join the Hatch team after graduation.

### Anonymous Donors, \$300K

Because the Province does not financially support international students at Ontario universities, students from outside Canada accepted into Engineering PhD programs cost their advisors' labs an incremental \$10,000 to \$15,000 each year. In an attempt to counterbalance this disincentive and allow the Faculty to continue to attract the best graduate students from around the world, two anonymous donors have established a new graduate fellowship fund in IBBME. The donors were inspired by their first-hand experience of international collaborations in IBBME, as well as the passionate explanation for the need of such support. This fund is just the latest example of the donors' generous support across the Faculty.

Figure 7.5 Endowments, 2002–2003 to 2011–2012



**Note 7.5:** Data are shown by fiscal year (e.g., May 2011 to April 2012).

# 8 Communications

We are a Faculty full of vital stories — about meaningful research that makes a difference; about students and faculty confronting the world's most challenging problems with innovative solutions; about contributions to engineering education, the profession and to society. The challenge is to keep pace with the rapidly changing communication landscape to ensure those stories reach and inspire our intended readers, viewers and listeners. In the past year, we have focused on ways to increase our capacity to capture and convey information. It is being done by thinking strategically and working collaboratively.

Our communications projects in 2011–2012 included refocusing the promotion of EngSci's Praxis Showcase, telling the story of organic light-emitting diodes and continuing to refresh communications to applicants, current students, donors, government agencies and other key audiences. Many of these initiatives added video and interactive website elements to bring attention to our Faculty's successes in new ways. We also maintained our role as a destination-of-choice for media outlets seeking engineering expertise.

Our Faculty is using social media to help expand conversations and collaborations. The Engineering Communication Network (ECN) Hub was launched in 2011 as a wiki for communicators across our Faculty to share information and discuss issues online. A growing number of our departments and administrative areas are also using Twitter and Facebook to interact more closely with our primary audiences.

Through our cumulative communications efforts, we are extending the reach of our impact, teaching and research.

## Increasing Our Capacity to Tell Stories

In order to tell our compelling stories, we are continually increasing the capacity to capture and convey our messages effectively, using traditional and emerging media. To that end, we:

- created an online collaborative workspace (wiki) for members of the Engineering Communications Network (ECN) called the ECN Hub. It encourages members to share information, events and learning. It is also the home of Brand Central Station, our repository of branded material and templates;
- continued to provide digital video training to the ECN community;
- worked with faculty, including Chairs and Directors, on their media relations skills so they can comfortably and professionally deliver our key messages while responding to questions about their research; and,
- developed an editorial style guide\* based on Canadian Press style with the addition of terminology and style issues unique to our Faculty and University.

We are in the midst of developing key messages aimed at specific audiences based on user needs assessments, focus groups and assessment of audience value propositions. This work is a lead-up to the development of a Strategic Communications Plan.

## Selected Communication Projects for 2011–2012

### Using Multimedia for the ‘Reinvent the Toilet Challenge’

U of T’s participation in the international Reinvent the Toilet Challenge created an opportunity to showcase the Faculty’s global impact. Building on the coverage generated by the Bill & Melinda Gates Foundation, we captured broad media attention nationally and internationally for the work undertaken by our research team, led by Professor Yu-Ling Cheng (ChemE). The coverage included a video interview featuring Professor Cheng discussing the challenge and the work that lay ahead. This multimedia element helped to extend the story through social media that helped boost online pickup.

### Illustrating Organic Light-Emitting Diodes

U of T Engineering teamed up with Ontario’s Ministry of Economic Development and Innovation to tell government officials and industrial representatives the story behind creating digital displays that use organic light-emitting diodes (OLEDs). A posting, written for the ministry’s blog, described the promising research coming out of the Materials Science & Engineering laboratory of Professor Zheng-Hong Lu and PhD candidate Michael G. Helander, a Vanier Scholar. The article looked at the economic potential for using electrically stimulated organic dyes to create light on paper-thin devices — an innovation that opens up the prospect for very-flat-screen TVs that can be folded or rolled up. It was accompanied by a video, produced in-house, that gave Helander an opportunity to elaborate upon the compelling research. The award-winning video has been used by MSE for student recruitment and to supplement a story on OLED research by *U of T Magazine* for online and iPad editions.

### Strategic Publicity for Praxis Showcase

The Praxis Design Showcase, which features design solutions developed by first-year Engineering Science students to solve challenges in Toronto, has earned significant media coverage in past years. However, finding a way to continue to attract media attention required a fresh approach to sustain media interest. Our Faculty pitched individual projects to specific reporters. For example, we shared transit-related projects with transportation reporters, including a *Toronto Star* reporter who produced a feature-length report on the students’ proposed solutions. Coverage received an additional boost from a new micro-website that was developed to highlight the student project proposals and summaries.

### Reimagining Undergraduate Applicant Communications

The recruitment and admissions cycle involves engaging prospective students, and print publications have played a critical role in our communications efforts. However, most prospective students rely heavily on the web for information. In spring 2012, our Faculty developed an enhanced experience for students who received an offer of admission. On camera and in their own words, a number of current undergraduates were asked to tell future students why they enjoy studying at U of T Engineering. The result was a series of seven videos on topics ranging from engineering design and academic choice to our community and the benefits of the Professional Experience Year. Online, the videos were complemented by additional content and photos, and a brochure was produced featuring the students. The seven videos received 1,448 plays from more than 125 countries around the world.

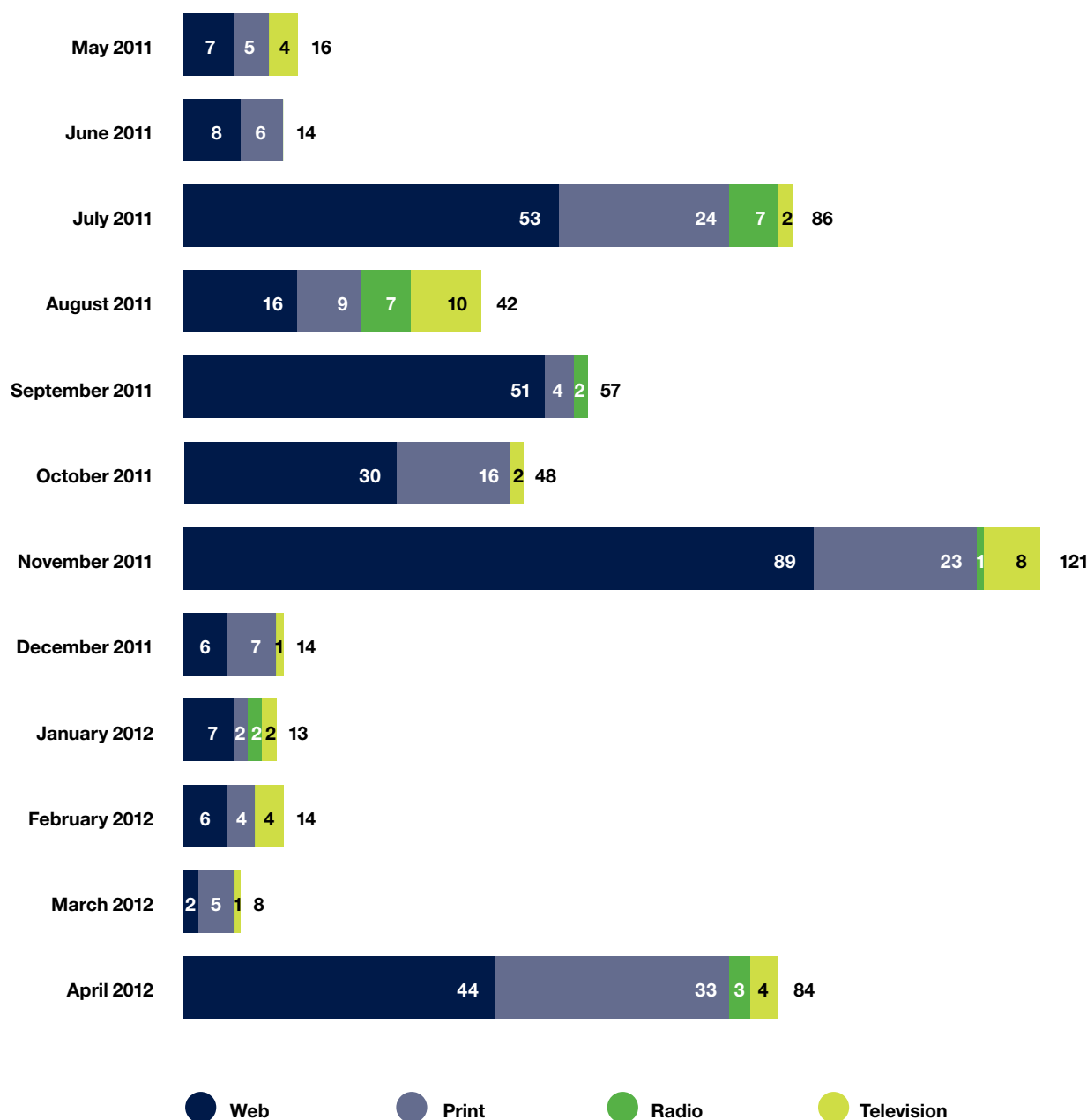
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**Note:** (\*) The editorial style guide will be released in fall 2012.

## Media Coverage

The biggest Faculty stories picked up by the media in 2011–2012 included the receipt of funding from the Bill & Melinda Gates Foundation for the first phase of the Reinvent the Toilet Challenge (July 2011), the creation of the world’s most efficient OLED on plastic (November 2011) and the Engineering Science Praxis Design Showcase (April 2012). The most significant increase in general coverage in the past year has been on television, where our Faculty was part of 38 stories.

Figure 8.1 Media Monitoring, 2011–2012



**Note 8.1:** Media coverage reflects data as recorded by University of Toronto Strategic Communications between May 2011 and April 2012.

## Website Activity

Websites continued to be the primary platform for online communications across our Faculty. All departments and offices are using their dedicated public sites to provide essential information including news, events listings and multimedia content.

Two of our most popular Faculty-wide websites — [www.engineering.utoronto.ca](http://www.engineering.utoronto.ca) and [www.discover.engineering.utoronto.ca](http://www.discover.engineering.utoronto.ca) — play a primary role in communicating with several of our key audiences, ranging from prospective students and parents to potential industry partners, reporters and members of the U of T community.

In comparison to 2010–2011 metrics, the total number of visits to the Faculty’s main website ([www.engineering.utoronto.ca](http://www.engineering.utoronto.ca)) grew by 8.5 per cent, while unique visitors increased by 8 per cent. After the home page, the most visited page on the site was for future students considering undergraduate studies, followed by a landing page for prospective graduate students.

While statistics for the prospective undergraduate website ([www.discover.engineering.utoronto.ca](http://www.discover.engineering.utoronto.ca)) were not included in previous annual reports, Figure 8.2b demonstrates that it is a popular and engaging website where users on average spend more than four minutes and view four pages per visit. Countries with the most views align with where our applicants are from, confirming that prospective undergraduates rely heavily on online content as a source of information.

Shown in Figure 8.2c, visitors to both the Faculty website and the prospective undergraduate website came from a range of countries across North America, Asia and Europe, demonstrating their global reach and diverse influence. Within Canada, visitors to both sites were primarily from Toronto. Top visitors from other major Canadian cities were from Calgary, Edmonton, Montreal, Ottawa and Vancouver. While the Faculty website had almost twice the number of American visitors than the prospective undergraduate website, it is interesting to note that both were visited the most by the same five states: California, Florida, Massachusetts, New York and Texas.

**Figure 8.2a Summary of Analytics for Faculty Website, 2010–2011 to 2011–2012**

|                                        | 2010–2011 | 2011–2012 |
|----------------------------------------|-----------|-----------|
| Total number of visits                 | 325,693   | 353,226   |
| Number of unique visitors              | 193,820   | 208,579   |
| Average number of pageviews per visit  | 2.7       | 2.6       |
| Average number of pageviews per day    | 2,414     | 2,478     |
| Average amount of time spent on site   | 2.43 min. | 2.72 min. |
| Number of cities visitors came from    | 6,673     | 6,489     |
| Number of countries visitors came from | 193       | 194       |

**Figure 8.2b Summary of Analytics for Prospective Undergraduate Website, 2011–2012**

|                                        | 2011–2012 |
|----------------------------------------|-----------|
| Total number of visits                 | 230,306   |
| Number of unique visitors              | 146,552   |
| Average number of pageviews per visit  | 4.0       |
| Average number of pageviews per day    | 2,523     |
| Average amount of time spent on site   | 4.23 min. |
| Number of cities visitors came from    | 4,842     |
| Number of countries visitors came from | 189       |

**Figure 8.2c Top 10 Countries Visiting Faculty and Prospective Undergraduate Websites, 2011–2012**

| Faculty Website |          |       | Prospective Undergraduate Website |          |       |
|-----------------|----------|-------|-----------------------------------|----------|-------|
| Country         | Visitors | %     | Country                           | Visitors | %     |
| 1 Canada        | 253,216  | 71.7% | Canada                            | 137,030  | 59.5% |
| 2 U.S.          | 21,922   | 6.2%  | U.S.                              | 10,054   | 4.4%  |
| 3 India         | 9,445    | 2.7%  | India                             | 9,058    | 3.9%  |
| 4 China         | 6,988    | 2.0%  | China                             | 8,844    | 3.8%  |
| 5 U.K.          | 4,789    | 1.4%  | Pakistan                          | 6,053    | 2.6%  |
| 6 Iran          | 3,941    | 1.1%  | U.A.E.                            | 4,648    | 2.0%  |
| 7 Pakistan      | 3,552    | 1.0%  | U.K.                              | 3,212    | 1.4%  |
| 8 U.A.E.        | 1,948    | 0.6%  | Saudi Arabia                      | 2,892    | 1.3%  |
| 9 Australia     | 1,853    | 0.5%  | Bangladesh                        | 2,497    | 1.1%  |
| 10 Germany      | 1,818    | 0.5%  | Iran                              | 2,359    | 1.0%  |

**Note 8.2a, 8.2b and 8.2c:** All website statistics (from Google Analytics) represent data collected between May 2011 and April 2012.

## Social Media

In 2011–2012, we expanded our social media presence, continuing to grow our online community across the Faculty. Nine Twitter accounts are in operation, ranging from a general account for U of T Engineering to departmental accounts in specific administrative units. They include:

| Account Owner                                                            | Twitter Account             |
|--------------------------------------------------------------------------|-----------------------------|
| Faculty of Applied Science & Engineering                                 | twitter.com/uoftengineering |
| Department of Chemical Engineering & Applied Chemistry                   | twitter.com/ChemEng_UofT    |
| Department of Civil Engineering                                          | twitter.com/civmin          |
| The Edward S. Rogers Sr. Department of Electrical & Computer Engineering | twitter.com/eceuoft         |
| Department of Materials Science & Engineering                            | twitter.com/uoftmse         |
| Institute of Biomaterials & Biomedical Engineering                       | twitter.com/IBBME_UofT      |
| U of T Engineering Media Relations                                       | twitter.com/uofteng_media   |
| U of T Engineering Registrar                                             | twitter.com/uofteng_registr |
| Engineering Leaders of Tomorrow                                          | twitter.com/EngineeringLOT  |

As of June 30, 2012, all of our Faculty's Twitter accounts had collectively gathered a community of 5,013 followers. U of T Engineering's general Twitter account had the largest share of followers at 3,356 people and the largest number of retweets at 250.

In 2011–2012, 76 videos were added to the Faculty's website and Vimeo channel, covering news, Professional Experience Year internships, new academic appointments, convocation and other U of T Engineering activities. These videos drew 87,392 plays. The most-watched video during this reporting period was *Creating the Digital Displays of Tomorrow*, with 14,500 views, followed by *New Solutions for Electronic Displays* at 11,700 views and *HPO The Snowbird* at 11,400 views. While the total number of views for our videos this year is lower than last year's total of 1.66 million, 1.59 million of those plays came from a single video called *The Flight of the Ornithopter* in 2010.

Although Canadians were the principal viewers of our videos (27,143 plays), Americans were not far behind (19,250 plays). They were followed by viewers from Italy, Poland, United Kingdom, India, Germany, Finland, Russia and Brazil. While China ranked 56th with 89 plays, the 2011–2012 reporting period marks the first time that country has appeared in our video statistics, indicating that audiences there are now able to access our content.

# 9 International Initiatives

Our international focus continues to grow as we incorporate a global perspective into our teaching, learning and research. We are also building intercultural and international competence into curriculum and increasing opportunities such as internships, teaching exchanges, research projects and academic partnerships that have a global dimension.

The expanding roster of experiential learning opportunities for students includes the cross-cultural capstone design program we offer with the College of Engineering at Peking University in Beijing and our Structured Exchange Pathways program, which helps students map their international exchange possibilities. We also launched certificates at the undergraduate and graduate levels in global engineering, bringing diverse perspectives to our classrooms and enhancing the learning experience for everyone.

International collaboration not only broadens learning and research, it strives to make a positive impact by providing engineering solutions that address global realities. Research activities in 2011–2012 illustrate the practical ways we are transforming communities around the world. One example is the lab-on-a-chip that will make HIV monitoring more affordable in AIDS-infected regions. Another is the toilet prototype the Centre for Global Engineering is designing for the developing world as part of the Bill & Melinda Gates Foundation's Reinvent the Toilet Challenge.

U of T Engineering professors, researchers and students will soon be expanding our efforts in tackling engineering challenges faced by urban areas around the world. It is part of a new collaboration with the Center for Urban Science and Progress (CUSP) in New York. This and other important connections with universities in Ethiopia, Chile and Saudi Arabia are allowing us to further our global reach.

## Selected Highlights of Global Impact for 2011–2012

### Chip Revolutionizes HIV Tracking

A lab-on-a-chip could be the key to making affordable HIV monitoring a reality in the developing world. Created by ECE PhD candidate James Dou and his supervisor Professor Stewart Aitchison (ECE), the blood-testing device costs between \$5,000 and \$10,000 to produce and provides results in minutes. Current devices, called flow cytometers, are bulkier and can cost as much as \$100,000.

With support from U of T's Innovations & Partnerships Office and the Rotman School of Management, the team has created a start-up company, ChipCare Corp., that aims to make 100 devices available to organizations in Malawi and Thailand in 2012. With further development, the researchers hope to reduce the cost and shrink the monitoring tool down to the size of a hand-held device.

### Battery Generator Makes Oxygen Possible

The daunting task of making oxygen easily available to remote hospitals in low-income African countries received a boost with the creation of a battery-powered machine to generate oxygen. Developed by ChemE PhD candidate Bev Bradley and a team of Gambian technicians, the generator offers a realistic alternative to heavy oxygen cylinders that are not easily refilled.

The research stems from Bradley's involvement in the Faculty's Centre for Global Engineering and with Engineers Without Borders. Her thesis is investigating other alternatives, such as a solar-powered generator, that will recognize the unique local challenges of providing life-saving oxygen to hospitals treating childhood pneumonia and other illnesses.

### Rising Stars Streamlines Water Purification

Professor David Sinton (MIE), Director of the Centre for Sustainable Energy, was one of three U of T faculty named a Rising Star in Global Health for his work in developing an energy-efficient water purification method. The system uses ion concentration polarization to reduce the energy needed to purify water, a development of particular help to regions unable to afford or generate enough energy to meet their needs. The Rising Stars program is part of Grand Challenges Canada, a global health organization supported by Canada's foreign aid budget. Nineteen researchers received the first awards in 2011.

### Reinvent the Toilet Challenge Prototype Being Developed

Eight university teams around the world, including one from U of T Engineering, took up the challenge in 2011–2012 to develop an alternative to the standard toilet. The goal was to create a toilet for the developing world that would be affordable, sanitary and sustainable. Led by Professor Yu-Ling Cheng (ChemE), Director of the Centre for Global Engineering, the U of T group designed a prototype that filters liquid waste using sand and a UV-ray disinfecting chamber, and incinerates solid waste that has been flattened and dried. The result is a toilet that is sustainable, easy to use and processes waste while protecting the community from contamination. It was showcased in Seattle for the sponsors, the Bill & Melinda Gates Foundation, in summer 2012, garnering third place in the international challenge. As a result, the U of T Engineering research team has received additional funding to follow up with field tests in Bangladesh.

### PEY Internship in Ghana

Last year, EngSci student Elmira Reisi spent her PEY internship in Ghana as a Junior Fellow in international development with Engineers Without Borders (EWB) Canada. EWB partnered Reisi with YGL, a Ghanaian company that enables smallholder and low-income cocoa farmers to sell their crop at a premium price as organic and certified products (under the UTZ Sustainable Cocoa Code of Conduct). In partnership with YGL, Reisi applied her knowledge of systems and critical analysis skills to train farmers on good agricultural practice and creating market connections. She also promoted farmer-to-farmer learning to ensure more efficient and effective extension of service. Consolidated farmer groups will play an important role in empowering them to leverage global market demand and negotiate fair prices for their labour.

### Improving Rehabilitation with Inexpensive Artificial Leg

Professor Jan Andrysek, a scientist at Holland Bloorview Kids Rehabilitation Hospital and Assistant Professor in IBBME, developed an artificial leg that features a patented knee-joint mechanism and carries a pricetag of less than \$100. Many prosthetic limbs cost more than \$3,000 in many parts of the world. His innovation will enable people who have lost a leg to a high-quality, affordable prosthetic. Professor Andrysek is now working with the International Committee of the Red Cross to test the leg in several countries, including Tanzania and Chile.

## Selected International Partnerships for 2011–2012

### Center for Urban Science and Progress (CUSP) in New York

In spring 2012, New York City Mayor Michael Bloomberg announced the establishment of the Center for Urban Science and Progress (CUSP), which will focus on research and designing technologies to address the critical challenges facing the world's cities. U of T Engineering is the only Canadian contributor to this collaboration, which also includes New York University, Polytechnic Institute of New York University, Carnegie Mellon University, University of Warwick, Indian Institute of Technology Bombay, as well as leading companies like IBM, CISCO and Siemens.

When complete, CUSP will house 430 graduate students researching issues that affect infrastructure, energy efficiency, transportation congestion, technical integration, public safety and public health in large urban areas. U of T's Cities Centre, NSERC Strategic Network for Smart Applications on Virtual Infrastructures (SAVI), Centre for Resilience of Critical Infrastructure and Centre for Sustainable Energy will all have a role to play. CUSP — based in Brooklyn — will also house visiting professors, doctoral researchers and interns, and will serve as one destination for students in the practicum component of our proposed Master of Engineering in Cities Engineering and Management program.

### China's Institute of Earthquake Sciences

Over the next three years, Civil Engineering researchers and graduate students will be part of an exchange with China's Institute of Earthquake Sciences (IES) to investigate the generic mechanisms of earthquakes and ways to reduce seismic hazards. The letter of intent between U of T Engineering and IES recognizes the leading-edge facilities and research teams that each brings to the collaboration. Our Faculty's credentials in structural engineering and geomechanics will figure heavily in the exchange.

### Earthquake Training in Haiti and Workshops in Israel

Much of the devastation in Haiti's 2010 earthquake could have been prevented. That was one of the messages delivered to Haitian engineering and government personnel by Professor Constantin Christopoulos (CivE) of the Faculty's Centre for the Resilience of Critical Infrastructure (RCI) during a two-day earthquake engineering course he presented in Haiti in August 2011. Because Haiti had no building codes, many structures were simply unable to withstand the tremors. Professor Christopoulos, the Canada Research Chair in Seismic Resilience of Infrastructure, worked with local experts to determine a process to create guidelines that will include standards for steel structures that are more resistant to earthquakes.

Through a joint U of T-Technion Israel Institute of Technology initiative, RCI also held a workshop in Haifa in July 2012. Attended by eight U of T researchers and 17 Technion counterparts, the academic exchange was one of many partnerships established to further the understanding of infrastructure resilience globally. Please see the Research chapter for more on RCI.

## **Istituto Universitario di Studi Superiori di Pavia in Italy**

Through a Memorandum of Understanding signed in November 2011, our Faculty is pleased to collaborate with the Istituto Universitario di Studi Superiori di Pavia (IUSS) in Italy on a doctoral cotutelle. In the next two years, this unique program will allow exceptional PhD candidates to study and research at both world-class institutions at an early stage of their career. The industrial and collaborative research ties our Faculty and IUSS have established across the world will provide a remarkable training ground for these students.

## **Saudi Arabia and Ethiopia**

The most efficient CQD (colloidal quantum dot) solar cell ever produced is a result of a fruitful four-year partnership with King Abdullah University of Science & Technology (KAUST), one of Saudi Arabia's newest universities. Despite its miniature size, the cell produced energy conversion efficiency as high as 6 per cent, the highest rate ever seen. The collaborative effort, which included researchers from Penn State, has resulted in a first-of-its-kind licensing agreement by U of T and KAUST for rights to quantum-dot solar technology. The two universities celebrated their partnership by hosting a 2011 nanomaterials international conference in Toronto, organized by Professor Ted Sargent (ECE), the Faculty's Vice-Dean, Research.

A similar licensing agreement for quantum-dot solar technology rights has been developed with Addis Ababa University. It represents an expanding partnership between Addis Ababa and U of T. Faculty members from ECE and MIE taught at the Ethiopian university in 2011, with ChemE scheduled to visit in fall 2012.

## **Universidad de Santiago de Chile**

The Memorandum of Understanding signed in 2011 with the engineering school at Universidad de Santiago de Chile (USACH) opens up the potential for joint research initiatives, co-hosted conferences, internships and exchanges. In particular, the collaboration creates opportunities as we seek to recruit top international students for our PhD programs and USACH works towards addressing a shortage of PhD-trained engineering faculty.

## **Graduate International Foundation Program**

The International Foundation Program for undergraduates, launched successfully in 2011, is migrating to graduate studies. Nearly 70 applicants expressed interest in the Graduate International Foundation Program (G-IFP) that began in September 2012. The G-IFP represents a transitional opportunity for eligible international graduate students who do not meet U of T's English language standard. It grants them conditional acceptance to the MEng program while they participate in a four-month course of intensive English instruction in an engineering context. Upon successful completion of the program, students begin their MEng the following January with a half-course credit towards their degree. The Faculty received applications for the first offering of G-IFP by students from 15 countries.

# 10 Space

U of T Engineering continues to plan and carry out a variety of ambitious building and renovation projects, responding directly to the challenges posed in our 2008–2009 Space Review. A key initiative in addressing those space challenges is the new Centre for Engineering Innovation & Entrepreneurship. The facility — which will be built on the site of Simcoe Hall’s parking lot — received University approval in February 2012 and a project planning committee is currently defining its requirements. The last new Engineering building constructed on campus was the Bahen Centre in 2000.

2011–2012 was an active year for infrastructure renovations, relocations and enhancements, with several major projects now complete. The fourth and fifth floors of the Lassonde Mining Building officially reopened as the Goldcorp Mining Innovation Suite in November 2011. And we created new spaces for BioZone, an IBBME undergraduate teaching lab and the Microsatellite Science and Technology Centre at UTIAS in Downsview. Other changes included relocating the Engineering Career Centre and Engineering Strategic Communications.

The past year was also one of planning for several projects, including an expansion of Gull Lake Survey Camp, a transformation of the Heat Engines Lab into an Energy Fundamentals Lab, and the installation of electronic directories dedicated to helping people find their way around major Engineering buildings.

We have undertaken three space audits: student club and study space; meeting rooms; and undergraduate labs. These audits provide detailed information on existing space usage and refinements, allowing us to identify opportunities for space sharing, increased functionality and full utilization. The audits have already resulted in recommendations for a central room-booking system and a bookable multi-purpose room for student presentations and club meetings.

## Infrastructure and Facilities

The buildings we occupy have been on the receiving end of more than 30 projects at stages ranging from planning to completed in 2011–2012. They reflect the Faculty's efforts to expand and renovate space that, in some cases, has not been updated in decades. Improving our physical infrastructure and facilities continues to be a focus for our fundraising efforts. These projects ensure we meet the needs of our students, faculty, researchers and staff.

Figure 10.1 looks at our footprint in each of our buildings as measured in net assignable square metres (NASMs), which have been fine-tuned over the past year to make the measurements more accurate. An increase in total NASMs for 2011–2012 by more than 200 is a result of the renovations and relocations completed in the last year, as outlined on the following pages.

**Figure 10.1 Summary of Buildings Occupied by Engineering, 2011–2012**

| Code | Building          | Office of the Dean  | EngSci     | UTIAS        | ChemE        | CivE & MinE  | ECE           | IBBME        | MIE           | MSE          | Total NASMs   |
|------|-------------------|---------------------|------------|--------------|--------------|--------------|---------------|--------------|---------------|--------------|---------------|
| AS   | Aerospace         |                     |            | 4,268        |              |              |               |              |               |              | 4,268         |
| EA   | Annex             | 233                 |            |              |              |              | 946           |              | 92            |              | 1,271         |
| BA   | Bahen Centre      | 1,219               | 564        |              |              |              | 5,680         |              | 1,362         |              | 8,825         |
| EL   | Electrometal      |                     |            |              |              |              |               |              |               | 149          | 149           |
| FI   | Fields Institute  | 340                 |            |              |              |              |               |              |               |              | 340           |
| GB   | Galbraith         | 1,670               |            |              |              | 4,853        | 4,216         |              |               |              | 10,740        |
| HA   | Haultain          |                     |            |              | 198          | 110          |               |              | 639           | 721          | 1,667         |
| MC   | Mechanical        | 63                  |            |              |              |              |               |              | 5,446         |              | 5,509         |
| MB   | Mining            |                     |            |              |              | 524          |               | 1,366        | 1,899         | 830          | 4,619         |
| RM   | 256 McCaul        | 450                 |            |              |              |              |               |              | 59            |              | 509           |
| PT   | Pratt             |                     |            |              |              |              | 1,342         |              |               | 1,491        | 2,833         |
| RS   | Rosebrugh         |                     |            |              |              |              |               | 814          | 2,111         |              | 2,925         |
| SF   | Sandford Fleming  | 817                 |            | 692          |              | 1,487        | 3,671         |              |               |              | 6,667         |
| WB   | Wallberg          | 374                 |            |              | 7,821        |              | 130           |              |               | 1,327        | 9,652         |
| DC   | CCBR              |                     |            |              | 575          |              |               | 991          |               |              | 1,566         |
| CX   | 245 College*      | 513                 |            |              |              |              |               |              |               |              | 513           |
|      | <b>Total Area</b> | <b>5,679</b>        | <b>564</b> | <b>4,960</b> | <b>8,594</b> | <b>6,973</b> | <b>15,985</b> | <b>3,172</b> | <b>11,609</b> | <b>4,517</b> | <b>62,053</b> |
|      |                   | <b>62,053 NASMs</b> |            |              |              |              |               |              |               |              |               |

**Note 10.1:** (\*) 245 College is a temporary space allocation. A map of the buildings within the Engineering precinct is available in Appendix I.

## Projects Completed in 2011–2012

### Goldcorp Mining Innovation Suite (Lassonde Mining Building)

The Lassonde Mining Building's attic has been transformed into a bright new space that features collaborative student design studios, airy teaching spaces and a large meeting room. Now called the Goldcorp Mining Innovation Suite, the 1904 structure is also more accessible with the addition of an elevator in the atrium running from the basement to the fifth floor. Photovoltaic solar panels on the south roof add to the building's sustainability. They are linked to digital dashboards that monitor the electrical energy being generated and compares it with usage in the suite. Rainwater is collected to be used for landscape irrigation, while the lighting system has been designed to reduce power consumption.

### IBBME Undergraduate Teaching Lab Renovation (Lassonde Mining Building)

Changes to the third floor of the Lassonde Mining Building created an opportunity to reorganize and update the IBBME Undergraduate Bioengineering Teaching Lab. Two separate clusters of rooms have been turned into a single suite featuring a large, open wet lab and a self-contained microscope room.

### BioZone, Phase II (Wallberg Building)

The BioZone bioengineering centre in ChemE has acquired more third-floor lab space in the Wallberg Building, as well as a fourth-floor rooftop addition as part of the second-phase renovations. The project includes a wet lab, a mass spectrometer lab and offices for researchers and graduate students. Phase III is slated for completion in fall 2012, as outlined in the next section.

### Microsatellite Science and Technology Centre (UTIAS Downsview)

UTIAS in Downsview is the new home of the Microsatellite Science and Technology Centre (MSTC). Along with work areas for research, analysis and fabrication, the centre includes a network hub where students and researchers can collaborate and meet with industry clients. The centre's move has freed up space in the main building for other UTIAS initiatives.

### Air-Conditioning Upgrade (Galbraith Building)

The Registrar's Office, First Year Office, ECE Undergraduate Teaching Lab, and various graduate student offices and research labs are the beneficiaries of a new ductless air-conditioning system installed in the Galbraith Building. The upgrade covers parts of the first floor and basement.

### Engineering Career Centre Relocation (Fields Institute)

In June 2012, the Engineering Career Centre moved into its new home on the ground floor of the Fields Institute. The College Street location places the centre — which includes the Professional Experience Year (PEY) Office and the new Graduate Enterprise Internship Program — closer to our students and staff.

### Engineering Strategic Communications Relocation (Bahen Centre)

Accessible from the Bahen Centre, Engineering Strategic Communications now resides in the third floor of the Dean's Office at 44 St. George Street. The communications team moved from the eighth floor of Bahen in fall 2011. The suite includes a small meeting space equipped with a large flatscreen monitor.

### Other completed projects include:

- Office Renovation (44 St. George)
- MIE Analytical Research Lab (Engineering Annex)
- Research Server Room (Wallberg Building)
- Electrical Re-feed (Galbraith and Sandford Fleming buildings)
- Canadian Aerosol Research Network Renovation (various buildings)
- Centre for Microfluidic Systems Renovation (various buildings)
- Rooftop Research Wind Turbine (Galbraith Building)
- Leaders of Tomorrow Office Renovation (Wallberg Building)

## Projects Set for Completion in Fall 2012

### BioZone, Phase III (Wallberg Building)

The third phase of the BioZone research initiative includes upgrades to the heating, ventilation, air conditioning and electrical systems in Wallberg's basement and third-floor labs. Phase III prepares the space for the world-class protein production and characterization facility (Structural Proteomics in Toronto, or SPiT) that will relocate from the Best Institute.

### Air-Conditioning Upgrade (Mechanical Engineering Building)

A new ductless, split system removes the window air-conditioning units on the front and sides of the Mechanical Engineering Building. The upgrade will reduce energy consumption and make it possible to restore the historic facades to their original appearance.

### Student Design Labs (Mechanical Engineering Building)

Access to new workshop and fabrication space will become a reality for undergraduate and graduate students in the Mechanical Engineering Building with an update of existing space. The new facilities will make it easier for students to carry out a wide variety of projects.

### Centre for Industrial Application of Microcellular Plastics

The Centre for Industrial Application of Microcellular Plastics in Mississauga will feature an injection-molding machine and two extrusion lines for plastics-molding experimentation. There will also be a large overhead crane, a data analysis room and a gas detection and alarm system. The new facility will add more than 1,000 NASMs of leased space to our Faculty's activities.

## Projects Underway

### Centre for Engineering Innovation & Entrepreneurship

The project planning committee for our proposed new building on the Simcoe Hall parking lot site began work in early 2012 and is being chaired by Professor Emeritus Ron Venter (MIE). The committee is evaluating different types of spaces within the proposed Centre for Engineering Innovation & Entrepreneurship, previously known as Site 10. Meeting with potential occupants to discuss their goals, the committee members have been drafting detailed room data sheets that will provide documentation for the building architect. The goal is to complete the project planning report in December 2012 while the process to select an architect is anticipated to be initiated early in 2013.

### Turning the Heat Engines Lab into an Energy Fundamentals Lab (Mechanical Engineering Building)

A new cross-discipline Energy Fundamentals Lab, replacing the old Heat Engines Lab in the Mechanical Engineering Building, will centralize all energy-related labs in one space. The renovation includes replacing obsolete equipment and installing a new HVAC (heating, ventilation, air conditioning) system.

### ECE Server Room Expansion (Sandford Fleming Building)

A proposed expanded server room on the second floor of the Sandford Fleming Building will create more capacity for growing research computing needs.

### Departmental Digital Displays (various buildings)

Approved as one of the Dean's Strategic Fund projects, digital displays will be installed in high-traffic locations to create a centrally managed network of digital information. The boards make it possible to provide local content and other electronic messages that are relevant and timely to the U of T Engineering community. Eleven displays will operate by the end of 2012.

### Revitalization of Gull Lake Survey Camp

An expansion and upgrades to Gull Lake Survey Camp in Minden, Ontario, will extend the capacity to accommodate 100 students and broaden curriculum. Sustainable initiatives are being incorporated into the rejuvenated camp, without compromising the 90-year history of the site.

### Other initiated projects include:

- Interactive, electronic directories at main entrances of various Engineering buildings
- Research Lab Renovation (Rosebrugh Building)
- Drinking Water Research Group Lab Expansion (Galbraith Building)
- Microfabrication Cleanroom Clean Dry Air System (Pratt Building)
- Phase II of Air-Conditioning Upgrade (Mechanical Building)
- Fluid Mechanics and Turbulent Combustion Research Lab Renovation (UTIAS)
- Window Replacement (Lassonde Mining Building)
- Washroom Upgrade (Wallberg Building)
- Fire Alarm Upgrade (Galbraith and Sandford Fleming Buildings)

## Determining Needs

To ensure that we are efficiently using space, we undertook three space audits:

- student club and study space (completed in fall 2011);
- meeting rooms (to be completed in fall 2012); and
- undergraduate labs (in the planning stages).

Although the meeting room audit is still underway, it and the student club and space audit suggest the implementation of a central room-reservation system and a bookable multi-purpose space for club meetings and presentations.

# 11 Finance

The new budget allocation model is two-thirds of the way through its initial three-year period. The model distributes revenues based on drivers and activities, improving transparency and providing incentives for academic units to increase revenues and contain costs.

This was also the second year of the Dean's Strategic Fund that offers financial support to strategically important initiatives outside of operating budgets. Launched in 2010, this Faculty-wide initiative provides seed money for academic, research and student experience initiatives until they become financially independent. Projects supported by the inaugural call for proposals in the past year range from program development (e.g., MEng in Global Engineering) and infrastructure (e.g., energy undergraduate lab) to student experience (e.g., MSE's portable teaching lab) and research collaboration (e.g., creating ties between UTIAS and ECE in the area of space robotics control).

We created a Chief Financial Officer (CFO) position in 2011, with responsibility for financial management and compliance, and ensuring that resource allocations reflect academic priorities.

In 2012–2013, we will continue working with the Faculty of Arts & Science to codify our interdivisional teaching arrangements. This includes aligning historical teaching agreements with the University's budget model, established in 2006. Our aim is to provide Engineering students with better access to Arts & Science elective courses, and to ensure revenue sharing as enrolments and teaching requirements fluctuate each year.

In 2011–2012, we continued to strengthen our financial position with our total revenues increasing by 10 per cent to \$159.1 million while research funding also had a sharp increase of 24 per cent to \$77.9 million. These increases were accompanied by careful cost containment and mindful resource allocation. With revenue sources — particularly government — under extreme pressure and amidst ongoing economic uncertainty, it is important to retain sufficient financial operating reserves. The start of our new Boundless Campaign is timely and will provide the necessary funding to continue our space renovations and to enhance student scholarship initiatives.

## Total Revenue and Central Costs

Figures 11.1, 11.2 and 11.3 show our total revenue and the associated central costs attributed to the Faculty since the University's new budget model was established in 2006–2007. In the past year, total revenue grew by 10 per cent to \$159.1 million while the total central cost increased by 8 per cent to \$75.5 million. The central cost is made up of three components: 1) University-Wide Costs; 2) University Fund Contributions; and 3) the Student Aid Levy. The largest increase corresponded to the Faculty contribution to the University Fund (from \$12.5 million to \$13.9 million). Likewise, the net revenue (Figure 11.3) increased by 11 per cent to \$83.5 million.

Figure 11.1 Total Revenue, 2006–2007 to 2011–2012

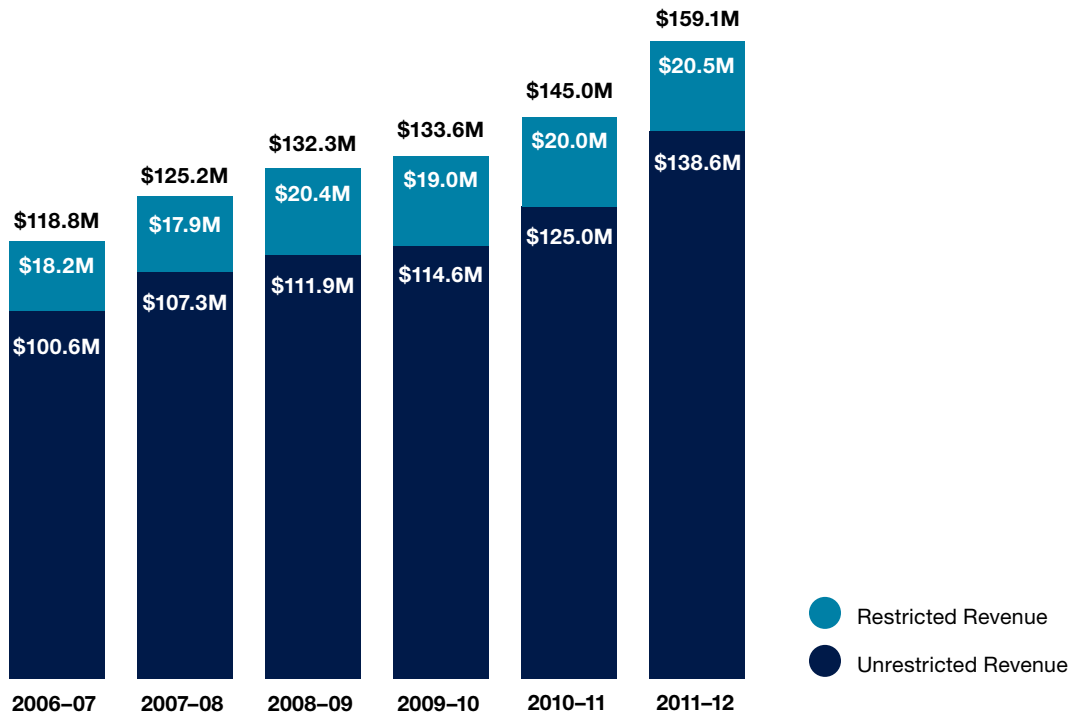
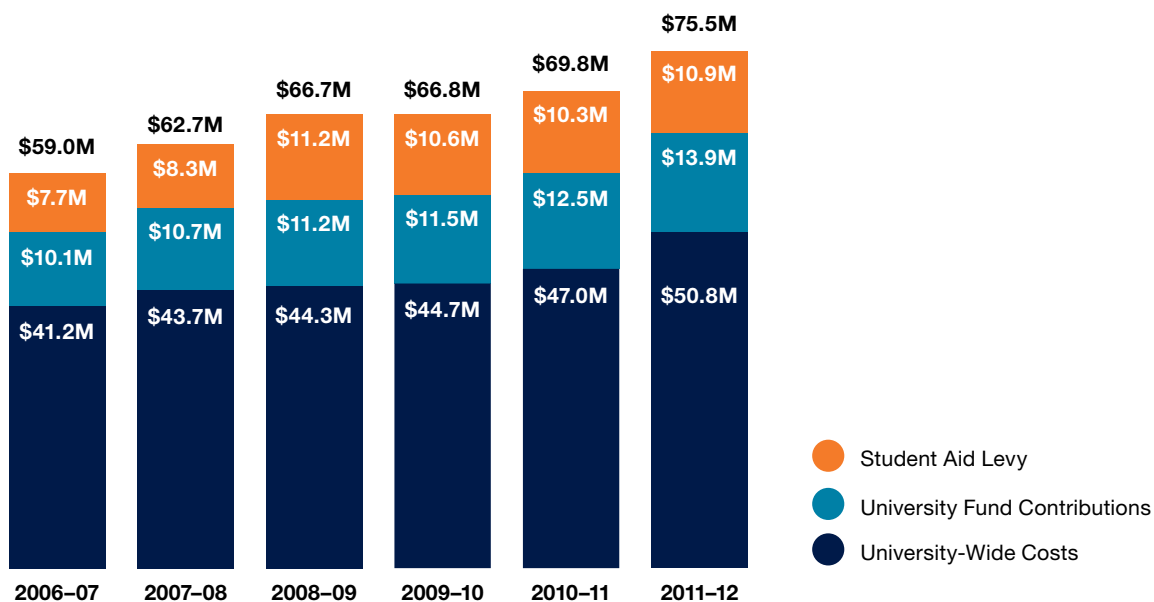


Figure 11.2 Total Central Costs, 2006–2007 to 2011–2012



**Note 11.1 and 11.2:** Data are shown by fiscal year (May to April). For example, 2011–2012 represents the financial cycle starting in May 2011 and ending in April 2012.

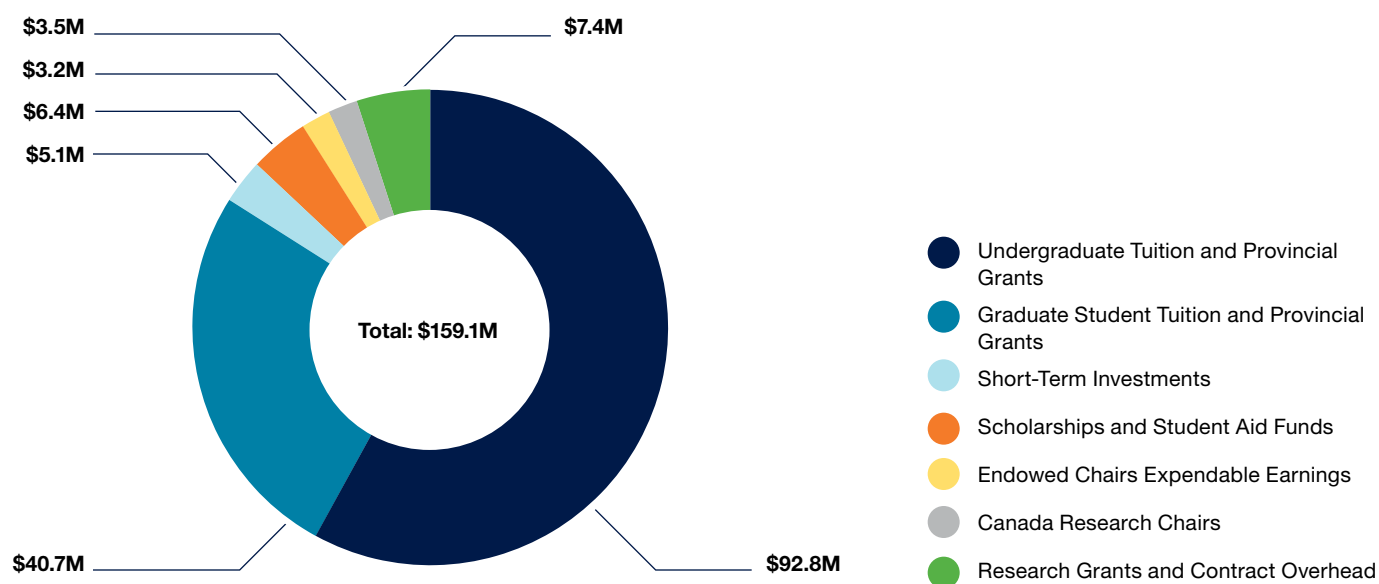
Figure 11.3 Budget Data, 2006–2007 to 2011–2012

|                                     | 2006–07              | 2007–08              | 2008–09              | 2009–10              | 2010–11              | 2011–12              |
|-------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <b>Total Revenue</b>                | <b>\$118,826,327</b> | <b>\$125,233,418</b> | <b>\$132,333,400</b> | <b>\$133,571,789</b> | <b>\$144,976,282</b> | <b>\$159,081,170</b> |
| <b>Unrestricted Revenue</b>         | \$100,663,690        | \$107,347,671        | \$111,937,605        | \$114,602,697        | \$124,966,518        | \$138,597,605        |
| <b>Restricted Revenue</b>           | \$18,162,637         | \$17,885,747         | \$20,395,795         | \$18,969,092         | \$20,009,764         | \$20,483,565         |
| <b>Total Central Costs</b>          | <b>\$58,976,711</b>  | <b>\$62,755,042</b>  | <b>\$66,667,514</b>  | <b>\$66,768,403</b>  | <b>\$69,837,572</b>  | <b>\$75,536,585</b>  |
| <b>University-Wide Costs</b>        | \$41,180,986         | \$43,698,011         | \$44,307,203         | \$44,693,620         | \$47,027,056         | \$50,817,454         |
| <b>University Fund Contribution</b> | \$10,066,369         | \$10,734,767         | \$11,193,761         | \$11,460,270         | \$12,496,652         | \$13,859,760         |
| <b>Student Aid Levy</b>             | \$7,729,356          | \$8,322,264          | \$11,166,550         | \$10,614,513         | \$10,313,864         | \$10,859,371         |
| <b>Net Revenue</b>                  | <b>\$59,849,616</b>  | <b>\$62,478,376</b>  | <b>\$65,665,886</b>  | <b>\$66,803,386</b>  | <b>\$75,138,710</b>  | <b>\$83,544,585</b>  |

## Budget Overview for 2011–2012

Revenues in 2011–2012 increased mainly due to rising enrolments, particularly of MEng and international students, and growing research funding. Combined with a prudent operating budget and careful fiscal management, the result has allowed us to rebuild reserves, upgrade infrastructure and invest in the Dean's Strategic Fund initiatives.

Figure 11.4 Revenue Sources, 2011–2012



**Note 11.3 and 11.4:** Data are shown by fiscal year (May to April).

Figure 11.5 Revenue Distribution, 2011–2012

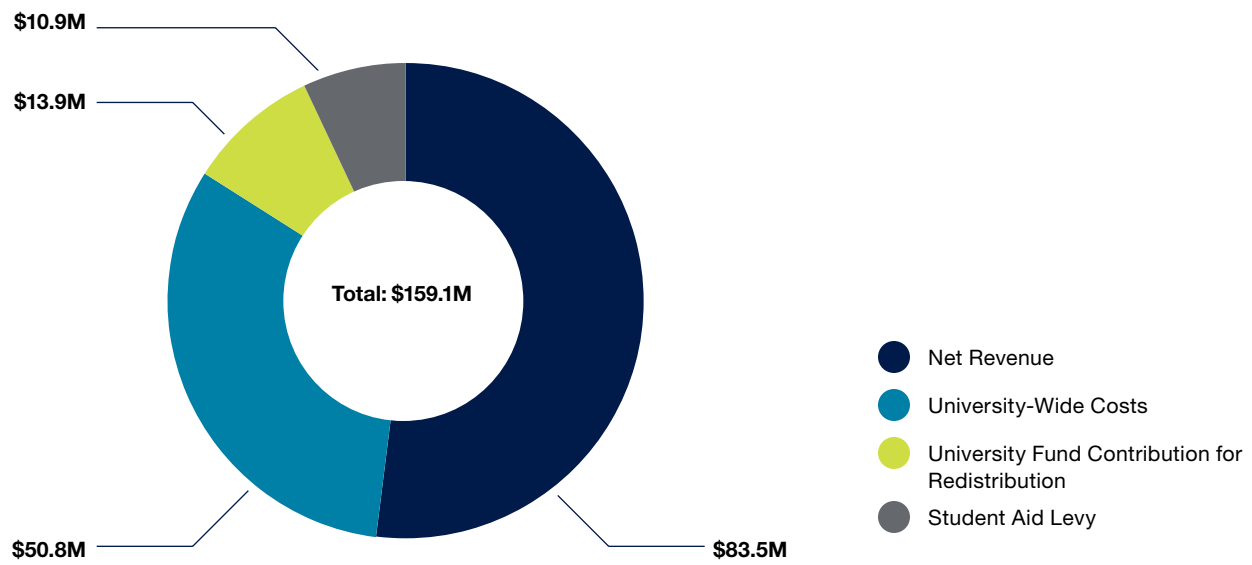
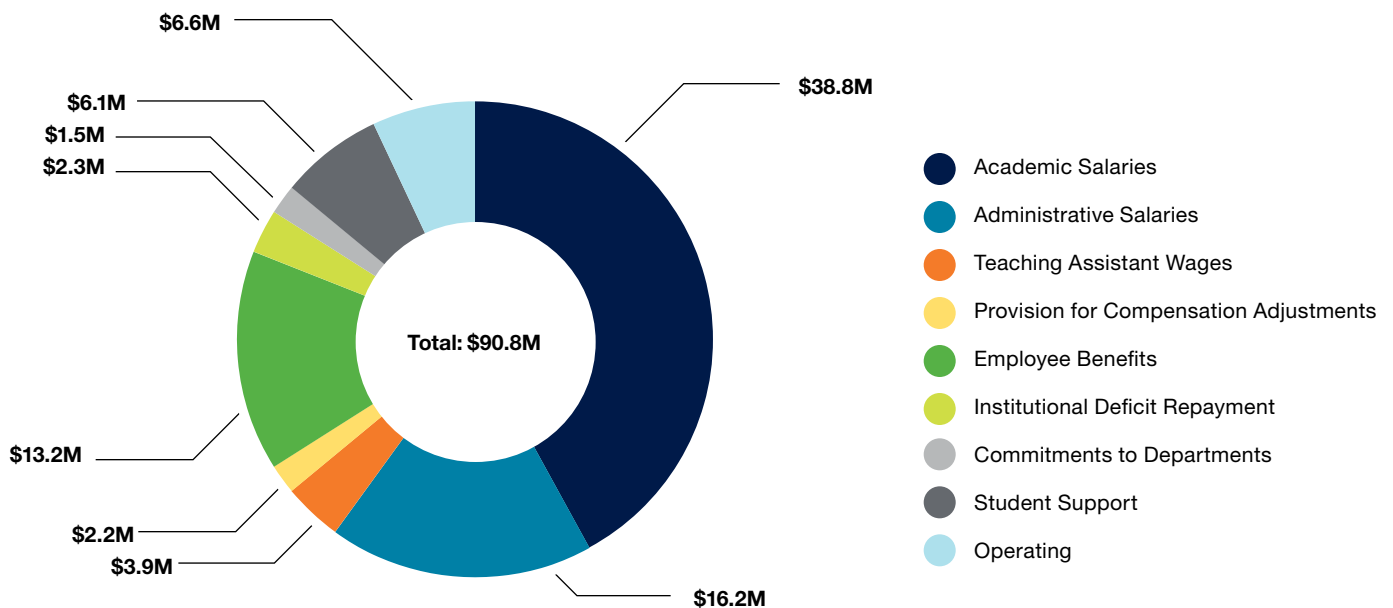


Figure 11.6 Total Operating Budget: Breakdown by Expense, 2011–2012



**Note 11.5 and 11.6:** Data are shown by fiscal year (May to April).

## Dean's Strategic Fund

In 2010, along with the new budget allocation model, we launched the Dean's Strategic Fund, in which 5 per cent of net revenues are directed to support strategic initiatives that will have a broad impact within the Faculty. The funding encourages the implementation of ideas that would not happen without start-up assistance. Particular emphasis is placed on projects that meet Academic Plan objectives such as fostering collaborative initiatives and enhancing the student experience.

In the inaugural call for proposals, we provided financial support to 19 projects ranging from program development and infrastructure to student experience and research collaboration. For example, in 2010–2011, MSE received funding to support the development of a new teaching delivery system for undergraduates involving portable laboratory kits. This approach allows the instructor to teach a complete lab to small groups in nearly any space with all the necessary equipment contained within a small rolling case. Over the last year, MSE tested and piloted the system and is now working to refine it with possible extension to other academic areas within the Faculty.

The Strategic Fund has also supported research collaboration and the development of graduate students through a joint initiative between ECE and UTIAS. The funds received in 2010–2011 are being used to facilitate the theses of four graduate students in an effort to create important research links in the area of space robotics control. Professors from ECE and UTIAS jointly supervise each participating graduate student.

In 2011–2012, the second competition for projects to be funded by the Strategic Fund resulted in 10 successful submissions. The projects will begin in 2012–2013 and be carried out in a time frame of up to three years.

**Figure 11.7 Dean's Strategic Fund Competition Results, 2011–2012**

| Name of Proposal                                                                | Lead Unit                                | Project Allocation |
|---------------------------------------------------------------------------------|------------------------------------------|--------------------|
| Academic Scheduling Software                                                    | Registrar's Office                       | \$152,000          |
| A Teaching Robotics Laboratory: Strengthening Robotics and Mechatronics Studies | IRM                                      | TBD                |
| Centre for Financial Engineering                                                | MIE                                      | TBD                |
| Centre for Research in Sustainable Aviation                                     | UTIAS (with MSE, ChemE, MIE, CivE & ECE) | \$248,000          |
| MEng Program in Advanced Water Technologies and Process Design                  | ChemE (with CivE, MSE)                   | \$140,000          |
| Multidisciplinary design facilities                                             | MIE                                      | TBD                |
| Skule Alumni Network                                                            | EngSci (with Advancement)                | \$29,250           |
| Surface Interface Ontario & Advanced Materials Characterization Initiatives     | ChemE (with MSE)                         | \$135,000          |
| The Engineering Leadership Project: Best Practice in Leadership Education       | ILead                                    | \$200,000          |
| Water-Jet Cutter for Student Design Projects                                    | MIE                                      | TBD                |

# Glossary

## Faculty of Applied Science & Engineering Academic Area Terms

|                      |                                                                                                                                                                                                                                                                                                              |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Academic Area</b> | For the purpose of the Annual Report, 'Academic Area' refers to the following departments, divisions and institutes: UTIAS, IBBME, ChemE, CivE, ECE, MIE and MSE. While TrackOne is not an academic unit, it is also included as an academic area in specific contexts in the Undergraduate Studies chapter. |
| <b>AeroE</b>         | Graduates who studied the discipline of Aerospace Engineering from the University of Toronto Institute of Aerospace Studies (UTIAS).                                                                                                                                                                         |
| <b>BioMedE</b>       | Graduates who studied the discipline of Biomedical Engineering at the Division of Engineering Science and the Institute of Biomaterials & Biomedical Engineering.                                                                                                                                            |
| <b>ChemE</b>         | Department of Chemical Engineering & Applied Chemistry: <a href="http://www.chem-eng.utoronto.ca">www.chem-eng.utoronto.ca</a><br>Graduates who studied the discipline of Chemical Engineering are also designated as ChemE.                                                                                 |
| <b>CivE</b>          | Department of Civil Engineering: <a href="http://www.civil.engineering.utoronto.ca">www.civil.engineering.utoronto.ca</a><br>Graduates who studied the discipline of Civil Engineering are also designated as CivE.                                                                                          |
| <b>CompE</b>         | Graduates of The Edward S. Rogers Sr. Department of Electrical & Computer Engineering (ECE) who studied the discipline of Computer Engineering.                                                                                                                                                              |
| <b>ElecE</b>         | Graduates of The Edward S. Rogers Sr. Department of Electrical & Computer Engineering (ECE) who studied the discipline of Electrical Engineering.                                                                                                                                                            |
| <b>ECE</b>           | The Edward S. Rogers Sr. Department of Electrical & Computer Engineering: <a href="http://www.ece.utoronto.ca">www.ece.utoronto.ca</a><br>Graduates of Electrical Engineering are designated as ElecE; graduates of Computer Engineering are designated as CompE.                                            |
| <b>EngSci</b>        | Division of Engineering Science: <a href="http://www.engsci.utoronto.ca">www.engsci.utoronto.ca</a><br>Graduates of this Division are also designated as EngSci.                                                                                                                                             |
| <b>IBBME</b>         | Institute of Biomaterials & Biomedical Engineering: <a href="http://www.ibbme.utoronto.ca">www.ibbme.utoronto.ca</a><br>Graduates who studied the discipline of Biomedical Engineering within this Institute are referred to as BioMedE.                                                                     |
| <b>IndE</b>          | Graduates from the Department of Mechanical & Industrial Engineering (MIE) who studied the discipline of Industrial Engineering.                                                                                                                                                                             |
| <b>MechE</b>         | Graduates from the Department of Mechanical & Industrial Engineering (MIE) who studied the discipline of Mechanical Engineering.                                                                                                                                                                             |
| <b>MIE</b>           | Department of Mechanical & Industrial Engineering: <a href="http://www.mie.utoronto.ca">www.mie.utoronto.ca</a><br>Graduates of Mechanical Engineering are designated as MechE; graduates of Industrial Engineering are designated as IndE.                                                                  |
| <b>MinE</b>          | Graduates from the Department of Civil Engineering (CivE) who studied the discipline of Mineral Engineering.                                                                                                                                                                                                 |
| <b>MSE</b>           | Department of Materials Science & Engineering: <a href="http://www.mse.utoronto.ca">www.mse.utoronto.ca</a><br>Graduates who studied the discipline of Materials Engineering are also designated as MSE.                                                                                                     |
| <b>TrackOne</b>      | General first-year undergraduate studies in Engineering. Upon successful completion of TrackOne, students choose from one of the Engineering undergraduate programs, excluding Engineering Science.                                                                                                          |
| <b>UTIAS</b>         | University of Toronto Institute for Aerospace Studies: <a href="http://www.utias.utoronto.ca">www.utias.utoronto.ca</a><br>Graduates who studied the discipline of Aerospace Engineering within this Institute are designated as AeroE.                                                                      |

## Additional Terms

|                            |                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>AAAS</b>                | American Association for the Advancement of Science: <a href="http://www.aaas.org">www.aaas.org</a>                                                                                                                                                                                                                                                      |
| <b>Academic Year</b>       | The University of Toronto academic year runs from September to August.                                                                                                                                                                                                                                                                                   |
| <b>BASc</b>                | Bachelor of Applied Science                                                                                                                                                                                                                                                                                                                              |
| <b>CAE</b>                 | Canadian Academy of Engineering: <a href="http://www.acad-eng-gen.ca">www.acad-eng-gen.ca</a>                                                                                                                                                                                                                                                            |
| <b>CCBR</b>                | Donnelly Centre for Cellular and Biomolecular Research: <a href="http://tdccbr.med.utoronto.ca">tdccbr.med.utoronto.ca</a>                                                                                                                                                                                                                               |
| <b>CIHR</b>                | Canadian Institutes of Health Research: <a href="http://www.cihr-irsc.gc.ca">www.cihr-irsc.gc.ca</a>                                                                                                                                                                                                                                                     |
| <b>CRC</b>                 | Canada Research Chair                                                                                                                                                                                                                                                                                                                                    |
| <b>Cotutelle</b>           | University partnership that allows students to complete a degree while studying at two institutions                                                                                                                                                                                                                                                      |
| <b>CUSP</b>                | Center for Urban Science and Progress                                                                                                                                                                                                                                                                                                                    |
| <b>DEEP Summer Academy</b> | Da Vinci Engineering Enrichment Program (DEEP) Summer Academy; an advanced summer engineering, science, business and technology program for high school students worldwide: <a href="http://www.outreach.engineering.utoronto.ca">www.outreach.engineering.utoronto.ca</a>                                                                               |
| <b>DMAIC</b>               | Define, Measure, Analyze, Improve and Control                                                                                                                                                                                                                                                                                                            |
| <b>Domestic</b>            | Students who are citizens, landed immigrants or permanent residents of Canada                                                                                                                                                                                                                                                                            |
| <b>ECF</b>                 | Engineering Computing Facility                                                                                                                                                                                                                                                                                                                           |
| <b>ECN</b>                 | Engineering Communications Network                                                                                                                                                                                                                                                                                                                       |
| <b>EDU</b>                 | Extra-Departmental Unit: <a href="http://www.provost.utoronto.ca/policy/interdisciplinary">www.provost.utoronto.ca/policy/interdisciplinary</a>                                                                                                                                                                                                          |
| <b>EIC</b>                 | Engineering Institute of Canada: <a href="http://www.eic-ici.ca">www.eic-ici.ca</a>                                                                                                                                                                                                                                                                      |
| <b>EFTE</b>                | Eligible Full-Time Equivalent                                                                                                                                                                                                                                                                                                                            |
| <b>ELITE</b>               | Entrepreneurship, Leadership, Innovation & Technology in Engineering: <a href="http://www.gradstudies.engineering.utoronto.ca/entrepreneurship-leadership-innovation-and-technology-in-engineering-elite-certificate">www.gradstudies.engineering.utoronto.ca/entrepreneurship-leadership-innovation-and-technology-in-engineering-elite-certificate</a> |
| <b>Engineering Society</b> | Student government for Engineering students at the University of Toronto: <a href="http://www.skule.ca">www.skule.ca</a>                                                                                                                                                                                                                                 |
| <b>FedDev</b>              | Federal Development Agency for Southern Ontario: <a href="http://www.feddevontario.gc.ca">www.feddevontario.gc.ca</a>                                                                                                                                                                                                                                    |
| <b>Fiscal Year</b>         | The University of Toronto fiscal year runs from May to April.                                                                                                                                                                                                                                                                                            |
| <b>FTE</b>                 | Full-Time Equivalent                                                                                                                                                                                                                                                                                                                                     |
| <b>GEI</b>                 | Graduate Enterprise Internships: <a href="http://www.graduateinternships.utoronto.ca">www.graduateinternships.utoronto.ca</a>                                                                                                                                                                                                                            |
| <b>G-IFP</b>               | Graduate International Foundation Program                                                                                                                                                                                                                                                                                                                |
| <b>GLEE</b>                | Girls' Leadership in Engineering Experience                                                                                                                                                                                                                                                                                                              |
| <b>Grant Year</b>          | The grant year runs from April to March.                                                                                                                                                                                                                                                                                                                 |
| <b>Headcount</b>           | Number of degree-seeking students                                                                                                                                                                                                                                                                                                                        |
| <b>IEEE</b>                | Institute of Electrical and Electronics Engineers: <a href="http://www.ieee.org">www.ieee.org</a>                                                                                                                                                                                                                                                        |

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IFP</b>                     | International Foundation Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>LinkedIn</b>                | Social media site where professionals build their networks                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>MASc</b>                    | Master of Applied Science: <a href="http://www.gradstudies.engineering.utoronto.ca/masc">www.gradstudies.engineering.utoronto.ca/masc</a>                                                                                                                                                                                                                                                                                                                                                       |
| <b>MEng</b>                    | Master of Engineering: <a href="http://www.gradstudies.engineering.utoronto.ca/meng">www.gradstudies.engineering.utoronto.ca/meng</a>                                                                                                                                                                                                                                                                                                                                                           |
| <b>MHSc</b>                    | Master of Health Science in Clinical Engineering:<br><a href="http://www.gradstudies.engineering.utoronto.ca/mhsc">www.gradstudies.engineering.utoronto.ca/mhsc</a>                                                                                                                                                                                                                                                                                                                             |
| <b>NAE</b>                     | National Academy of Engineering: <a href="http://www.nae.edu">www.nae.edu</a>                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>NSERC</b>                   | Natural Sciences and Engineering Research Council of Canada: <a href="http://www.nserc-crsng.gc.ca">www.nserc-crsng.gc.ca</a>                                                                                                                                                                                                                                                                                                                                                                   |
| <b>NSERC CREATE</b>            | Collaborative Research and Training Experience program funded by NSERC                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>PEO</b>                     | Professional Engineers Ontario: <a href="http://www.peo.on.ca">www.peo.on.ca</a>                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>PhD</b>                     | Doctor of Philosophy (doctoral program): <a href="http://www.gradstudies.engineering.utoronto.ca/phd">www.gradstudies.engineering.utoronto.ca/phd</a>                                                                                                                                                                                                                                                                                                                                           |
| <b>Praxis</b>                  | Engineering design course for first-year Engineering Science students: <a href="http://engsci.utoronto.ca/explore_our_program/esc102showcase.htm">engsci.utoronto.ca/explore_our_program/esc102showcase.htm</a>                                                                                                                                                                                                                                                                                 |
| <b>Retention Rate</b>          | The proportion of first-year students who move into second year                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>RobotX</b>                  | Robotics and mechatronics program for high school students: <a href="http://www.outreach.engineering.utoronto.ca">www.outreach.engineering.utoronto.ca</a>                                                                                                                                                                                                                                                                                                                                      |
| <b>ROSI</b>                    | Repository of Student Information: <a href="http://www.rosi.utoronto.ca">www.rosi.utoronto.ca</a>                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>SCFI</b>                    | Stronach Centre for Innovation                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Special Student Status</b>  | Also known as a non degree-seeking student. A student who is enrolled in a class, but is not proceeding toward degree completion (e.g., a special student is a visiting student from another institution who is taking a course to meet admission requirements for graduate studies).                                                                                                                                                                                                           |
| <b>SSHRC</b>                   | Social Sciences and Humanities Research Council: <a href="http://www.sshrc.ca">www.sshrc.ca</a>                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Teaching-Stream Faculty</b> | Academic staff including lecturers, instructors and other teaching faculty with continuing appointments                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Tenure-Stream Faculty</b>   | Academic staff including Assistant Professors, Associate Professors and Professors; excludes lecturers                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Tri-Council</b>             | Typically refers to NSERC, CIHR, SSHRC                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>UTAPS</b>                   | University of Toronto Advance Planning for Students (UTAPS) is a financial aid program for full-time students who are Canadian citizens, permanent residents or protected persons (recognized convention refugees) and are eligible for need-based government student assistance or funding from a First Nations band. <a href="http://www.adm.utoronto.ca/adm-awards/html/financial%20aid/utaps_ext/default.htm">www.adm.utoronto.ca/adm-awards/html/financial%20aid/utaps_ext/default.htm</a> |
| <b>U15</b>                     | Group of 15 leading, research-intensive universities in Canada, including: University of Alberta, University of British Columbia, University of Calgary, Dalhousie University, Université Laval, University of Manitoba, McGill University, McMaster University, Université de Montréal, University of Ottawa, Queen's University, University of Saskatchewan, University of Toronto, University of Waterloo, Western University                                                                |
| <b>YWCA</b>                    | A women's multi-service organization: <a href="http://www.ywcacanada.ca/en">www.ywcacanada.ca/en</a>                                                                                                                                                                                                                                                                                                                                                                                            |

## Appendix A: Student Clubs and Teams

Below is a listing of Engineering student clubs and teams, referenced in the Undergraduate Studies chapter. Beyond the groups listed here, our students also have access to clubs and teams across the University of Toronto. To read about the achievements of select Engineering student groups for 2011–2012, please see the Undergraduate Studies chapter.

### Academic Clubs

- Chemical Engineering Club
- Civil Engineering Club
- Computer Engineering Club
- Electrical Engineering Club
- Engineering Science Club
- Industrial Engineering Club
- Materials Science & Engineering Club
- Mechanical Engineering Club
- Mineral Engineering Club
- TrackOne Committee

### Athletic

- Engineering Athletic Association
- Iron Dragons Dragon Boat Team
- Skule Ninja Club
- U of T Quidditch Team
- U of T Ski and Snowboard Club
- U of T Yoga Club

### Cultural

- Egyptian Students Association
- Engineering Chinese Culture Club
- Korean Engineering Students' Association
- Multicultural Student Society
- Muslim Students' Association
- National Society of Black Engineers
- U of T Engineering Chinese Club
- U of T Mandarin Chinese Christian Fellowship

### Design

- Destination Imagination
- Solar Blimp Design Team
- Spark
- U of T Aeronautics Team
- U of T Blue Sky Solar Racing
- U of T Concrete Canoe Team
- U of T Formula SAE Racing Team
- U of T Human-Powered Vehicle Design Team
- U of T Mechatronics Design Association
- U of T Mining Games Team

### Performance

- Appassionata Music Group
- Brass Ring
- Skule Arts Festival
- Skule Jazz Combo
- Skule Nite
- Skule Orchestra
- Skule Stage Band
- Skule Stage Band Blue
- Tales of Harmonia
- U of T Music Clubs

### Professional

- A Promise to Future Generations
- American Society of Mechanical Engineers, U of T Chapter
- Astronomy and Space Exploration Society
- Canadian Society of Chemical Engineers, U of T Chapter
- Canadian Society of Industrial Engineers / Institute of Industrial Engineers, U of T Chapter
- Citizen Engineer
- Club for Undergraduate Biomedical Engineering
- Canadian Undergraduate Technology Conference
- CFES Leadership Summer School
- Engineers Without Borders, U of T Chapter
- Frontier College – St George Chapter
- Frontier College – Students for Literacy
- Hacker Academy
- Hi-Skule Committee
- Kidney Disease Screening and Awareness Program
- LeadingLEED
- MSE Industry club
- National Business and Technology Conference
- Nspire
- Ontario Engineering Competitions
- Ontario Water Works Association
- Rational Capital Investment Fund
- Skule Model United Nations
- Student Issues Committee
- Students Fighting Cancer

- Students in Technology and Engineering in Medicine
- Sustainable Engineers Association
- Take Action! Organization
- Tetra Society at the U of T
- TrackOne Alumni Committee
- TrackOne Mentorship Program
- U of T Campus Conservatives
- U of T Consulting Association
- U of T Engineering First Responders
- U of T Engineering Competitions
- U of T Engineering Toastmasters
- U of T Space Design Contest
- U of T Student Chapter of the Water Environment Association of Ontario
- U of T Sustainable Energy Fair
- U of T Robotics Association
- U of T iGEM
- U of T IHI Open School
- Women in Science and Engineering

### Publications

- Skulebook
- Technophilic Magazine at the University of Toronto
- The Cannon Newspaper
- The Toike Oike Newspaper

### Social

- 1T2 Committee
- 1T3 Committee
- 1T4 Committee
- 1T5 Committee
- Blue and Gold Committee
- Board Gamers
- Engineering Lego Group
- Engineers for Christ
- Eyes of Hope
- Lady Godiva Memorial Bnad [sic]
- LGBTQ Engineering
- U of T Engineering Photography Club

## Appendix B: Outreach Programs

Between July 2011 and July 2012, we offered the following pre-university outreach programs, reaching approximately 5,675 students across Ontario, Canada and the world.

| Program                                 | Audience                              | Session                                    | Approx. Number of Participants |
|-----------------------------------------|---------------------------------------|--------------------------------------------|--------------------------------|
| Camp U of T                             | Grades 5 to 8                         | July 2011                                  | 75                             |
| DEEP Summer Academy                     | Grades 9 to 12; worldwide             | July 2011                                  | 1,000                          |
| DEEP Leadership Camp                    | Grades 11 to 12; worldwide            | July 2011                                  | 25                             |
| Girls' Jr. DEEP                         | Grades 4 to 8; girls                  | July 2011                                  | 75                             |
| Jr. DEEP                                | Grades 5 to 8                         | August 2011                                | 200                            |
| ENGage                                  | Grades 5 to 8; black students         | August 2011                                | 50                             |
| Girls' Science & Engineering Saturdays  | Grades 5 to 12; girls                 | October to December 2011                   | 50                             |
| Go ENG Girl                             | Grades 7 to 10; girls                 | October 2011                               | 100                            |
| Saturday Science & Engineering Academy  | Grades 5 to 12                        | October to December 2011                   | 200                            |
| Engineering for Educators               | High school teachers                  | December 2011                              | 25                             |
| Engineering Family Program              | Parents of students in grades 5 to 12 | November to March 2011                     | 50                             |
| Girls' Science & Engineering Saturdays  | Grades 5 to 12; girls                 | February to April 2012                     | 50                             |
| Saturday Science & Engineering Academy  | Grades 5 to 12                        | February to April 2012                     | 200                            |
| Reading Week Workshops                  | Grades 9 to 10 in 25 schools          | February 2012                              | 525                            |
| March Break Program                     | Grades 5 to 8                         | March 2012                                 | 100                            |
| Science Rendezvous                      | General Public                        | May 2012                                   | 150                            |
| RobotX                                  | Grades 9 to 12                        | May to June 2012                           | 50                             |
| In-School and On-Campus Workshops       | Grades 4 to 8                         | May to June 2012                           | 2,500                          |
| Boys and Girls Club: Workshops and Camp | Grades 1 to 8                         | July 2012 (Camp);<br>June 2012 (Workshops) | 300                            |
| <b>Total Estimated Reach</b>            |                                       |                                            | <b>5,675</b>                   |

**Note:** Does not include DEEP Summer Academy, which was offered in July 2012.

## Appendix C: Research Chairs

In 2011–2012, U of T Engineering had 64 chairholders, up from 55 in 2010–2011. The list below reflects four types of Chairs:

### Canada Research Chair (CRC)

Established by the Government of Canada to attract and retain some of the world's most outstanding researchers in Canadian degree-granting institutions. The program invests a total of \$300 million per year across the country. There are two types of CRCs: 1) **Tier 1** — a renewable title that is held for seven years; and 2) **Tier 2** — a junior chair that is held for five years and is eligible for renewal only once. The University receives \$200,000 annually per Tier 1 Chair and \$100,000 annually per Tier 2 Chair.

### Endowed Research Chair

Created with the generous support of donations and indicates a broad and continuing commitment to the position and discipline of research. Each faculty member who holds a Chair position is considered to be of great distinction and typically at the rank of professor with tenure. Each Chair position is held for a fixed term.

### Industrial Research Chair

Jointly funded by NSERC and industry to help universities build on existing strengths or develop major research capacity in areas of interest to industry.

### U of T Distinguished Professor

Designed to advance and recognize faculty with highly distinguished accomplishments. This Chair is limited to no more than 3 per cent of tenured professors within a Faculty.

**Figure C.1 Research Chairs, 2011–2012**

| Title                                                                                            | Chairholder          | Sponsor | Tier   | Dep't        |
|--------------------------------------------------------------------------------------------------|----------------------|---------|--------|--------------|
| Alumni Chair in Bioengineering                                                                   | Cristina Amon        | Endowed |        | MIE          |
| Bahen/Tanenbaum Chair in Civil Engineering                                                       | Jeffrey Packer       | Endowed |        | CivE         |
| Bahen/Tanenbaum Chair in Civil Engineering                                                       | Michael Collins      | Endowed |        | CivE         |
| Baxter Chair in Health Technology                                                                | Tony Easty           | Endowed |        | IBBME        |
| Bell Canada Chair in Multimedia                                                                  | Dimitrios Hatzinakos | Endowed |        | ECE          |
| Bell University Laboratories Chair in Computer Engineering                                       | Baochun Li           | Endowed |        | ECE          |
| Bell University Laboratories Chair in Software Engineering                                       | Hans-Arno Jacobsen   | Endowed |        | ECE          |
| Canada Research Chair in Autonomic Service Architecture                                          | Alberto Leon-Garcia  | NSERC   | Tier 1 | ECE          |
| Canada Research Chair in Autonomous Space Robotics                                               | Tim Barfoot          | NSERC   | Tier 2 | UTIAS        |
| Canada Research Chair of Biotechnology                                                           | Warren Chan          | NSERC   | Tier 2 | IBBME        |
| Canada Research Chair in Communication Algorithms                                                | Frank Kschischang    | NSERC   | Tier 1 | ECE          |
| Canada Research Chair in Computational Aerodynamics and Environmentally Friendly Aircraft Design | David Zingg          | NSERC   | Tier 1 | UTIAS        |
| Canada Research Chair in Computational Modeling and Design Under Uncertainty                     | Prasanth Nair        | NSERC   | Tier 2 | UTIAS        |
| Canada Research Chair in Diffusion-Wave Sciences and Technologies                                | Andreas Mandelis     | NSERC   | Tier 1 | MIE          |
| Canada Research Chair in Digital Communications                                                  | Wei Yu               | NSERC   | Tier 2 | ECE          |
| Canada Research Chair in Fuel Cell Materials and Manufacturing                                   | Olivera Kesler       | NSERC   | Tier 2 | MIE          |
| Canada Research Chair in Functional Cardiovascular Tissue Engineering                            | Milica Radisic       | NSERC   | Tier 2 | IBBME, ChemE |
| Canada Research Chair in Information Processing and Machine Learning                             | Brendan Frey         | NSERC   | Tier 2 | ECE          |
| Canada Research Chair in Integrated Photonic Devices                                             | Joyce Poon           | NSERC   | Tier 2 | ECE          |
| Canada Research Chair in Internet Video, Audio and Image Search                                  | Parham Aarabi        | NSERC   | Tier 2 | ECE          |
| Canada Research Chair in Mechanobiology                                                          | Craig Simmons        | CIHR    | Tier 2 | MIE, IBBME   |

| Title                                                                                                                     | Chairholder              | Sponsor          | Tier   | Dep't        |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------|--------|--------------|
| Canada Research Chair in Micro and Nano Engineering Systems                                                               | Yu Sun                   | NSERC            | Tier 2 | MIE          |
| Canada Research Chair in Microcellular Plastics                                                                           | Chul Park                | NSERC            | Tier 1 | MIE          |
| Canada Research Chair in Nano- and Micro-Structured Electromagnetic Materials and Applications                            | George Eleftheriades     | NSERC            | Tier 1 | ECE          |
| Canada Research Chair in Nanotechnology                                                                                   | Ted Sargent              | NSERC            | Tier 1 | ECE          |
| Canada Research Chair in Organic Optoelectronics                                                                          | Zheng-Hong Lu            | NSERC            | Tier 1 | MSE          |
| Canada Research Chair in Photonic Technologies and Applications                                                           | Li Qian                  | NSERC            | Tier 2 | ECE          |
| Canada Research Chair in Quantum Information                                                                              | Hoi-Kwong Lo             | NSERC            | Tier 2 | ECE          |
| Canada Research Chair in Rehabilitation Engineering                                                                       | Tom Chau                 | NSERC            | Tier 2 | IBBME        |
| Canada Research Chair in Seismic Resilience of Infrastructure                                                             | Constantin Christopoulos | NSERC            | Tier 2 | CivE         |
| Canada Research Chair in Signal Processing Systems                                                                        | Glenn Gulak              | NSERC            | Tier 1 | ECE          |
| Canada Research Chair in Smart and Functional Polymers                                                                    | Hani Naguib              | NSERC            | Tier 2 | MIE          |
| Canada Research Chair in Stem Cell Bioengineering                                                                         | Peter Zandstra           | NSERC            | Tier 1 | IBBME        |
| Canada Research Chair in Tissue Engineering                                                                               | Molly Shoichet           | NSERC            | Tier 1 | ChemE, IBBME |
| Celestica Chair in Materials for Microelectronics                                                                         | Doug Perovic             | Endowed          |        | MSE          |
| Chair in Computer Networks and Enterprise Innovation                                                                      | Elvino Sousa             | Endowed          |        | ECE          |
| Chair in Information Engineering (retired)                                                                                | Joseph Paradi            | Endowed          |        | ChemE        |
| Chair in Software Engineering                                                                                             | Tarek Abdelrahman        | Endowed          |        | ECE          |
| Clarice Chalmers Chair of Engineering Design                                                                              | Greg A. Jamieson         | Endowed          |        | MIE          |
| Claudette MacKay-Lassonde Chair in Mineral Engineering                                                                    | John Hadjigeorgiou       | Endowed          |        | CivE         |
| Dusan and Anne Miklas Chair in Engineering Design                                                                         | Paul Chow                | Endowed          |        | ECE          |
| Edward S. Rogers Sr. Chair in Engineering                                                                                 | Glenn Gulak              | Endowed          |        | ECE          |
| Eugene V. Polistuk Chair in Electromagnetic Design                                                                        | Costas Sarris            | Endowed          |        | ECE          |
| Frank Dottori Chair in Pulp and Paper Engineering                                                                         | Honghi Tran              | Endowed          |        | ChemE        |
| Gerald R. Heffernan Chair in Materials Processing                                                                         | Torstein Utigard         | Endowed          |        | MSE          |
| J. Armand Bombardier Foundation Chair in Aerospace Flight                                                                 | David Zingg              | Endowed          |        | UTIAS        |
| L. Lau Chair in Electrical and Computer Engineering                                                                       | Reza Irvani              | Endowed          |        | ECE          |
| Michael E. Charles Chair in Chemical Engineering                                                                          | Michael Sefton           | Endowed          |        | ChemE, IBBME |
| Nortel Institute Chair in Emerging Technology                                                                             | J. Stewart Aitchison     | Endowed          |        | ECE          |
| Nortel Institute Chair in Network Architecture and Services                                                               | Jörg Liebeherr           | Endowed          |        | ECE          |
| NSERC/Altera Industrial Research Chair in Programmable Silicon                                                            | Vaughn Betz              | NSERC/<br>Altera |        | ECE          |
| NSERC Associate Industrial Research Chair in Drinking Water                                                               | Ron Hofmann              | NSERC            |        | CivE         |
| NSERC/Cement Association of Canada Industrial Research Chair in Concrete Durability and Sustainability                    | Doug Hooton              | NSERC            |        | CivE         |
| NSERC Chair in Multidisciplinary Engineering Design                                                                       | Kamran Behdinan          | NSERC            |        | MIE          |
| NSERC Industrial Research Chair in Drinking Water Research                                                                | Robert Andrews           | NSERC            |        | CivE         |
| NSERC/P&WC Industrial Research Chair in Aviation Gas Turbine Combustion/Emissions Research and Design System Optimization | Sam Sampath              | NSERC/<br>P&WC   |        | UTIAS        |
| NSERC/UNENE Industrial Research Chair in Corrosion Control and Materials Performance in Nuclear Power Systems             | Roger Newman             | NSERC/<br>UNENE  |        | ChemE        |
| Stanley Ho Professorship in Microelectronics                                                                              | Sorin Voinigescu         | Endowed          |        | ECE          |
| The Stanley L. Meek Chair in Advanced Nanotechnology                                                                      | Harry Ruda               | Endowed          |        | MSE          |
| Toronto Rehabilitation Engineering Institute's Chair in Spinal Cord Injury                                                | Milos Popovic            | Endowed          |        | IBBME        |
| University of Toronto Distinguished Professor in Plasma Engineering                                                       | Javad Mostaghimi         | Endowed          |        | MIE          |
| Velma M. Rogers Graham Chair in Engineering                                                                               | George Eleftheriades     | Endowed          |        | ECE          |
| Wallace G. Chalmers Chair of Engineering Design                                                                           | Axel Guenther            | Endowed          |        | MIE          |
| W. M. Keck Chair of Seismology and Rock Mechanics                                                                         | John Harrison            | Endowed          |        | CivE         |

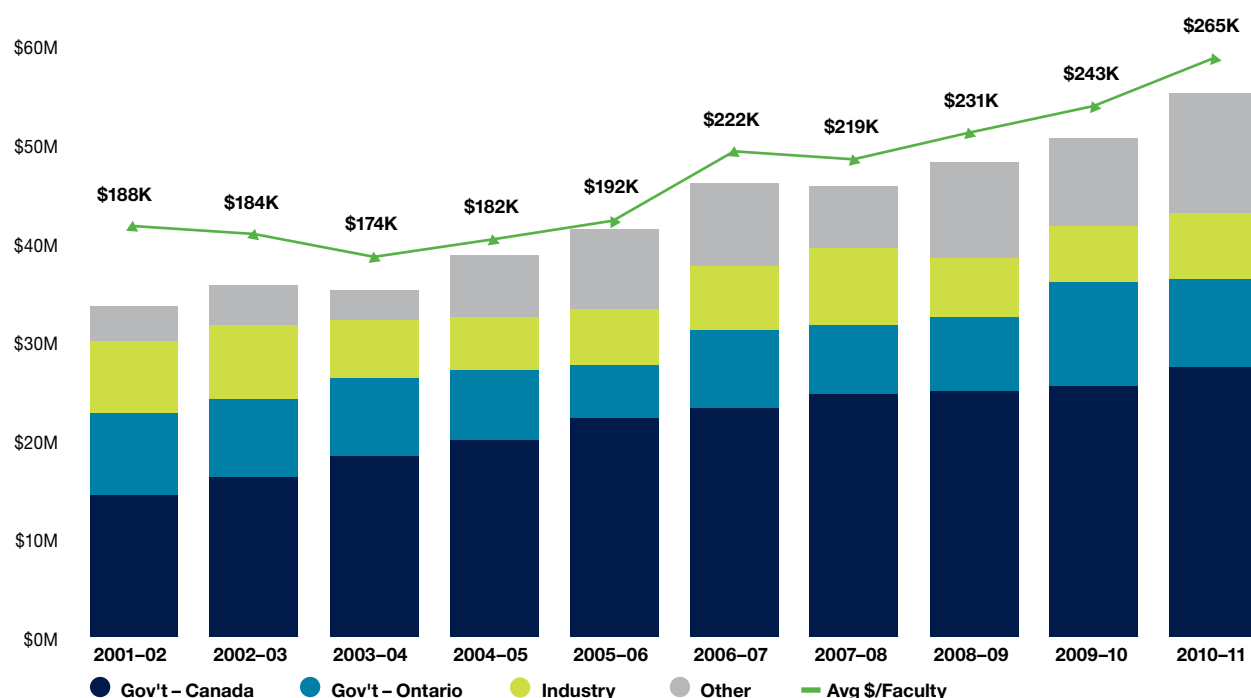
## Appendix D: Research Funding by Academic Area

While Figure 3.1a in the Research chapter presents the total amount of research funding received per year, the data presented here represents research funding for operating expenses, as portrayed in Figure 3.1b. The figures in this appendix exclude funding received under the following research infrastructure programs:

- Canada Foundation for Innovation (except the CFI Career Award)
- NSERC Research Tools & Instruments program for Faculty
- Ontario Innovation Trust
- Ontario Research Fund – Research Infrastructure

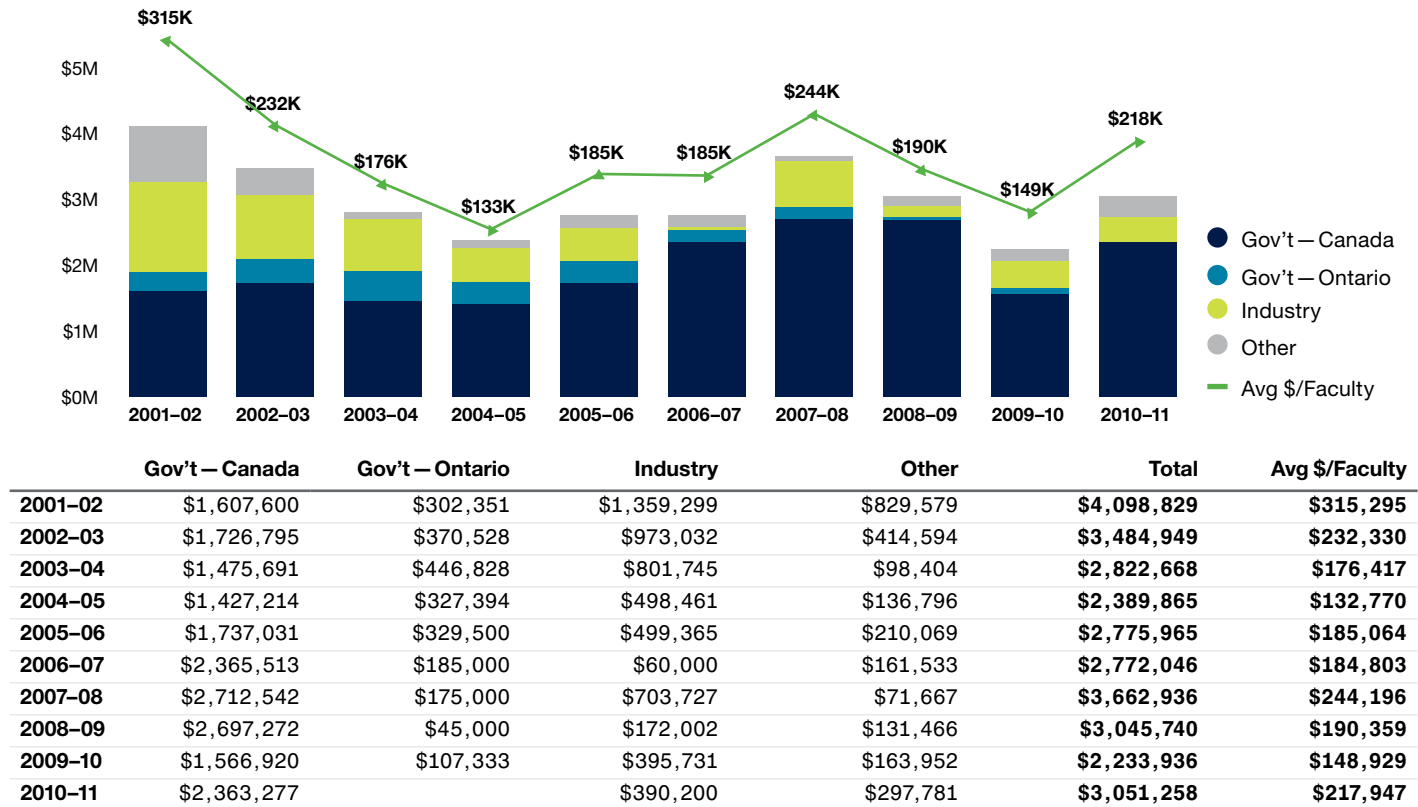
Data is based on grant years (April to March). For example, 2010–2011 represents the granting cycle starting in April 2010 and ending in March 2011.

**Figure D.1 University of Toronto Faculty of Applied Science & Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2001–2002 to 2010–2011**

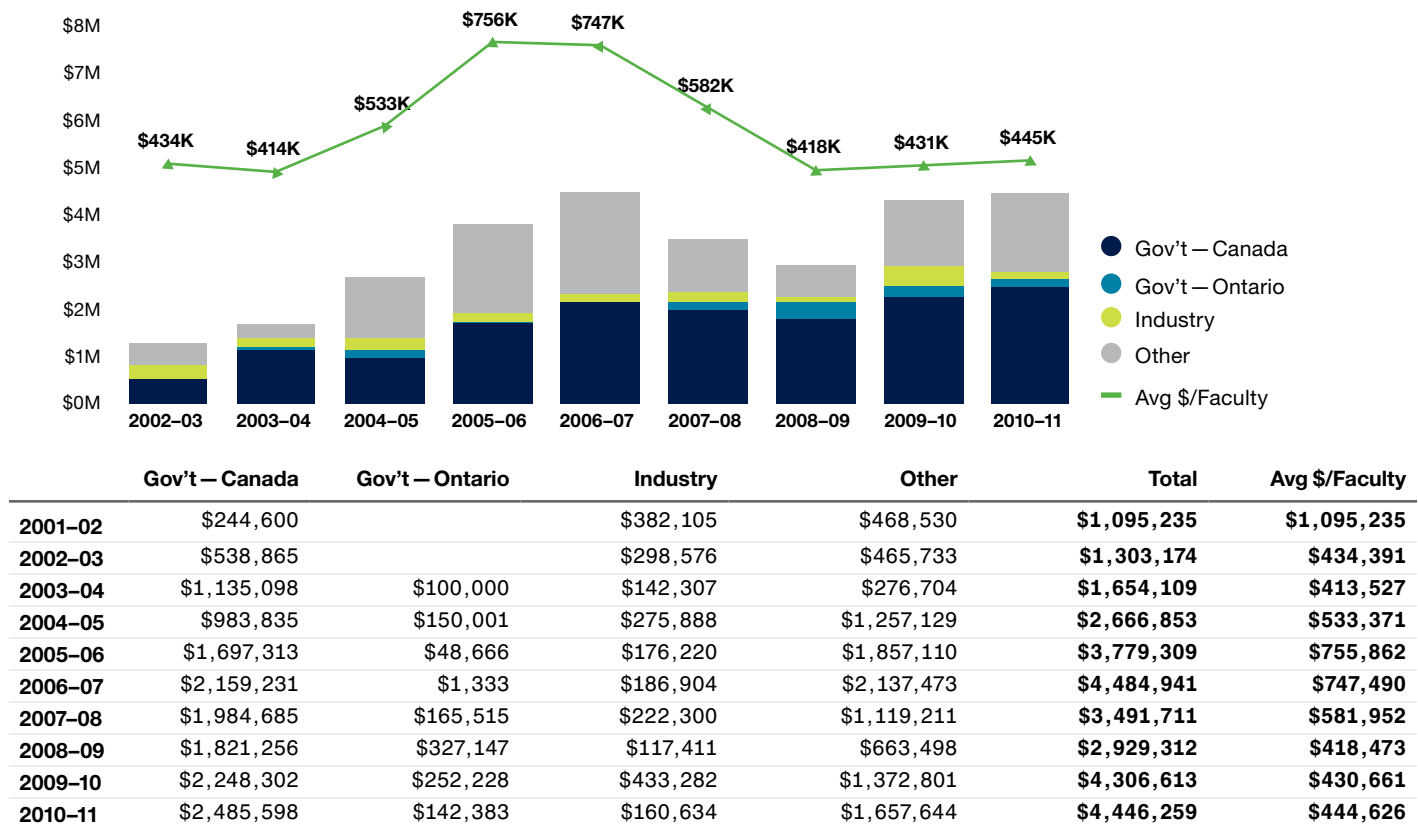


|         | Gov't – Canada | Gov't – Ontario | Industry    | Other        | Total        | Avg \$/Faculty |
|---------|----------------|-----------------|-------------|--------------|--------------|----------------|
| 2001–02 | \$14,542,532   | \$8,350,085     | \$7,214,347 | \$3,530,862  | \$33,637,826 | \$187,921      |
| 2002–03 | \$16,311,497   | \$7,923,760     | \$7,370,641 | \$4,139,958  | \$35,745,856 | \$184,257      |
| 2003–04 | \$18,488,888   | \$7,800,731     | \$5,978,724 | \$2,946,339  | \$35,214,682 | \$174,330      |
| 2004–05 | \$20,055,145   | \$7,161,908     | \$5,430,287 | \$6,003,160  | \$38,650,500 | \$182,314      |
| 2005–06 | \$22,140,217   | \$5,418,230     | \$5,771,219 | \$8,226,467  | \$41,556,133 | \$191,503      |
| 2006–07 | \$23,220,933   | \$8,038,997     | \$6,499,117 | \$8,432,879  | \$46,191,926 | \$222,077      |
| 2007–08 | \$24,632,185   | \$7,009,850     | \$7,928,921 | \$6,124,969  | \$45,695,925 | \$218,641      |
| 2008–09 | \$24,991,825   | \$7,519,179     | \$6,031,749 | \$9,706,819  | \$48,249,572 | \$230,859      |
| 2009–10 | \$25,622,824   | \$10,435,121    | \$5,695,565 | \$9,012,110  | \$50,765,620 | \$242,898      |
| 2010–11 | \$27,325,875   | \$9,082,788     | \$6,726,826 | \$12,251,741 | \$55,387,230 | \$265,011      |

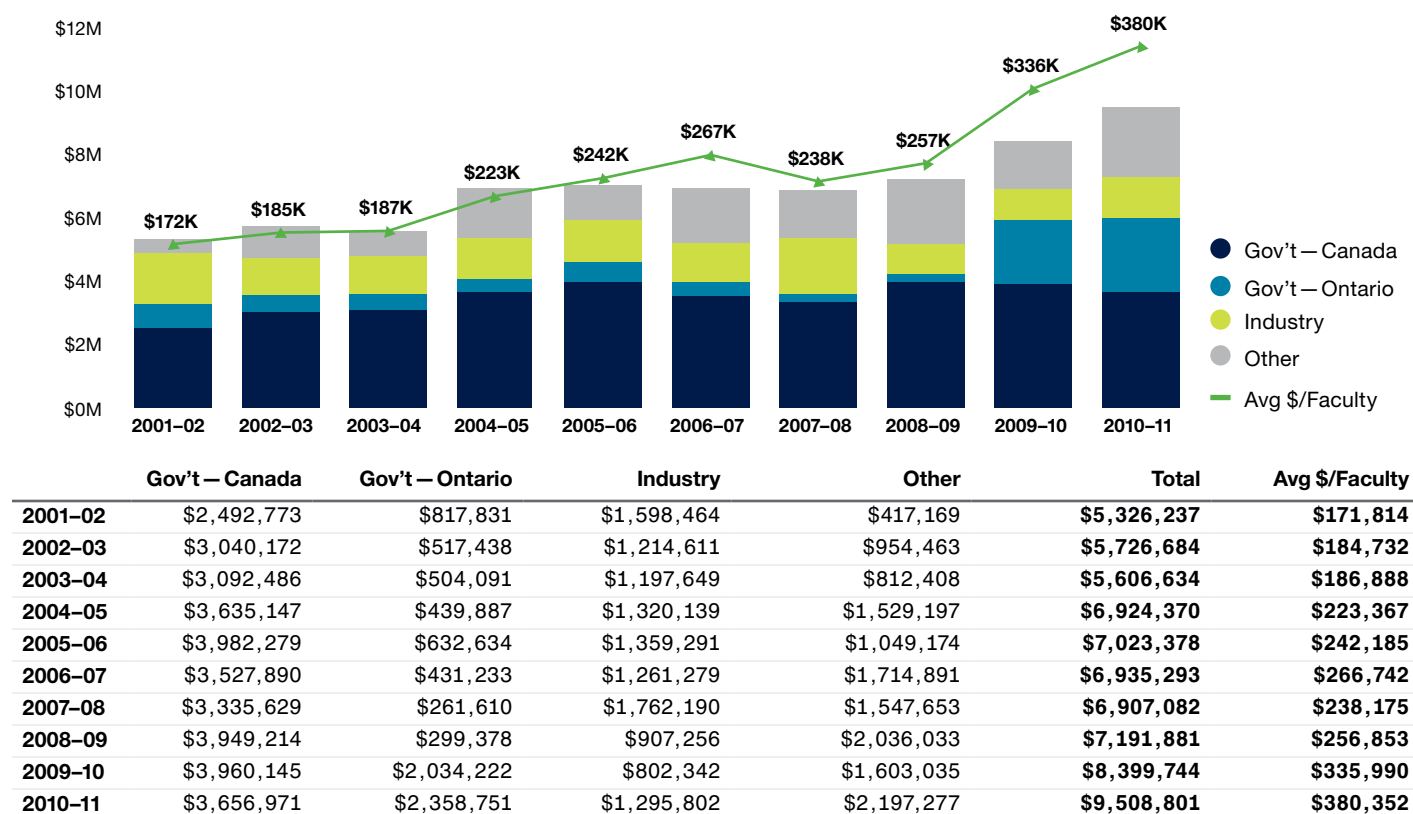
**Figure D.2 University of Toronto Institute for Aerospace Studies Research Operating Funding by Source and Average Funding per Faculty Member, 2001–2002 to 2010–2011**



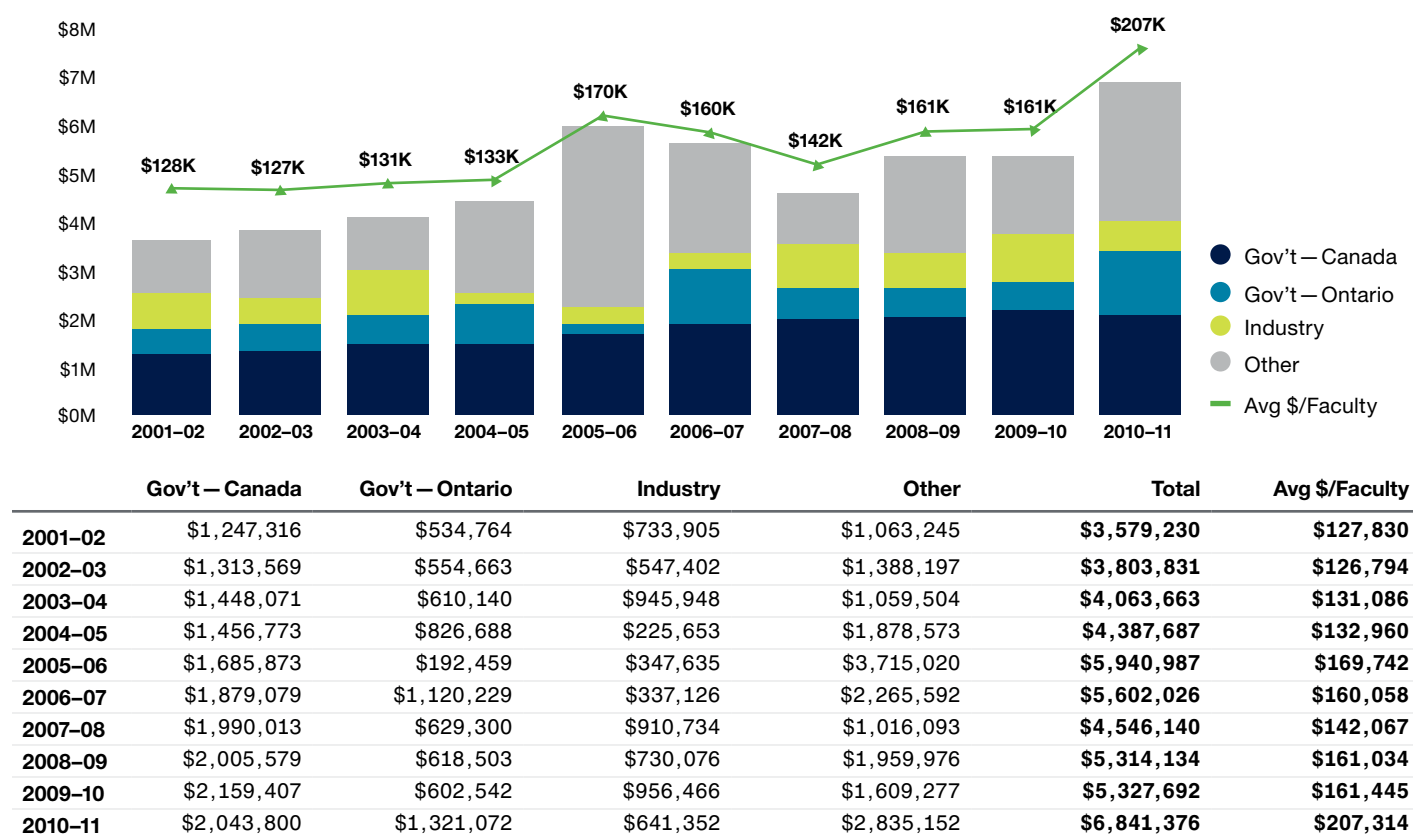
**Figure D.3 Institute of Biomaterials and Biomedical Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2001–2002 to 2010–2011**



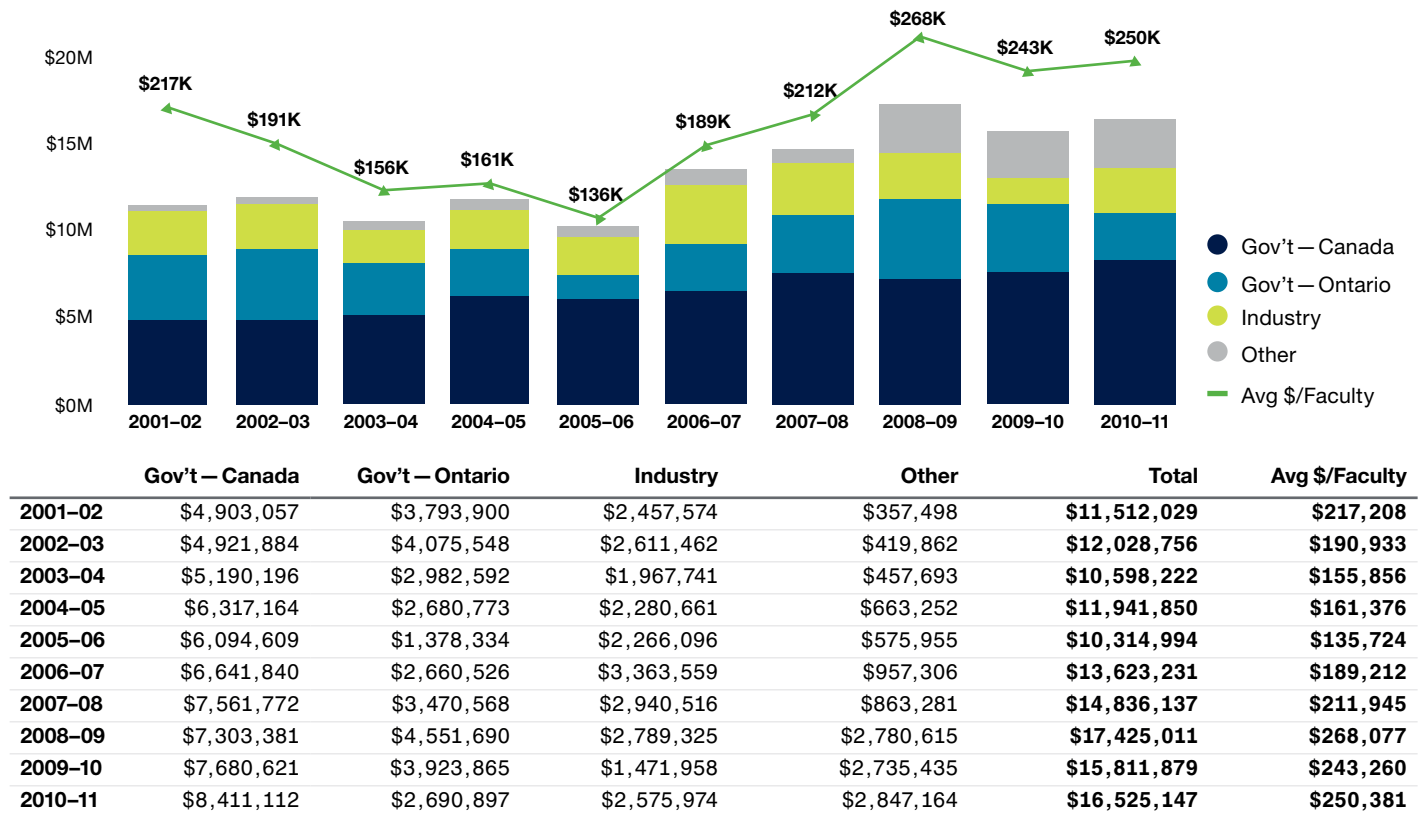
**Figure D.4 Department of Chemical Engineering & Applied Chemistry Research Operating Funding by Source and Average Funding per Faculty Member, 2001–2002 to 2010–2011**



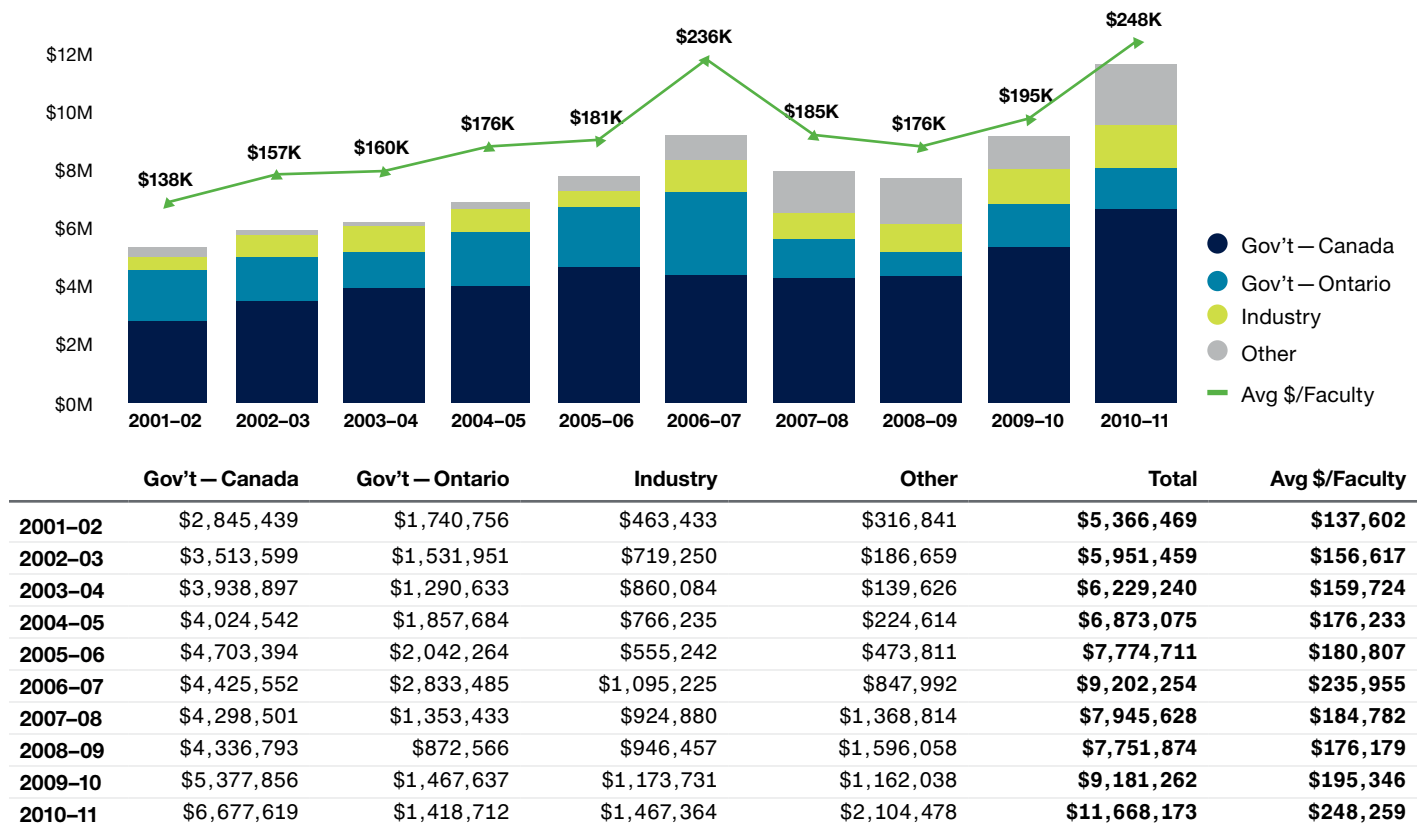
**Figure D.5 Department of Civil Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2001–2002 to 2010–2011**



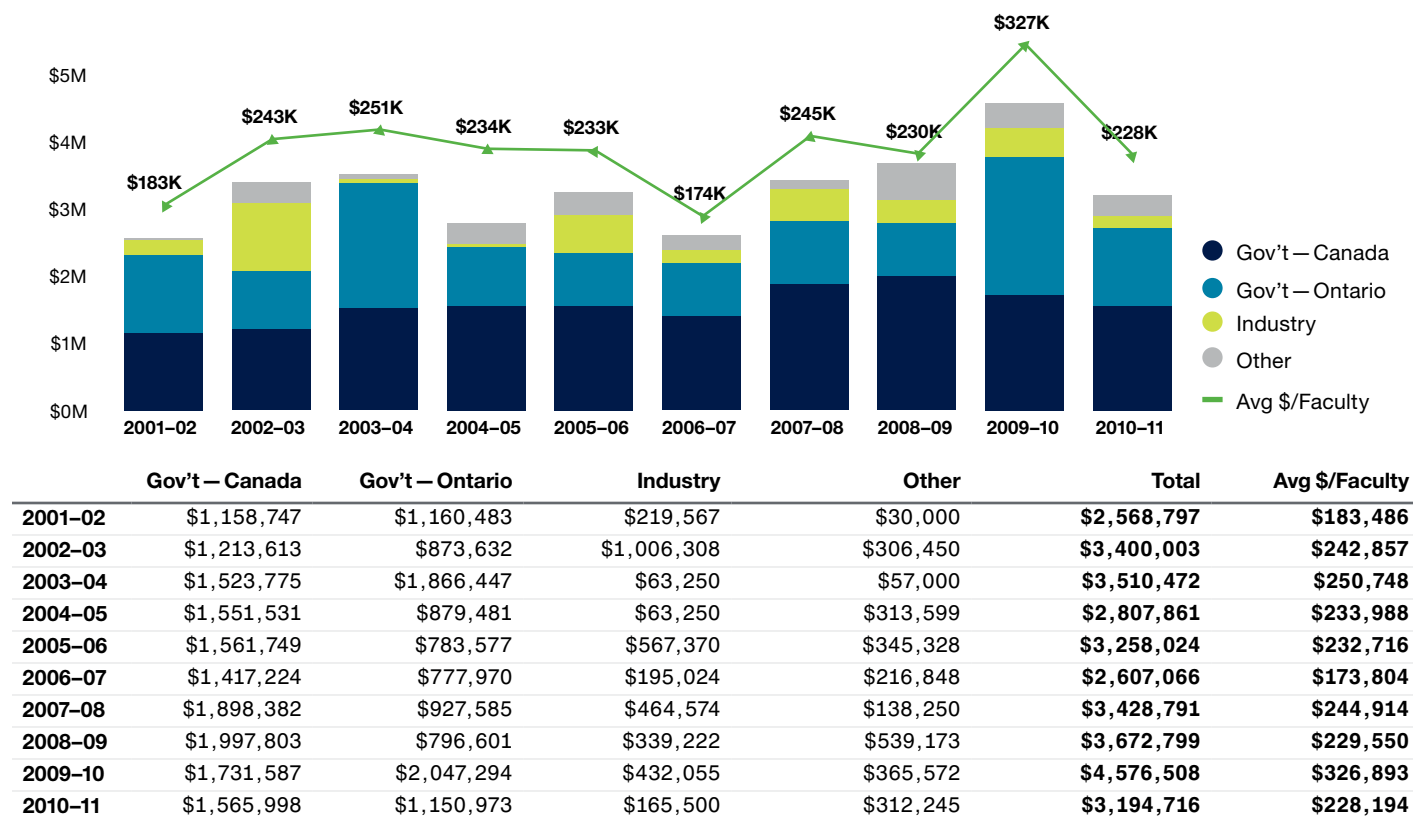
**Figure D.6 The Edward S. Rogers Sr. Department of Electrical & Computer Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2001–2002 to 2010–2011**



**Figure D.7 Department of Mechanical & Industrial Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2001–2002 to 2010–2011**



**Figure D.8 Department of Materials Science & Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2001–2002 to 2010–2011**



## Appendix E: Spin-Off Companies

Over the last 40 years, more than 100 spin-off companies have been launched from within our Faculty.

**Figure E.1 Engineering Spin-Off Companies, 1970 to 2011**

| Est. | Company Name                                   | Engineering Affiliation                              | Department      |
|------|------------------------------------------------|------------------------------------------------------|-----------------|
| 2011 | Kinetica Dynamics Inc.                         | Constantin Christopoulos                             | CivE            |
| 2011 | Ojito Inc.                                     | Tom Chau                                             | IBBME           |
| 2011 | Filaser Inc.                                   | Peter Herman                                         | ECE             |
| 2011 | RenWave                                        | Mohamed Kamh                                         | ECE             |
| 2011 | Xagenic Canada Inc.                            | Ted Sargent                                          | ECE             |
| 2010 | Arda Power Inc.                                | Peter Lehn                                           | ECE             |
| 2010 | FOTA Technologies                              | Tony Chan Carusone                                   | ECE             |
| 2009 | Chip Care Corp.                                | J. Stewart Aitchison                                 | ECE             |
| 2009 | Cytodiagnosics                                 | Warren Chan                                          | IBBME           |
| 2009 | Peraso Technologies Inc.                       | Sorin Voinigescu                                     | ECE             |
| 2008 | Ablazeon Inc.                                  | Javad Mostaghimi                                     | MIE             |
| 2008 | Arch Power Inc.                                | Mohammad (Reza) Iravani                              | ECE             |
| 2008 | AXAL Inc.                                      | Milos Popovic and Egor Sanin                         | IBBME           |
| 2008 | Incise Photonics Inc.                          | Peter Herman                                         | ECE             |
| 2008 | Quantum Dental Technologies                    | Andreas Mandelis                                     | MIE             |
| 2008 | Simple Systems Inc.                            | Milos Popovic, Aleksandar Prodic and Armen Baronijan | ECE, IBBME      |
| 2007 | 002122461 Ontario Inc.                         | Harry Ruda                                           | MSE             |
| 2007 | Cast Connex Corp.                              | Jeffrey Packer and Constantin Christopoulos          | CivE            |
| 2007 | Elastin Specialties                            | Kimberly Woodhouse                                   | ChemE           |
| 2007 | Inometrix Inc.                                 | Michael Galle                                        | ECE             |
| 2007 | Modiface Inc.                                  | Parham Aarabi                                        | ECE             |
| 2007 | Neurochip Inc.                                 | Berj Bardakjian                                      | IBBME           |
| 2007 | Viewgenie Inc.                                 | Parham Aarabi                                        | ECE             |
| 2006 | Anviv Mechatronics Inc. (AMI)                  | Andrew Goldenberg                                    | MIE             |
| 2006 | InVisage Technologies Inc.                     | Ted Sargent                                          | ECE             |
| 2006 | Metabacus                                      | Jianwen Zhu                                          | ECE             |
| 2006 | Vennsa Technologies Inc.                       | Andreas Veneris and Sean Safarpour                   | ECE             |
| 2005 | Greencore Composites                           | Mohini Sain                                          | Forestry, ChemE |
| 2004 | Field Metrica Inc. (FMI)                       | Tim DeMonte, Richard Yoon                            | IBBME           |
| 2004 | Tissue Regeneration Therapeutics Inc. (TRT)    | J.E. Davies                                          | IBBME           |
| 2003 | 1484667 Ontario Inc.                           | Brad Saville                                         | ChemE           |
| 2003 | ArchES Computing Systems Corp.                 | Paul Chow                                            | ECE             |
| 2003 | Norel Optonics Inc.                            | Zhenghong Lu                                         | MSE             |
| 2003 | Vocalage Inc.                                  | Mark Chignell                                        | MIE             |
| 2002 | Information Intelligence Corporation (IIC)     | Burhan Turksen                                       | MIE             |
| 2002 | MatRegen Corp.                                 | Molly Shoichet                                       | IBBME, ChemE    |
| 2002 | OMDEC Inc.                                     | Andrew K.S. Jardine                                  | MIE             |
| 2001 | Fox-Tek                                        | Rod Tennyson                                         | UTIAS           |
| 2001 | Inspection Biosciences                         | Peter Zandstra                                       | IBBME           |
| 2001 | Interface Biologics                            | Paul Santerre                                        | IBBME           |
| 2000 | Biox Corporation                               | David Boocock                                        | ChemE           |
| 2000 | Photo-Thermal Diagnostics Inc.                 | Andreas Mandelis                                     | MIE             |
| 2000 | Simulent Inc.                                  | Javad Mostaghimi                                     | MIE             |
| 2000 | Virtek Engineering Science Inc.                | Andrew Goldenberg                                    | MIE             |
| 1999 | Accelight Networks Inc.                        | Alberto Leon-Garcia and Paul Chow                    | ECE             |
| 1999 | em2 Inc.                                       | J.E. Davies                                          | IBBME           |
| 1999 | Soma Networks                                  | Michael Stumm and Martin Snelgrove                   | ECE             |
| 1999 | Vivosonic Inc.                                 | Yuri Sokolov and Hans Kunov                          | IBBME           |
| 1998 | 1208211 Ontario Ltd. (affiliate: Regen StaRR)  | Robert Pilliar, Rita Kandel and Marc Gryn timer      | IBBME           |
| 1998 | BANAK Inc.                                     | Andrew K.S. Jardine                                  | MIE             |
| 1998 | BoneTec Corp. (Now owned by subsidiary of TRT) | J.E. Davies and Molly Shoichet                       | IBBME           |
| 1998 | Right Track CAD Corp.                          | Jonathan Rose                                        | ECE             |

|      |                                         |                                           |              |
|------|-----------------------------------------|-------------------------------------------|--------------|
| 1998 | SMT HyrdaSil                            | Rod Tennyson                              | UTIAS        |
| 1998 | Snowbush Microelectronics               | Kenneth Martin and David Johns            | ECE          |
| 1997 | Rimon Therapeutics                      | Michael Sefton                            | IBBME, ChemE |
| 1996 | OANDA Corp.                             | Michael Stumm                             | ECE          |
| 1996 | Rocscience Inc.                         | John Curran                               | CivE         |
| 1995 | Amilog Systems                          |                                           | MIE          |
| 1995 | Electrobiologies                        | Paul Madsen                               | IBBME        |
| 1995 | Hydrogenics Corp.                       |                                           | MIE          |
| 1995 | Tribokinetics Inc.                      | Raymond Woodhams                          | ChemE        |
| 1994 | Key Lime Co.                            | Honghi Tran                               | ChemE        |
| 1994 | Trantek Power                           |                                           | ECE          |
| 1993 | Electro Photonics                       | Raymond Measures                          | UTIAS        |
| 1993 | Liquid Metal Sonics Ltd.                |                                           | MSE          |
| 1993 | SAFE Nozzle Group                       | Honghi Tran                               | ChemE        |
| 1993 | SmartSpeaker Corp.                      | Anees Munshi                              | ECE          |
| 1992 | Condata Technologies Ltd.               |                                           | ECE          |
| 1992 | Gao Research & Consulting Ltd.          | Frank Gao                                 | ECE          |
| 1992 | Novator Systems Ltd.                    | Mark Fox                                  | MIE          |
| 1992 | Paul Madsen Medical Devices             | Hans Kunov                                | IBBME        |
| 1992 | PolyPhalt Inc.                          | Raymond Woodhams                          | ChemE        |
| 1991 | Advent Process Engineering Inc.         |                                           | MSE          |
| 1991 | LinShin Canada Inc.                     |                                           | IBBME        |
| 1991 | Minnovex                                | Glenn Dobby                               | MSE          |
| 1991 | Redrock Solvers Inc.                    | Michael Carter                            | MIE          |
| 1990 | Fibre Metrics                           | Dale Hogg                                 | UTIAS        |
| 1989 | Apollo Environmental Systems Corp.      | John Harbinson                            | ChemE        |
| 1989 | Integrity Testing Laboratory Inc. (ITL) |                                           | UTIAS        |
| 1989 | Translucent Technologies                | Paul Milgram                              | MIE          |
| 1989 | Xiris Automation Inc.                   | Cameron Serles                            | MIE          |
| 1988 | Advanced Materials Technologies         | Steven Thorpe                             | MSE          |
| 1988 | Food BioTek Corp.                       | Leon Rubin                                | ChemE        |
| 1988 | HydraTek and Associates Inc.            | Bryan Karney and (since 2006) Fabian Papa | CivE         |
| 1986 | EHM Rehabilitation Technologies         | Pomeranz Salansky                         | UTIAS        |
| 1986 | LACEC Energy Systems Inc.               | Charles Ward                              | MIE          |
| 1985 | El-Mar Inc.                             |                                           | IBBME        |
| 1985 | Electrocaps Inc.                        | J. Smith                                  | ChemE        |
| 1985 | Katosizer Industries Ltd.               | W. Snelgrove                              | ECE          |
| 1985 | Tibur-Howden                            |                                           | MSE          |
| 1984 | ABIT Systems Inc.                       | Burhan Turksen                            | MIE          |
| 1984 | Ergotechnics                            | P. Foley                                  | MIE          |
| 1984 | MERP Enhanced Composites Inc.           | Michael Piggott                           | ChemE        |
| 1983 | Human Factors North                     | N. Moray                                  | MIE          |
| 1982 | DMER                                    | D. MacKay                                 | ChemE        |
| 1982 | Engineering Services Inc. (ESI)         | Andrew Goldenberg                         | MIE          |
| 1982 | Owl Instruments                         | J.W. Smith                                | IBBME        |
| 1980 | Almax Ltd.                              | G. Sinclair                               | ECE          |
| 1980 | Dynaco Inc.                             | Peter Hughes                              | UTIAS        |
| 1980 | SatCon Power Systems Canada Ltd.        | Shashi Dewan                              | ECE          |
| 1978 | Aurora Scientific Inc.                  | David James                               | MIE          |
| 1978 | Hummel Energy Systems Ltd.              | R.L. Hummel                               | ChemE        |
| 1976 | Hooper & Angus Consulting Engineers     | Frank Hooper                              | MIE          |
| 1976 | Kings Engineering Associates Ltd.       | Ilan Currie                               | MIE          |
| 1975 | General Communion Inc.                  | Olev Trass                                | ChemE        |
| 1974 | Envirogetics                            | Frank Hooper                              | MIE          |
| 1974 | MDS Sciex - Division of MDS Inc.        | Barry French                              | UTIAS        |
| 1974 | Tibur Metals Inc.                       |                                           | MSE          |
| 1973 | Hooper & Hix, Engineers and Architects  | Frank Hooper                              | MIE          |
| 1970 | Eco-Tec Ltd.                            | R. Hunter                                 | ChemE        |

## Appendix F: Descriptions of Major Awards

The Awards and Honours chapter summarizes the international, national and provincial awards received by our faculty. Below are descriptions of those awards and honours.

### International

#### AAAS Fellowship

Recognition for meritorious efforts to advance science or its applications from the American Association for the Advancement of Science

#### Guggenheim Fellowship

Intended for men and women who have demonstrated exceptional capacity for productive scholarship

#### MIT Top 35 Under 35

Awarded to world's top 35 young innovators under the age of 35 by *MIT Technology Review* magazine

#### NAE Fellowship

Election to the National Academy of Engineering is among the highest professional distinctions accorded to an engineer

### National

#### 3M Teaching Fellowship

Canada's highest teaching award in recognition of teaching excellence and educational leadership

#### Alan Blizzard Award

Recognition for exemplary collaboration in university teaching as it enhances student learning

#### Canada's Top 40 Under 40

Honours the top 40 Canadians who have reached a significant level of success prior to age 40

#### CAE Fellowship

Fellows elected by the Canadian Academy of Engineering for distinguished achievements and career-long service to the engineering profession

#### EIC Fellowship and Award

Recognition for exceptional contributions to engineering in Canada and for service to the profession and to society by the Engineering Institute of Canada

#### Killam Research Fellowship

Awarded to an established scholar who has demonstrated outstanding research ability and has published research results in substantial publications in their field by the Canada Council for the Arts. Recipients have the opportunity to devote two years to full-time research

#### Killam Prize

Awarded to distinguished Canadian scholars conducting research in one of five fields of study, including engineering, by the Canada Council for the Arts

#### Royal Society of Canada Fellowship

Highest Canadian honour a scholar can achieve in the arts, humanities and sciences

#### Steacie Fellowship

Awarded to enhance the career development of outstanding and highly promising scientists and engineers by NSERC

#### Synergy Award for Innovation

Recognition for university-industry collaboration that stand as a model of effective partnership

### Provincial

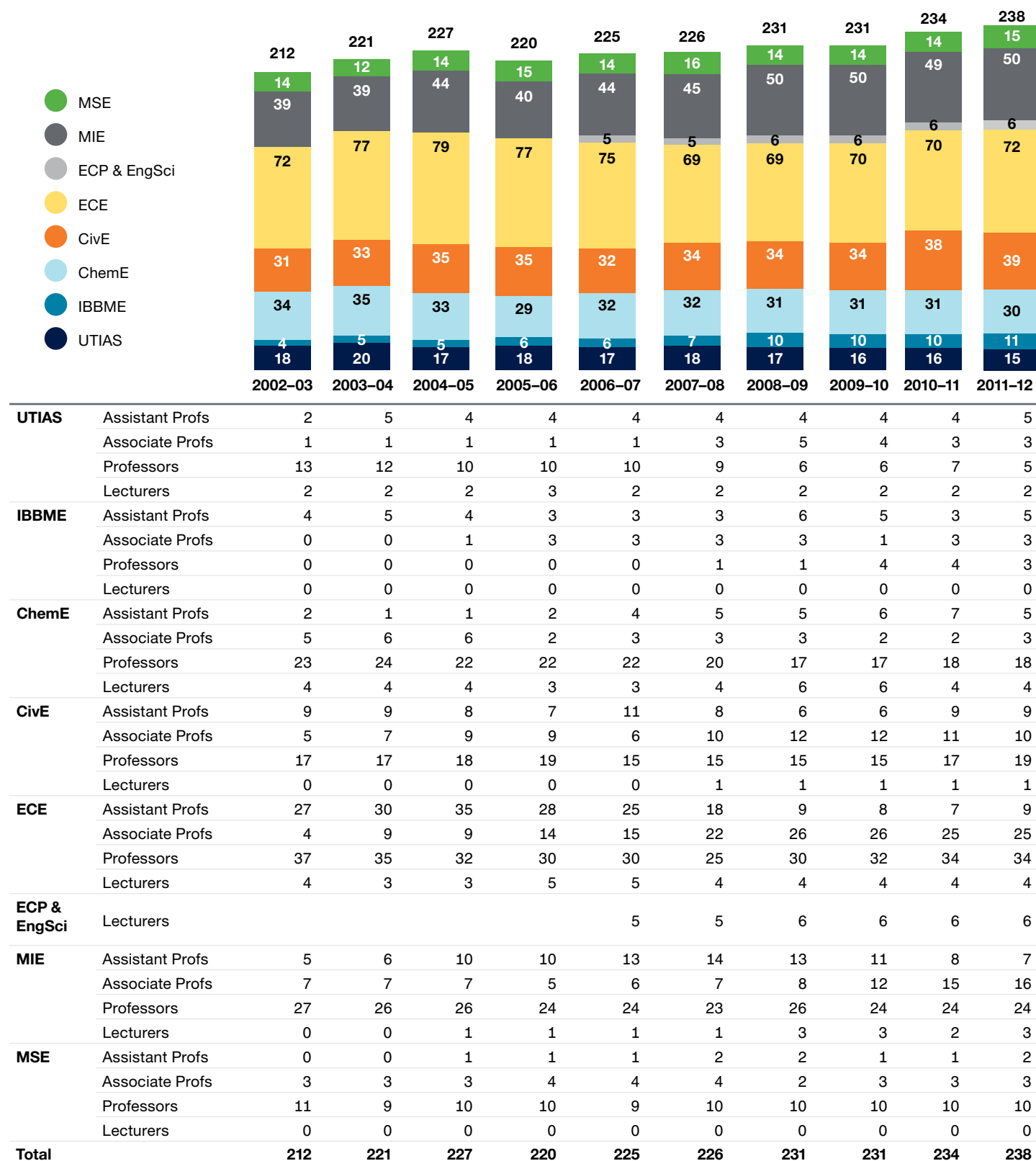
#### PEO Medal

Awarded to a PEO member who has contributed substantially to the advancement of the engineering profession in any of its branches

## Appendix G: Academic Staff by Academic Area

The figures in Appendix G show the composition of our academic staff from 2002–2003 to 2011–2012. Figures G.1a and G.1b provide a Faculty overview and G.2 to G.8 depict the composition.

Figure G.1a Total Academic Staff by Academic Area, 2002–2003 to 2011–2012



**Note:** Number of lecturers from Engineering Communications Program (ECP) and EngSci is unavailable prior to 2006–2007.

Figure G.1b University of Toronto Faculty of Applied Science & Engineering Total Academic Staff by Position with Percentage of Women, 2002–2003 to 2011–2012

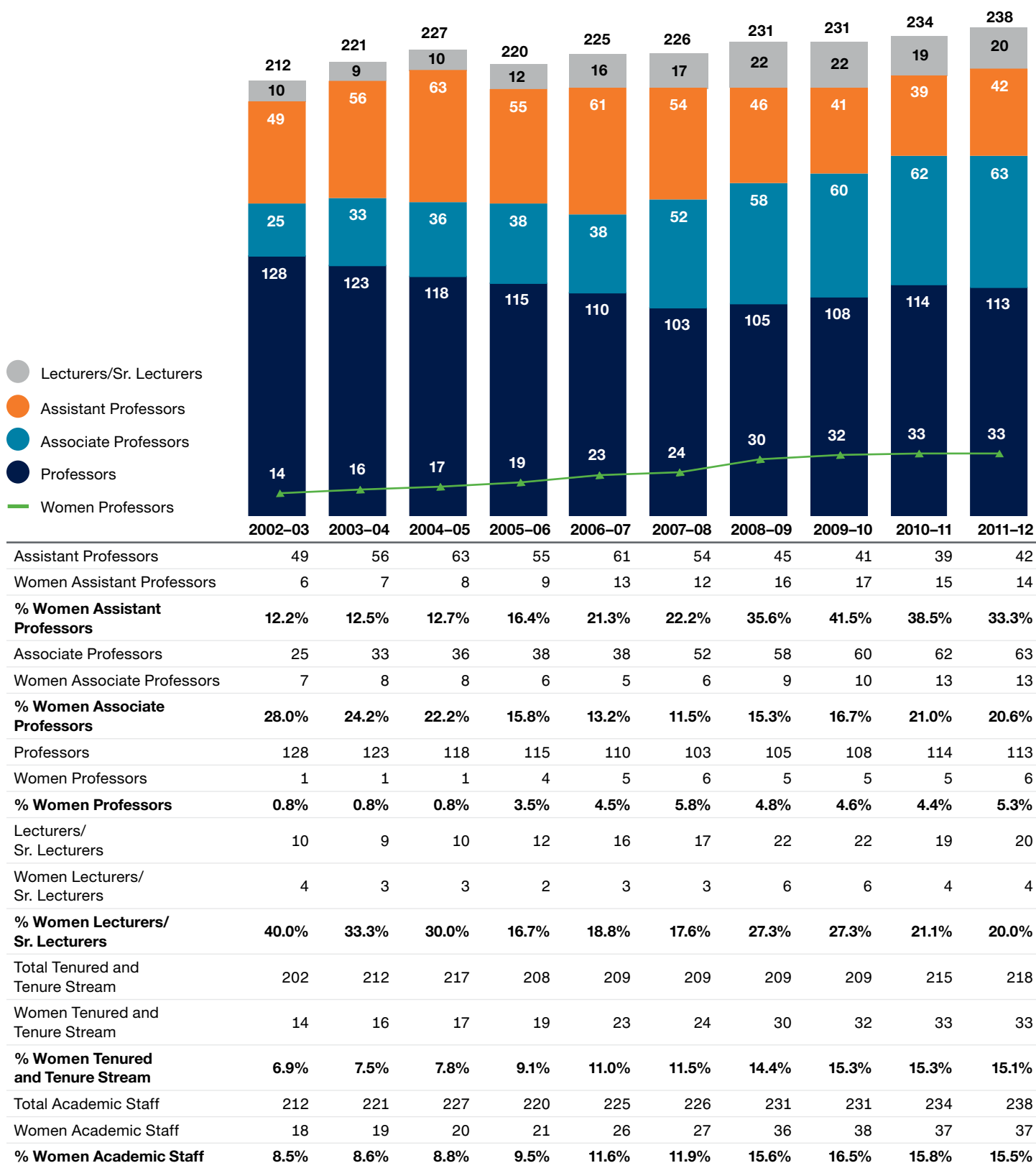
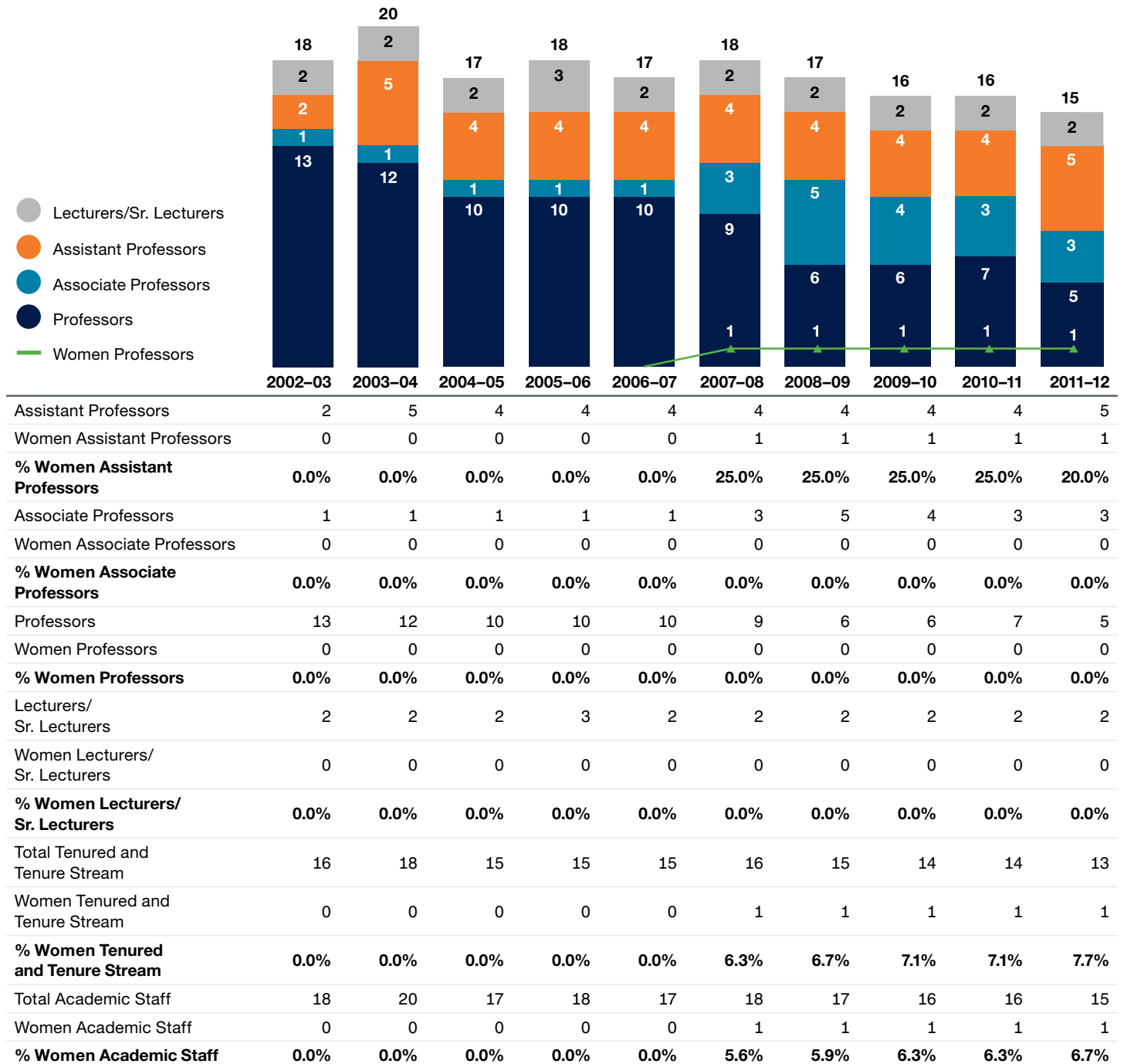


Figure G.2 University of Toronto Institute for Aerospace Studies:  
Academic Staff by Position with Percentage of Women, 2002–2003 to 2011–2012



**Figure G.3 Institute of Biomaterials & Biomedical Engineering:  
Academic Staff by Position with Percentage of Women, 2002–2003 to 2011–2012**

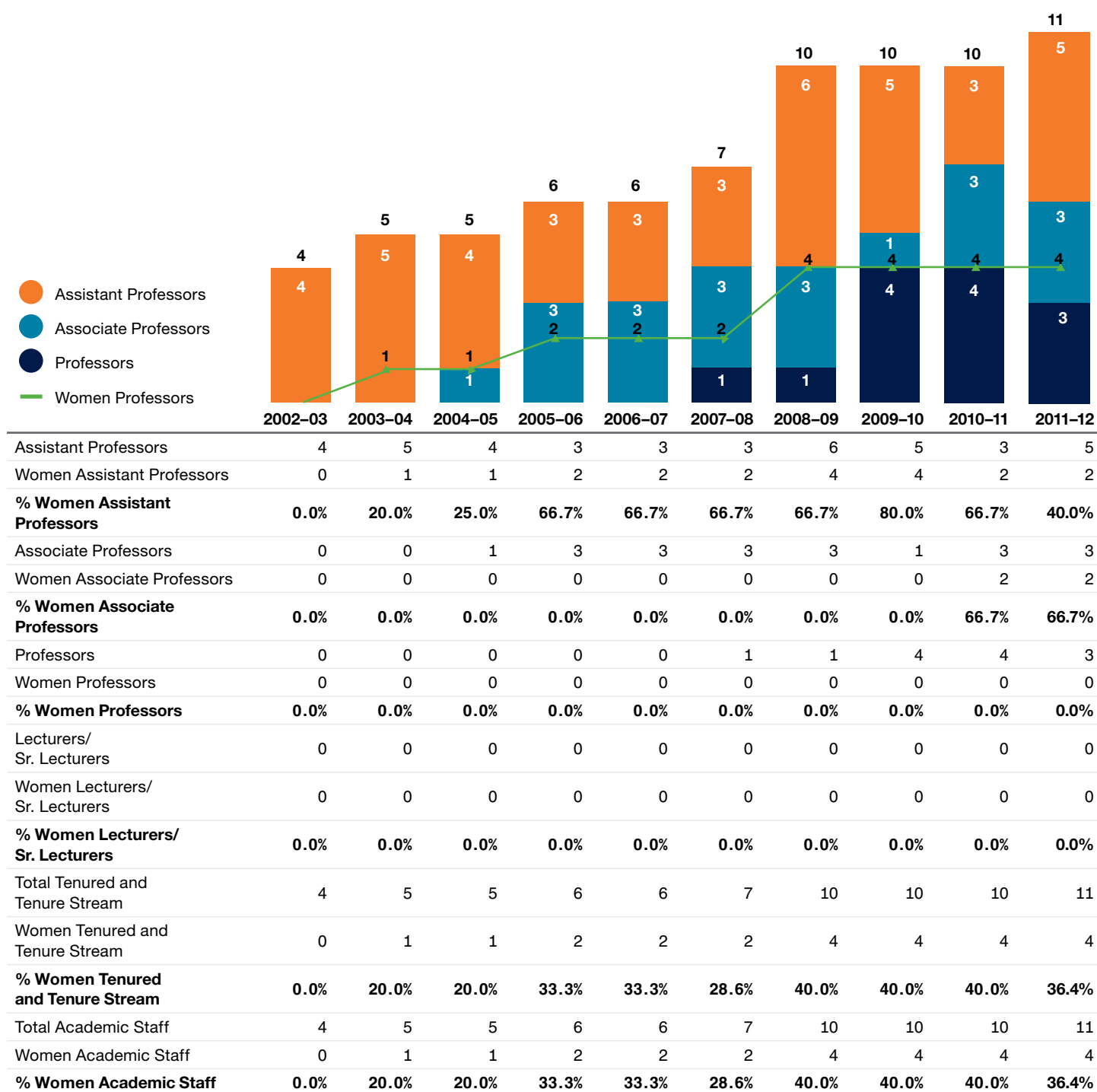


Figure G.4 Department of Chemical Engineering & Applied Chemistry:  
Academic Staff by Position with Percentage of Women, 2002–2003 to 2011–2012

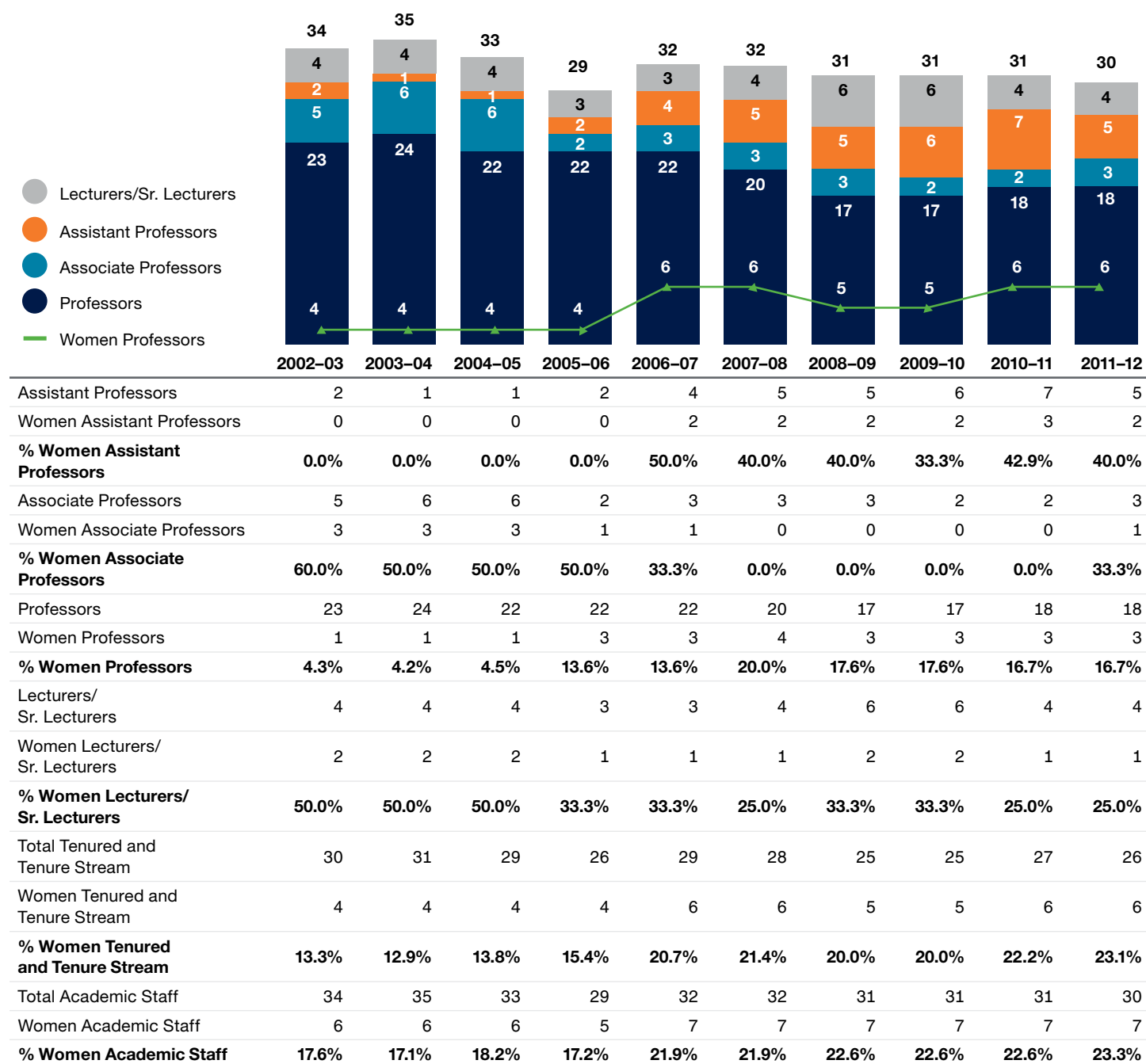
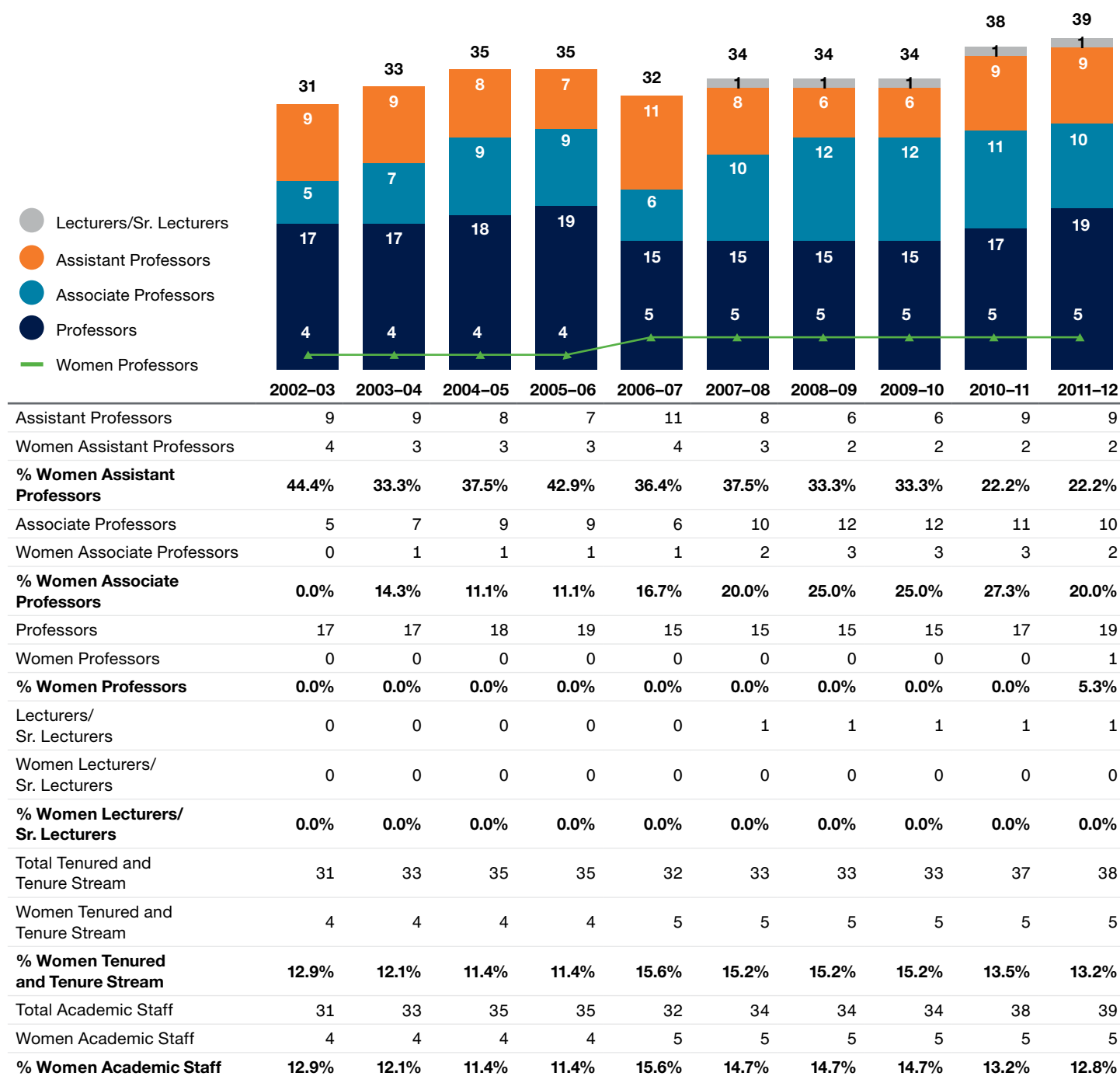


Figure G.5 Department of Civil Engineering:  
Academic Staff by Position with Percentage of Women, 2002–2003 to 2011–2012



**Figure G.6 The Edward S. Rogers Sr. Department of Electrical & Computer Engineering:  
Academic Staff by Position with Percentage of Women, 2002–2003 to 2011–2012**

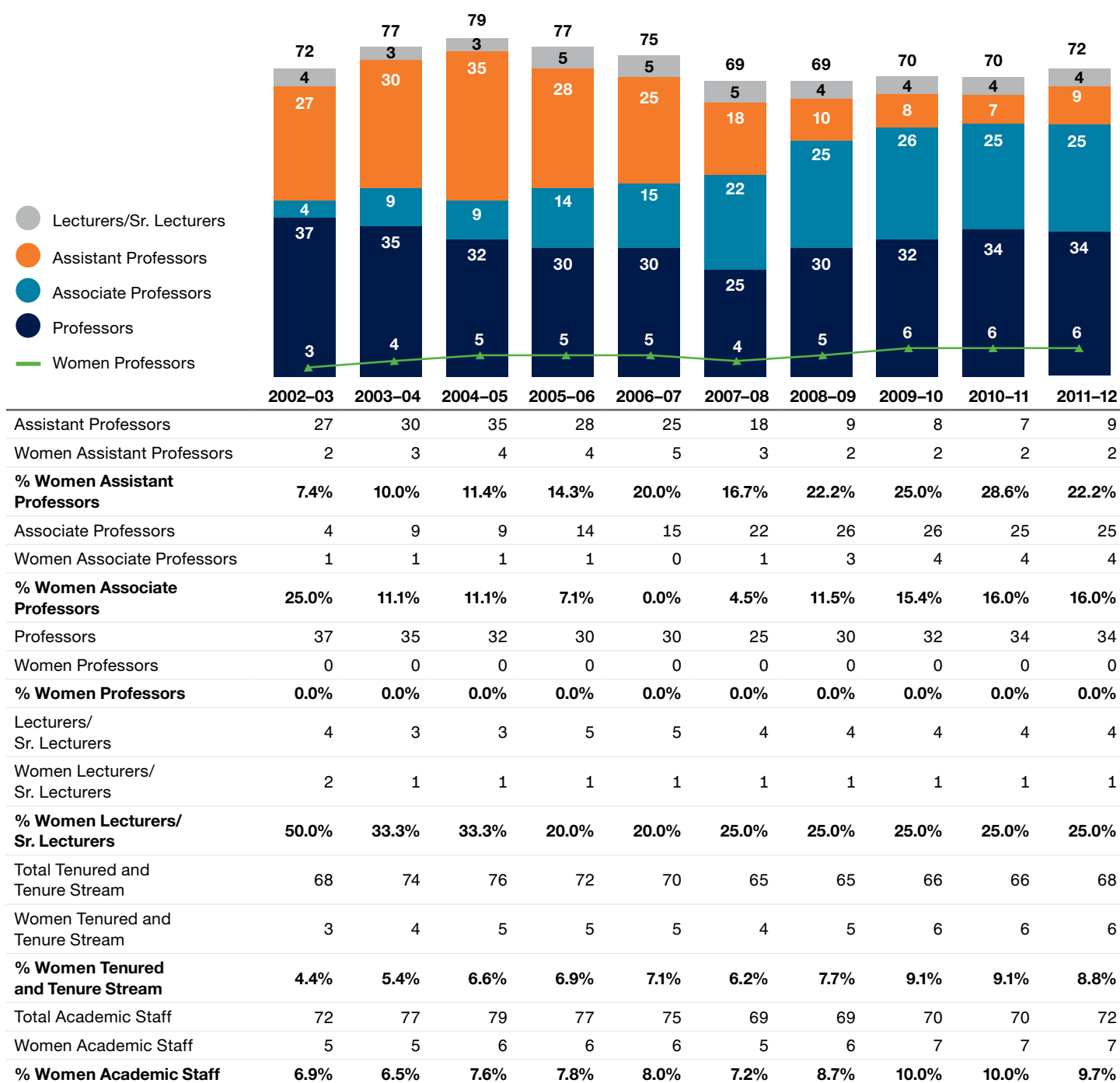
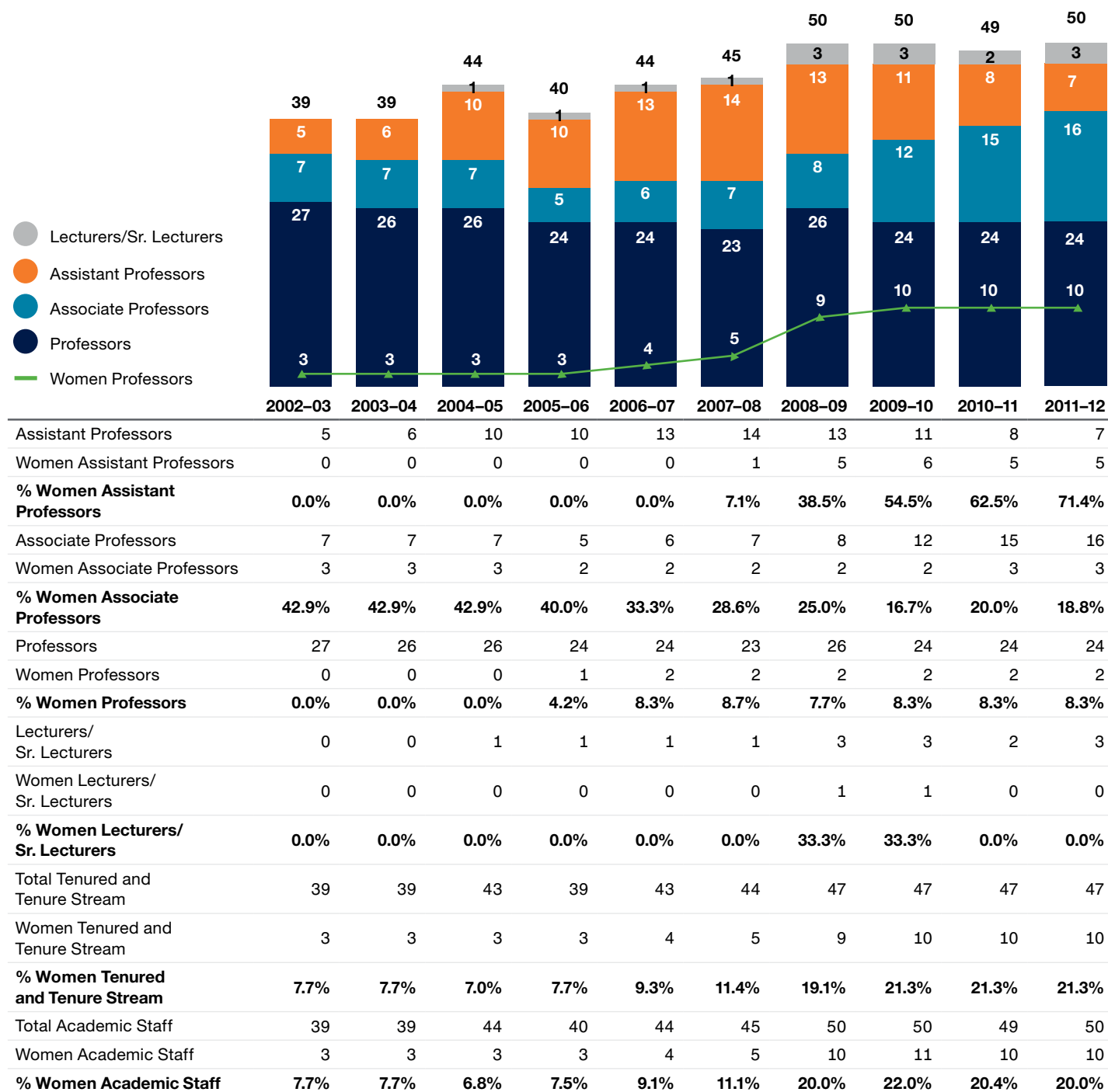
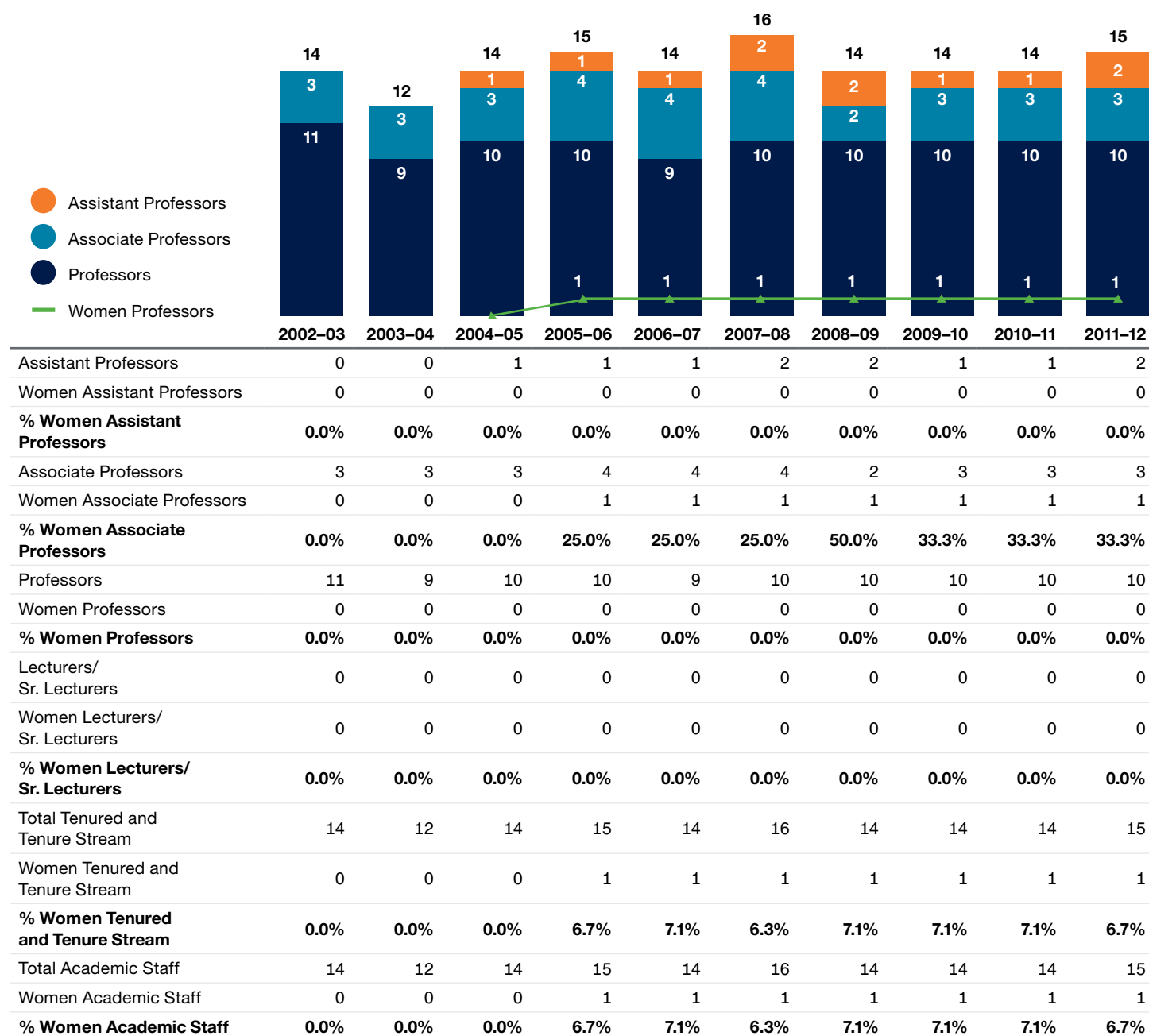


Figure G.7 Department of Mechanical & Industrial Engineering:  
Academic Staff by Position with Percentage of Women, 2002–2003 to 2011–2012



**Figure G.8 Department of Materials Science & Engineering:  
Academic Staff by Position with Percentage of Women, 2002–2003 to 2011–2012**



## Appendix H: Women at U of T Engineering

Recruiting women students and faculty members continues to be a priority across our Faculty. Appendix H presents a series of figures that illustrate the number of women undergraduates, graduate students and faculty within U of T Engineering.

Figure H.1 **Percentage of Women Students and Faculty in Engineering, 2002–2003 to 2011–2012**

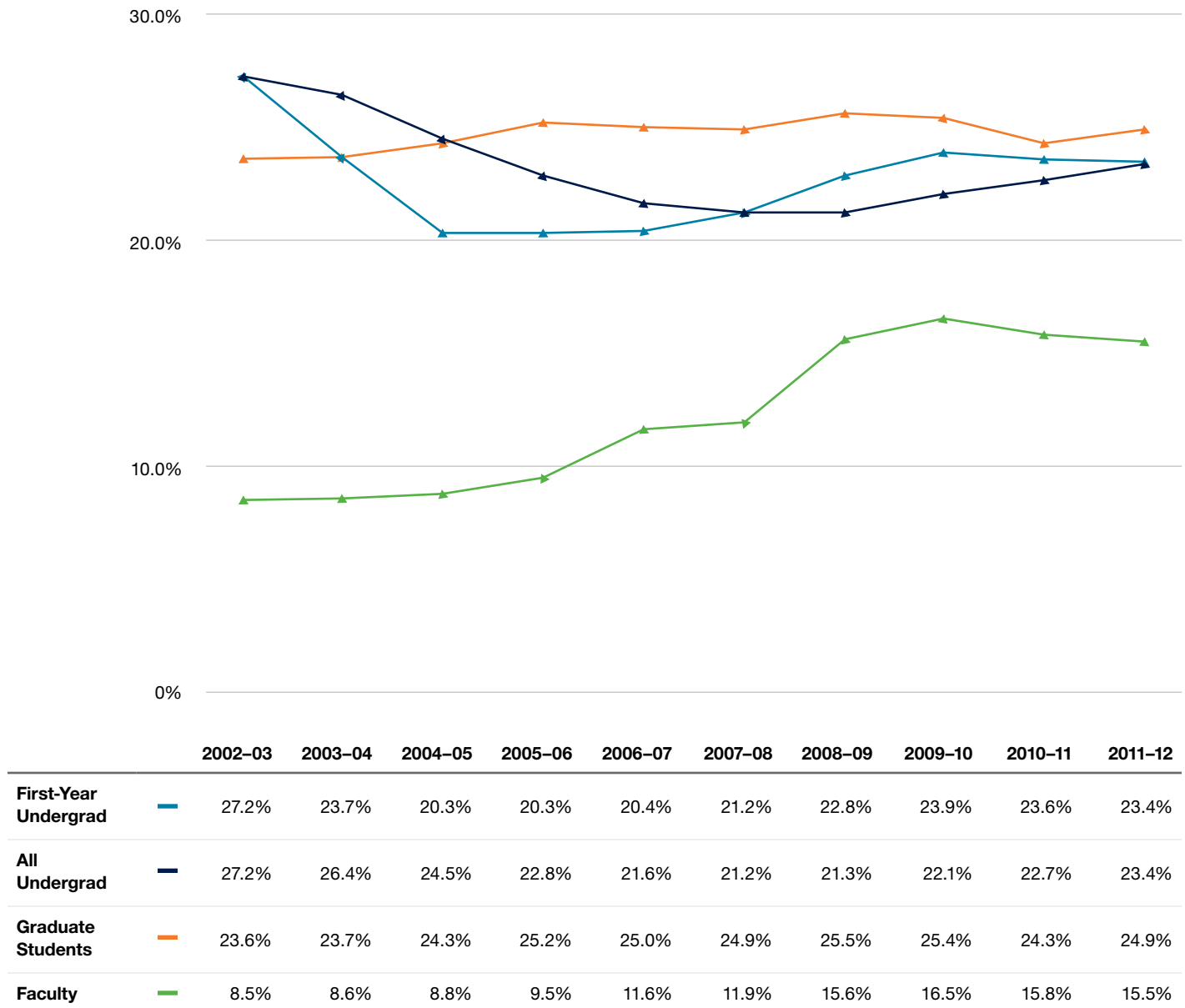


Figure H.2 Total Number of Faculty with Percentage of Women, 2002–2003 to 2011–2012

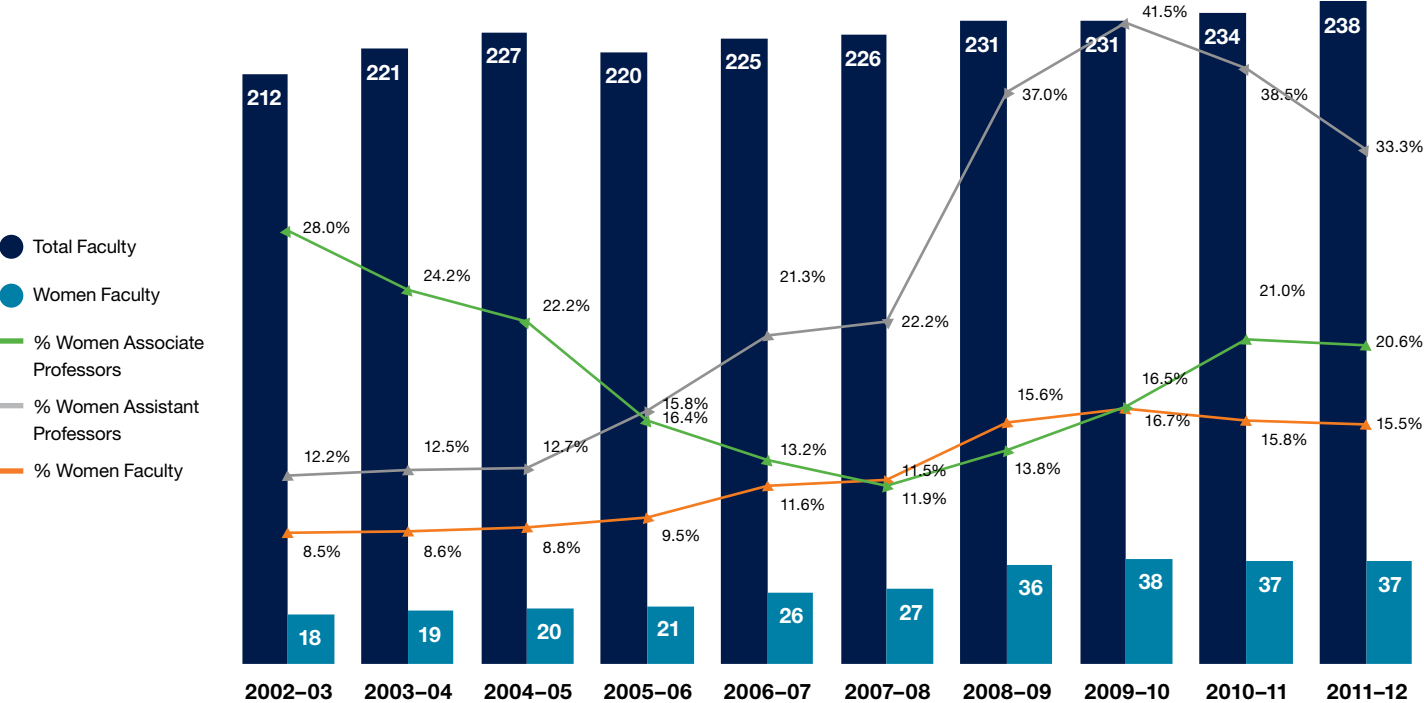
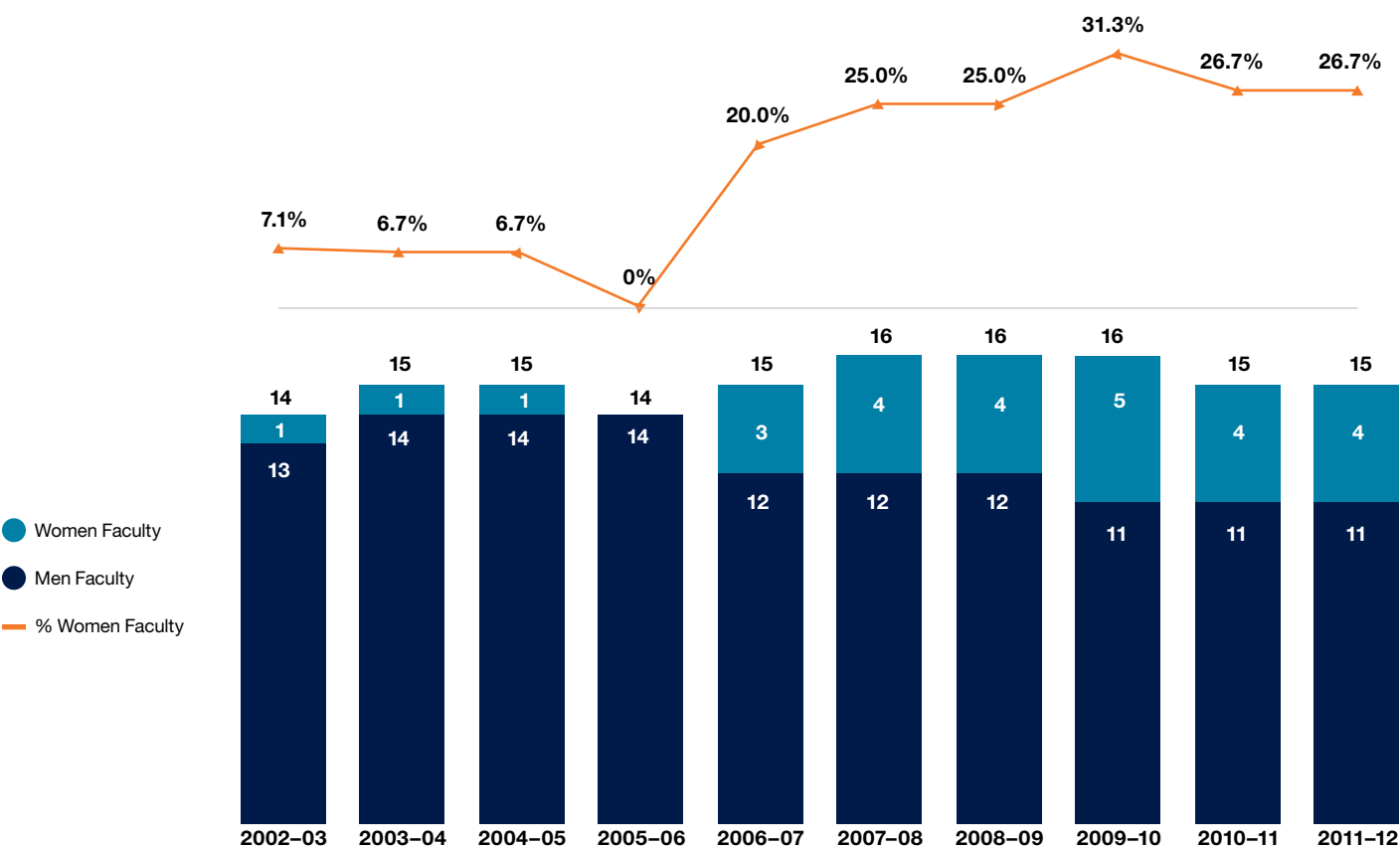
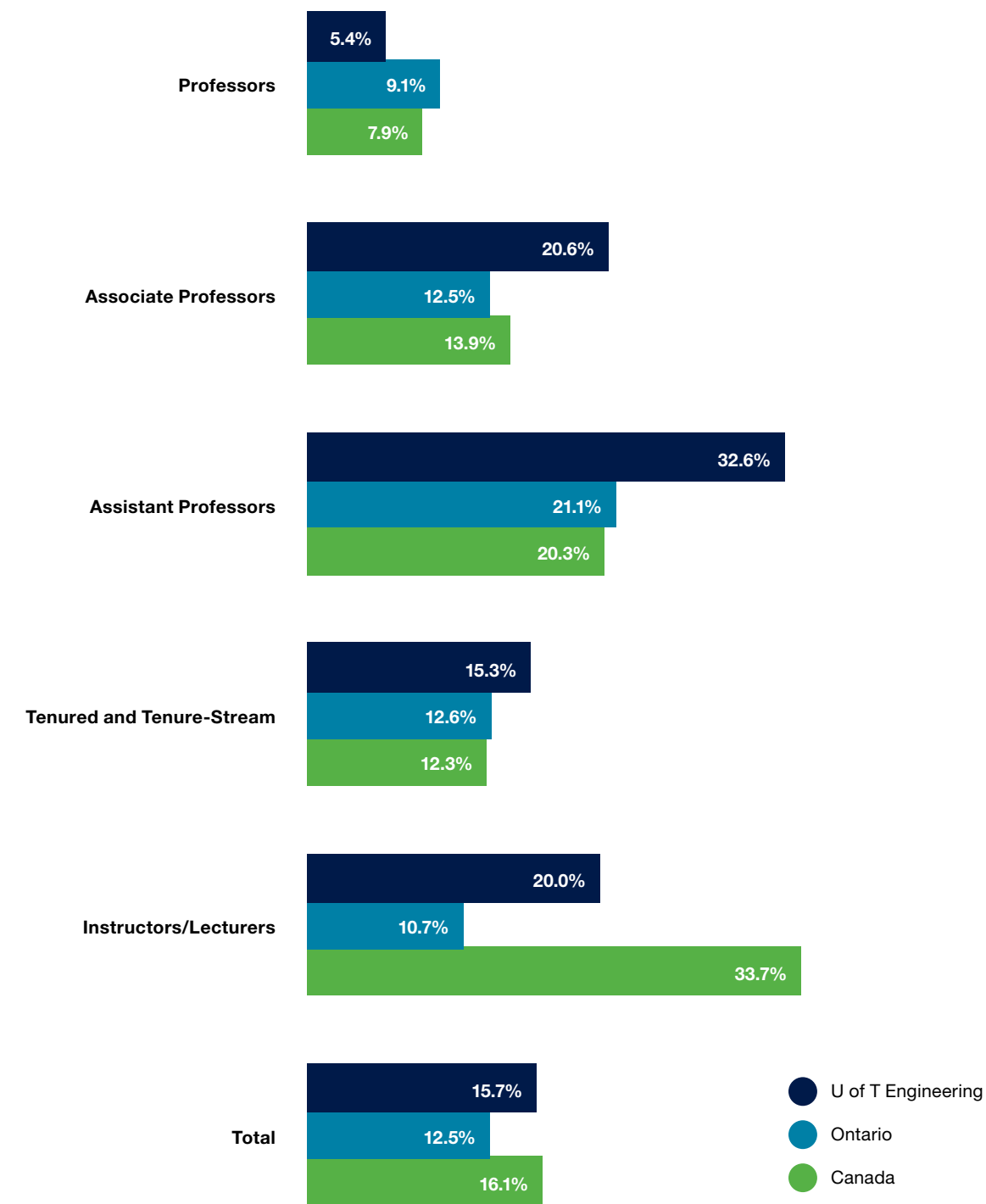


Figure H.3 Academic Administrative Faculty Roles and Percentage of Women, 2002–2003 to 2011–2012



**Note H.3:** Positions included in the total number of academic administrative roles: Dean; Vice-Deans of Undergraduate, Graduate and Research; Associate Dean, Cross-Disciplinary Programs; Chair, First Year; Chairs/Directors of ChemE, CivE, ECE, EngSci, MIE, MSE, UTIAS, IBBME; and Faculty Council Speaker.

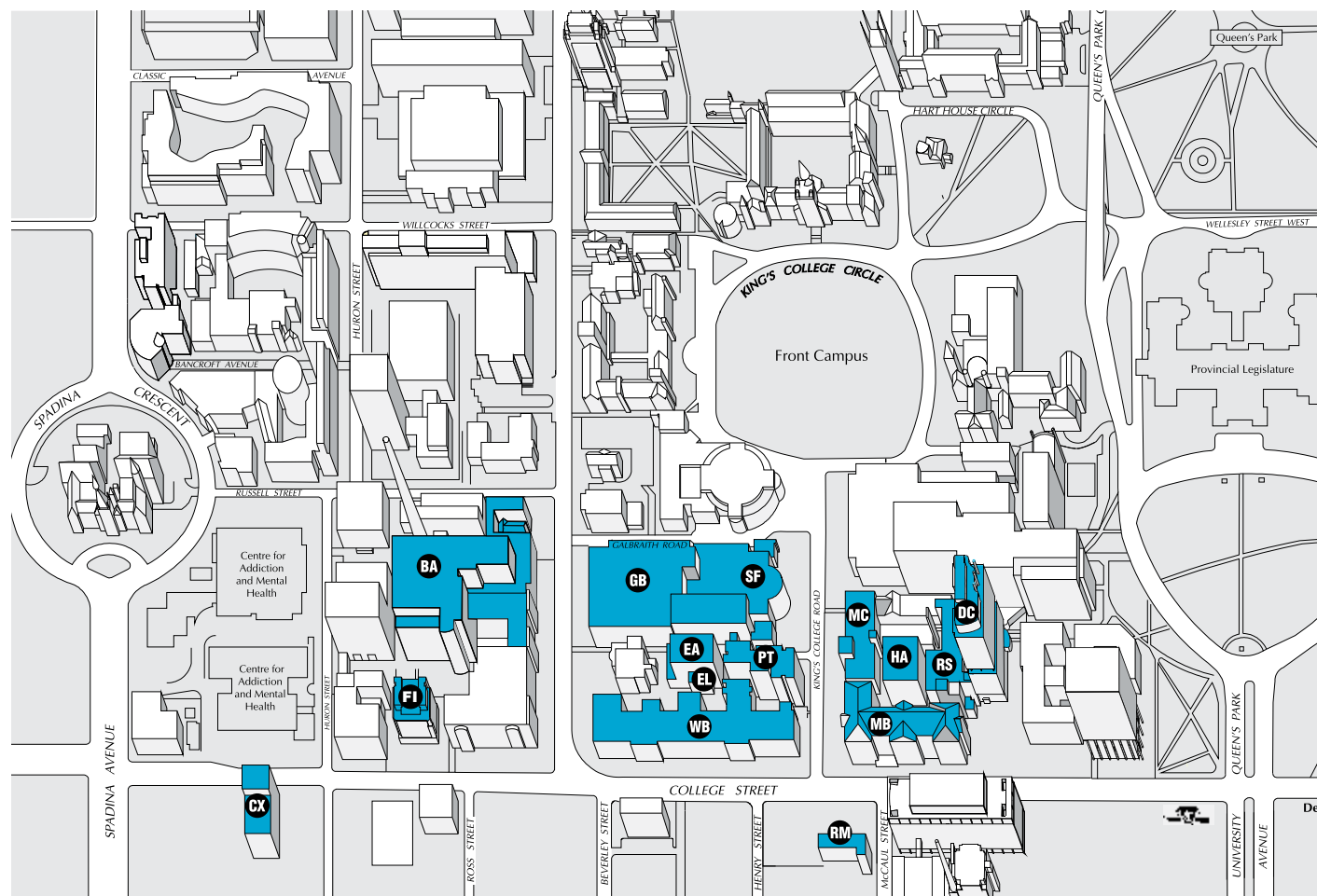
Figure H.4 **Percentage of Women Faculty at U of T Engineering Compared with Women Faculty in Ontario and Canadian Engineering Faculties, 2011**



**Note H.4:** Based on November 15, 2011 data analysed by Engineers Canada.

## Appendix I: The Engineering Precinct

The map below highlights buildings on the St. George campus that form the Engineering Precinct. Most of our buildings reside on the southern-most part of campus. Along with UTIAS in Downsview (not pictured below), these 16 buildings house our students, faculty, staff, research and teaching spaces. For details on the buildings we occupy, please see the Space chapter.



|           |                                                                  |
|-----------|------------------------------------------------------------------|
| <b>EA</b> | Engineering Annex / Electro-Metallurgy Lab Building (South Side) |
| <b>BA</b> | Bahen Centre for Information Technology                          |
| <b>EL</b> | Electrometallurgy Lab                                            |
| <b>FI</b> | Fields Institute                                                 |
| <b>GB</b> | Galbraith Building                                               |
| <b>HA</b> | Haultain Building                                                |
| <b>MC</b> | Mechanical Engineering Building                                  |
| <b>MB</b> | Lassonde Mining Building                                         |

|           |                                                               |
|-----------|---------------------------------------------------------------|
| <b>RM</b> | 256 McCaul Street                                             |
| <b>PT</b> | D.L. Pratt Building                                           |
| <b>RS</b> | Rosebrugh Building                                            |
| <b>SF</b> | Sandford Fleming Building                                     |
| <b>WB</b> | Wallberg Building                                             |
| <b>DC</b> | Donnelly Centre for Cellular and Biomolecular Research (CCBR) |
| <b>CX</b> | 245 College Street                                            |
| <b>-</b>  | UTIAS (Downsview)                                             |

# Data Sources

This section indicates the sources for data and information presented throughout this report. Sources are organized in order of appearance by page number, figure number and title.

| Page                                    | Figure | Data Source                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         |        | <b>Faculty Leadership, 2011–2012</b><br>Information provided by Assistant Dean, Academic HR & Diversity, Faculty of Applied Science & Engineering. A current organizational chart is also available online at <a href="http://www.engineering.utoronto.ca/About/deans_office/Academic_Administrative_Leadership.htm">www.engineering.utoronto.ca/About/deans_office/Academic_Administrative_Leadership.htm</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 6                                       |        | <b>Comparison of U of T Engineering with Ontario and Canada, 2011–2012</b><br>Enrolment, degrees granted and faculty data are based on the 2011 calendar year and come from the National Council of Deans of Engineering and Applied Science (NCDEAS) 2011 Resources Report, prepared by Engineers Canada and circulated to Canadian engineering deans in June 2012. Undergraduate enrolment figures exclude non-degree students and those doing a Professional Experience Year (PEY). Full-time equivalent (FTE) enrolment statistics represent averages that take into account all three terms of the year (winter, summer and fall). Undergraduate FTE shows the three-term total divided by two; Graduate FTE shows the three-term total divided by three. Research funding data comes from the Natural Sciences and Engineering Research Council (NSERC) search engine ( <a href="http://www.outil.ost.uqam.ca/CRSNG/Outil.aspx?Langue=Anglais">www.outil.ost.uqam.ca/CRSNG/Outil.aspx?Langue=Anglais</a> ) and includes grants only for the 2011–2012 NSERC fiscal year (April to March). Major awards data comes from the Director, Awards and Honours, Faculty of Applied Science & Engineering, based on press releases and websites of individual awards for the 2011–2012 grant year (April to March).                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 7                                       |        | <b>Comparison of U of T Engineering with St. George Campus and University of Toronto, 2011–2012</b><br>All student enrolment statistics are based on headcount for the fall of 2011 from the Undergraduate or Graduate U of T Reporting Cube (St. George and U of T statistics do not include Toronto School of Theology). All degrees awarded statistics come from ROSI and reflect September 2011 to June 2012 dates (St. George and U of T statistics do not include Toronto School of Theology). All sponsored-research funding statistics come from the U of T Research Reporting Cube, based on 2010–2011 grant year and exclude partner hospitals; includes all program types; data current as of August 2012. Engineering academic staff statistics provided by Assistant Dean, Academic HR & Diversity, Faculty of Applied Science & Engineering (based on HRIS and published lists of faculty members). Engineering administrative and technical staff statistic from 2011 Resources Survey prepared by Engineers Canada for NCDEAS (based on calendar year). U of T academic and administrative staff statistics come from U of T Facts and Figures 2011. Engineering total revenue provided by Chief Financial Officer, Faculty of Applied Science & Engineering. U of T total revenue provided by the Office of the Vice-Provost, Planning & Budget. Engineering space statistic from U of T Office of Space Management data, November 2011. U of T and St. George space statistics from U of T Facts and Figures 2011, which is available online at: <a href="http://www.utoronto.ca/about-uoft/quickfacts/factsandfigures/Facts_Figures_2011.htm">www.utoronto.ca/about-uoft/quickfacts/factsandfigures/Facts_Figures_2011.htm</a> |
| <b>Chapter 1: Undergraduate Studies</b> |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 9                                       | 1.1    | <b>Applications, Offers, Registrations, Selectivity and Yield of First-Year Undergraduates, 2002 to 2011</b><br>All years data for applications and offers are based on annual Admissions Committee reports to Faculty Council (November), counting new admissions only, FT and PT, all years of study. Excludes students with special status. Registrations only are from U of T Undergraduate Enrolment Reporting Cube: Faculty = Faculty of Applied Science & Engineering, New Students Only (based on candidacy session). Cube Parameters: All Fall Terms for 2002–2011, Year 1 (SESLEV), First Time Registered (LEVSTAT), Measure = Headcount.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 9                                       | 1.2    | <b>Ontario Secondary School Averages of Incoming First-Year Undergraduates and Retention Rate Between First and Second Year, 2002 to 2011</b><br>Averages of incoming first-year students from Admissions Committee Report to Faculty Council (November). Retention rates based on Undergraduate Enrolment Projections documents, published by the U of T Planning and Budget Office, October 2011 and January 2012.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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|----|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | 1.3   | <b>Incoming First-Year Undergraduates with Percentage of Women and International Students, 2002 to 2011</b><br>Headcount from U of T Undergraduate Enrolment Cube. Excludes students with special status. Cube Parameters: All Fall Terms for 2002–2011; First Time Registered (LEVSTAT); Measure = Headcount; [Gender] and [DOM_INTL] parameters used to calculate percentages of women and international students, respectively.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 11 | 1.4   | <b>Incoming First-Year Domestic and International Undergraduates, 2005 to 2011</b><br>Headcount from University of Toronto Enrolment Master Files, the source of U of T Reporting Cube. Includes new and returning students. Excludes students with special status. Cube Parameters: Year 1 (SESLEV); Fall Terms for 2005–2011; Degree Type = Undergraduate; excludes students with special status.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 11 | 1.5   | <b>International and Domestic Undergraduate Enrolment, 2002–2003 to 2011–2012</b><br>Headcount from U of T Undergraduate Enrolment Reporting Cube. Excludes students with special status. Cube Parameters: Fall Terms for 2002–2011; Degree Type = Undergraduate; Excludes students with special status.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 12 | 1.6   | <b>Undergraduates by Program, Year of Study and Professional Experience Year, 2011–2012</b><br>Headcount from U of T Undergraduate Enrolment Reporting Cube. Includes full-time students, part-time students and students on PEY internship. Excludes students with special status. Cube Parameters: Years 1–4; Fall 2011; by Department; Degree Type = Undergraduate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 13 | 1.7   | <b>Undergraduates by Program, 2002–2003 to 2011–2012</b><br>Headcount for the fall of each year from U of T Undergraduate Enrolment Reporting Cube. Includes full-time students, part-time students and students on PEY internship. Excludes students with special status. Cube Parameters: All Fall Terms for 2002–2011; Years 1–4 (SESLEV); Degree Type = Undergraduate; Measure = Headcount; Departments based on [Programs] field.                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 13 | 1.8a  | <b>Number of Awards Received by Cohort with Total Number of Undergraduate Need-Based Award Recipients, 2002–2003 to 2011–2012</b><br>Data provided by Information Analyst, Admissions Information, Office of the Faculty Registrar, Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 14 | 1.8b  | <b>Total Value of Undergraduate Need-Based Awards and Percentage Distributed by Year of Study, 2002–2003 to 2011–2012</b><br>Data provided by Information Analyst, Admissions Information, Office of the Faculty Registrar, Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 15 | 1.9a  | <b>Undergraduate Degrees Awarded by Program, 2002–2003 to 2011–2012</b><br>All data from ROSI download: 5EA (Graduated Students); Faculty = Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 15 | 1.9b  | <b>U of T Engineering Degrees Awarded by Academic Area Compared with Canadian and North American Degree Totals, 2010</b><br>U of T and Canadian statistics are based on the 2010 calendar year and come from Engineers Canada Report of Enrolment & Degrees Granted ( <i>Canadian Engineers for Tomorrow, 2006–2010</i> ), revised December 2011, and available online at: <a href="http://www.engineerscanada.ca/files/w_report_enrolment_eng.pdf">www.engineerscanada.ca/files/w_report_enrolment_eng.pdf</a> . American statistics used to calculate North American percentages are based on the 2009–2010 academic year and come from the 2011 American Society of Engineering Educators (ASEE) Report, available online at: <a href="http://www.asee.org/papers-and-publications/publications/college-profiles">www.asee.org/papers-and-publications/publications/college-profiles</a> |
| 16 | 1.10a | <b>Undergraduate and Graduate Full-Time Equivalent Student-Faculty Ratios, 2002–2003 to 2011–2012</b><br>Number of undergraduates from U of T Undergraduate Enrolment Reporting Cube. Excludes students on PEY internship and students with special status. Cube Parameters: Fall terms 2002–2011; Degree Type = Undergraduate; Measure = Headcount. To exclude PEY: for 2002–2004 = FT only; for 2005+ AssocOrg = blank. Number of FTE graduate students from U of T Graduate Enrolment Reporting Cube. Cube Parameters: Fall terms 2002–2011; Measure = Total FTE (UAR); excludes students with special status. Number of faculty included in the calculation provided by Assistant Dean, HR & Diversity, Faculty of Applied Science & Engineering (based on HRIS and published lists of faculty).                                                                                        |

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|----|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16 | 1.10b | <b>Undergraduate Student-Faculty Ratios by Academic Area, 2011–2012</b><br>Number of undergraduates from U of T Undergraduate Enrolment Reporting Cube. Excludes students on PEY internship and students with special status. Cube Parameters: Fall 2011, Degree Type = Undergraduate; AssocOrg = blank (to exclude PEYs); Measure = Headcount. Faculty Total does not include teaching done for Engineering by extra-divisional units (especially Arts & Science departments). Results are not adjusted for departmental contributions to shared first-year curriculum, Engineering Science or Engineering minors. FTE faculty counts are derived from 2012–2013 (FY13) budget calculations, based on data from 2011–2012. Calculation includes tenured/tenure-stream and lecturers/teaching stream faculty. |
| 17 | 1.11  | <b>Undergraduate Course Teaching Evaluations by Academic Area, 2005–2006 to 2011–2012</b><br>Course evaluation average scores are based on data obtained from the Office of the Registrar, Faculty of Applied Science & Engineering, which administers the evaluations. Data shown here summarizes the results of Question #16 that asks students for their overall rating of the instructor as a teacher.                                                                                                                                                                                                                                                                                                                                                                                                    |
| 18 | 1.12a | <b>PEY Internship Placements for Engineering Undergraduates with Percentage Participation from Previous Third-Year Class, 2004–2005 to 2011–2012</b><br>Statistics provided by Assistant Director, Engineering Career Centre, Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 18 | 1.12b | <b>Canadian and International PEY Internship Placements for Engineering Undergraduates, 2004–2005 to 2011–2012</b><br>Statistics provided by Assistant Director, Engineering Career Centre, Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 19 | 1.13a | <b>Undergraduate Participation in Summer Research Opportunities, 2009–2010 to 2011–2012</b><br>Information regarding Canadian placements provided by each department and division within the Faculty of Applied Science & Engineering. International placement statistics provided by the University of Toronto's Centre for International Experience.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 19 | 1.13b | <b>Undergraduate Participation in Summer Research Opportunities, 2011–2012</b><br>Information regarding Canadian placements provided by each department and division within the Faculty of Applied Science & Engineering. International placement statistics provided by the University of Toronto's Centre for International Experience.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 19 | Text  | <b>Pre-University Engineering Outreach</b><br>Information and statistics provided by Associate Director, Engineering Student Outreach Office, Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 20 | Text  | <b>Student Clubs and Teams</b><br>Information from the Engineering Society: <a href="http://www.skule.ca">www.skule.ca</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Chapter 2: Graduate Studies

|    |      |                                                                                                                                                                                                                                                                                  |
|----|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22 | 2.1a | <b>Applications, Offers, Registrations, Selectivity and Yield of Graduate Students, 2002–2003 to 2011–2012</b><br>All data from annual Admission & Registration Statistics reports published by the School of Graduate Studies.                                                  |
| 23 | 2.1b | <b>Applications, Offers, Registrations, Selectivity and Yield of Graduate Students by Degree Type, 2002–2003 to 2011–2012</b><br>All data from annual Admission & Registration Statistics reports published by the School of Graduate Studies.                                   |
| 24 | 2.2a | <b>International and Domestic Graduate Students by Degree Type, 2002–2003 to 2011–2012</b><br>Student counts for fall terms from U of T Graduate Enrolment Reporting Cube. Excludes special status students. Cube Parameters: All Fall Terms for 2002–2011, Measure = Headcount. |

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| 24 | 2.2b | <b>Graduate Students by Degree Type and Gender, 2002–2003 to 2011–2012</b><br>Student counts for fall terms from U of T Graduate Enrolment Reporting Cube. Excludes special students. Cube Parameters: All Fall Terms for 2002–2011; Measure = Headcount.                                                                                                                                                                                                                                                                                                                                                                      |
| 25 | 2.2c | <b>Enrolment by Full-Time Equivalent (FTE) and Headcount (HC) by Academic Area, 2002–2003 to 2011–2012</b><br>All enrolment counts are from U of T Graduate Enrolment Reporting Cube. Cube Parameters: Measure = Headcount or Total FTE (UAR). Headcounts are reported for all fall terms for 2002–2011. FTEs are counted by academic year as reported in the cube (May to April).                                                                                                                                                                                                                                             |
| 26 | 2.2d | <b>Graduate Students: International, Domestic and Eligible Full-Time Equivalent (EFTE), 2002–2003 to 2011–2012</b><br>EFTE and headcount for fall terms from U of T Graduate Enrolment Reporting Cube. Cube Parameters: All Fall terms for 2002–2011, Measure = Headcount or Eligible FTE.                                                                                                                                                                                                                                                                                                                                     |
| 26 | 2.3  | <b>Full-Time Equivalent (FTE) Graduate Student-Faculty Ratios by Academic Area and Degree Type, 2011–2012</b><br>Number of FTE graduate students from U of T Graduate Enrolment Reporting Cube. Cube Parameters: Fall 2011; Measure = Total FTE (UAR). Excludes students with special status. The number of graduate students per department is adjusted as per the budget calculation for inter-departmental graduate student supervision. Number of faculty included in the calculation provided by Assistant Dean, HR & Diversity, Faculty of Applied Science & Engineering (based on HRIS and published lists of faculty). |
| 27 | 2.4a | <b>External Graduate Student Scholarships by Source, 2001–2002 to 2010–2011</b><br>All data from U of T Graduate Student Income Reporting Cube, current as of September 2011 (includes complete 2010–2011 academic year). Faculty = Faculty of Applied Science & Engineering. Award Income only.                                                                                                                                                                                                                                                                                                                               |
| 27 | 2.4b | <b>Number of NSERC Graduate Student Scholarship Recipients by Academic Area, 2001–2002 to 2010–2011</b><br>All data from U of T Graduate Student Income Reporting Cube, current as of September 2011 (includes complete 2010–2011 academic year). Faculty = Faculty of Applied Science & Engineering. Award Income only. Source = Federal — Natural Sciences and Engineering Research Council. Measure = Student Count.                                                                                                                                                                                                        |
| 28 | 2.5a | <b>Graduate Student Funding by Category, 2002–2003 to 2011–2012</b><br>All data from U of T Graduate Student Income Reporting Cube, current as of May 2012. Reported by fiscal year (May to April). Faculty = Faculty of Applied Science & Engineering. Includes funding from all sources except work-study employment income.                                                                                                                                                                                                                                                                                                 |
| 28 | 2.5b | <b>Graduate Student Funding by Category and Academic Area, 2011–2012</b><br>All data from U of T Graduate Student Income Reporting Cube, current as of May 2012. Reported by fiscal year (May to April). Faculty = Faculty of Applied Science & Engineering. Includes funding from all sources except work-study employment income.                                                                                                                                                                                                                                                                                            |
| 29 | 2.6  | <b>Number of Students Fast-Trackered from MASc to PhD by Academic Area, 2006–2007 to 2010–2011</b><br>All data from ROSI 4FF downloads (Student Registrations). Fast-tracked students are identified by POST codes that end in 'PHD U.'                                                                                                                                                                                                                                                                                                                                                                                        |
| 29 | 2.7  | <b>Time to Graduation for PhD, MASc, MEng and MHSc Graduate Students, 2002–2003 to 2011–2012</b><br>All data from ROSI 4BEA downloads, originally created for Ontario Council of Graduate Studies (OCGS) reporting purposes. The data reflects median values based on the total number of terms in which a student is registered. Leaves, lapses and (in most cases) the term in which the convocation occurs are excluded. Where a student is fast-tracked from the MASc into a PhD, the total time for both programs is counted. Full-time and part-time MEng students are distinguished for greater clarity and accuracy.   |
| 30 | 2.8  | <b>Graduate Degrees Awarded by Degree Type and Gender, 2002–2003 to 2011–2012</b><br>All data from ROSI 5EA download (Graduated Students); Faculty = Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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|----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 31 | 2.9  | <b>ELITE Certificates Awarded, 2008–2009 to 2011–2012</b><br>Information provided by Faculty Graduate Coordinator, Vice-Dean Graduate Studies Office, Faculty of Applied Science & Engineering. |
| 31 | 2.10 | <b>MEng, SCFI Program Enrolment, Fall 2008 to Winter 2012</b><br>Information provided by Graduate Program Administrator, Department of Mechanical & Industrial Engineering.                     |

### Chapter 3: Research

|    |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 34 | Text | <b>Selected Research Highlights for 2011–2012</b><br>Information provided by Vice-Dean Research, Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 36 | 3.1a | <b>Research Funding by Year and Source and Funding per Faculty Member, 2001–2002 to 2010–2011</b><br>Data from the U of T Research Cube. Current as of August 2012. Organized by grant year (e.g., 2010–2011 = April 2010 to March 2011 = Grant Year 2011). Faculty = Applied Science & Engineering. Categories as defined in footnote to Figure 3.1a. Number of faculty included in the calculation provided by Assistant Dean, HR & Diversity, Faculty of Applied Science & Engineering (based on HRIS and published lists of faculty). Includes tenured and tenure-stream faculty only. |
| 37 | 3.1b | <b>Breakdown of Research Infrastructure Funding vs. Research Operating Funding, 2001–2002 to 2010–2011</b><br>Data from the U of T Research Cube. Current as of August 2012. Organized by grant year. Faculty = Applied Science & Engineering. Infrastructure funding includes the Canada Foundation for Innovation (except the CFI Career Award), the Ontario Research Fund (ORF) and the NSERC Research Tools and Instruments (RTI) Program.                                                                                                                                             |
| 37 | 3.1c | <b>Canadian Institutes of Health Research (CIHR) and Natural Sciences and Engineering Research Council (NSERC) Funding, 2001–2002 to 2010–2011</b><br>Data from the U of T Research Cube. Current as of August 2012. Organized by grant year (e.g., 2010–2011 = April 2010 to March 2011 = Grant Year 2011). Faculty = Faculty of Applied Science & Engineering.                                                                                                                                                                                                                           |
| 38 | 3.2a | <b>Natural Sciences and Engineering Research Council (NSERC) Funding, 2010–2011</b><br>Data from the U of T Research Cube. Current as of August 2012. Organized by grant year (e.g., 2010–2011 = April 2010 to March 2011 = Grant Year 2011). Faculty = Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                          |
| 39 | 3.2b | <b>NSERC Industrial Partnership Funding by Program, 2001–2002 to 2010–2011</b><br>Data from the U of T Research Cube. Current as of August 2012. Organized by grant year (e.g., 2010–2011 = April 2010 to March 2011 = Grant Year 2011). Faculty = Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                               |
| 40 | 3.2c | <b>Industrial Partnerships as a Proportion of Total NSERC Funding, 2001–2002 to 2010–2011</b><br>Data from the U of T Research Cube. Current as of August 2012. Organized by grant year (e.g., 2010–2011 = April 2010 to March 2011 = Grant Year 2011). Faculty = Faculty of Applied Science & Engineering.                                                                                                                                                                                                                                                                                |
| 41 | 3.2d | <b>Industrial Partnerships, 2011–2012</b><br>Data comes from a combination of the U of T Research Information Systems (RIS) for the 2011–2012 fiscal year and information provided by U of T Engineering departments, divisions and institutes.                                                                                                                                                                                                                                                                                                                                            |
| 42 | 3.3a | <b>Canadian Peer Universities vs. University of Toronto Share of NSERC Funding for Engineering, Cumulative Five-Year Share, 2007–2008 to 2011–2012</b><br>All data from NSERC Award Search Engine: <a href="http://www.outil.ost.uqam.ca/CRSNG/Outil.aspx?Langue=Anglais">www.outil.ost.uqam.ca/CRSNG/Outil.aspx?Langue=Anglais</a> . Grants only (no scholarships). Organized by grant year. Does not include Canada Research Chairs, Networks of Excellence or Indirect Costs of Research.                                                                                               |
| 42 | 3.3b | <b>U of T Annual Share of NSERC Funding in Engineering, 2002–2003 to 2011–2012</b><br>All data from NSERC Award Search Engine: <a href="http://www.outil.ost.uqam.ca/CRSNG/Outil.aspx?Langue=Anglais">www.outil.ost.uqam.ca/CRSNG/Outil.aspx?Langue=Anglais</a> . Grants only (no scholarships). Organized by grant year. Does not include Canada Research Chairs, Networks of Excellence or Indirect Costs of Research.                                                                                                                                                                   |

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|--------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 42                                                     | 3.4a | <b>Engineering Invention Disclosures by Academic Area, 2007–2008 to 2011–2012</b><br>Report of U of T Commercialization Indicators, including a supplement for the Faculty of Applied Science & Engineering, provided by the Office of the Vice President, Research. Data current as of May 1, 2012. |
| 43                                                     | 3.4b | <b>U of T Invention Disclosures by Faculty, 2011–2012</b><br>Report of U of T Commercialization Indicators, including a supplement for the Faculty of Applied Science & Engineering, provided by the Office of the Vice President, Research. Data current as of May 1, 2012.                         |
| 43                                                     | 3.4c | <b>U of T Patent Applications by Faculty, 2011–2012</b><br>Report of U of T Commercialization Indicators, including a supplement for the Faculty of Applied Science & Engineering, provided by the Office of the Vice President, Research. Data current as of May 1, 2012.                           |
| 44                                                     | 3.5  | <b>Distribution of Research Funding by Academic Area, 2001–2002 to 2010–2011</b><br>Data from the U of T Research Cube. Current as of August 2012. Organized by grant year. Faculty = Faculty of Applied Science & Engineering.                                                                      |
| <b>Chapter 4: Cross-Faculty Education and Research</b> |      |                                                                                                                                                                                                                                                                                                      |
| 46                                                     | Text | <b>Selected Cross-Faculty Education and Research Initiatives</b><br>Information provided by the Directors of IMDI and CSE.                                                                                                                                                                           |
| 47                                                     | Text | <b>Collaborative Milestones</b><br>Information taken from <i>The Engineering Newsletter</i> , Faculty of Applied Science & Engineering.                                                                                                                                                              |
| 48                                                     | 4.1  | <b>Undergraduate Enrolment in Engineering Minors, 2007–2008 to 2011–2012</b><br>Information provided by the Cross-Disciplinary Programs Office, Faculty of Applied Science & Engineering                                                                                                             |
| 49                                                     | Text | <b>Engineering Entrepreneurship</b><br>Information provided by Acting Director, The Entrepreneurship Hatchery, the Cross-Disciplinary Programs Office, and taken from <i>The Engineering Newsletter</i> , Faculty of Applied Science & Engineering.                                                  |
| <b>Chapter 5: Awards and Honours</b>                   |      |                                                                                                                                                                                                                                                                                                      |
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