

2018

ANNUAL REPORT

PERFORMANCE INDICATORS



UNIVERSITY OF
TORONTO

Engineering

U of T Engineering by the Numbers 2017–2018



145

years since the Faculty was established in 1873

7

degrees offered, including 2 undergraduate and 5 graduate degrees

25+

multidisciplinary research centres

18

buildings make up the Faculty's footprint, including the new Myhal Centre for Engineering Innovation & Entrepreneurship

U of T Engineering Community

5,298

undergraduate students (ch.1)

2,415

graduate students (ch.2)

260

faculty (ch.9)

322

administrative and technical staff (p.9)

50,000+

alumni worldwide (ch.7)

100+

countries our students and faculty call home (ch.1)

Research & Innovation

120

chairs and professorships (ch.3)

400+

industrial research partners worldwide (ch.3)

\$35.3M

in Tri-Agency funding (ch.3)

8

NSERC CREATE grants (ch.3)

140+

spinoff companies since 1980 (appendix F)

27

new projects awarded through Dean's Strategic Fund (ch.11)

Transdisciplinary and Experiential Education

9

undergraduate programs and 8 Engineering Science majors (ch.1)

19

undergraduate minors and certificates (ch.9)

3

cross-Faculty Collaborative Specializations for graduate students (ch.2)

10+

MEng emphases (ch.2)

12,880

applicants to undergraduate studies (ch.1)

1,065

undergraduates in first year (ch.1)

40.2%

women in first year of undergraduate studies (ch.1)

93.2%

mean entering average of incoming Ontario students (ch.1)

160+

partner universities offering study-abroad opportunities (ch.9)

100+

student-run engineering clubs and teams (appendix A)

300+

companies hired 779 undergraduate students through the Professional Experience Year Co-op Program (ch.4)

Message from the Dean

It is my privilege to present our 2018 Annual Report of Performance Indicators, highlighting our achievements and initiatives over the 2017–2018 academic year — the first of our *Academic Plan 2017–2022*.

Our Faculty reached a significant milestone this spring with the opening of the Myhal Centre for Engineering Innovation & Entrepreneurship, which maximizes prime space on campus for research collaboration and active, experiential learning both inside and outside the classroom. The support we received from the province, the University and our students, donors and alumni demonstrates their confidence in our Faculty to continue on its impressive trajectory as Canada's top-ranked engineering school, and among the best in the world. The Faculty's newest building launches the next era in engineering education and research, and embodies the collaborative spirit of our community, fostering greater interaction among students, staff, faculty, alumni and partners in industry and government. Its technology-enhanced active learning spaces, prototyping facilities and flexible design studios will spark impactful collaborations, initiatives and startups. The Myhal Centre also features dedicated space for clubs, teams and musicians that enrich our student experience — from the Skule™ Orchestra to the Human Powered Vehicles Design Team, which this year won the World Human Powered Speed Challenge in Battle Mountain, Nevada.

The Myhal Centre houses multidisciplinary research institutes and centres, such as the Centre for Global Engineering, the Troost Institute for Leadership Education in Engineering, and the Institutes for Sustainable Energy, Robotics & Mechatronics and Water Innovation. Through these and others, we leverage our strengths in strategic areas, including sustainability, human health and data analytics, to improve the quality of life for people around the world and to create technologies and products that drive economic and social prosperity. This year, we also launched the Institute for Studies in Transdisciplinary Engineering Education and Practice (ISTEP), which brings together people and programs from across — and beyond — our Faculty to support the development of engineering pedagogies among faculty, and to foster professionalism, effective communication, leadership, global fluency and lifelong learning among our students.

In 2017–2018 we further expanded opportunities for our students to customize their degree paths and collaborate across disciplines. We welcomed the first students into our undergraduate minor in Advanced Manufacturing



and certificate in Forensic Engineering, and launched an MEng emphasis in Analytics. This fall, we will launch our Engineering Science major in Machine Intelligence — the first of its kind in Canada — as well as our undergraduate minor in Music Performance and certificate in Music Technology, created in collaboration with the Faculty of Music.

U of T Engineering strives to create an inclusive community that embraces and celebrates all perspectives, and we continue to strengthen diversity among our students, staff and faculty. For the second year in a row, more than 40% of our incoming undergraduates were women, and we are on track to maintain a similar percentage in September 2018. We are advancing Engineers Canada toward its objective of 30% female representation among newly licensed engineers by 2030. We are also leading in the calls to action made by U of T's Truth and Reconciliation Steering Committee. Through our Eagles' Longhouse and the appointments of Dean's advisors on Indigenous and Black inclusivity initiatives, we aim to ensure that our Faculty and our profession reflect the rich diversity of the society we serve.

I take tremendous pride in all that we have accomplished together this past year. We know there is still more to be done, and our Academic Plan 2017–2022 lays out an ambitious vision for deepening our culture of excellence, inclusion, innovation and creativity over the next five years.

Cristina Amon, Dean

Faculty Leadership, 2017–2018

Dean

Cristina Amon

Vice-Dean, Graduate Studies

Julie Audet

Vice-Dean, Undergraduate

Thomas Coyle

Vice-Dean, Research

Ramin Farnood

Associate Dean, Cross-Disciplinary Programs

Bryan Karney

Vice-Dean, First Year

Micah Stickel

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

Christopher Damaren

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

Warren Chan

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

Grant Allen

Chair, Department of Civil & Mineral Engineering

Brent Sleep

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

Farid Najm

Chair, Division of Engineering Science

Deepa Kundur

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

Jun Nogami

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

Markus Bussmann

Assistant Dean, Administration

Lisa Camilleri

Chief Financial Officer

Brian Coates

Executive Director, Communications

Catherine Riddell

Faculty Registrar

Don MacMillan

Note: To view the full organizational chart, please visit: www.uoft.me/FASEleadership.

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Summary of Academic Plan Goals, 2017–2022

The Academic Plan defines our Faculty's priorities and objectives for a five-year period. Over the course of our last plan from 2011 to 2016, we made tremendous progress toward achieving, and in many cases surpassing, our ambitious goals.

On December 12, 2017, the Faculty approved the Academic Plan 2017–2022 (www.uoft.me/FASEAcademicPlanning), which outlines our strategic goals in key areas as described in this section.

In December 2018, we will issue our first report on progress and achievements under this plan.

Transformative Teaching and Learning

Admission to our programs is highly competitive and we attract some of the brightest students from across Canada and around the world. Through both curricular and co-curricular activities, we enable these students to develop a strong technical foundation as well as key engineering competencies such as leadership, communication, entrepreneurship, multidisciplinary collaboration and global fluency.

Over the next five years, we will:

- Establish U of T Engineering as a global leader in pedagogical development and teaching innovation in engineering education.
- Continue to develop rich opportunities for experiential learning and professional development for undergraduate and graduate students, including interdisciplinary fluency and working effectively and collaboratively across cultures.
- Further integrate active learning pedagogies into curriculum delivery to encourage lifelong learning and knowledge creation.
- Prepare students with the technical and transdisciplinary competencies necessary for them to identify, learn and apply these along with engineering practices to resolve global challenges, create new technologies and contribute to the prosperity of society.
- Leverage the Myhal Centre for Engineering Innovation & Entrepreneurship's state-of-the-art facilities, as well as instructional technology tools, to further enrich our student experience through active learning, engineering design, prototyping and collaborative, multidisciplinary projects.
- Attract diverse, outstanding students from a wide range of backgrounds; and leverage all types of diversity to promote inclusivity and create opportunities to experience working collaboratively across cultures.
- Ensure U of T Engineering remains a leader in the promotion and support of research training for graduate and undergraduate students.

Student Experience

We are dedicated to providing an unparalleled experience that speaks to the diversity and international outlook of our students, while enhancing our culture and pursuit of excellence. Through comprehensive support systems for academic advising, mental wellness and healthy lifestyles, we ensure that our students are prepared to thrive — academically, personally and professionally.

Over the next five years, we will:

- Create a Centre for Engineering Student Success — a “one stop” point of access for information, resources and assistance.
- Encourage all undergraduate students to participate in a significant co-curricular experience and enhance programs to further undergraduate professional development; increase the number and diversity of PEY Co-op positions, summer research internships and international experiences.
- Improve the quality, accessibility and delivery of academic advising services.
- Leverage and create resources, and develop policies and procedures to support mental wellness, assist students in need and promote healthy lifestyles.
- Build on the pilot professional development program for PhD students, expand to all graduate students and promote industrial interactions.
- Encourage participation and support co- and extra-curricular student activities, such as the competitive student design teams and other student clubs and groups.
- Ensure that infrastructure (space and IT) supports are in place to facilitate collaboration and innovation within student teams and clubs.
- Support deeper engagement and community among graduate and undergraduate students, in addition to enhanced faculty-student interaction across undergraduate and graduate programs.
- Equip students, staff and faculty with the competencies necessary to navigate cross-cultural communications and interactions, thereby creating an enriching, inclusive environment where everyone will excel and flourish.

Innovative Research and Entrepreneurship

Our vibrant research community is defined by creativity, multidisciplinary collaboration, innovation and entrepreneurship. The world-class research we produce addresses critical challenges and creates new technologies in a wide variety of fields, from human health to sustainability to smart cities. Maintaining our track record of excellence in research, we continue to attract the most talented students and professors from around the world.

Our goals for research and entrepreneurship fall into four subcategories:

Research Excellence

- Increase our support for transformative cross-disciplinary collaborative research that inspires innovation.
- Continue fostering multidisciplinary collaborative research and education so it becomes an integral part of our culture.
- Lead impactful multi-institutional research collaborations in strategic areas that will address local and global needs, in addition to creating new technologies that will act as an engine of prosperity and economic development.
- Create a vibrant research ecosystem, which is nurturing, collaborative and inclusive, with centres/institutes focusing on impactful priority areas.
- Expand our mentorship programs for early-career researchers.
- Increase our reputation and visibility, and be recognized for excellence and the impact of our contributions.

International Outreach

- Enhance our impact through international institutional

and industry research co-operation that addresses global challenges.

- Increase our leadership and participation in internationally significant and impactful projects.
- Develop/expand faculty and research student international mobility programs (e.g. Named Opportunities for Visiting Professors) and highly qualified personnel (HQP) international exchange capacity to educate and prepare the next generation of global leaders.

Industry and Entrepreneurship

- Strengthen our research impact via the translation of basic discovery to application through increased industry partnerships and support for entrepreneurship initiatives.

Infrastructure and Space

- Create a forward-looking plan for our research space and infrastructure renewal, both in quality and quantity.
- Devise and implement a sustainable model for research support and for the operation of major research infrastructure.

Influence, Collaboration and Partnerships

Partnering with organizations, industrial collaborators and peer institutions locally and worldwide enables us to create outstanding opportunities for knowledge exchange between the Faculty and industry through student internships and multidisciplinary initiatives. How effectively we connect with these stakeholders has an important impact on our ability to attract the brightest students and faculty members, address complex engineering challenges and create new technologies for global prosperity.

Over the next five years, we will:

- Inspire and influence education and learning in science, technology, engineering and math (STEM) for K-12, while enhancing the student experience for undergraduate and graduate students.
- Create connections within our community to enrich the City and the University.
- Strengthen the relationship with alumni and increase interactions between alumni and current students.
- Foster a stronger sense of community with alumni and donors who volunteer and provide philanthropic support to the Faculty.
- Continue nurturing cross-disciplinary collaborations with other University of Toronto faculties.
- Develop strategic partnerships with key institutions and industry (local, national and international).
- Increase the Faculty's impact through advocacy to — and support from — government agencies and industry; contribute to shaping the Canadian and global research agenda by influencing federal and provincial R&D priorities.
- Raise the profile of the Faculty by actively participating in and providing leadership to professional societies, editorial boards and external research committees.
- Provide outstanding leadership and influence for excellence in education.
- Monitor and measure the impact of the Faculty's outreach, collaboration and partnerships.

Organization and Strategic Resources

We effectively and strategically use our resources — financial, physical and human — to advance our innovation in research, support faculty and staff, and create an extraordinary learning environment for our students. Strategic investment, such as the creation of the Myhal Centre for Engineering Innovation & Entrepreneurship, has put us in an excellent position, and our goals for the future build on this achievement, leveraging its extraordinary spaces to enhance our impact in research and education.

Over the next five years, we will:

- Expand opportunities for staff development to address the evolving needs of our Faculty, to provide appropriate tools to increase effectiveness and to create innovative approaches for staff advancement.
- Emphasize diversity and cross-disciplinary strategic research themes when recruiting faculty and become a magnet for world-class talent.
- Continue to enhance teaching and design facilities, improve laboratory and research space and provide co-curricular space for undergraduate and graduate students.
- Strengthen our network of faculty, staff, students and alumni for the betterment of the Faculty and our broader community.
- Continue to increase the quality of our communications and key messaging, and increase the Faculty's visibility to target audiences.
- Create a base level of IT services across the Faculty and enhance professional development for staff and faculty in the use of new technologies.
- Ensure operating budgets, capital plans and fundraising continue to align with our academic mission and priorities, and invest strategically for the future.

Comparison of U of T Engineering with Ontario and Canada, 2017–2018

The table below compares U of T Engineering metrics against those of engineering Faculties in Ontario and across Canada for 2017–2018. Within Canada, we awarded 7.3% of all undergraduate engineering degrees, 10.0% of all engineering master’s degrees and 10.7% of all engineering doctoral degrees this past year.

Our internationally renowned scholars have received the single largest proportion of major awards (21.3%) and Natural Sciences and Engineering Research Council (NSERC) engineering funding (10.0%) in 2017–2018, despite comprising only 6.2% of Canada’s tenured and tenure-stream engineering professors.

	U of T Engineering	Ontario	U of T % of Ontario	Canada	U of T % of Canada
Undergraduate					
Enrolment (FTE)	4,553	36,521	12.5%	81,172	5.6%
% Women	32.0%	22.7%		23.9%	
Degrees Awarded	1,116	7,127	15.7%	15,283	7.3%
% Women	25.1%	21.4%		20.6%	
Master's (MEng, MAsC and MHSc)					
Enrolment (FTE)	1,246	7,319	17.0%	16,926	7.4%
Degrees Awarded	676	3,494	19.3%	6,781	10.0%
% Women	25.6%	25.0%		25.4%	
Doctoral (PhD)					
Enrolment (FTE)	840	3,718	22.6%	10,576	7.9%
Degrees Awarded	178	796	22.4%	1,660	10.7%
% Women	26.4%	23.0%		23.4%	
Faculty					
Tenured and Tenure-Stream	234	1,593	14.7%	3,760	6.2%
% Women	20.1%	15.5%		14.8%	
Major Awards					
Major Awards Received	16	33	48.5%	75	21.3%
Research Funding					
NSERC Funding for Engineering	\$32.3M	\$136.4M	23.7%	\$321.4M	10.0%

Note: Unlike data contained in the rest of this report, enrolment (Full-time Equivalent, or FTE) and degrees awarded are based on the 2017 calendar year. Faculty data is current as of November 2017. NSERC research funding is based on the 2017–2018 grant year (April to March).

Comparison of U of T Engineering with St. George Campus and University of Toronto, 2017–2018

The following chart compares U of T Engineering with the University of Toronto based on key metrics for 2017–2018. Since our activities are concentrated on the St. George campus, we also present our relative metrics where available.

	U of T Engineering	St. George Campus	Engineering % of Campus	University of Toronto	Engineering % of U of T
Student Enrolment					
Undergraduate	5,298	38,555	13.7%	65,991	8.0%
Professional Master's (MEng and MHSc)	899	8,057	11.2%	8,601	10.5%
Research Master's (MAsc)	670	3,150	21.3%	3,287	20.4%
Doctoral (PhD)	846	5,933	14.3%	6,279	13.5%
All Students	7,713	55,695	13.8%	84,158	9.2%
Degrees Awarded					
Undergraduate	1,052	7,997	13.2%	12,642	8.3%
Professional Master's (MEng and MHSc)	490	3,718	13.2%	4,038	12.1%
Research Master's (MAsc)	226	1,288	17.5%	1,350	16.7%
Doctoral (PhD)	165	918	18.0%	966	17.1%
Total Degrees	1,933	13,921	13.9%	18,996	10.2%
Faculty and Staff					
Professoriate	260			3,075	8.5%
Administrative and Technical Staff	322			7,224	4.5%
Research Funding					
Sponsored Research Funding	\$80.6M			\$487.8M	16.5%
Industry Research Funding	\$8.6M			\$20.6M	41.4%
Space					
Space (NASMs)	70,933	648,072	10.9%	847,988	8.4%
Revenue					
University-wide Costs	\$70.4M			\$551.5M	12.8%
Total Operating Revenue	\$222.0M			\$2,095.6M	10.6%

Note: Student enrolment is shown as of November 1. Degrees awarded are based on the 2017–2018 academic year. Professoriate includes tenured, tenure-stream and teaching-stream faculty members. Administrative and technical staff includes full- and part-time staff. Research funding is based on the 2016–2017 grant year (April to March). Space is measured in Net Assignable Square Metres (NASMs) and includes the footprint of the Myhal Centre for Engineering Innovation & Entrepreneurship, which officially opened in April 2018. Revenue is based on the 2017–2018 U of T fiscal year (May to April).

Myhal Centre for Engineering Innovation & Entrepreneurship

On April 27, 2018, the U of T Engineering community celebrated the official opening of the Myhal Centre for Engineering Innovation & Entrepreneurship and the remarkable leadership of Dean Cristina Amon. This moment also marked the success of our ambitious philanthropic campaign and launched a new era for engineering education and innovation — one with multidisciplinary collaboration and active, experiential learning at its core. →



Myhal Centre: A bold commitment to engineering innovation

Named in honour of George Myhal (IndE 7T8), his wife Rayla and their family, the building embodies key engineering qualities such as collaboration across disciplines, experiential learning, leadership and entrepreneurship. It includes flexible, technology enhanced active learning spaces, fabrication facilities to support both curricular and co-curricular design projects, and dedicated space for student clubs and teams.

The Myhal Centre was designed by University of Toronto alumnus Robert Davies of Montgomery Sisam Architects in Toronto, in association with Peter Clegg of Feilden Clegg Bradley Studios in England. It features interactive classroom technologies, open-concept spaces for leading-edge laboratories and collaborative spaces for students, faculty, alumni and staff. It is home to leading multidisciplinary research centres and institutes as well as design, fabrication and prototyping facilities. The building offers one of the finest teaching and research environments of any engineering school in the world, fostering entrepreneurship and collaboration among exceptional students and faculty at Canada's #1-ranked engineering school and one of the world's best.

“The Myhal Centre is where tomorrow’s engineering solutions, technologies and industries will be born. Its state-of-the-art facilities will spark new multidisciplinary collaborations, foster rich learning experiences and create further opportunities to enhance how we develop the next generation of global engineering leaders.”

– Cristina Amon, Dean, Faculty of Applied Science & Engineering

Spotlight on the Myhal Family

When Dean Cristina Amon (centre) envisioned this state-of-the-art space in the heart of U of T's St. George campus, George Myhal (right) and his wife, Rayla (left), were immediately taken with the idea, and quickly became two of the project's most ardent champions. To rally support from the broader U of T Engineering community and government, George Myhal took the lead as the chair of the Dean's Campaign Executive Committee.

George credits his professional successes, in part, to the educational opportunities afforded to him after his family emigrated from western Ukraine. When he and Rayla thought about the best way they could give back, it seemed natural to choose U of T Engineering.



The Myhal Centre exceeds many of the Tier 2 Toronto Green Standard performance measures for sustainable site and building design

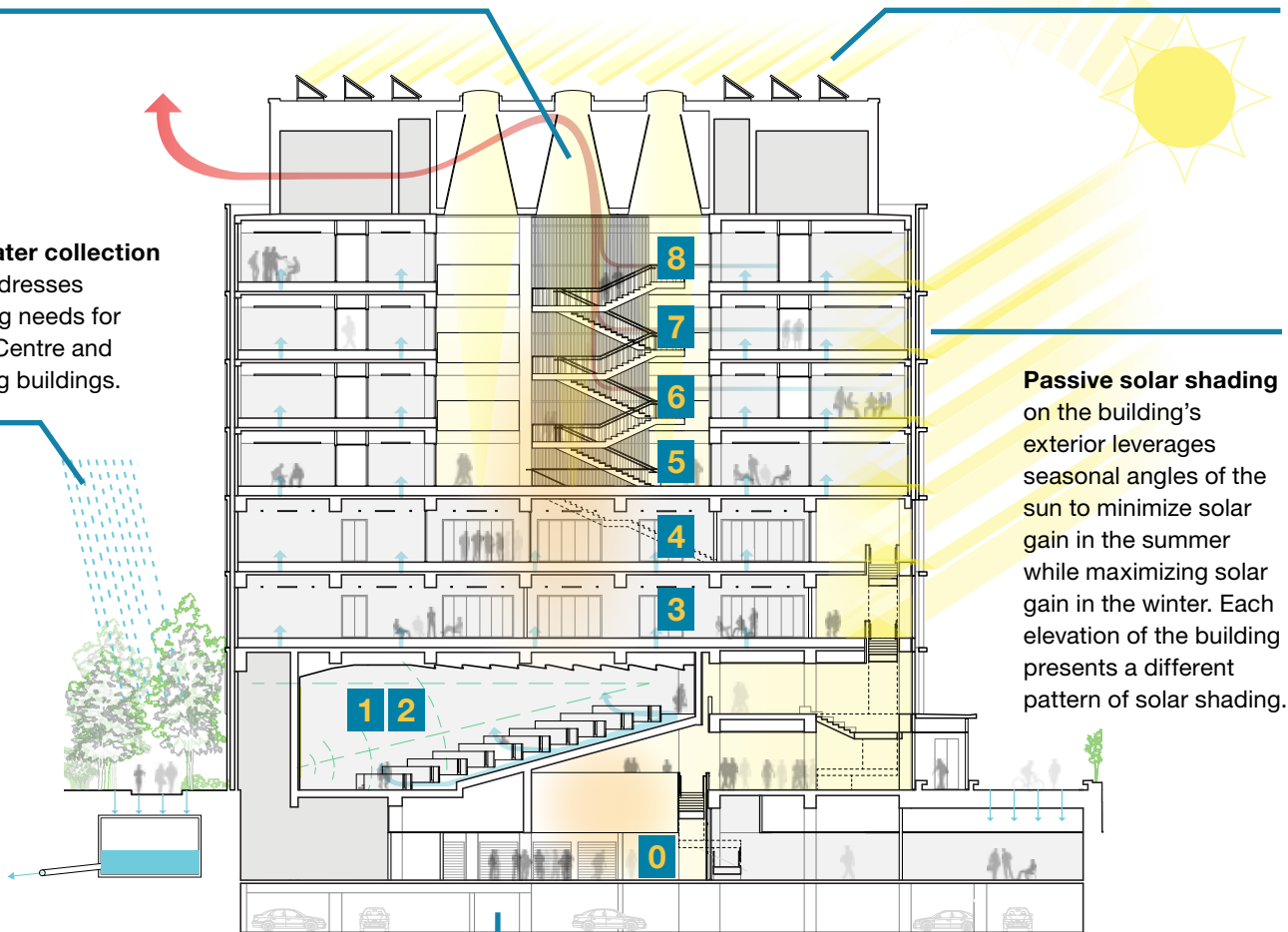
The **advanced air-delivery system** distributes conditioned air from under-floor ducts, conserving cool air when needed and dispelling warm air in the summer.

Rooftop photovoltaic cells harness the sun's energy, generating 70 kWh of electricity annually. Skylights draw natural light deep into the building, reducing dependence on artificial lighting.

The **rainwater collection system** addresses landscaping needs for the Myhal Centre and surrounding buildings.

Passive solar shading on the building's exterior leverages seasonal angles of the sun to minimize solar gain in the summer while maximizing solar gain in the winter. Each elevation of the building presents a different pattern of solar shading.

The **underground parking level** accommodates cars and bicycles.



“U of T Engineering offers an outstanding education. The new building will enable world-class research and education, providing a rich environment for collaboration and excellence. This is critical for 21st-century engineers who are driving innovation in industry, government, academia and beyond. This space will inspire a very bright future for us all.”

– George Myhal (IndE 7T8)

Features of the Myhal Centre by **Level**

0 Versatile student club space

- The **Engineering Society Arena** houses flexible facilities that serve the engineering student clubs, including open work areas, fabrication studios, project storage and meeting rooms.
- The music room provides Skule™ musicians a sound-buffered space to practice. It also supports the undergraduate music performance minor and music technology certificate.
- The **Stewart Blusson Visualization Laboratory** for large data analytics makes use of immersive screen technology.
- A 64-seat computer teaching lab facilitates software instruction.

1 2 World-class event space and auditorium

- The 468-seat **Lee & Margaret Lau Auditorium** is a marquee facility that optimizes audience engagement through group seating, multiple-screen projection and theatre-quality lighting. It contains a number of features to encourage active learning and nimble transitions between lecturing and student interaction, including a data communication system that enables students to share content with the instructor and one another. Several of the auditorium benches and tables are named in honour of alumni, faculty, staff and donors.

3 Technology Enhanced Active Learning Rooms

- Five technology enhanced active learning (TEAL) rooms reside here, each designed to accommodate several scenarios through flexible seating and multiple flat-panel screens:
 - **Singapore Malaysia Alumni TEAL Room**
 - **Taiwan Alumni TEAL Room**
 - **Hong Kong Alumni TEAL Room**
 - **Estate of John Edgar McAllister TEAL Room**
 - **Brookfield TEAL Room**
- Two studios facilitate design innovation: **Fung Family Design Studio** and the **Ron Venter Design Studio**.

4 Design, fabrication and prototype facilities

- This floor features a number of design studios, including the **Dorothy Szymaszek Design Studio, John H. Weber 7T9 Design Studio, William C. Bowman Design Studio** and others.
- The design studios surround a supervised fabrication facility, which includes a rapid prototyping space. The design of this floor enables students to move seamlessly between fabrication facilities and their respective working groups.

5 Multidisciplinary design and robotics

- This level is home to the **U of T Institute for Multidisciplinary Design & Innovation** and **Institute for Robotics & Mechatronics**.
- Supported by an anonymous donor, the **revealed atrium** begins on Level 5. This dramatic, four-level atrium provides exceptional study and event space.
- The atrium is bounded by the **Heuckroth Learning Commons**, the **Bill Buckley Quiet Study Space** and the **Norris Walker 5T7 Robotics Laboratory**, a two-storey space for drone testing and research.
- Level 5 houses the **Sidney Cooper Project Room, James Peers Project Room** and the **Juhan Kalmet Meeting Room**.

6 Industry collaboration and The Entrepreneurship Hatchery

- **The Entrepreneurship Hatchery** (supported by Gerald and Geraldine Heffernan) provides space, equipment and mentorship to student entrepreneurs.
- The **Ajax Alumni Attractor** is an on-campus home for alumni collaborations.
- The **Professional Master's Student Lounge** (supported by Richard Venn) provides a space for MEng students to congregate.
- The Faculty's **Office of Advancement and Alumni Relations** resides on this floor, with space supported by the U of T Engineering Class of 5T3.

- This level contains a number of project rooms:
 - **Adediran Otegbade Project Room**
 - **Dave Liu & Lauren Wu Project Room**
 - **Hatch Project Room**
 - **Wildcat Project Room**
 - **Calgary Alumni Meeting Room**
 - three **Richard Venn Meeting Rooms**

7 Global engineering and leadership education

- Features dedicated space for the **Centre for Global Engineering** (supported by Paul Cadario), the **Troost Institute for Leadership Education in Engineering** (supported by Bill and Kathleen Troost) and the Institute for Studies in Transdisciplinary Engineering Education & Practice. Level 7 is designed to catalyze the next generation of global engineering leaders.
- Several spaces on this floor facilitate collaboration and innovation:
 - **Claire M.C. Kennedy Meeting Room**
 - **C. William Daniel Second Mile Meeting Room**
 - **Frank Milligan Meeting Room**
 - **Murray Metcalfe Project Room**
 - **John E. Akitt Project Room**

8 Dr. Woo Hon Fai Innovation Floor

- The **Dr. Woo Hon Fai Innovation Floor** is named for alumnus Henry Wu's late father who was an influential leader in Hong Kong's business landscape.
- This floor is home to the **Institute for Sustainable Energy**, the **Institute for Water Innovation**, four project rooms, two meeting rooms, the interactive **Dr. Woo Hon Fai Informal Study Space** and the adjacent terrace, which offers a spectacular view of U of T's iconic front campus.
- Level 8 houses project rooms and research areas that facilitate collaboration with industry and academic partners.



Groundbreaking Ceremony, June 2015



Topping Off, May 2017

↑ The platform party including, from left: Ernesto Diaz Lozano Patiño, Engineering Society President (2015-16); Professor Emeritus Ron Venter; Judy Goldring, Chair of the Governing Council; Meric Gertler, U of T President; Michael Wilson, U of T Chancellor; Dean Cristina Amon; George Myhal (IndE 7T8); and Mauricio Curbelo, Engineering Society President (2013-14).

↗ Dean Cristina Amon, centre, and representatives from Montgomery Sisam Architects, Bird Construction and a small group of faculty and staff held a “topping-off” ceremony in May 2017 for the Myhal Centre, following the completion of the building’s uppermost level.

→ Left to right: Professor Jason Bazylak, Dean Cristina Amon and Elder Kim Running Bear McDougall participated in a smudging ceremony for the Myhal Centre in October 2017.



Smudging Ceremony, October 2017



Visit from Governor General and Premier, February 2018

↑ The Myhal Centre received strong support from the provincial government. In February 2018, Premier Kathleen Wynne visited the Myhal Centre and met with students on the Blue Sky Solar Racing team. Later that month, Wynne invited alumna and Governor General Julie Payette (ECE MASc 9T0) to meet with the students and Dean Cristina Amon as part of Payette’s first official visit to Ontario (pictured).



Official Opening, April 2018

↑ Claire Kennedy (ChemE 8T9), Chair of Governing Council, centre, declares the Myhal Centre officially open. She was joined by (from left) U of T Chancellor Michael Wilson, George and Rayla Myhal, Dean Cristina Amon, President Meric Gertler, Engineering Society President Jonathan Swyers (2017-18), as well as more than 200 members of the U of T Engineering community to celebrate the building’s opening on April 27, 2018.

TIME CAPSULE

During the official opening of the Myhal Centre, Faculty and University leaders sealed a time capsule into a wall on Level 1. The capsule is to be opened in 2073 to celebrate the 200th anniversary of engineering education at the University of Toronto. Below are some of the items in the time capsule, each of which represents the traditions and excellence of the U of T Engineering community today.



← Postcard from the Governor General

An inspirational message to future engineering students from Governor General Julie Payette. Payette is an astronaut, musician, athlete — and a U of T Engineering alumna.



↗ Leather Jacket

This iconic garment is worn by many engineering students. Jackets are personalized with the wearer's year, program and patches representing their co-curricular involvement.



← Métis Fire Bag

The fire bag represents the ingenuity and resilience of the Métis people. This bag contains a message from the Eagles' Longhouse, our Indigenous Initiatives Steering Committee. Formed in 2018, the Eagles' Longhouse strives to enhance U of T Engineering's relationship with Indigenous peoples.

→ Tissue Scaffold

This state-of-the-art tissue scaffold engineered in the lab of Professor Milica Radisic (IBBME, ChemE) allows cells to adhere to microscopic biowires at the bottom of each well. These biowires, seeded with specific cell types such as heart or liver, could be implanted in damaged organs or tissues to allow regeneration and repair.



← Iron Ring

Worn by many Canadian-trained engineers, the Iron Ring symbolizes the obligations and ethics associated with the engineering profession. A tradition originating in 1922, the ring is presented to graduating students in a closed ceremony known as *The Ritual of the Calling of an Engineer*.

↘ Microscissors

Developed in the Microrobotics Lab led by Professor Eric Diller (MIE), these prototype microscissors are 2 cm long and made of stainless steel blades connected by a superelastic nitinol wire. They can be controlled by a single magnetic field to manipulate microscale objects.



← Telehex

Invented by entrepreneur Peter Wen (MechE 1T8) during his first year as an undergraduate student, the TeleHex is a unique ultra-light, ultra-compact tool that uses telescoping parts to automatically fit the appropriate key into the sockets that adjust several bicycle parts. Wen designed and launched his product through The Entrepreneurship Hatchery.



← City of Toronto Drinking Water

A vial of Toronto tap water collected from the Drinking Water Research Group's lab.

1

We continue to attract top students from around the world, and our incoming cohort is growing more diverse every year. We received a record number of undergraduate applications in 2017 — more than 12 for each place in our programs. The mean entering average of Ontario secondary school students was 93.2%, matching last year's value for the highest yet. In 2017, women comprised 40.2% of our first-year class and more than one in four entering undergraduates came from outside Canada.

Further enhancing our culture of diversity and inclusion is crucial to the collaboration, creativity and innovation that drive excellence in the engineering profession. Through the Eagles' Longhouse, our Engineering Indigenous Initiatives Steering Committee, and our new Dean's Advisor on Black Inclusivity Initiatives and Student Inclusion & Transition Mentor, we are working to enrich academic experiences for all our students and to increase diversity within our programs and the engineering profession.

We launched a number of new programs in 2017–2018 to further expand the range of opportunities available for our students to customize their degree programs. These included our undergraduate minor in Advanced Manufacturing and certificate in Forensic Engineering, which welcomed their first students in September 2017. We also created an Engineering Science major in Machine Intelligence and, in partnership with the Faculty of Music, a minor in Music Performance and certificate in Music Technology, which will begin in September 2018.

Our professors and graduate students are thought leaders in engineering education and professional development. We enhanced our support for excellence in these areas through initiatives such as the Technology Enhanced Active Learning (TEAL) Fellows Program, the Hart Teaching Innovation Professorships and our newly created Institute for Studies in Transdisciplinary Engineering Education and Practice (ISTEP). (*For more information on ISTEP, see Chapter 4.*)

Active learning and experiential education are also built into our physical spaces. The new Myhal Centre for Engineering Innovation & Entrepreneurship contains flexible design studios, technology enhanced learning spaces and prototyping facilities. It also includes dedicated space for student clubs and teams to store equipment, rehearse and perform music and host events, further enriching our learning environment.

Admissions and First-Year Students

We received 12,880 applications for admission to our programs for September 2017 entry, our highest total yet. This represents an increase of 4.7% from the previous year, and 79.6% since 2008. This rise in applicants has allowed us to be even more selective in terms of our offers of admission, which we provided to 24% of applications in 2017 compared with 43% in 2008. Our yield has remained nearly constant over the past 10 years, fluctuating between 34% to 39%.

Figure 1.1a Applications, Offers, Registrations, Selectivity and Yield of First-Year Undergraduates, 2008 to 2017

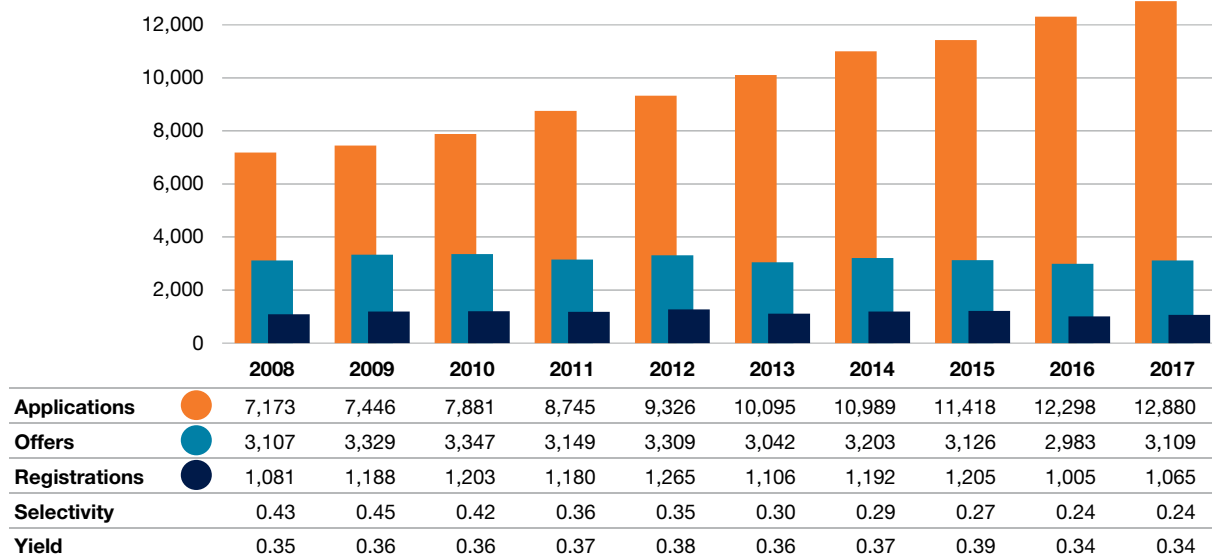
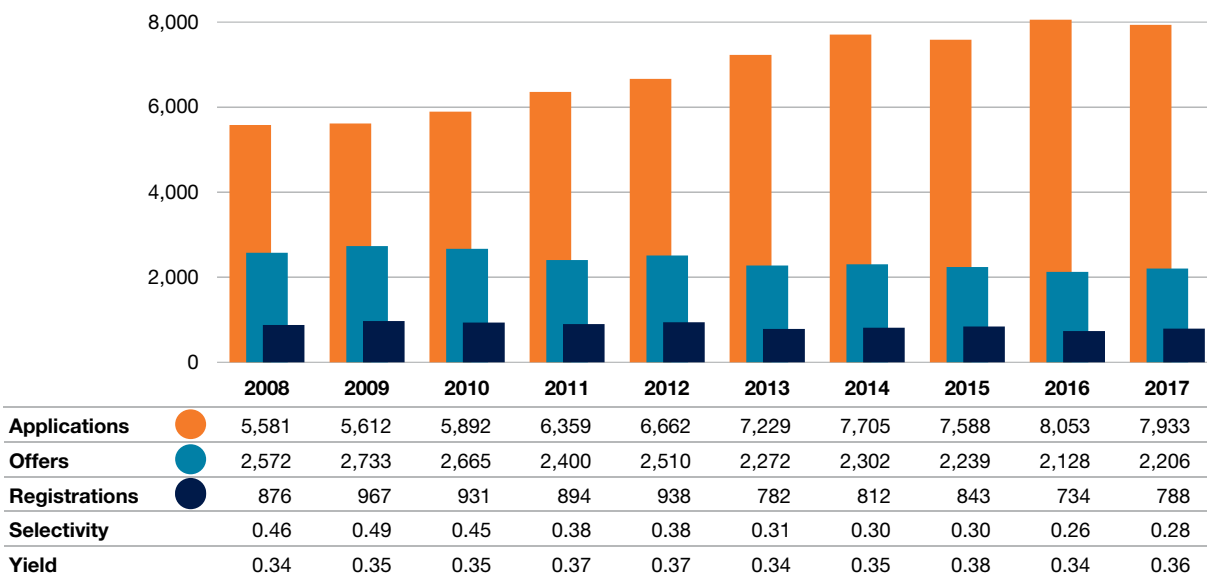


Figure 1.1b Applications, Offers, Registrations, Selectivity and Yield of Domestic First-Year Undergraduates, 2008 to 2017



Data in this chapter are presented by academic year (September to August). Highlights are from July 2017 to June 2018.

Note 1.1a, b, c: Student counts are shown as of November 1. Applications and offers are for the fall admissions cycle.

Selectivity = offers ÷ applications and represents the proportion of applicants who were offered admission. Yield = registration ÷ offers. Domestic students are defined as citizens (living in Canada or abroad) or permanent residents of Canada.

Growing interest from international students is one indication of our strong global reputation and the quality of our research and educational programs. International applications rose 16.5% over the previous year, and have more than tripled over the last decade.

Our admitted students are of the highest calibre, earning prestigious accolades such as the Schulich Leader Scholarships, C. David Naylor University Scholarships, Lester B. Pearson International Scholarships and International Engineering Scholar Awards. Incoming Ontario secondary school students achieved a mean entering average of 93.2%, the

highest in our Faculty’s history for the second year in a row.

We recognize that grades alone do not provide a complete understanding of each applicant’s candidacy, and we have implemented a broad-based admissions process to account for key engineering qualities such as logical thinking, communication skills, adaptability and perseverance. The process includes online videos and written, timed responses that are evaluated by more than 70 trained alumni screeners (increased from 60 the previous year) including many based outside of the Toronto region.

Figure 1.1c Applications, Offers, Registrations, Selectivity and Yield of International First-Year Undergraduates, 2008 to 2017

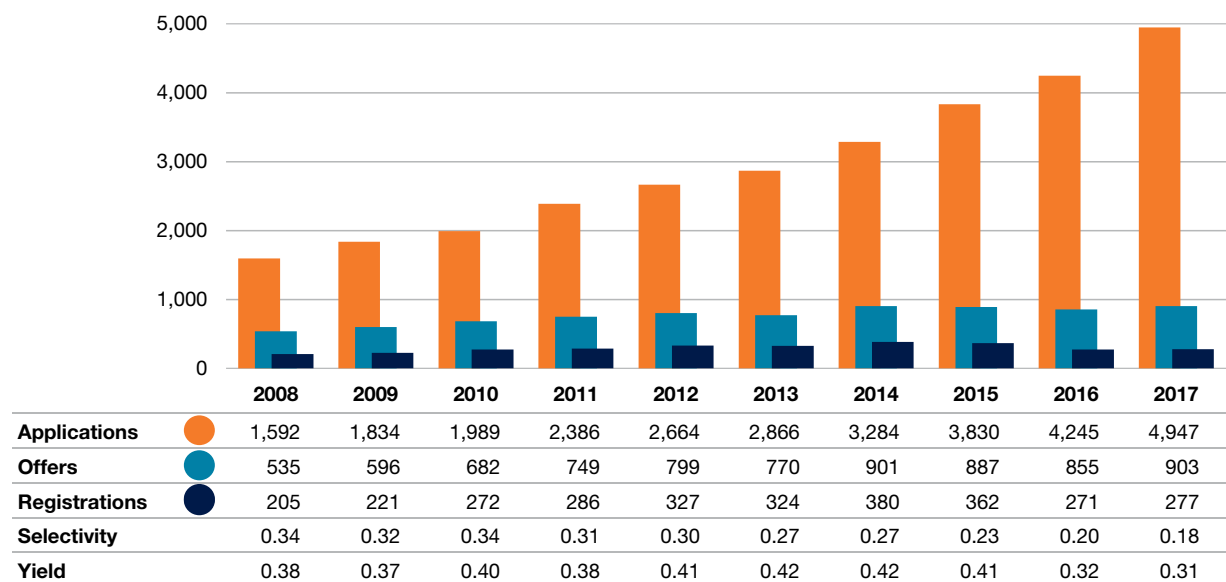
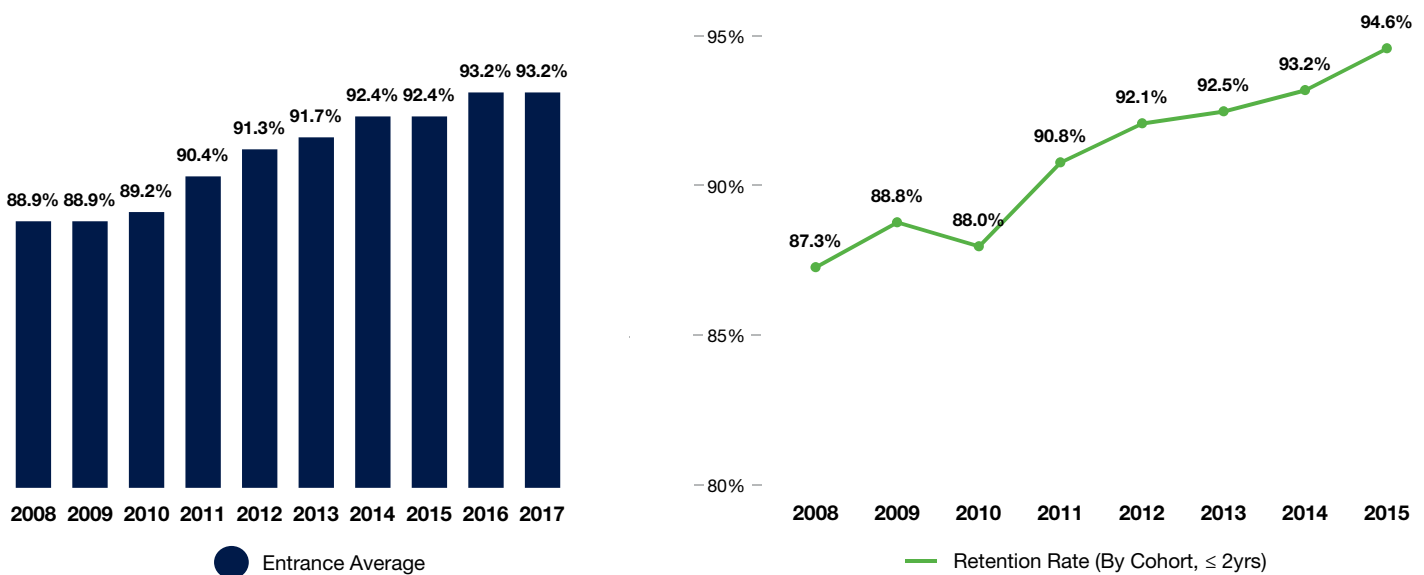


Figure 1.2 Ontario Secondary School Averages of Incoming First-Year Undergraduates and Retention Rate Between First and Second Year, 2008 to 2017



We augment the educational experience of our students with a robust suite of offerings aimed at supporting their success, from embedded academic advisors to peer-assisted study sessions. These initiatives have strengthened our high retention rates: 94.6% of the 2015 cohort continued on to second year, up from 93.2% in the previous cohort.

Our first-year undergraduate population was the most diverse in our history. Women comprised a record 40.2% of first-year students, the highest proportion of any engineering school in Canada, and international students made up 26.0% of our incoming cohort. A further 70 students (8.9% of the domestic cohort) completed their secondary education outside of Canada, but are Canadian citizens and therefore are considered domestic students (See Fig. 1.4).

Our ability to attract students from outside of Canada is enhanced by the Faculty’s Engineering International Scholar Awards, the MasterCard Foundation Scholars Program and the Lester B. Pearson International Scholarships. (For more details, please see Chapter 9: International Initiatives and Chapter 10: Diversity.)

Strategic recruitment events and activities enable us to attract the most accomplished candidates from across Canada and around the world. For the 2017 admissions cycle, key activities included:

- National Recruitment:** We distributed 12,567 *Discover Engineering* viewbooks at the Ontario Universities Fair at the Metro Toronto Convention Centre. We also increased the number of school visits in the Greater Toronto Area to 72 in 2017, up from 66 in 2016. Schools were selected on the basis of historic admission data, with an eye to our enrolment priorities. For the first time this year, we partnered with Youth Science Canada to conduct recruitment activities at the Canada-Wide Science Fair, the largest event of its kind, held May 12–19, 2018. We continued our traditional recruitment drives in Ottawa, Montreal, Vancouver, Calgary, Mississauga and Markham, as well as our participation in U of T’s Fall Campus Day.
- International Recruitment:** We conducted extensive recruitment activities including school visits, applicant events, information sessions, conference presentations and science fair participation in a wide range of countries, including Brazil, India, Turkey and the U.S. New this year: Colombia, Panama and Trinidad & Tobago.

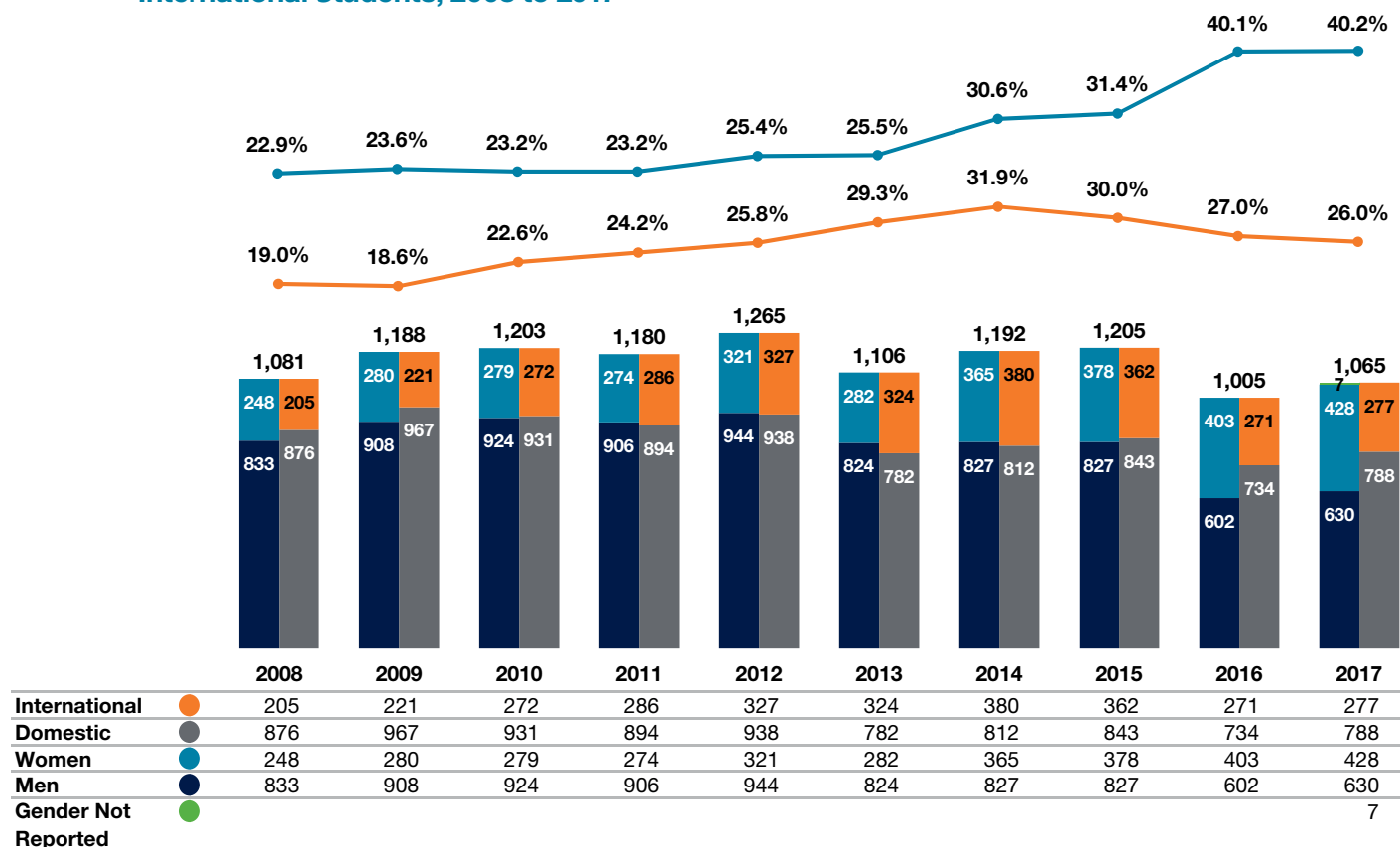
Note 1.2: Entrance average is calculated based on Ontario secondary school students. Retention rate is the proportion of students who successfully move on to second year within a two-year window of when they first enrolled. For example, the 2015 point refers to the proportion of the Sept 2015 entering cohort who had advanced to second year as of Nov 1, 2017.

- **Online Events:** We hosted 10 live-streamed events, panel discussions, live chats and videos throughout the admissions cycle to answer applicants' questions about such topics as application completion, program showcases, PEY Co-op and living on campus. We also piloted a program whereby current students speak online with admitted applicants from key regions.
- **Young Women in Engineering Symposium (YWIES) (May 2017 and May 2018):** For our fourth annual event in May 2017, we shifted our focus from female Grade 12 students early in their final year of high school to female Grade 11 students, enabling us to connect with students earlier in their decision-making process. We attracted 76 top female students from across the Greater Toronto Area to U of T where they learned more about engineering, participated in hands-on workshops and met students, faculty and alumni. Twenty-nine of the attendees ultimately applied to U of T Engineering. Our fifth annual symposium in May 2018 attracted 84 participants.
- **YWIES Red Carpet Overnight Program (November 2017):** New for the 2017–2018 recruitment cycle, this program is open to all YWIES participants, and provides an

opportunity to experience U of T Engineering firsthand by staying in residence and shadowing current women U of T Engineering students. Sixteen prospective women students from the Greater Toronto Area took part.

- **March Break Applicant Event (March 2018):** We hosted more than 650 applicants and their families during this invitation-only open house, which gave them an opportunity to learn more about the Faculty, specific programs, student life and our campus.
- **Engineer for a Day (May 2018):** We piloted this event in 2017 and expanded it in 2018, hosting 48 high-achieving Grade 11 math and science students from four Toronto schools that are typically underrepresented in our applicant pool, enabling them to experience a day in the life of a U of T Engineering student. Attendance was nearly double last year's level of 26.
- **Admitted Student Calling Campaign (March/April 2018):** Current U of T Engineering students reached more than 1,000 applicants from across Canada, the U.S., Mexico, South America and the Caribbean by phone to congratulate them on being offered admission and answer their questions with a focus on student experience.

Figure 1.3 Incoming First-Year Undergraduates with Percentage of Women and International Students, 2008 to 2017

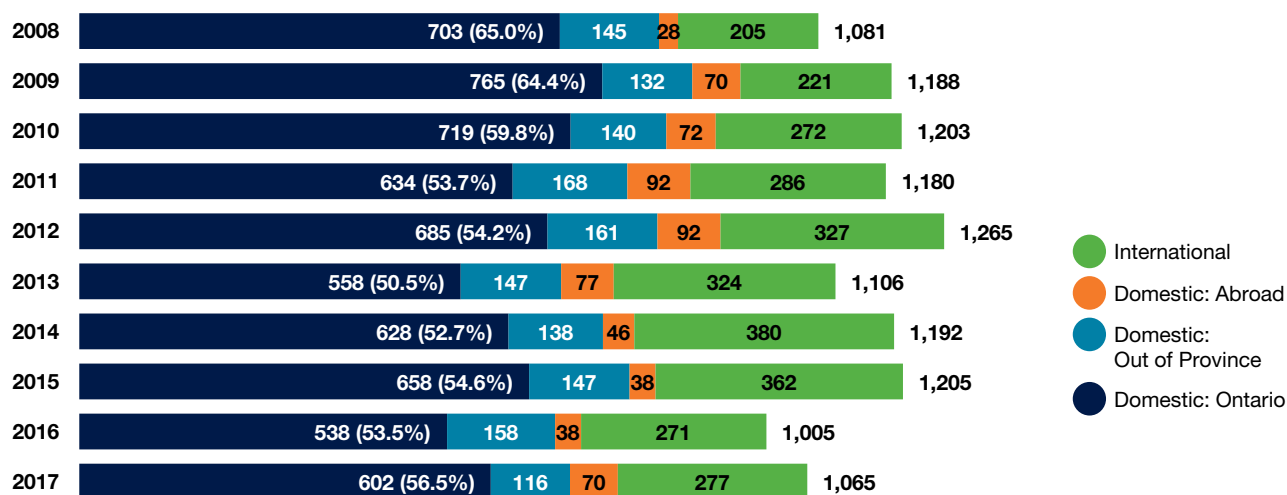


Note 1.3: Student counts are shown as of November 1. Domestic students are defined as citizens or permanent residents of Canada. Data on student gender comes from the OUAC admissions form. In 2017, gender identification on the form was changed from mandatory to optional and a third category, "Another Gender Identity," was added. All seven of the incoming students presented in Figure 1.3 chose not to report their gender.

- **GLEE: Girls' Leadership in Engineering Experience (March 2018 and May 2018):** This annual, weekend-long program inspires and empowers women who have received offers of admission to our programs by connecting them with women faculty members, students and alumnae. It includes a dinner and reception hosted by the Dean as well as a keynote address from one of our women professors. Two events were held in 2018: one in March that attracted 12 students from outside Ontario, and one in May for 105 more from within Ontario.
- **Welcome to Engineering (May 2018):** This full-day event gave admitted students an opportunity to learn more about U of T Engineering before the final deadline for applicants to accept offers from Ontario universities. More than 350 admitted students attended this event in 2018.

In 2017, we established the Eagles' Longhouse, our Engineering Indigenous Initiatives Steering Committee, with members from across our Faculty and the Oneida Nation. Chaired by Professor Jason Bazylak, our Dean's Advisor on Indigenous Initiatives, the mandate of the Eagles' Longhouse is to engage Indigenous representatives and engineering educators to design a *Blueprint for Action* to ensure a welcoming and supportive environment for Indigenous students, faculty and staff, and to intensify engineering outreach to these underrepresented communities. Its report was delivered in June 2018. (For more information, see Chapter 10: Diversity.)

Figure 1.4 Incoming First-Year Domestic and International Undergraduates, 2008 to 2017



Enrolment

In 2017–2018, the undergraduate student population was 5,298, with the overall proportion of women reaching 33%, up from 30% in 2016–2017. This threshold is significant as U of T Engineering continues to work with Engineers Canada and other Canadian

engineering schools to achieve the “30 by 30” goal to have the proportion of women among newly licensed engineers reach 30% by 2030. Our international student population now stands at 28.6% of all undergraduates.

Note 1.4: Student counts are shown as of November 1. Domestic students are defined as citizens or permanent residents of Canada.

Figure 1.5a Undergraduate Enrolment with Percentage of Women and International Students, 2008–2009 to 2017–2018

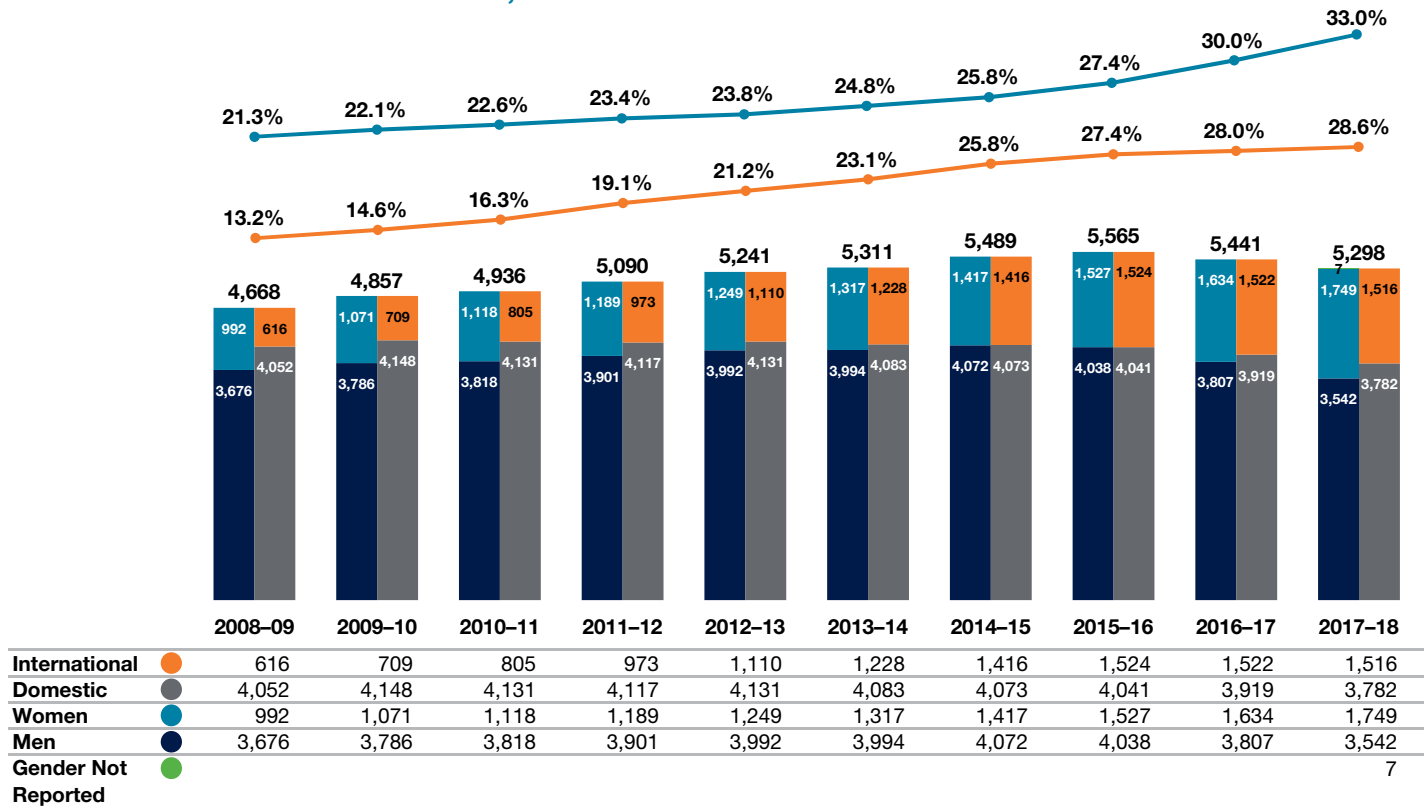
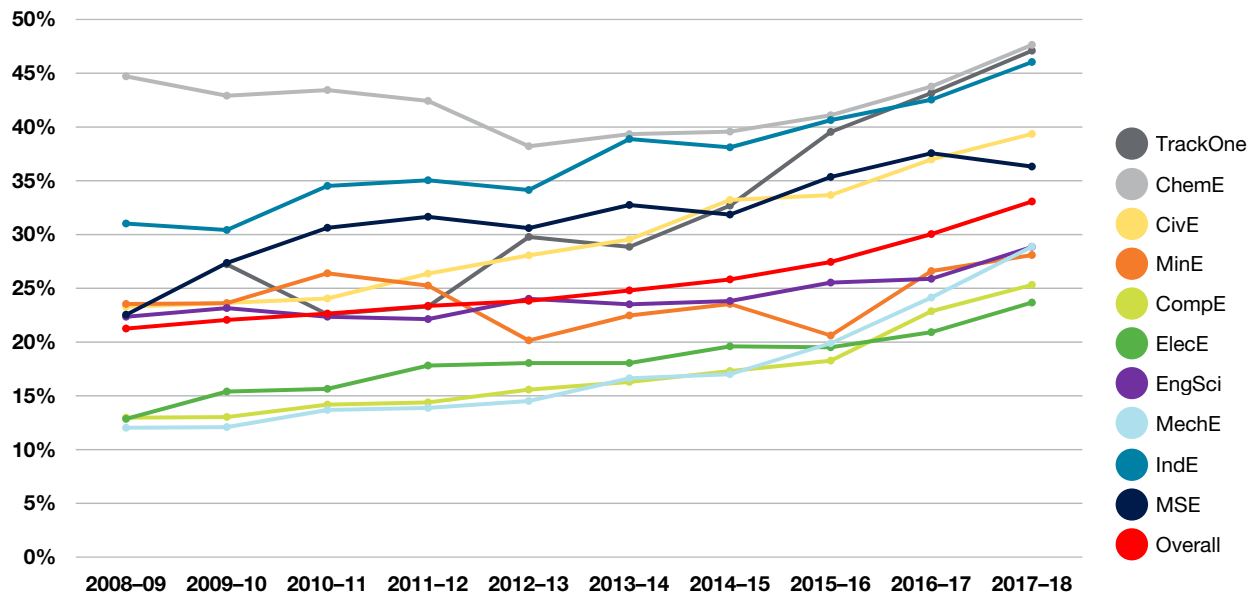
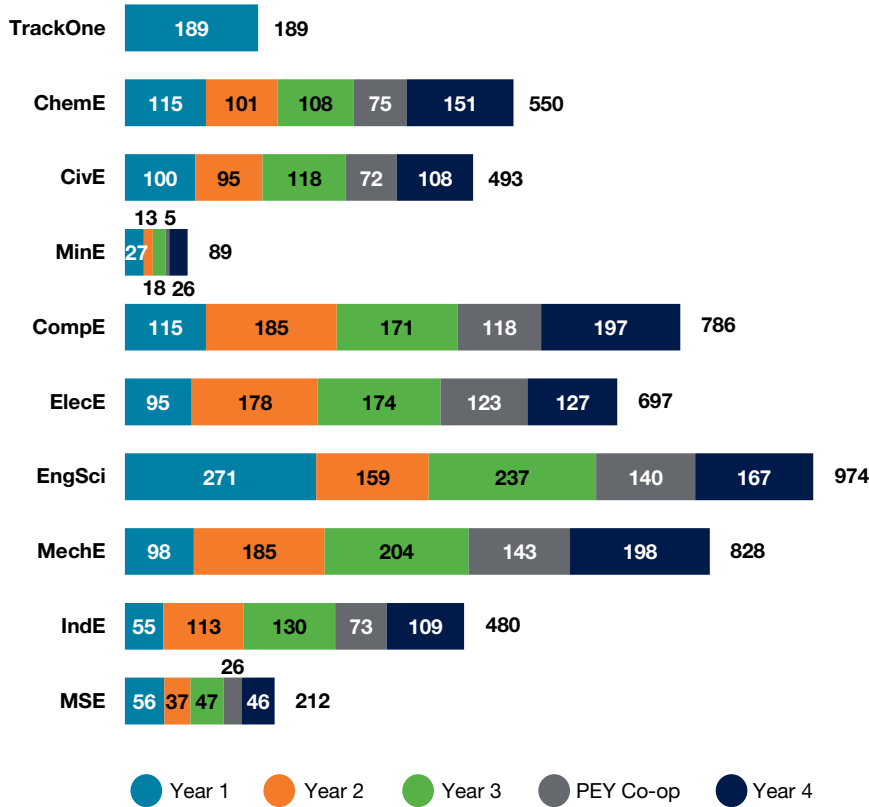


Figure 1.5b Percentage of Women by Undergraduate Program, 2008–2009 to 2017–2018



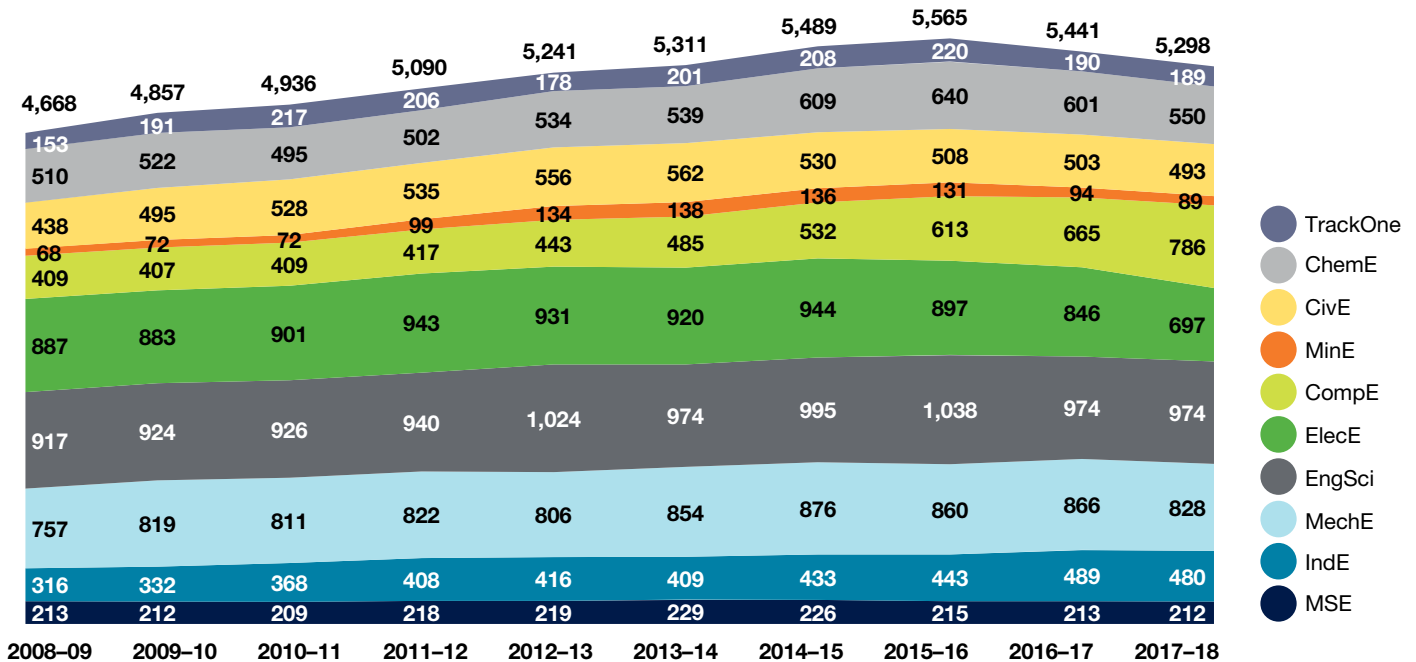
Note 1.5a: Includes full- and part-time students and those working full time through the Professional Experience Year Co-op Program (PEY Co-op). Does not count students with special (non-degree) status. Student counts shown as of November 1, 2017. Domestic students are defined as citizens or permanent residents of Canada. Data on student gender comes from the OUAC admissions form. In 2017, gender identification on the form was changed from mandatory to optional and a third category, “Another Gender Identity,” was added. All seven of the students presented in Figure 1.5a chose not to report their gender.

Figure 1.6 Undergraduates by Program, Year of Study and Professional Experience Year Co-op, 2017–2018



Engineering Science Majors	Enrolment
Aerospace Engineering	40
Biomedical Systems Engineering	54
Electrical and Computer Engineering	97
Energy Systems Engineering	15
Infrastructure Engineering	17
Mathematics, Statistics and Finance	58
Engineering Physics	24
Robotics Engineering	99
Total	404

Figure 1.7 Undergraduates by Program, 2008–2009 to 2017–2018



Note 1.6: Student counts are shown as of November 1. Engineering Science Majors show only students in Year 3 and Year 4 and do not count students on PEY Co-op.

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

Need-Based Funding

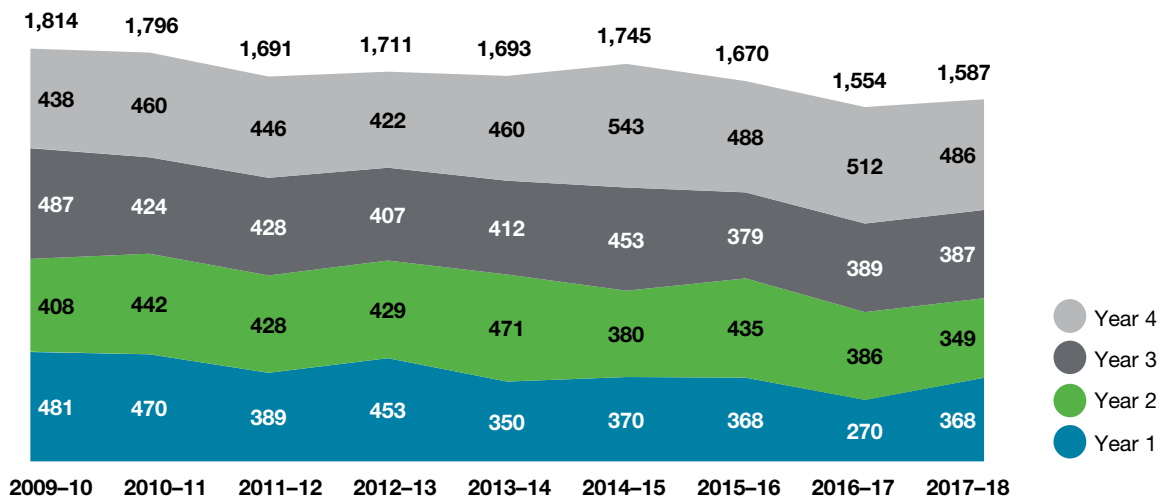
Our Faculty is committed to the University of Toronto’s Policy on Student Financial Support, which states that no student offered admission to a program at the University of Toronto should be unable to enter or complete the program due to lack of financial means.

We offer a wide range of student aid options — including scholarships, bursaries and other awards based on merit and need — funded by donors and the University of Toronto Advanced Planning for Students (UTAPS) program. Our financial aid officer helps students prepare personal budgets, learn about funding sources and manage appeals through the Ontario Student Assistance Program (OSAP) process.

The number of undergraduate students receiving need-based awards in 2017–2018 was 1,587 with the total amount of student support reaching \$12.0 million. This funding is distributed relatively evenly across all years of study, and represents a 25.0% increase over the last 10 years.

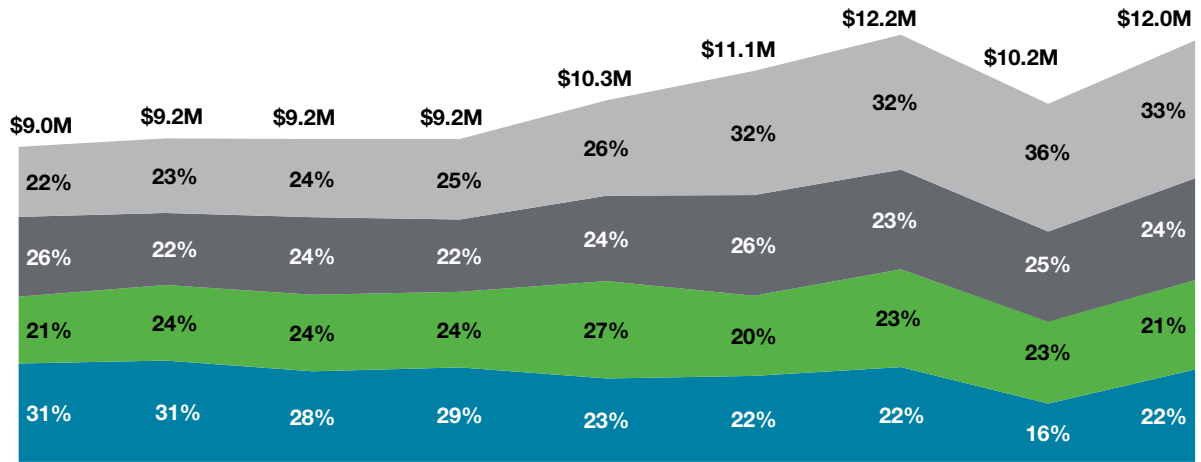
The amounts reported in Figures 1.8a and 1.8b do not include external merit-based scholarships or awards, or funding from provincial assistance programs, including OSAP.

Figure 1.8a Number of Awards Received by Cohort with Total Number of Undergraduate Need-Based Award Recipients, 2009–2010 to 2017–2018



Note 1.8a: Data comes from the Student Accounts Reporting Cube.

Figure 1.8b Total Value of Undergraduate Financial Assistance and Percentage Distributed by Year of Study, 2009–2010 to 2017–2018



	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Year 4	\$1,995,808	\$2,130,098	\$2,229,278	\$2,296,173	\$2,725,785	\$3,534,244	\$3,853,161	\$3,644,310	\$3,933,142
Year 3	\$2,280,152	\$2,049,237	\$2,205,736	\$2,061,174	\$2,429,321	\$2,871,229	\$2,839,851	\$2,570,428	\$2,912,515
Year 2	\$1,897,712	\$2,157,800	\$2,185,640	\$2,160,969	\$2,781,695	\$2,289,069	\$2,792,715	\$2,335,933	\$2,545,499
Year 1	\$2,806,624	\$2,886,898	\$2,580,676	\$2,687,414	\$2,372,994	\$2,450,470	\$2,700,169	\$1,662,682	\$2,631,654
Total	\$8,980,296	\$9,224,033	\$9,201,330	\$9,205,730	\$10,309,795	\$11,145,012	\$12,185,896	\$10,213,353	\$12,022,810

Note 1.8b: Data comes from the Student Accounts Reporting Cube.

Degrees Awarded

U of T Engineering students earn either a Bachelor of Applied Science (BASc) or Bachelor of Applied Science in Engineering Science (BASc EngSci). Both degrees can be completed in four years. However, many of our second- and third-year students choose to augment their degrees with a 12- to 16-month job through the

Professional Experience Year Co-op Program (PEY Co-op), which adds one year to their time to completion. *(For more information on PEY Co-op, please refer to Chapter 4: Cross-Faculty Education and Experiential Learning.)*

Figure 1.9a Undergraduate Degrees Awarded by Program, 2008–2009 to 2017–2018

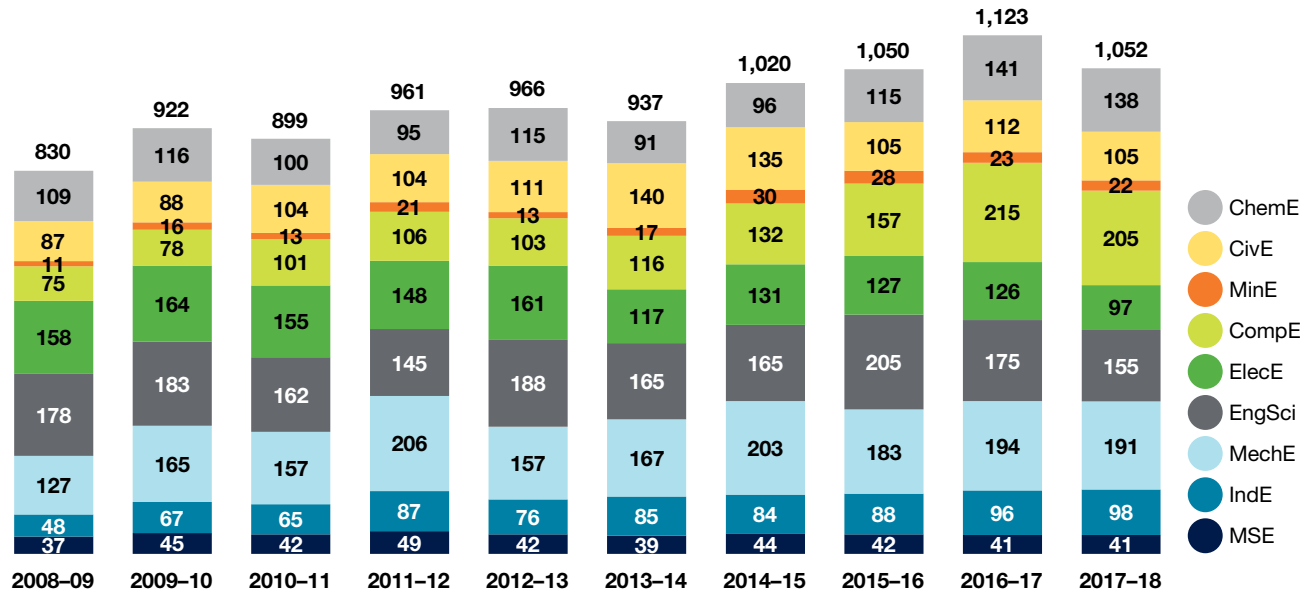
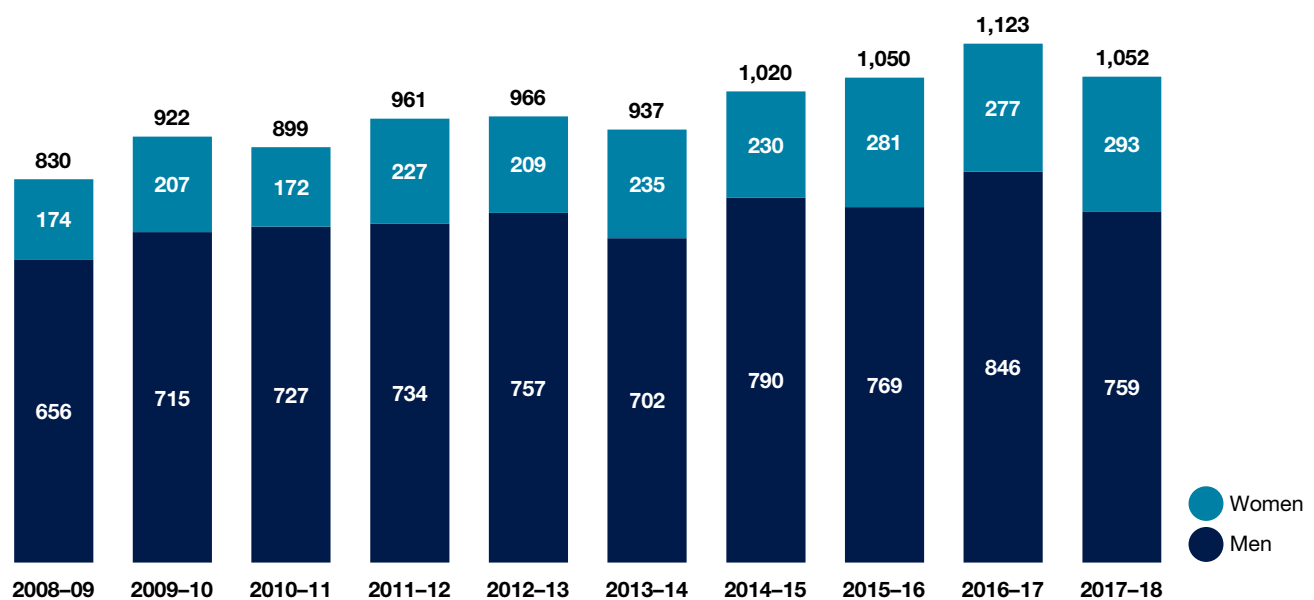
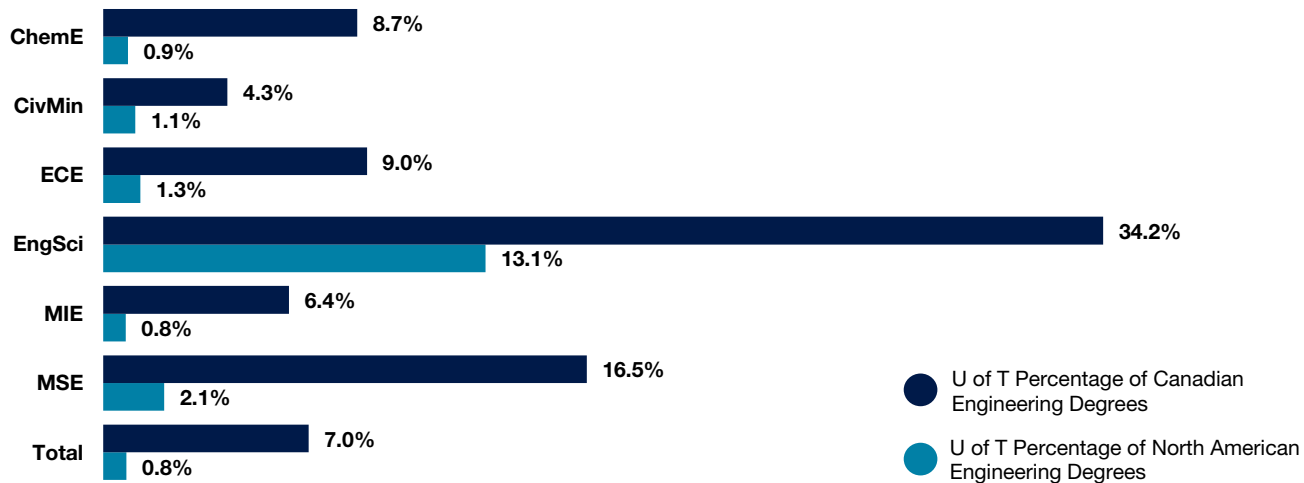


Figure 1.9b Undergraduate Degrees Awarded by Gender, 2008–2009 to 2017–2018



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

Figure 1.9c U of T Engineering Degrees Awarded by Academic Area Compared with Canadian and North American Degree Totals, 2016



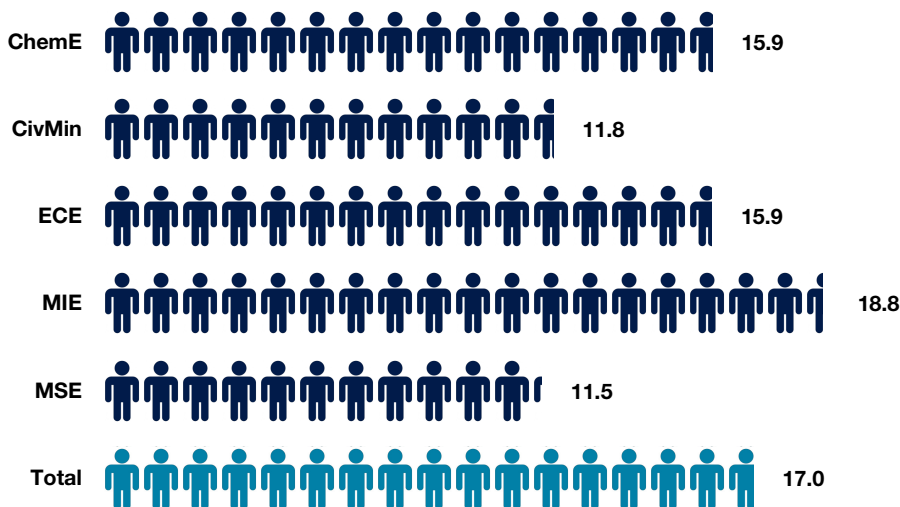
Student-to-Faculty Ratios

Figure 1.10a shows the number of undergraduates relative to the number of faculty in each department. Students in programs that employ a cross-Faculty teaching approach, such as Engineering Science and TrackOne, Undeclared, are included only in the “Total” bar.

the last 10 years and a goal of our previous Academic Plan. This decrease reflects our increasing selectivity, resulting in a smaller undergraduate student body, as well as the addition of 14 new professors hired in recent years. Lower undergraduate student-to-faculty ratios allow for smaller class sizes and enhanced interaction between professors and students. *(For more information on student-to-faculty ratios at the graduate level, see Figure 2.2a.)*

Figure 1.10b shows that the overall undergraduate student-to-faculty ratio has decreased to 17.0, our lowest value in

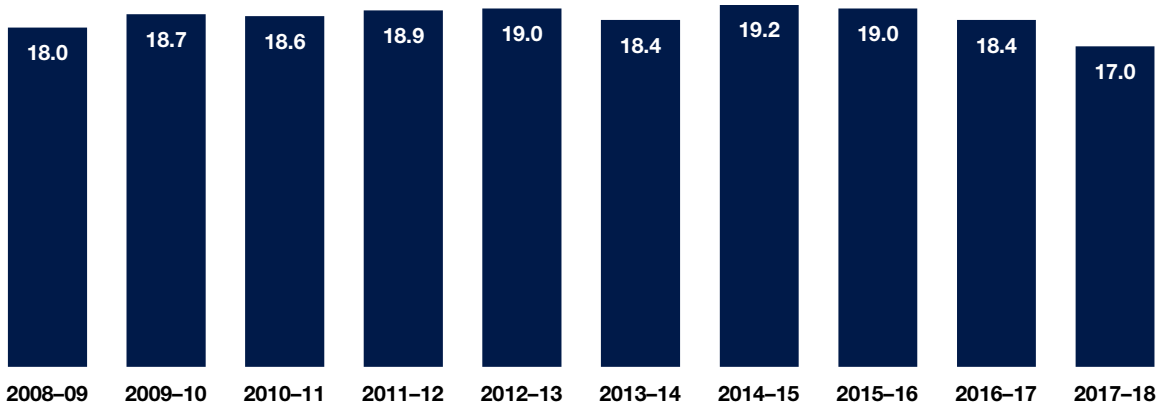
Figure 1.10a Undergraduate Student-to-Faculty Ratios by Academic Area, 2017–2018



Note 1.9c: Data sourced from reports produced by Engineers Canada and the American Society for Engineering Education; 2016 is the most recent year for which reports from both these institutions have been published. Total percentages show U of T as a proportion of all engineering degrees in North America, including those awarded in fields for which U of T does not have a specific degree program (e.g. Biomedical, Environmental, Software, etc.).

Note 1.10a, b: Student and faculty counts are shown as of November 1. For full-time equivalency (FTE), each part-time student is counted as 0.3 FTE. Students with special (non-degree) status or on PEY Co-op are not included. Faculty counts include tenure-stream and teaching-stream faculty.

Figure 1.10b Undergraduate Full-Time Equivalent Student-Faculty Ratios, 2008–2009 to 2017–2018



Dean’s Honour List

To graduate with Honours, a full-time student must achieve a cumulative average of higher than 79.5% across second, third and fourth years and a weighted sessional fourth-year average of 74.5% or higher. The designation of High Honours, created in June 2015, distinguishes students who obtain a cumulative average of 87.5% or higher and a weighted sessional fourth-year average of 82.5% or higher. Both designations provide a measure of the outstanding academic achievement of our students.

In 2018, 1,011 of our students achieved Honours or High Honours, representing 44.0% of the graduating class (Figure 1.11a). This is our highest-ever proportion and reflects the high calibre of our students and the success of our many programs designed to support students throughout all years of study.

Figure 1.11a Number of Students and Percentage of Class Graduating with Honours, 2009 to 2018

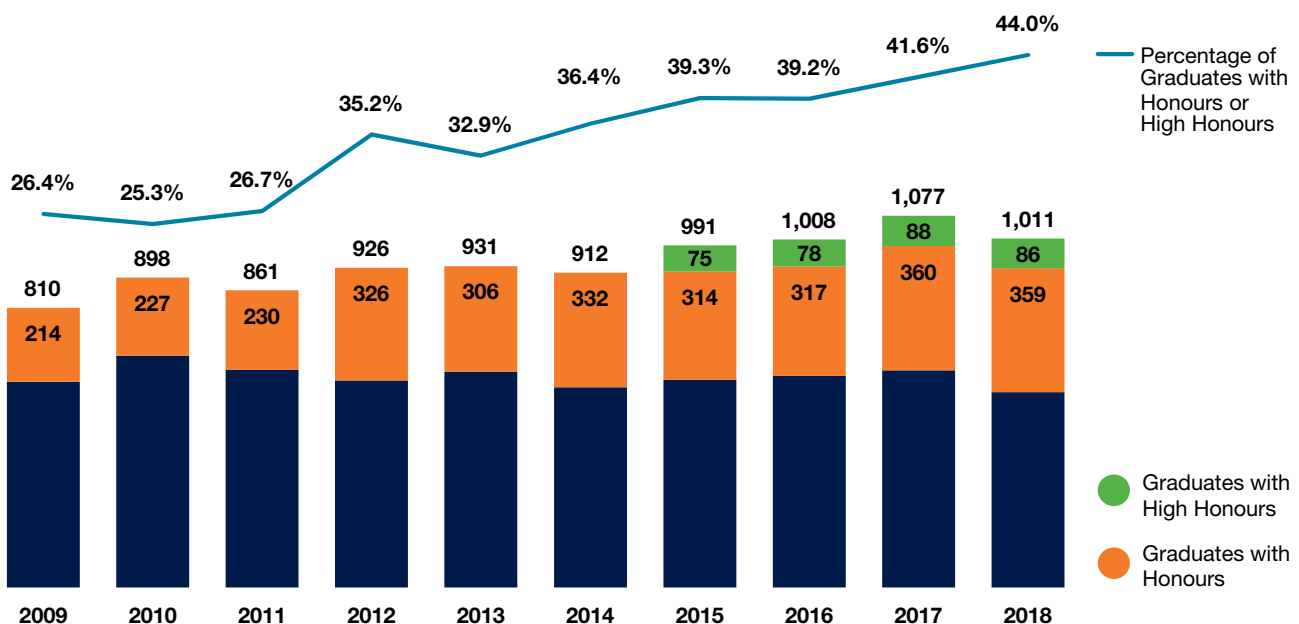
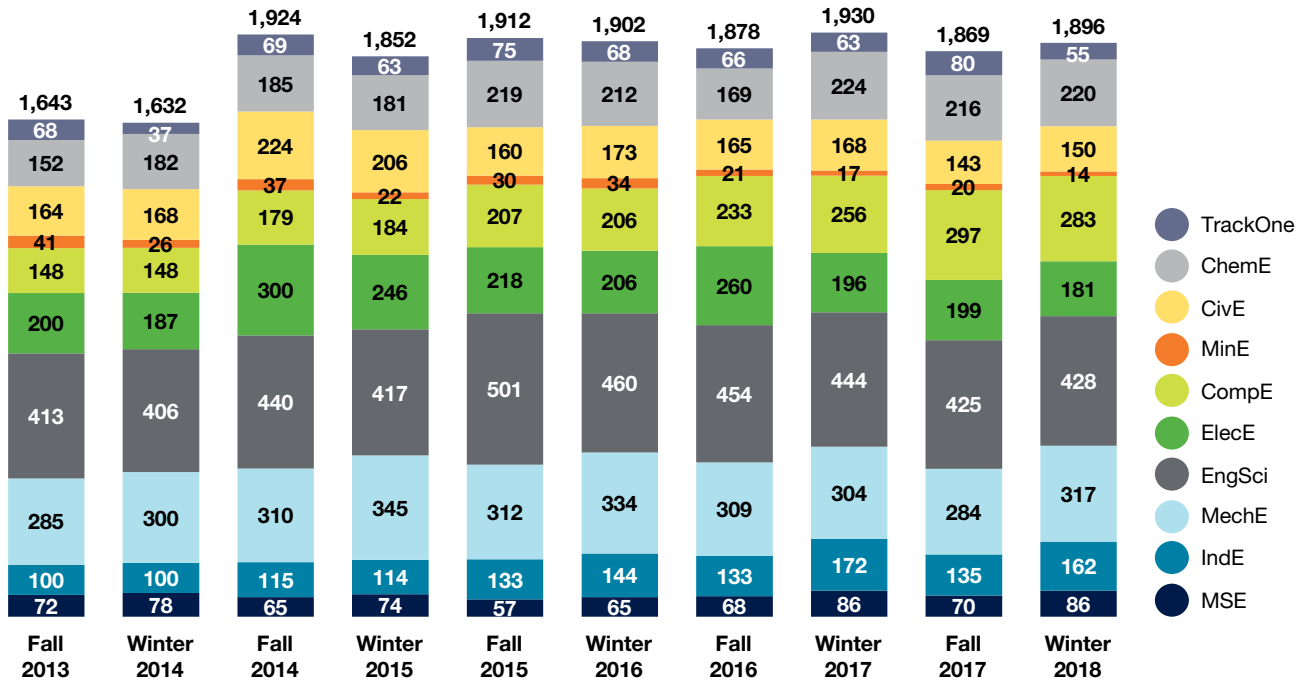


Figure 1.11b Number of Students on the Dean's Honour List by Term and Academic Area, Fall 2013 to Winter 2018



Enriching the Undergraduate Engineering Experience

Our undergraduate experience includes both curricular and co-curricular learning opportunities, with an emphasis on multidisciplinary collaboration, leadership and professional development. In 2017–2018, we continued to enrich our programming with new specializations and initiatives for student support.

New programs, courses and learning opportunities

Our newest undergraduate minor in Advanced Manufacturing and our newest certificate in Forensic Engineering both launched in September 2017. In September 2018, we will launch a new cross-disciplinary minor in Music Performance and a certificate in Music Technology, created in partnership with the Faculty of Music. *(For more information on cross-disciplinary minors, see Chapter 4, Cross-Faculty Education and Experiential Learning).* All of these programs enable our students to customize their degrees and to collaborate with experts in other disciplines and areas of shared interest.

In September 2018, we will add a new Engineering Science major in Machine Intelligence. It will provide

students with a cutting-edge education in the concepts and tools that underlie state-of-the-art advances in machine learning, artificial intelligence and data analytics. Students will study, develop and apply algorithms that can learn and make decisions based on data. They will be able to enter and innovate in this rapidly developing field, which sits at the intersection of engineering and computer science.

We created 10 new undergraduate courses in 2017–2018, including:

- MIE324H1: Introduction to Machine Intelligence
- BME520H1: Imaging Case Studies in Clinical Engineering
- MSE415H1: Environmental Degradation of Materials
- MSE437H1: Process Metallurgy of Iron and Steel
- ECE367H1: Matrix Algebra & Optimization
- ECE368H1: Probabilistic Reasoning
- MIE567H1: Dynamic & Distributed Decision Making
- CIV578H1: Design of Building Enclosures
- ROB311H1: Artificial Intelligence
- CME500H1: Fundamentals of Acid Rock Drainage

Note 1.11b: Students are normally eligible to be considered for Honours standing only if they are carrying a full academic load (2.5 credits per session, excluding extra courses) and if the session is not being repeated. During fourth year, a student may reduce their course load in either semester (but not both) and still be eligible for Honours standing, provided the other conditions are met.

Our First-Year Summer Research Fellowship launched in summer 2016 with its first cohort of eight research fellows. The Fellowship provides \$5,000 in support to students seeking to gain research experience immediately after their first year of study. Students enrolled in all first-year programs are eligible. Nine students participated in the program in summer 2017, and 10 in summer 2018.

Student support

We recognize that the transition from secondary school to university can be challenging for many students, so we provide a wide range of programs to support success for our first-year students. These include:

- **Success 101:** This three-day mini-course is part of the First Year Foundations program that includes courses on engineering design and computer programming. Success 101 runs three times over the summer, providing guidance on time management, effective note taking, and classroom etiquette and communication.
- **T-Program:** The Transition Program, or T-Program, enables first-year students faced with academic challenges to redistribute their course load, defer courses to the summer session and retake up to three fall courses in the winter term.
- **GEARS:** Guided Engineering Academic Review Sessions (GEARS) are weekly drop-in sessions led by upper-year students. They provide guidance on both course material and specific strategies for academic success, including study habits and time management skills.
- **Support personnel:** The Faculty provides a full-time Learning Strategist who develops academic programming and workshops to assess and enhance students' academic

Pre-University Engineering Outreach

The Engineering Student Outreach Office designs and delivers a wide range of programs that engage students in Grades 3 to 12 in science, technology, engineering and mathematics (STEM). The aim is to inspire pre-university students to pursue careers in science and engineering, recruit undergraduate students by giving them positive engineering educational experiences, enhance the student experience for our current undergraduate and graduate students, and foster positive relationships between the University and the community.

The U of T Engineering students who provide instruction and support for these programs serve as ambassadors for the Faculty. They gain valuable experience in youth education and project management, strengthen their leadership, team-building and communication competencies, and deepen their understanding of basic engineering principles. We also bring together elementary and secondary school teachers to share innovative ways to bring STEM into their classrooms.

competencies related to task prioritization, note taking, critical thinking, problem solving, exam preparation, and coping with stress and anxiety. Our embedded advisors provide students with personalized support for learning strategies, health and wellbeing, and international transition.

- **Online courses:** We offer four courses online in order to enhance the flexibility of the first-year course schedule, including one (*APS162: Calculus for Engineers I*) held over the summer before first year begins. Enrolment across all of these courses increased to 219 in 2017–2018 from 192 the previous year.

In 2017–2018, we further strengthened our embedded supports by adding a full-time academic advisor to augment the work of our existing part-time advisors. We also developed an online advising portal that enables students to book appointments with their academic advisors. The portal serves as a central repository for data related to academic well-being, such as advising notes and resources for advisors. This program was piloted among first-year students and is now moving to upper years. These initiatives respond to the recommendations of the Decanal Task Force on Academic Advising, which was completed in 2016.

In partnership with the Health & Wellness Centre, we provide 'Identify, Assist and Refer' folders to all professors. These packages advise staff and faculty what to look for, say and do when responding to a student in distress. We also provide complementary training for staff and faculty through the Engineering Engagement & Development Network. These initiatives respond to the January 2017 recommendations of the Decanal Task Force on Mental Health.

Every summer, our Da Vinci Engineering Enrichment Program (DEEP) Summer Academy draws motivated high school students from around the world to week-long courses, where they explore a variety of engineering, business and science disciplines. We also offer March Break and summer camps, Saturday programs and in-school workshops that inspire elementary school students to explore topics such as aerospace engineering, coding and regenerative medicine. We are particularly proud that our programs successfully connect girls and youth from underrepresented communities — including Indigenous youth — with STEM.

In 2017–2018, we reached more than 7,500 pre-university students through our outreach programs. (*See Appendix B for a full list of these programs.*)

Selected highlights of our outreach programs include:

- **Partnerships with the National Society of Black Engineers (NSBE):** During Black History Month in February 2018, we partnered with the U of T NSBE chapter and two other chapters to host the NSBE Region 1 East Canada Zone conference, designed to strengthen the pipeline of students from traditionally underrepresented groups into engineering careers and leadership positions. We also continued to partner with U of T's local chapter of NSBE on existing outreach programs such as our ENGage summer day camps, ENGage in Schools and ENGage in Your Community. *(For more detail on these initiatives, please see Chapter 10 — Diversity.)*
- **Go North:** Created in partnership with Google Canada and Actua, a national STEM charity, Go North is designed to encourage students to become the inventors, innovators

and makers of tomorrow by playing and experimenting with technologies today. On June 5, 2018 we hosted Go North for the third consecutive year, engaging more than 1,100 Ontario students in Grades 4 to 8 in hands-on activities, demonstrations and workshops designed to ignite curiosity about the vast potential of STEM.

- **City of the Future: Launch of Quayside:** On October 17, 2017, 20 aspiring engineers in Grades 4 to 6 spent the day imagining, designing and building components of the neighbourhood of the future. In the afternoon, they met with Prime Minister Justin Trudeau as well as Ontario Premier Kathleen Wynne, Toronto Mayor John Tory and representatives of Sidewalk Labs, a company that aims to design Quayside, an innovative mixed-use, technology-enabled community on Toronto's Eastern Waterfront.

Selected Undergraduate Student Highlights

U of T Engineering students win global speedbike competition

U of T Engineering's Human-Powered Vehicle Design Team (HPVDT) placed first in the 2017 World Human Powered Speed Challenge. Their recumbent bicycle, named Eta Prime, was clocked at an impressive 127.6 kilometres per hour, the fastest in this year's competition at Battle Mountain, Nev. Eta Prime's design is modelled closely on Eta, the vehicle that currently holds the record for the world's fastest bicycle at 144.17 km/h. Eta was built by AeroVelo, a company founded by U of T Engineering alumni Todd Reichert (EngSci 0T5, UTIAS PhD 1T1) and Cameron Robertson (EngSci 0T8, UTIAS MAsc 0T9). Although it did not race at this year's competition, Eta was the result of a long-standing collaboration between AeroVelo and HPVDT. Through a combination of innovations, HPVDT was able to make Eta Prime 20% lighter than Eta, while maintaining its internal strength. In fact, the team's models showed that the difference in speed between the two vehicles was due primarily to the power output of the rider, raising the possibility that Eta Prime, or a redesigned version of it, could set a new world record in next year's competition.

Unraveling physics mysteries in microgravity

In July 2017, four U of T Engineering students earned the rare chance to carry an experiment they designed onto a Falcon-20 jet, an aircraft similar to those used to train astronauts. Their goal was to better understand how liquids flow in microgravity, and to explore how 3D printers could make long-term space missions more feasible. Team AVAIL (Analyzing Viscosity And Inertia in Liquids) — consisting of Neell Young (EngSci 1T4 + PEY, UTIAS MAsc candidate), Caulan Rupke, Michael Lawee and Andrew Ilersich (all Year 4 EngSci) — was among four chosen to participate in the Canadian Reduced Gravity

Experiment Design Challenge (CAN-RGX), supported by the National Research Council and the Canadian Space Agency. In May 2018, a second team — Team FAM (Fluids Affected by Magnetism) consisting of Twesh Upadhyaya, Tyler Gamvrelis, Jacob Weber and Hanzhen Lin (all Year 3 EngSci) — was among four finalists in the 2018 competition. Their experiment was designed to examine heat transfer in paramagnetic fluids and their behavior under external magnetic fields. The results could lead to improved heat management in space crafts, space stations and satellites.

Engineering student and alumnus named to list of future aerospace leaders

Jeremy Wang (Year 4 EngSci) and recent graduate Arthur Brown (EngSci 1T6) were among 20 people in their 20s named to a prestigious aerospace industry list of future engineering leaders. The list of *Tomorrow's Technology Leaders: The 20 Twenties* was published by the Aviation Week Network in January 2018. The awards recognize academic performance, civic contribution and a research or design project. Wang was recognized for overseeing a major expansion of the University of Toronto Aerospace Team (UTAT) while serving as its executive director, as well as presenting at the 2016 International Astronautical Congress (IAC) in Guadalajara, Mexico. He currently serves as the Chief Technology Officer for The Sky Guys, a company that supplies drones and aerial photography services for sporting events, inspecting industrial sites and a variety of other applications. While at U of T Engineering, Brown was an aerodynamicist with Blue Sky Solar Racing and with the Human-Powered Vehicles Design Team (HPVDT). In 2015, he became the first Canadian student to win the American Institute of Aeronautics and Astronautics Foundation's Undergraduate Individual Aircraft Design Competition. He is now pursuing a master's degree at MIT.

2

Our reputation for excellence in engineering research and education enables us to recruit talented graduate students from across Canada and around the world. Through a rich suite of academic, co-curricular and experiential learning opportunities, we empower them to become leaders in their fields.

Our graduate students continue to earn prestigious honours such as the Vanier Canada Graduate Scholarships. Across our professional and research-based programs, total enrolment is now 2,415, a new high for our graduate programs and an increase of almost two-thirds since 2008. Much of this growth has been driven by higher enrolment in our MEng and PhD programs, particularly among international students.

Recruiting domestic candidates for PhD and MAsC programs continues to be a priority for our Faculty. We are founding members of the Canadian Graduate Engineering Consortium, which coordinates efforts from our Faculty leadership, our departments and our peer institutions to raise awareness of the impact that Canadian students can make through engineering graduate studies. Our Graduate Research Days event, held each February, continues to attract many outstanding applicants, and we conduct similar recruitment events across the country.

We have enhanced our curricular and co-curricular offerings to ensure our graduates are well-prepared for careers in academia, industry and other sectors. In 2017–2018, we launched the Opportunities for PhDs: Transitions, Industry Options, Networking and Skills (OPTIONS) program, which builds on the success of our Prospective Professors in Training (PPIT) program. We also initiated a new career fair for graduate students that attracted leading companies in a variety of sectors. Our Cross-Faculty Collaborative Master's Specialization in Psychology and Engineering (PsychEng) and our MEng emphasis in Forensic Engineering enrolled their first students in September 2017. Our new MEng emphasis in Analytics launched in January 2018.

Through campus-linked accelerators such as the Hatchery Launch Lab, we provide opportunities for our graduate students to translate their innovative discoveries into market-ready solutions. Mentorship, seed funding and infrastructure provided by U of T Engineering has helped launch companies such as Trexo Robotics, SensOR Medical Laboratories Ltd. and Aurorem.

Enrolment

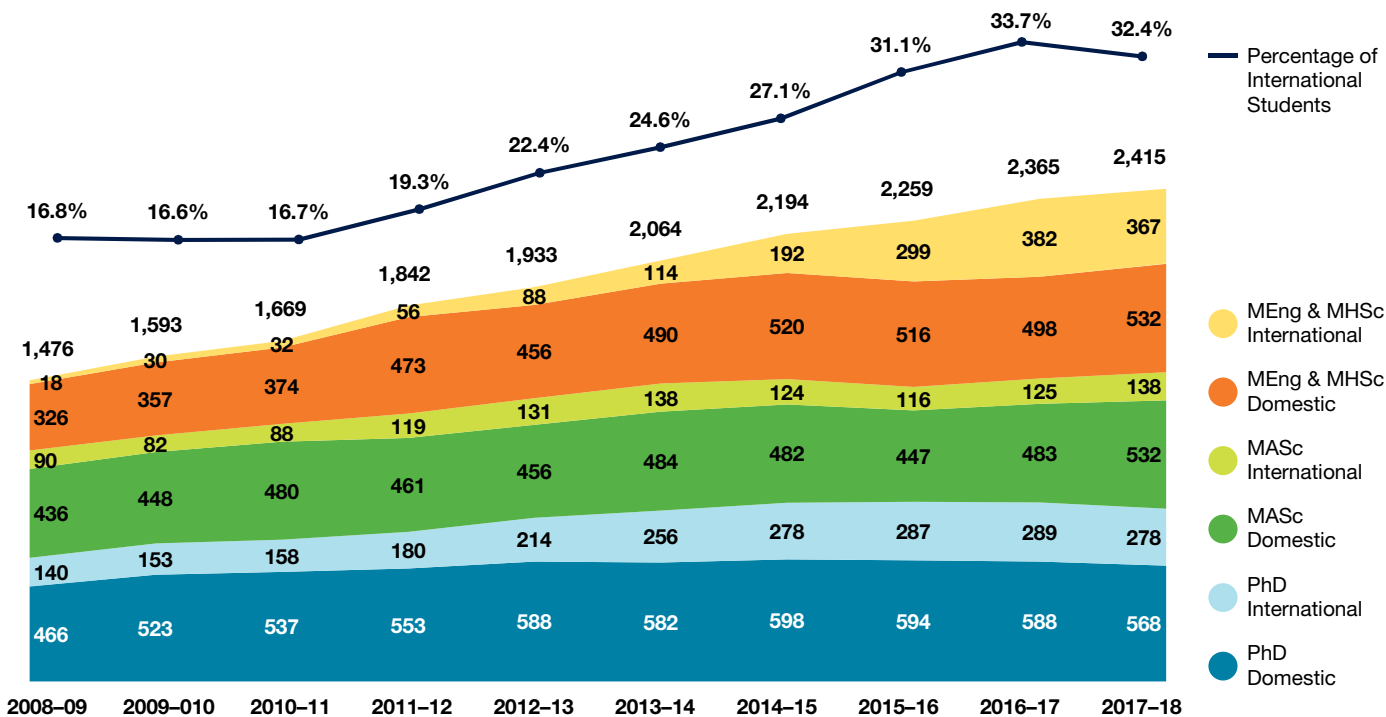
Our renowned, leading-edge research drives our recruitment of the world’s top candidates for MEng, MAsc, MHSc and PhD studies. Through curricular and co-curricular programs, we enable them to develop into the next generation of engineering professionals and researchers.

Our current graduate total enrolment is 2,415. This is an increase of almost two-thirds since 2008, and brings us closer to our Academic Plan goal of reaching a 60:40 ratio of undergraduate to graduate students. It includes 899 professional master’s students and 1,516 MAsc and PhD students, our highest on record. Total enrolment in our research-based programs has increased by 33.9% over the past decade, including a 39.6% increase in PhD enrolment, while numbers in our professional programs have more than doubled over the same period. The proportion of

graduate students in our overall student body is 33.9%. Professional master’s students now constitute 53% of all U of T Engineering master’s students on a full-time equivalent basis. Our goal is to increase research-based and professional graduate student enrolment by 15% by 2022.

Diversity within our graduate student body remains strong. The proportion of women in our graduate programs reached a new high of 27.5%. We expect this proportion to grow as the number of women graduating from undergraduate programs increases. International students made up 32.4% of our graduate students in 2017–2018, compared to 33.7% the previous year. We continue to recruit talented graduate students both domestically and internationally through a number of initiatives, which are outlined in more detail in the following section: *Admissions and Recruitment*.

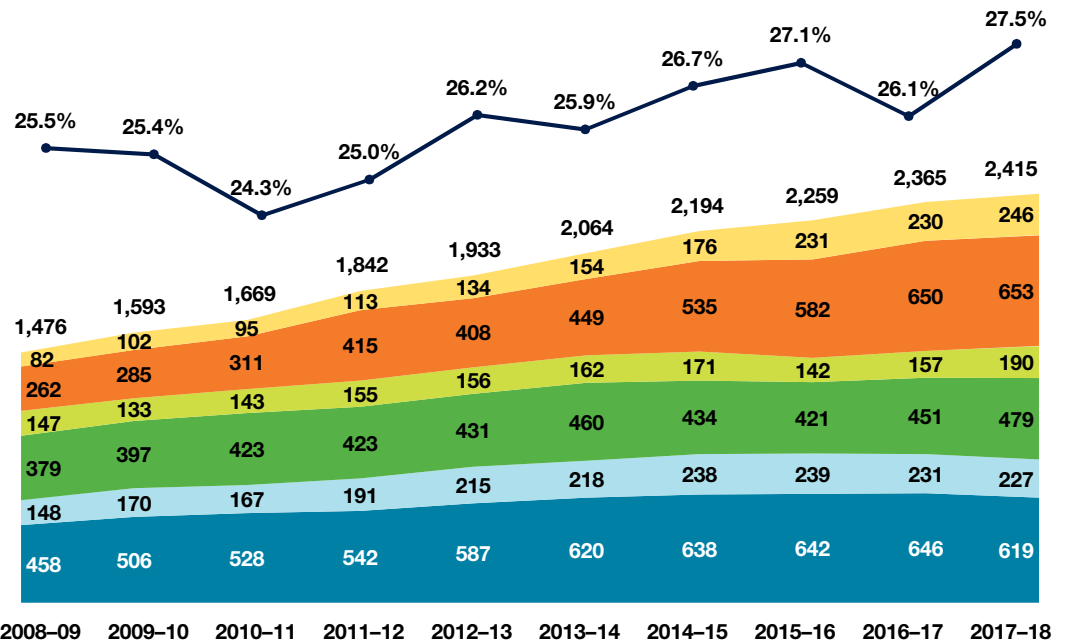
Figure 2.1a International and Domestic Graduate Students by Degree Type, with Percentage of International Students, 2008–2009 to 2017–2018



Data in this chapter are presented by academic year (September to August) unless otherwise noted. Highlights are from June 2017 to July 2018.

Note 2.1a: Student counts are shown as of November 1, 2017.

Figure 2.1b Graduate Students by Degree Type and Gender with Percentage of Women Students, 2008–2009 to 2017–2018



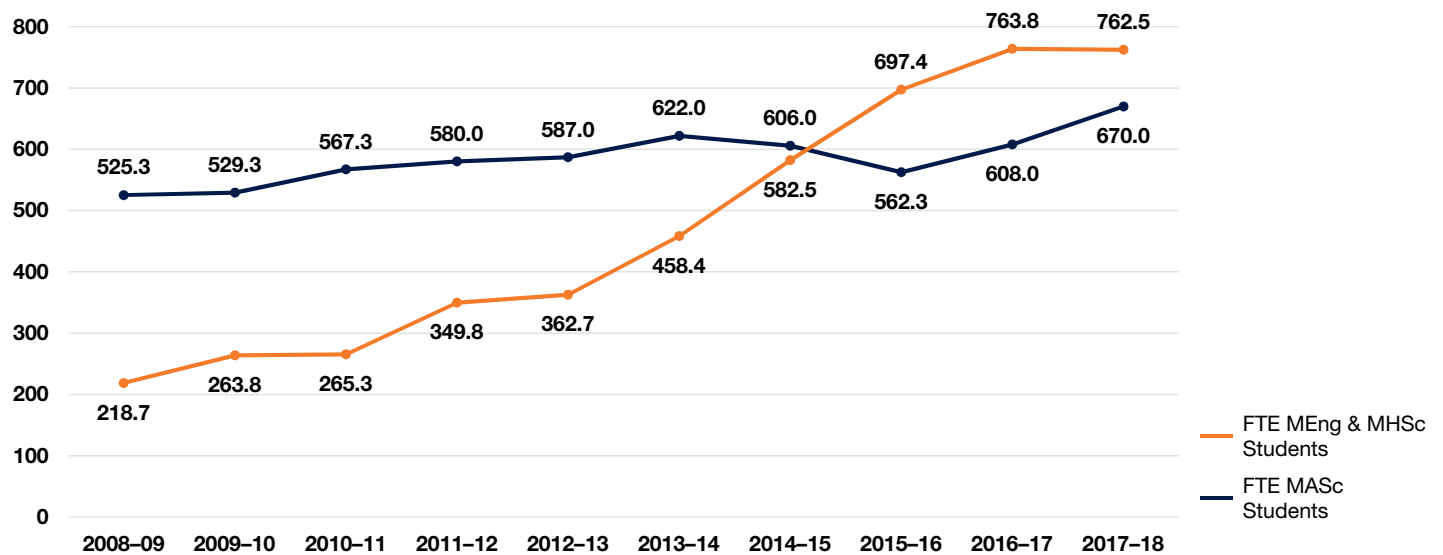
		2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
MEng & MHSc Women	●	82	102	95	113	134	154	176	231	230	246
MEng & MHSc Men	●	262	285	311	415	408	449	535	582	650	653
MEng & MHSc Gender Not Reported					1	2	1	1	2		
MASc Women	●	147	133	143	155	156	162	171	142	157	190
MASc Men	●	379	397	423	423	431	460	434	421	451	479
MASc Gender Not Reported				2	2			1			1
PhD Women	●	148	170	167	191	215	218	238	239	231	227
PhD Men	●	458	506	528	542	587	620	638	642	646	619

Note 2.1b: Student counts are shown as of November 1, 2017. Data on gender comes from the School of Graduate Studies' student enrolment cube, where gender is an optional category. Students who opted not to report their gender appear in the data table, but not the graph presented above.

Figure 2.1c Graduate Student Enrolment by Full-Time Equivalent (FTE) and Headcount (HC) by Academic Area, 2008–2009 to 2017–2018

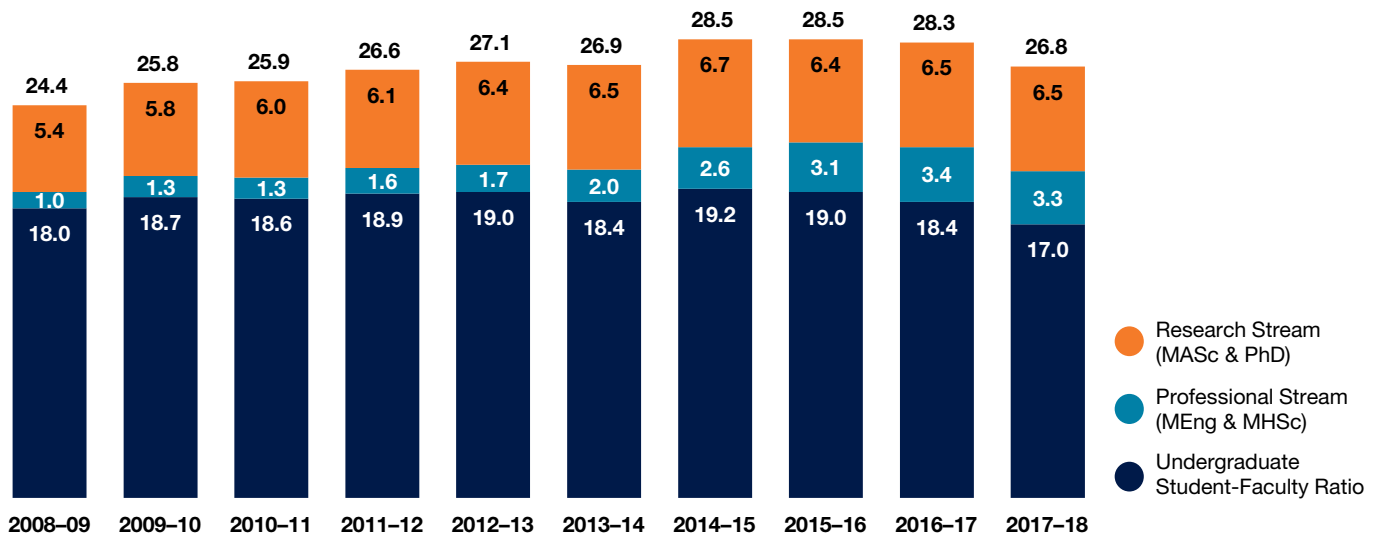
		UTIAS	IBBME	ChemE	CivMin	ECE	MIE	MSE	Total
2008–2009	FTE	122.9	140.0	167.8	184.0	415.4	237.1	82.8	1,350.0
	HC	125	140	179	219	442	284	87	1,476
2009–2010	FTE	130.6	153.0	209.1	200.2	421.5	284.3	70.4	1,469.1
	HC	132	153	221	238	453	320	76	1,593
2010–2011	FTE	140.9	168.0	195.4	212.6	403.0	339.2	68.5	1,527.6
	HC	143	168	208	256	431	391	72	1,669
2011–2012	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
2012–2013	FTE	146.7	208.3	193.2	243.3	504.8	387.2	68.2	1,751.7
	HC	153	209	203	279	565	453	71	1,933
2013–2014	FTE	162.1	219.0	209.9	290.5	509.8	436.2	90.9	1,918.4
	HC	167	219	219	322	556	488	93	2,064
2014–2015	FTE	182.4	228.0	238.0	293.1	531.5	511.2	80.3	2,064.5
	HC	188	228	245	312	577	563	81	2,194
2015–2016	FTE	143.2	241.0	253.0	299.4	591.5	532.9	79.0	2,140.0
	HC	146	241	260	326	637	570	79	2,259
2016–2017	FTE	178.2	269.0	245.0	306.3	577.0	580.3	92.3	2,248.1
	HC	181	269	252	335	619	616	93	2,365
2017–2018	FTE	170.1	296.0	246.7	313.0	551.5	602.8	94.9	2,275.0
	HC	175	303	253	348	597	642	97	2,415

Figure 2.1d Comparison of MASc and MEng/MHSc Full-Time Equivalent Enrolment Trends, 2008–2009 to 2017–2018



Note 2.1c: A difference between FTE and HC exists only when discussing part-time students. At U of T Engineering, MEng candidates are the only graduate students who can pursue their studies on a part-time basis.

Figure 2.2a Undergraduate and Graduate Full-Time Equivalent Students per Faculty Member, 2008–2009 to 2017–2018



Over the past 10 years, we have consistently balanced our number of faculty members with the changing sizes of our graduate and undergraduate cohorts. Today, we have an average of 6.5 graduate students per faculty member, compared with 5.4 in 2008–2009, reflecting larger lab groups and increased research impact. At the same time, our undergraduate student-to-faculty ratio is at its lowest level in 10 years, providing for smaller class sizes and enhanced interaction between professors and students.

Note 2.2a: To allow more accurate comparisons, undergraduate FTEs are determined by counting each part-time student as 0.3 FTE.

Figure 2.2b Ratio of Undergraduate to Graduate Full-Time Equivalent Students, 2008–2009 to 2017–2018

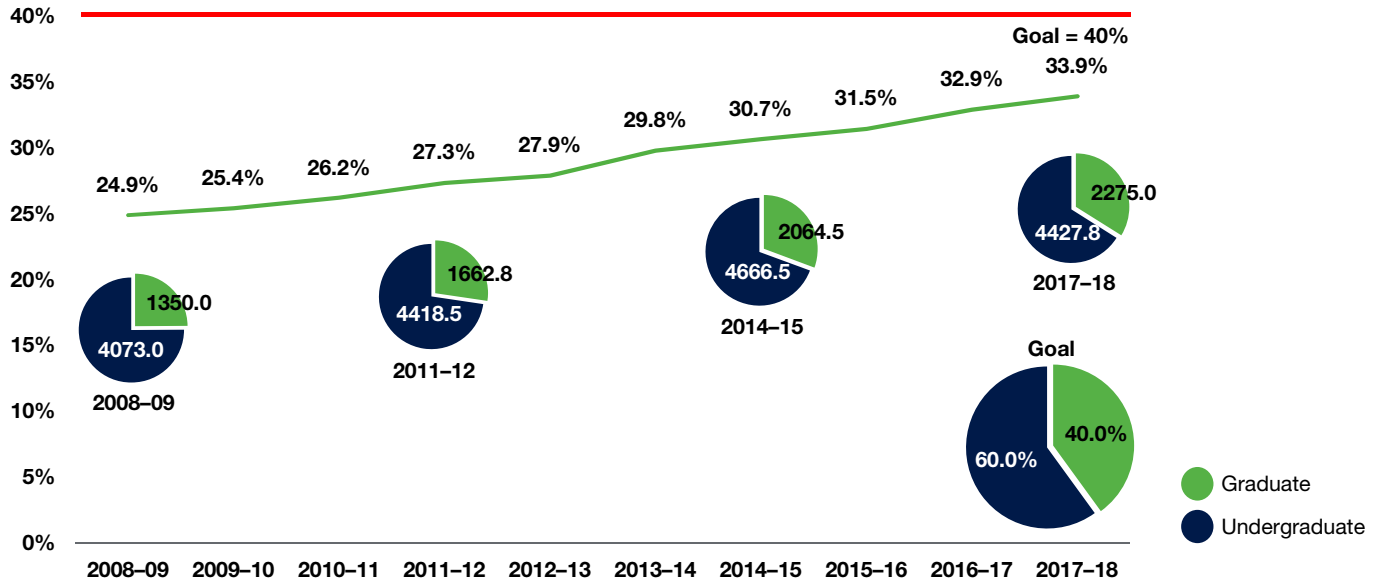
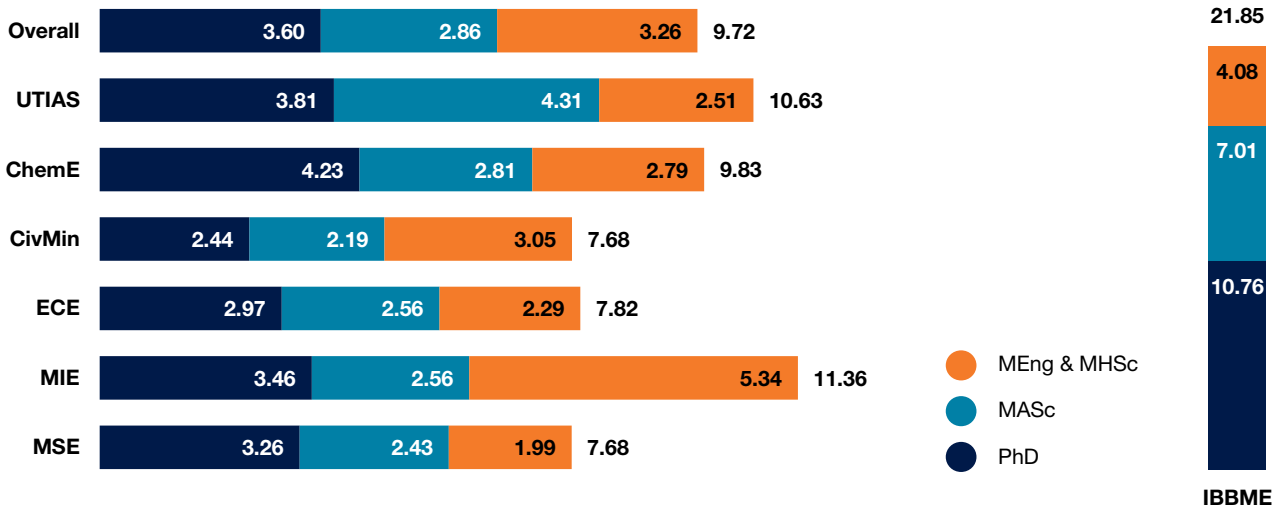


Figure 2.2c FTE Graduate Student-to-Faculty Ratios by Academic Area and Degree Type, 2017–2018



Note 2.2b: Students on PEY Co-op are not included in this count.

Note 2.2c: Some students in IBBME are supervised by faculty members from the Faculties of Medicine and Dentistry and affiliated hospitals, as well as from other departments within U of T Engineering. Because the ratio includes only faculty with a budgetary appointment in IBBME, comparisons with other Engineering departments are not possible. For that reason, this figure shows IBBME in a visually distinct way. In cases of inter-departmental supervision within the Faculty, PhD and MAsC students are assigned 100% to their primary supervisor's department.

Admissions and Recruitment

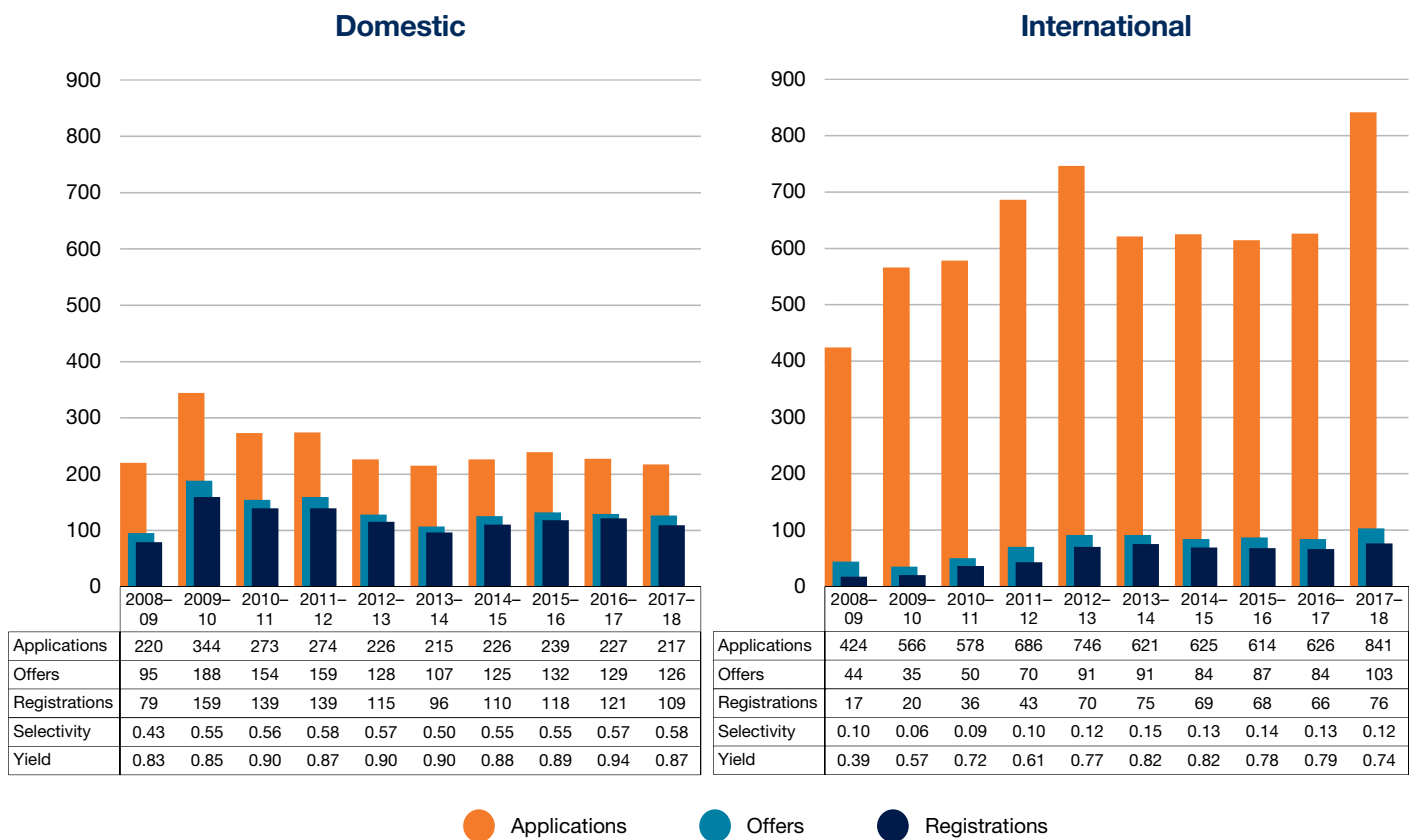
Our international reputation for research excellence enables us to recruit talented graduate students both within Canada and from abroad. International applications for our MASC programs increased by 24.8% and those for PhD programs by 34.3%, a significant increase over the previous year. This reflects strong interest in our programs from abroad, as well as changes in the global marketplace for graduate-level engineering studies.

Domestic registrations for our research-stream programs held steady. We continue to strategically recruit talented domestic students into our graduate programs. Through an ongoing digital marketing campaign, we advertise to top students at engineering schools across the country, driving

them to our graduate studies website for further information. We are also a founding member of the Canadian Graduate Engineering Consortium, and through this body we hosted the U of T Graduate Engineering Fair on October 2, 2017 with 324 students in attendance. We conducted similar events held in Vancouver, Edmonton, Calgary, Hamilton, Waterloo, Kingston and Montreal throughout fall 2017.

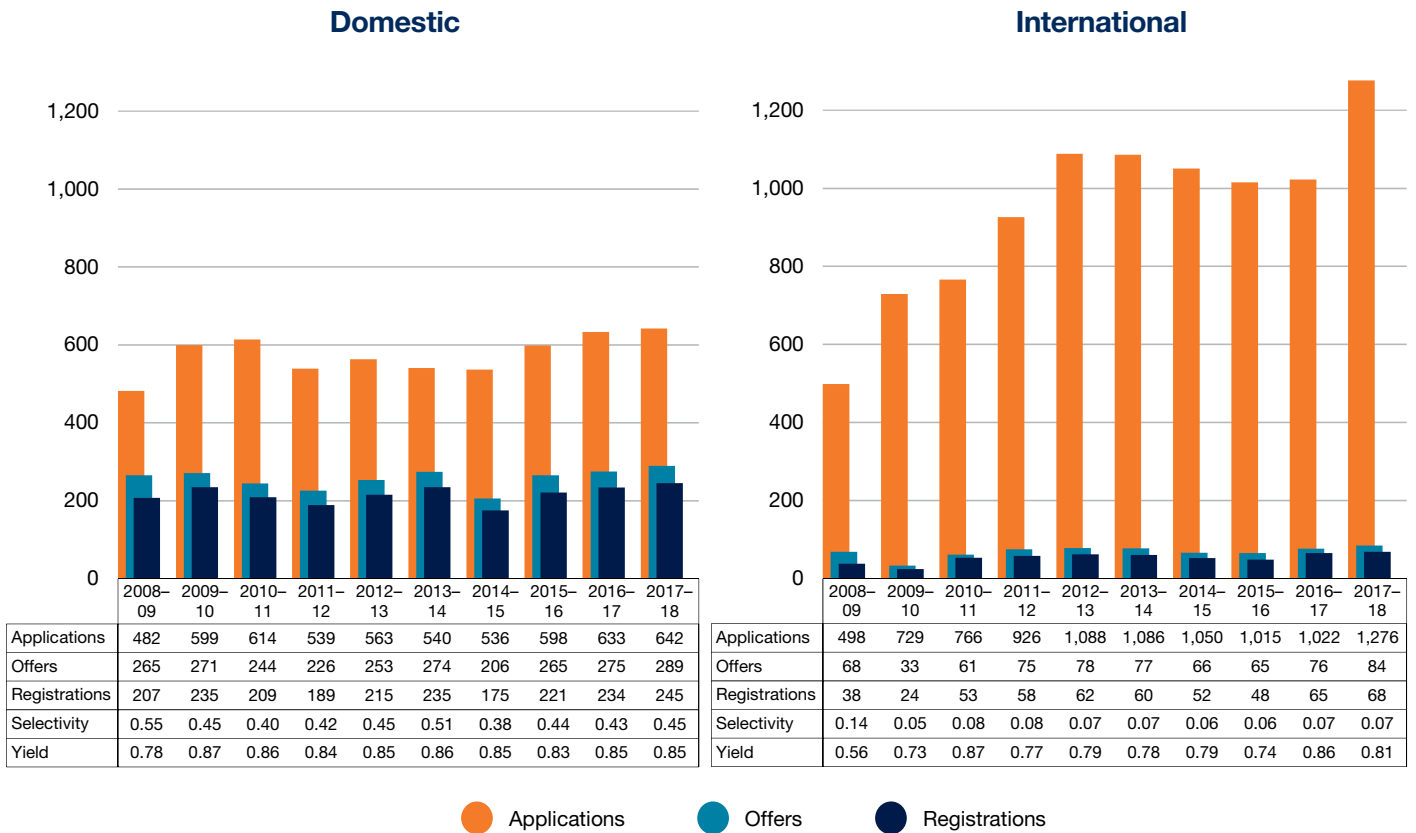
We held our fourth annual Graduate Research Days event on February 22 and 23, 2018, inviting talented students to learn more about our innovative research projects and meet prospective supervisors. We hosted 165 prospective graduate students from nine Canadian provinces as well as the U.S., Iran, India and the U.K.

Figure 2.3 Domestic and International PhD Students: Applications, Offers, Registrations, Selectivity and Yield, 2008–2009 to 2017–2018



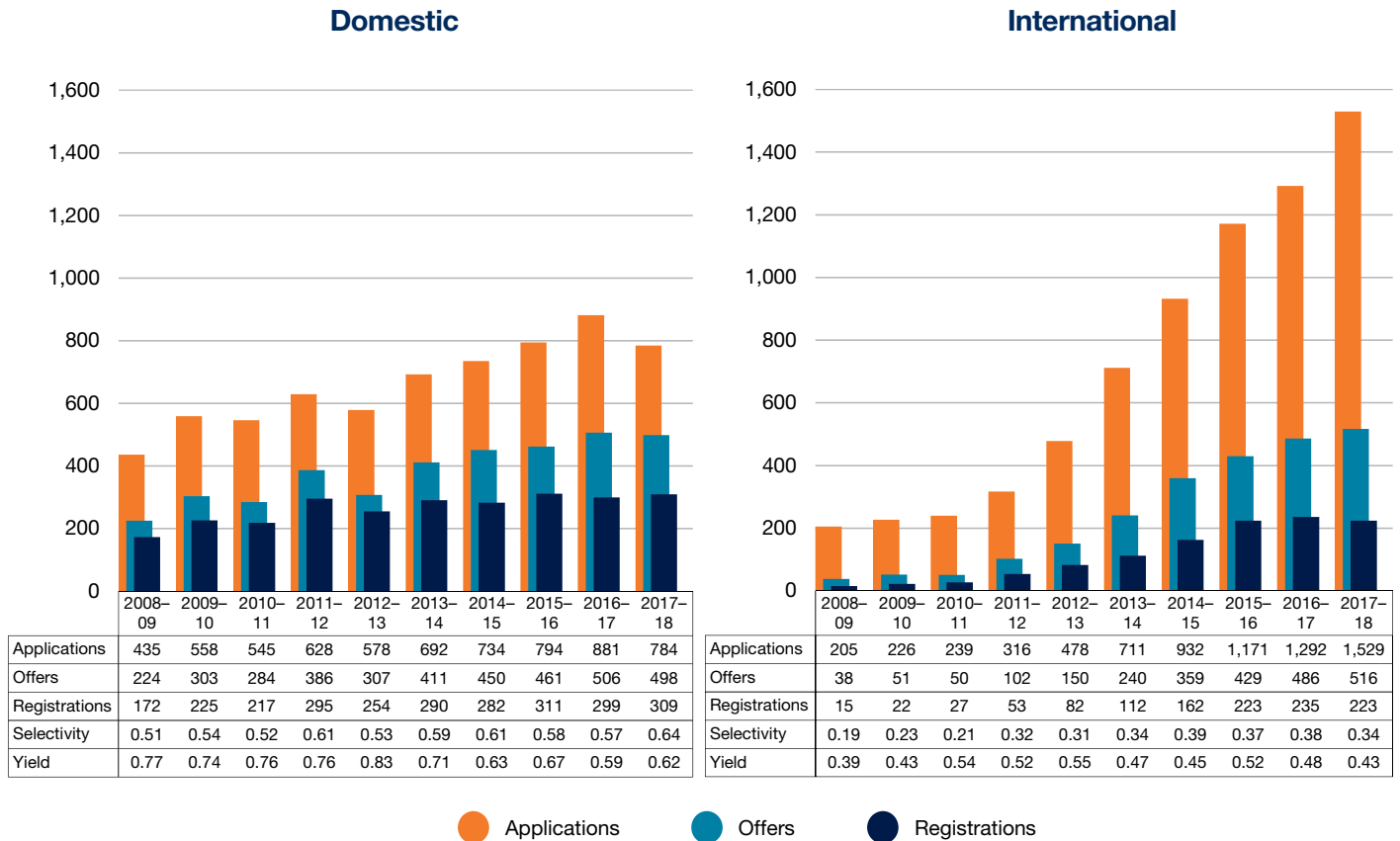
Note 2.3: Student counts are shown as of November 1, 2017. Selectivity = offers ÷ applications and represents the proportion of applicants who were offered admission. Yield = registration ÷ offers. Domestic students are defined as citizens (living in Canada or abroad) or permanent residents of Canada. Students who have fast-tracked from MASC programs into PhD programs are counted in this figure as applications, offers and admissions.

Figure 2.4 Domestic and International MASc Students: Applications, Offers, Registrations, Selectivity and Yield, 2008–2009 to 2017–2018



Note 2.4: Student counts are shown as of November 1, 2017. Selectivity = offers ÷ applications and represents the proportion of applicants who were offered admission. Yield = registration ÷ offers. Domestic students are defined as citizens (living in Canada or abroad) or permanent residents of Canada.

Figure 2.5 Domestic and International MEng and MHSc Students: Applications, Offers, Registrations, Selectivity and Yield, 2008–2009 to 2017–2018



We attracted 2,313 applications to our professional-stream programs in 2017–2018, a 6.4% increase over the previous year, driven by 18.3% more applications from outside of Canada. Over the last decade, we nearly tripled annual registrations for our MEng and MHSc programs, reflecting the growing demand for programs that offer practicing engineers advanced technical and professional competencies.

Note 2.5: Student counts are shown as of November 1. Selectivity = offers ÷ applications and represents the proportion of applicants who were offered admission. Yield = registration ÷ offers. Domestic students are defined as citizens (living in Canada or abroad) or permanent residents of Canada.

Funding

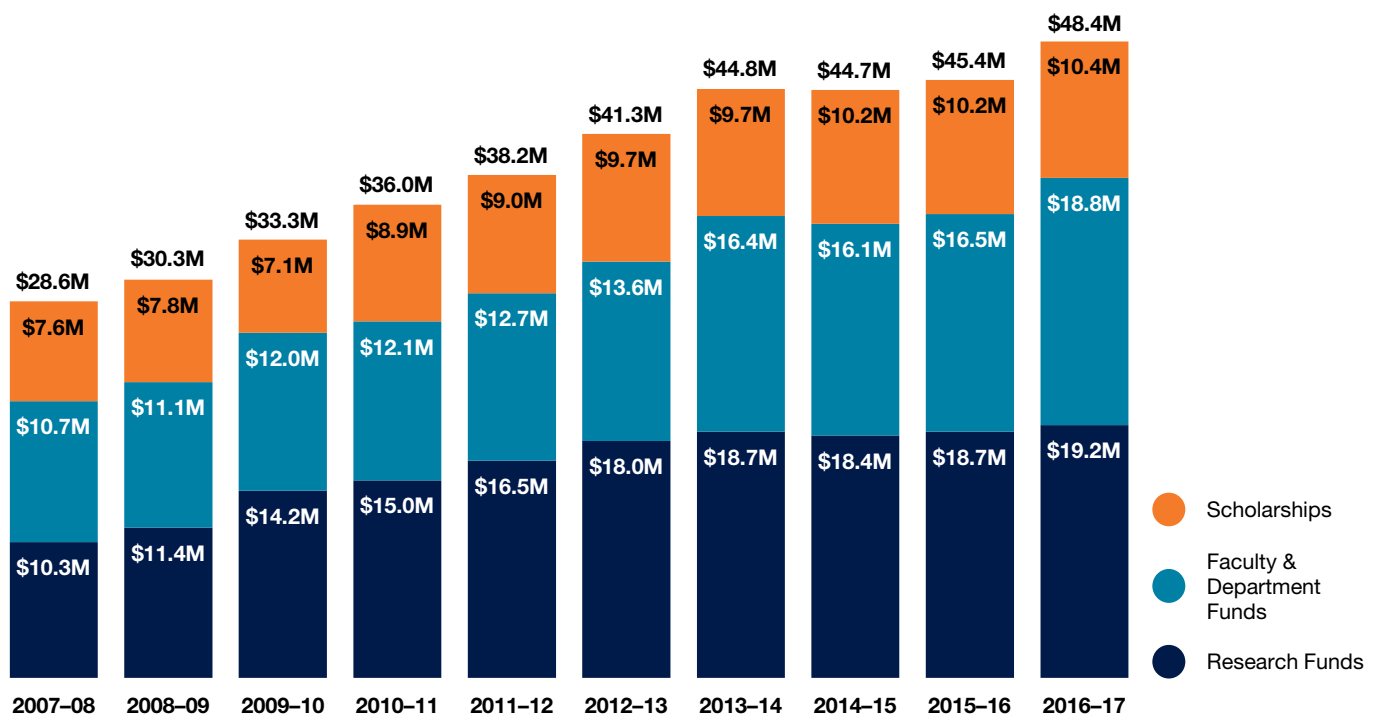
In 2016–2017, the most recent year for which data is available, total graduate funding reached an historic high of \$48.4 million, a 6.8% increase over the previous year. Part of this is due to an increase in the minimum funding package guaranteed to graduate students. As of September 2017, all programs offer an amount sufficient to cover tuition and fees and provide, in addition, an annual stipend of at least \$17,000 per year for PhD students and \$15,500 per year for MASc students, which will increase to \$16,000 starting in September 2018. Most students earn more than this minimum as a result of scholarships and teaching assistantships, so the average engineering graduate student stipend for those in the funded cohort is approximately \$25,000 per year.

Starting in the fall of 2018, international PhD students at U of T Engineering will pay the same tuition fees as domestic students. The new fee structure will benefit current and prospective international PhD students. It will include students in all years of a PhD program, and exclude students in research master's programs.

The total amount of graduate student scholarships increased from \$10.2 million in 2015–2016 to \$10.4 million in 2016–2017 (Fig. 2.6a) and included a wide range of sources, both external to U of T Engineering (e.g. Ontario Graduate Scholarships, NSERC) and internal (including donor-supported scholarships). Over the past 10 years, we have significantly increased the number of internal awards, such that they now represent 49.7% of total graduate student funding, compared to 36.3% in 2007–2008. This reflects the dedication of our vibrant community of donors and our ability to attract support for engineering research.

Future opportunities include increased governmental funding for industrial internships and research exchanges abroad. We continue to promote these options to our graduate students and encourage them to apply for external scholarships, and work with the provincial and federal governments to increase the amount of funding available in direct support.

Figure 2.6a Graduate Student Funding by Category, 2007–2008 to 2016–2017



Note 2.6a: Data from 2009–2010 onward were obtained from the new Student Accounts Reporting Cube. Data for prior years (and for all years in previous annual reports) were obtained from the Graduate Student Income Reporting Cube. For more information, see Data Sources.

Figure 2.6b Graduate Student Funding by Category and Academic Area, 2016–2017

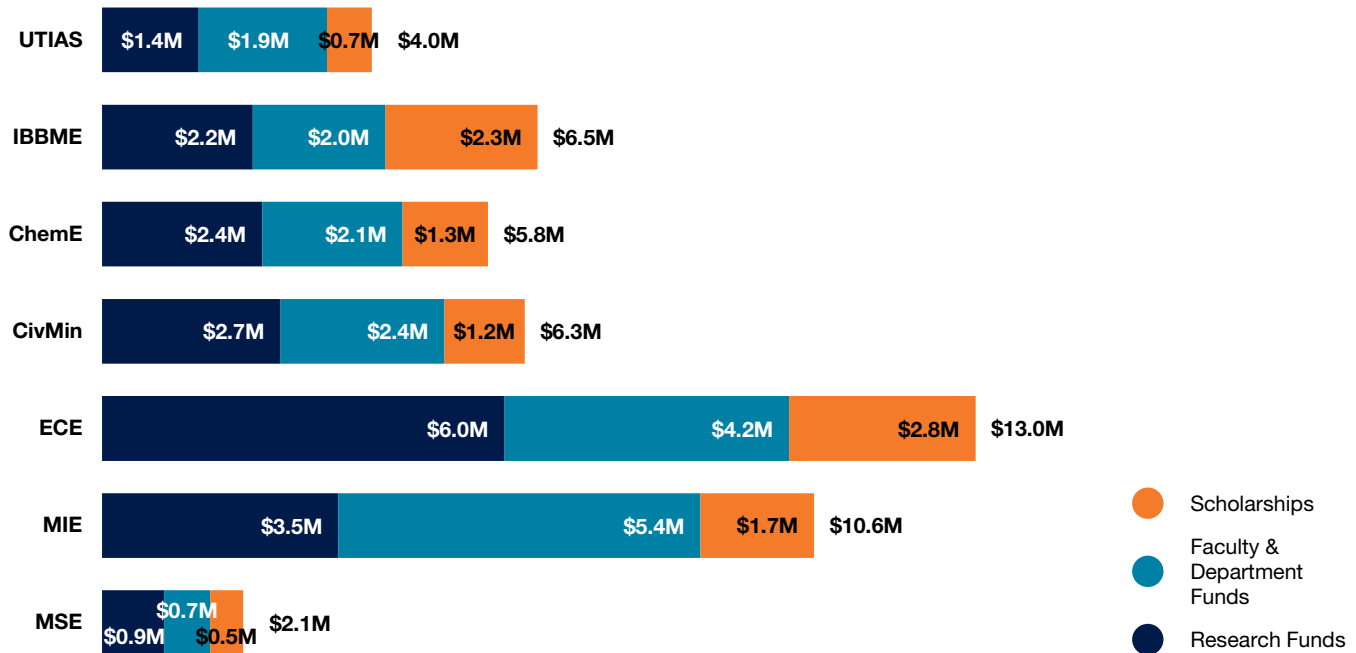


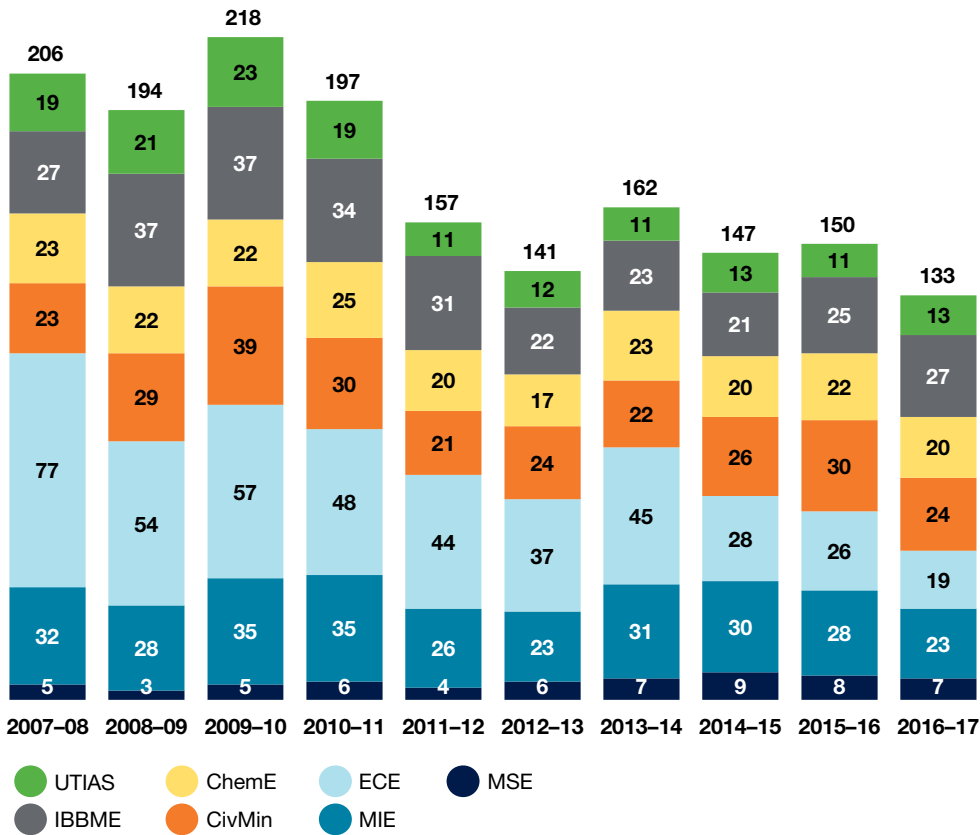
Figure 2.7a Total Graduate Student Scholarships by Source, 2007–2008 to 2016–2017

	NSERC	OGS	External-Other	Internal	Total
2007–08	\$3,827,494	\$930,000	\$68,167	\$2,752,772	\$7,578,433
2008–09	\$3,737,157	\$868,332	\$111,770	\$3,075,758	\$7,793,017
2009–10	\$4,393,513	\$853,334	\$203,167	\$1,613,187	\$7,063,201
2010–11	\$4,396,617	\$1,036,675	\$179,580	\$3,280,401	\$8,893,273
2011–12	\$3,765,883	\$1,593,328	\$256,860	\$3,381,086	\$8,997,157
2012–13	\$3,374,183	\$1,583,333	\$285,501	\$4,445,430	\$9,688,448
2013–14	\$3,759,671	\$1,236,666	\$582,170	\$4,088,309	\$9,666,816
2014–15	\$3,488,447	\$1,336,670	\$877,587	\$4,487,866	\$10,190,570
2015–16	\$3,315,223	\$1,223,331	\$926,787	\$4,748,300	\$10,213,641
2016–17	\$3,315,223	\$1,223,331	\$926,787	\$5,157,619	\$10,381,390

Note 2.6b: Data were obtained from the new Student Accounts Reporting Cube. Data for previous annual reports were obtained from the Graduate Student Income Reporting Cube. For more information, see Data Sources.

Note 2.7a: Data from 2009–2010 onward were obtained from the new Student Accounts Reporting Cube. Data for prior years (and for all years in previous annual reports) were obtained from the Graduate Student Income Reporting Cube. For more information, see Data Sources.

Figure 2.7b Number of NSERC Graduate Student Award Recipients by Academic Area, 2007–2008 to 2016–2017



Note 2.7b: Data from 2009–2010 onward were obtained from the new Student Accounts Reporting Cube. Data for prior years (and for all years in previous annual reports) were obtained from the Graduate Student Income Reporting Cube. For more information, see Data Sources.

Graduate Studies Completion

We continue to encourage students to maximize their research impact by fast-tracking from MASc programs into PhD programs, and to apply for PhD programs directly from their undergraduate degrees. In 2017–2018, 44 students fast-tracked, our highest total to date, and 13 students started direct-entry PhD programs, our second highest total to date.

Figure 2.8a **Number of Students Fast-Tracked from MASc to PhD by Academic Area, 2008–2009 to 2017–2018**

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
UTIAS	8	6	5	2	5	6	10	1	3	10
IBBME	5	12	8	5	8	8	12	14	8	10
ChemE	7	11	4	8	7	14	8	5	7	5
CivMin	5	3	2	5	2	3	1	5	5	7
ECE	0	1	6	4	2	4	5	4	3	6
MIE	7	7	6	6	6	5	2	8	13	6
MSE	3	1	3	7	1	3	4	2	2	0
Total	35	41	34	37	31	43	42	39	41	44

Figure 2.8b **Number of Direct-Entry PhD Students by Academic Area, 2008–2009 to 2017–2018**

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
IBBME	1	6	6	5	5	7	3	5	7	11
ChemE				1				5	1	
CivMin									1	
ECE							2	2	2	2
MIE				1	1				4	
Total	1	6	6	7	6	7	5	12	15	13

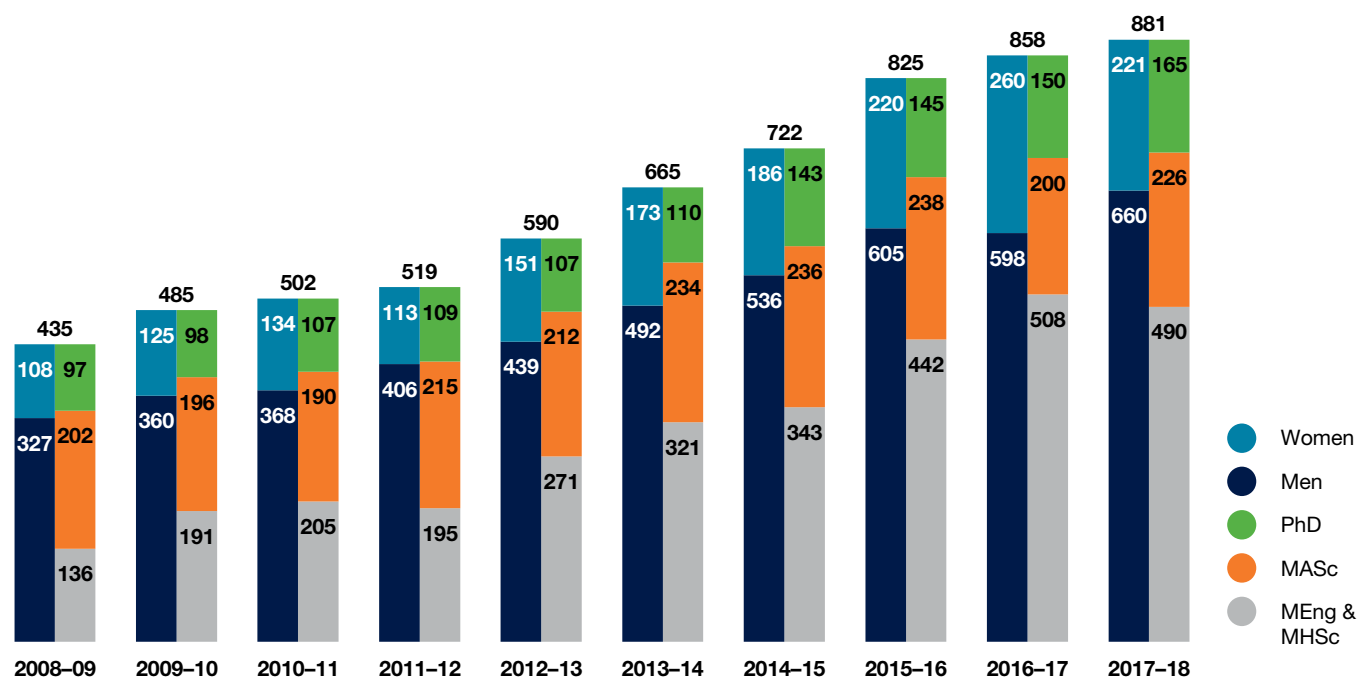
Note 2.8a and b: For counting purposes, the academic year is from May to April.

Figure 2.9 Time to Completion for PhD, MASc, MEng and MHSc Students, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
PhD	4.7	4.7	5.3	5.0	5.3	5.2	5.3	5.3	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)	1.0	1.0	1.0	1.0	1.3	1.0	1.0	1.0	1.0	1.0
MEng (ExtFT)							1.3	1.7	1.7	1.7
MEng (PT)	2.3	2.3	2.3	2.0	2.0	2.0	2.0	2.0	2.3	2.0

In 2017–2018, women made up 25% of our graduating class. The number of women receiving degrees has more than doubled over the past decade. The number of PhDs awarded in 2017–2018 was 490, representing an 3.6-fold increase over the past 10 years.

Figure 2.10 Graduate Degrees Awarded by Degree Type and Gender, 2008–2009 to 2017–2018



Post-Graduation Employment

In early 2018, U of T’s School of Graduate Studies released the data for the 10,000 PhDs project, a comprehensive database of the employment status of the 10,886 doctoral students who graduated from U of T between 2000 and 2015. The study successfully located 88% (9,583) of these graduates, including 85% (1,246 of 1,461) of the PhD students that graduated from our Faculty during that time. According to this data:

- Among U of T Engineering PhD graduates, a higher proportion were employed in the private sector (44.5%) than the overall U of T PhD graduate population (21.8%). Post-

secondary education is also a major employer of U of T Engineering graduates, accounting for 44.6%, nearly identical to the proportion in the private sector.

- Over the last 15 years, there has been a shift in employment among PhD graduates, with fewer working in post-secondary education and more choosing to work in the private sector. The proportion in the private sector grew from 37.1% among the 2000–2003 cohort to 47.2% in the 2012–2015 cohort.

These findings reflect our commitment to prepare graduate students for a wide range of potential career paths. Some of our newest initiatives are outlined in the next section: *Enriching the Graduate Student Experience*.

Enriching the Graduate Student Experience

Whether our students aspire to a career in academia, industry or entrepreneurship, we provide a wide range of curricular and co-curricular opportunities that enable them to develop the competencies they need to be successful and to lead change.

Through our professional master's programs, students gain specialized technical knowledge and develop leadership and other professional competencies to advance their careers. MEng students apply through one of seven departments and institutes and can select from among a growing number of optional emphases, including our newest in Aerial Robotics, Analytics and Forensic Engineering.

The Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) emphasis continues to be the most popular of these emphases. In 2017–2018, 118 students completed an ELITE emphasis. We expanded our ELITE curriculum to include six new courses in 2017–2018:

- APS1049 Management Consulting for Engineers (start date summer 2018)
- APS1050 Blockchain technologies and cryptocurrencies (start date fall 2018)
- APS1051 Portfolio management praxis under real market constraints (start date winter 2019)
- APS1502 Leading Engineering Design Projects, (start date fall 2017)
- APS1305/1308 PsychEng Seminars Series, (start date fall 2017)
- APS1061 Business Strategy and Intrapreneurship (start date summer 2018)

In 2017–2018, we further expanded our academic offerings with new programs, including:

- **Cross-Faculty Collaborative Master's Specialization in Psychology and Engineering (PsychEng):** This new program is delivered jointly by the Department of Mechanical & Industrial Engineering and the Department of Psychology in the Faculty of Arts & Science. Students study topics such as how product design can encourage pro-environmental behavior and how the communication of information about climate change can lead to action.
- **MEng Emphasis in Forensic Engineering:** This emphasis recognizes specialized work by graduate students in areas related to forensic engineering, including assessment of deterioration in infrastructure, product quality and product failure, and procedural practice improvement as a result of investigations.
- **MEng Emphasis in Analytics:** Launched in January 2018, this emphasis draws on the Faculty's existing expertise in areas such as operations research, computational genomics and intelligent mechatronic systems. It will provide students with techniques and strategies to translate large data sets into useful insights in sectors such as manufacturing, transportation, banking and health care.

Figure 2.11 ELITE Emphases Awarded, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
AeroE		1	2		7	2	4	11	1	17
ChemE		2	12	11	17	8	20	20	18	13
CivMin	3	11	13	11	9	12	12	24	22	16
ECE		3	3	3	22	32	22	14	28	30
MIE		7	19	20	26	36	39	50	53	41
MSE			1	1	4	6	11	5	15	1
Total	3	24	50	46	85	96	108	124	137	118

Professional Development

To further enrich the graduate student experience, the Faculty offers a number of opportunities for graduate students to develop professional competencies and gain industry exposure:

- **Prospective Professors In Training (PPIT):** Launched in 2007–2008, PPIT has a rich history of preparing doctoral students for the rigors of an academic position. The program includes seminars on applying for academic positions and grants, managing a classroom, starting research programs, as well as topics in teaching and learning. For 2017–2018, 23 PhD candidates enrolled in PPIT.
- **Opportunities for PhDs: Transitions, Industry Options, Networking and Skills (OPTIONS):** Developed in 2017–2018 and supported by the School of Graduate Studies' Innovation in Graduate Professional Development Fund, OPTIONS builds on the format of the Faculty's PPIT program, exploring non-academic careers in industry research and development, government policy and entrepreneurship. Through a series of workshops, panel discussions and networking events, OPTIONS participants learn about labour market information, career planning, resumé building and fostering productive team dynamics. Fifty-six students enrolled in its inaugural year.
- **Graduate Engineering Council of Students (GECoS):** This new student body meets regularly with the Vice-Dean, Graduate Studies to advise on academic policy and programs. GECoS includes representation from each graduate unit, and played a major role in the execution of Graduate Research Days in February 2018. In May 2017, GECoS spearheaded a new Graduate Career Fair on the St. George Campus.
- **Graduate Career Fair:** Since 2017, we have hosted a Graduate Career Fair, bringing together a diverse number of employers looking to recruit U of T Engineering graduate students and alumni. In the event's second iteration in May 2018, GECoS partnered with the Engineering Career Centre to broaden the range of company partnerships. The career fair brought out 29 companies, including Intel Programmable Solutions Group, Toyota Canada and Baylis Medical Company. Attendees also had the opportunity to participate in a speed networking event, which aims to build career-advancing connections with industry. In 2018, 434 graduate students and engineering professionals with graduate degrees were in attendance.

Selected Graduate Student Highlights

Four U of T Engineering graduate students awarded Vanier Scholarships

In the summer of 2017, four students from U of T Engineering received a total of \$600,000 from the 2017 Vanier Canada Graduate Scholarships competition. The awards recognize doctoral students at Canadian universities who demonstrate excellence in academics, research impact and leadership. The winners are:

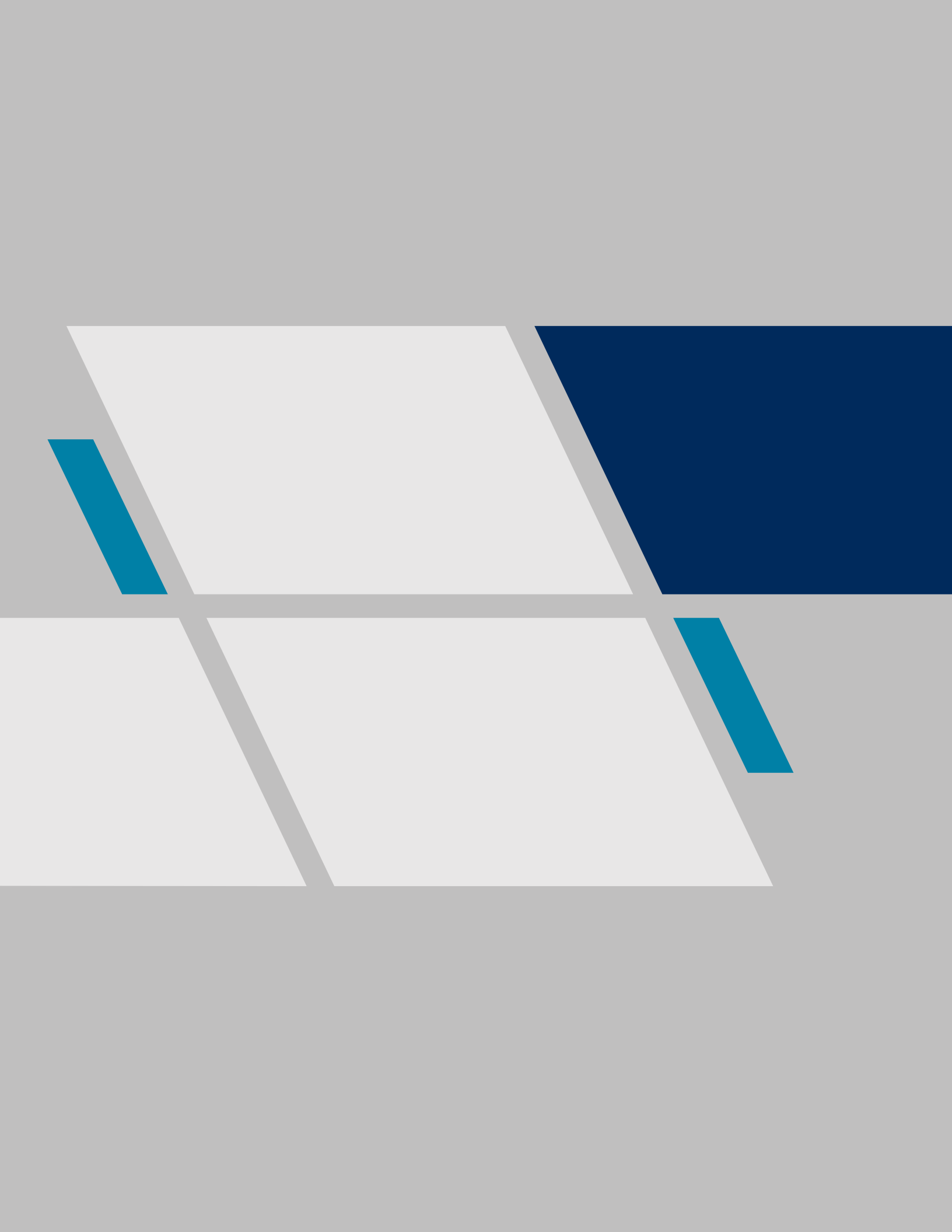
- **Neal Callaghan (IBBME PhD candidate):** Co-supervised by professors Craig Simmons (MIE, IBBME) and Paul Santerre (IBBME), Callaghan is working on methods for culturing pluripotent stem cells, which have the ability to develop into any cell type found in the human body. By better understanding the chemical and physical signals that tell pluripotent stem cells when to turn into cardiomyocytes, or heart muscle cells, the research will accelerate progress toward custom tissues to repair hearts damaged by disease or injury, as well as lab-grown tissues and organs which can be used to test new drug candidates for potentially dangerous side effects.
- **Marta Overchuk (IBBME PhD candidate):** Under the supervision of Professor Gang Zheng (IBBME), Overchuk is combining light-sensitive molecules and lasers to treat cancer tumours. The molecules bind to specific proteins on the surface of cancer cells. Once they are bound, she shines laser light through the skin to activate the molecules, releasing reactive oxygen species that destroy cancer cells. The goal is to kill cancer cells without harming the healthy cells that surround them, providing a more targeted form of cancer treatment.
- **Reza Rafie (ECE PhD candidate):** Supervised by Professor Frank Kschischang (ECE), Rafie is using advanced mathematical tools to estimate the capacity — the ultimate limit to the rate at which one can reliably transmit information — of optical fibres. He then uses other mathematical tools to design communication mechanisms capable of operating at data rates near those theoretical limits. Fibre-optic cables are the backbone of global phone networks and the Internet, so increasing data rates will enable online services to become both faster and less expensive.
- **Christopher Sun (EngSci 1T3+PEY, MIE PhD candidate):** Under the supervision of Professor Timothy Chan (MIE), his research focuses on optimizing the distribution of life-saving automated external defibrillators (AEDs) in public places across the city. In 2015, his research revealed that many AEDs are located in buildings that are locked overnight, rendering them inaccessible. More recently, Chan and Sun created a “Top 10” list of prime spots to place AEDs in order to increase their availability and save lives. Ideal locations included coffee retailers like Tim Hortons, Starbucks and Second Cup as well as ATMs operated by large banks.

U of T Engineering team wins first AutoDrive Challenge

Graduate students Keenan Burnett (UTIAS MASc candidate) and Mona Gridseth (UTIAS PhD candidate), along with their supervisor Professor Angela Schoellig (UTIAS) are leading U of T Engineering’s team in the AutoDrive Challenge™, a new intercollegiate autonomous vehicle competition. They are retrofitting a Chevrolet Bolt, an electric vehicle, with an array of sensors and machine learning algorithms, turning it into a self-driving car. Sponsors include General Motors, the Society of Automotive Engineers (SAE) and a number of companies that produce hardware and software for self-driving cars. More than 50 undergraduate and graduate students have joined the U of T Engineering team, named aUToronto. From April 30 to May 5, 2018, the team travelled to the General Motors Proving Grounds in Yuma, Ariz., for the first of three challenges in the competition. They performed in the top three in all six categories used to judge the teams, including: social responsibility report and presentation; concept design report and presentation; mapping challenge; stop line challenge; lateral challenge; and obstacle detection and avoidance challenge. Overall, the team earned first place among the eight North American universities invited to participate, including the University of Waterloo, Virginia Tech, Texas A&M, Michigan State, Michigan Tech, North Carolina A&T State and Kettering University.

U of T Awards of Excellence recognize U of T Engineering PhD candidate

Graduate student Locke Davenport Huyer (ChemE, IBBME PhD candidate) was named a University of Toronto Alumni Association (UTAA) Graduate Scholar in March 2018. His biomedical engineering research focuses on creating a new kind of polyester material for building artificial cardiac tissue, and he has already been the first author on two papers about his findings and organized two research conferences. An enthusiastic mentor, Davenport Huyer is a volunteer lecturer for the Let’s Talk Science program and co-founder of the IBBME Discovery Program, an enriched science course taught by U of T students to high schoolers in one of Toronto’s low-income communities. He was awarded a Vanier Scholarship in 2016.



3

Our approach to research is defined by ambition, innovation, multidisciplinary collaboration and strong partnerships with industry, non-profit organizations and community groups. Enabled by the rich entrepreneurial ecosystem at U of T — including our own campus-linked accelerators and our vibrant alumni network — our professors and students translate their innovations from the lab to the global marketplace.

U of T Engineering is home to 120 chairs and professorships, and more than 25 multidisciplinary research centres and institutes. In 2016–2017, the most recent year for which data is available, we attracted research operating funds of \$74.4 million, a 17% increase over the previous year and a 62% increase over the past decade. Our funding comes from a range of sources, including federal government (NSERC, CIHR, SSHRC and National Centres of Excellence) grants and scholarships, provincial research grants, industrial research partnerships and philanthropic support. Each year, we collaborate with more than 400 external partners, from major global corporations to local hospitals and startups.

In the past year, our faculty and students created flexible heart repair kits that could save and extend human lives, as well as leading-edge techniques for storing energy from intermittent sources such as solar and wind, among many other innovations. They are also developing the technologies that will drive new business models, including in advanced manufacturing, artificial intelligence and robotics.

Through initiatives such as EMHSeed with U of T's Faculty of Medicine and a new agreement with the Faculty of Arts & Science, we bring together principal investigators from a wide range of fields. We have also been successful in obtaining a number of prestigious NSERC Collaborative Research and Training Experience (CREATE) grants, which enable our graduate students to gain relevant experience in their chosen industry.

The Myhal Centre for Engineering Innovation & Entrepreneurship, which opened this year, will enhance our research in many ways. It significantly expands our Faculty's fabrication and prototyping facilities, and provides a new home for our Centre for Global Engineering, Institute for Robotics & Mechatronics, Institute for Sustainable Energy and Institute for Water Innovation. It also strengthens our connections with alumni and partners, enabling us to leverage our global network to address challenges and create new technologies.

Selected Highlights Organized by Research Theme

Data Analytics and Intelligent Systems

U of T attracts Fujitsu Co-Creation Research Laboratory

A new multidisciplinary research hub, created in partnership with Fujitsu Laboratories Limited, will accelerate collaborative work in fields including machine learning, quantum computing, smart cities, advanced health care and financial technology. The seeds of the collaboration were planted in 1998 when Professor Ali Sheikholeslami (ECE), then a PhD student, completed a six-week internship at the company's headquarters in Tokyo. That work grew into a collaboration that has lasted more than 20 years, and culminated in the Fujitsu Co-Creation Research Laboratory, which will be led by Sheikholeslami. A global delegation led by Tatsuya Tanaka, President of Fujitsu Laboratories Limited, met with U of T leaders and researchers in March 2018 to celebrate the agreements and tour the new Myhal Centre for Engineering Innovation & Entrepreneurship. Fujitsu plans to work with U of T to accelerate the practical use of quantum computing technologies that can reach beyond the limitations of today's supercomputers. For example, such technologies could help health-care professionals more precisely calibrate the dosage and angle of beam radiation needed to shrink tumours and kill cancer cells with little to no damage to surrounding healthy tissue. The Fujitsu Co-Creation Research Laboratory includes partnership agreements with U of T Engineering professors Alberto Leon-Garcia (ECE), Shahrokh Valaee (ECE), Taufik Valiante (Department of Surgery, ECE) and Yuri Lawryshyn (ChemE), each of whom will work with Fujitsu to introduce quantum computing technology into their respective areas of research expertise.

U of T Engineering spinoff Deep Genomics raises US\$13 million to fund expansion

Deep Genomics, an artificial intelligence-powered health startup co-founded by Professor Brendan Frey (ECE) has raised US\$13 million from a Silicon Valley venture capital firm. The startup, launched in 2015, combines artificial intelligence (AI) and genomics research to help develop genetic medicines to treat a myriad of disorders — everything from autism to cancer. At the heart of the company is a set

of machine learning algorithms capable of harnessing the massive amount of genetic data that has become available since the human genome was sequenced in 2001. Unlike traditional drug discovery algorithms, which focus on a particular protein involved in a disease, Deep Genomics focuses on the genetic mutations that are the source of the problem. Researchers can then use this information to screen giant libraries of chemical compounds — tens of billions of molecules — to generate compounds that can lead toward new therapeutics. In addition to being the CEO of Deep Genomics, Frey is a founding member of the Vector Institute for artificial intelligence research, an academia-industry-government centre that solidifies Toronto's position as a global hub for AI research and development. With over \$200 million in funding, the institute builds on U of T's longstanding strength in branches of AI such as deep learning, machine learning, neural networks, augmented reality, autonomous vehicles and robotics.

U of T Engineering spinoff LegUp Computing secures seed funding from Intel Capital

LegUp Computing Inc., co-founded by Professor Jason Anderson (ECE) with alumni Andrew Canis (CompE PhD 1T5), Jongsok Choi (CompE MSc 1T2, PhD 1T6) and Ruolong Lian (CompE 1T3, MSc 1T6) announced in February that it closed a seed funding round led by Intel Capital. Anderson's research area is computer hardware design, focusing on field-programmable gate arrays (FPGAs): programmable and reprogrammable computer chips that can be configured by the end user to implement any digital circuit. While FPGAs have been traditionally used for specialized functions — such as network switches — more recently they have been deployed by a number of cloud service providers. But servers based on FPGA chips come with a challenge: the difficulties of designing hardware can be an impediment to their adoption. LegUp Computing, founded in 2015, provides users with a cloud platform that enables software developers to program, scale and manage FPGA devices for accelerating high-performance applications. The company received early funding from UTEST, a University of Toronto accelerator partnered with MaRS Innovation.

Data in this chapter are presented for the 2016-2017 grant year (April to March). This is the most recent year for which complete data are available. Highlights are from July 2017 to June 2018.

Advanced Materials and Manufacturing

Natural fibres: New yeast strains could turn plant waste into fabrics

Nylon is used in everything from clothing to car parts to toothbrush bristles, but it is derived from oil, a nonrenewable fossil fuel. A team of researchers from U of T Engineering is working on a way to make the same chemical from a renewable source: plants. Professor Krishna Mahadevan (ChemE) and his collaborators are engineering strains of yeast that can make hexamethylene diamine and adipic acid — the two precursors of the nylon polymer — from sugar. The sugar, in turn, will be derived from cellulose, the major component of bark, corn stalks, leaves, corn cobs and other biomass that is most often discarded as waste. The project's partners include BioAmber, a company that uses yeast to turn corn sugar into a chemical called succinic acid on the industrial scale at its Sarnia, Ont. plant, and FPIInnovations, which has developed a process to turn bark and other forestry waste into sugars. Over the past few years, the project has received more than \$10 million from a variety of sources, including NSERC, the Ontario Ministry of Research and Innovation and Genome Canada.

New smart material from U of T researchers aids in the fight against tooth decay

When patients go to the dentist to fill a cavity, they are trying to solve a problem — not create a new one. But many dental patients get some bad news: bacteria can dig under their tooth-coloured fillings and cause new cavities, called recurrent caries. Recurrent caries affect 100 million patients every year and cost an additional US\$34 billion to treat. In a paper published this year in *Scientific Reports*, professors Ben Hatton (MSE), Yoav Finer (Dentistry) and PhD student Cameron Stewart (IBBME) proposed a novel solution: a filling material that slowly releases antimicrobial drugs throughout the lifetime of the patient. The material is made from a combination of drugs and silica glass. These materials organize themselves on a molecule-by-molecule basis to maximize drug density, with enough supply to last years as opposed to the weeks provided by more traditional materials. The team plans on testing these new drug-storing particles in dental fillings, monitoring their performance when attacked by bacteria and saliva in the complex environment in the mouth. If successful, this new material could create a stronger filling and fewer trips to the dentist.

Sustainability

Artificial photosynthesis gets big boost from new catalyst

A new catalyst created by U of T Engineering researchers brings them one step closer to artificial photosynthesis — a system that, just like plants, would use renewable energy to convert carbon dioxide (CO₂) into stored chemical energy. Phil De Luna (MSE PhD candidate) and his co-lead authors Xueli Zheng (ECE PhD 1T7), postdoctoral fellow Bo Zhang and Professor Ted Sargent (ECE) created a new catalyst for a chemical reaction that splits water into protons and oxygen gas: this reaction is one half of the artificial photosynthesis system. Unlike previous catalysts which required high pH levels to work, this one is highly active at neutral pH, increasing the overall efficiency of the system. The catalyst is made of nickel, iron, cobalt and phosphorus, all elements that are low-cost and pose few safety hazards. The research was published in *Nature Chemistry*.

Elements of bio-mining: Engineering collaboration aims to turn mine waste into valuable metals

Professors Vladimiro Papangelakis (ChemE) and Elizabeth Edwards (ChemE) are leading the Elements of Bio-mining project. The initiative is a multidisciplinary collaboration between U of T Engineering, Laurentian University, and the University of British Columbia (UBC), as well as a number of technology, engineering and mining companies, including Glencore, Vale, Teck, Barrick and Hatch. Together, the team is developing ways to process a number of different types of materials left over from mining activities across Canada, from nickel mines in Sudbury, Ont. to coal mines in British Columbia. They aim to understand how native microorganisms at these sites convert chemicals from one form to another, and how they might encourage certain beneficial reactions while discouraging others. For example, there may be up to \$7 billion worth of nickel alone locked in the tailings from Sudbury's mines. The Elements of Bio-mining project aims to determine whether this value could be recovered in a way that makes the treatment and remediation process economically viable. In addition to the universities and industrial partners, the project has attracted support from a number of research funding agencies, including NSERC, Genome British Columbia and Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO). Most recently, the project received \$4 million from the Ontario Research Fund.

Crunching the numbers on Toronto's King Street transit pilot

Toronto's one-year King Street transit pilot project, launched in November 2017, involves altering traffic patterns on the stretch of King Street from Bathurst Street in the west to Jarvis Street in the east to prioritize through-traffic from streetcars, cyclists and pedestrians. It aims to improve transit reliability, speed and capacity, along with a number of other measures included in a comprehensive evaluation and monitoring program. For a team of researchers including Professor Marianne Hatzopoulou (CivMin), it also presents an ideal opportunity to study the effects — both direct and indirect — of traffic changes on air and noise pollution, public health and commuter decision-making. Hatzopoulou and her team are using portable exposure monitors that measure traffic-related air pollution such as small inhalable particles and soot on simulated visits through the area via several modes, such as cycling, walking, riding the streetcar or sitting in a coffee shop. Postdoctoral fellow Cheol-Heon Jeong (ChemE) and Peter Murphy (ChemE MASc candidate) of the Southern Ontario Centre for Atmospheric Aerosol Research (SOCAAR) at U of T Engineering have also installed several of its stationary AirSENCE™ monitors throughout the pilot project area, as well as air quality monitors on two TTC streetcars dedicated exclusively to King Street routes for the duration of the project. These devices measure ozone, carbon monoxide, carbon dioxide, ultrafine particles, black carbon and PM 2.5, a measure of airborne particulate matter. In December 2017, the researchers met with representatives from the City of Toronto's Transportation Services and Public Health teams to discuss coordinated data collection, information sharing, survey design and next steps.

U of T Engineering spinoff Appulse Power acquired by Silanna Semiconductor

In March 2018, Appulse Power Inc., a startup company founded by U of T Engineering alumni Ahsan Zaman (ElecE 0T9, ECE MASc 1T2, PhD 1T5), Behzad Mahdavihah (ECE PhD 1T4), Aleksandar Radić (ECE PhD 1T4) and Professor Aleksandar Prodić (ECE), announced its acquisition by the multinational Silanna Semiconductor. Appulse designs application-specific integrated circuits to allow devices, including smartphones and tablets, to charge faster and consume less power. Its innovations enable more efficient charging and smaller components both within and outside its devices — shrinking the footprint required for power management and downsizing clunky chargers and adapters. Appulse has 13 employees across two offices in Toronto and San Diego, Calif., all of whom are staying with Silanna and will operate as an independent business unit within the company. The Toronto office will become Silanna's first Canadian location, in addition to hubs in San Diego; Raleigh, NC; Brisbane and Sydney, Australia; and Singapore.

CERT team advances to finals of Carbon XPRIZE

In April 2018, a U of T Engineering-led team working to capture greenhouse gas and recycle it into useful chemicals advanced to the finals of the international NRG COSIA Carbon XPRIZE. The competition challenges teams to capture carbon emissions from power plants and efficiently convert them into valuable chemical products. Carbon Electrocatalytic Recycling Toronto (CERT) is a team of two dozen multidisciplinary researchers working with Professors Ted Sargent (ECE) and David Sinton (MIE). They are among the five teams from around the world to make it into the third and final round in the natural gas plant stream of the competition. CERT leveraged the team's expertise in electrocatalysis to develop nanoparticle-based catalysts that use clean electricity to recycle CO₂ into valuable carbon-based products. They demonstrated they could convert kilograms of CO₂ into carbon monoxide, a widely utilized industrial chemical. They also achieved significant scale-up: in just one year, they advanced their technology from a catalyst the size of a fingernail in a beaker to a continuous flow system the size of a small car. By advancing to the finals, the team earned US\$500,000 to continue their research. The final winner will receive a US\$7.5-million grand prize.

Engineering and Human Health

Injectable tissue patch could help repair damaged organs

A team of U of T Engineering researchers is mending broken hearts with an expanding tissue bandage a little smaller than a postage stamp. The team, which includes IBBME PhD candidate Miles Montgomery and Professor Milica Radisic (IBBME, ChemE), built their scaffold out of POMaC, a polymer that is both biodegradable and biocompatible. Its physical shape enables it to match the mechanical properties of the target heart tissue, and gives it the required shape-memory behaviour: as it emerges from a needle, the patch unfolds itself into a bandage-like shape. Similar tissue scaffolds have been proposed as a treatment for heart attacks before, but the method by which they are implanted — open-heart surgery — usually poses more risks than the potential benefits of the device. By creating a patch that can be injected rather than implanted, Radisic and her team are aiming to offer a more realistic solution that can improve the lives of heart attack patients around the world. The research was published in *Nature Materials*.

Searching for toxins in the aftermath of the Fort McMurray wildfire

The wildfires that raged through northern Alberta in the summer of 2016 are estimated to be the most costly natural disaster in Canada's history, destroying approximately 2,400 homes and forcing the evacuation of nearly 90,000 people.

But the ash left behind by the fire can continue to affect people's health long after the flames have gone out. Professor Arthur Chan (ChemE), along with postdoctoral researcher Lukas Kohl (ChemE) and undergraduate student Cynthia Jing (Year 2 EngSci) created the Fire Ash Characterization and Evaluation of Toxicity (FACET) study to assess the human health hazards posed by this ash. They are gathering dust from the homes of people affected by the fires and analyzing it for a variety of substances, including heavy metals such as lead, a potential neurotoxin, and organic chemicals such as polycyclic aromatic hydrocarbons (PAHs), which have been associated with cancer. More than 60 homes were sampled three times throughout the summer and fall of 2017 and the winter of 2018. Results are expected to be published later this year.

U of T Engineering researchers develop handheld 3D skin printer

U of T Engineering researchers have developed a handheld 3D skin printer that deposits even layers of skin tissues to cover and heal deep wounds. The team believes it to be the first device that forms tissue *in situ*, depositing and setting in place in two minutes or less. Their research, led by Navid Hakimi (MIE PhD candidate) under the supervision of Professor Axel Guenther (MIE, IBBME), and in collaboration with Dr. Marc Jeschke, director of the Ross-Tilley Burn Centre at Sunnybrook Hospital, was recently published in the journal *Lab on a Chip*. The current preferred treatment for deep skin wounds is called split-thickness skin grafting, where healthy donor skin is grafted into the surface epidermis and part of the underlying dermis. This requires enough healthy donor skin to traverse all three layers of skin — the epidermis, dermis and hypodermis — and sufficient graft skin is rarely available. The research team believes their in-situ skin printer is a platform technology that can overcome these barriers, while improving the skin-healing process. Resembling a white-out tape dispenser, the handheld device uses vertical stripes of "bio ink." This ink is made up of protein-based biomaterials including collagen, the most abundant protein in the dermis, and fibrin, a protein involved in wound healing. Working with Jeschke's team at Sunnybrook Hospital, the team plans to perform more *in vivo* studies. They hope that one day they can begin running clinical trials on humans, and eventually revolutionize burn care.

Lab-on-a-chip delivers critical immunity data for vulnerable populations

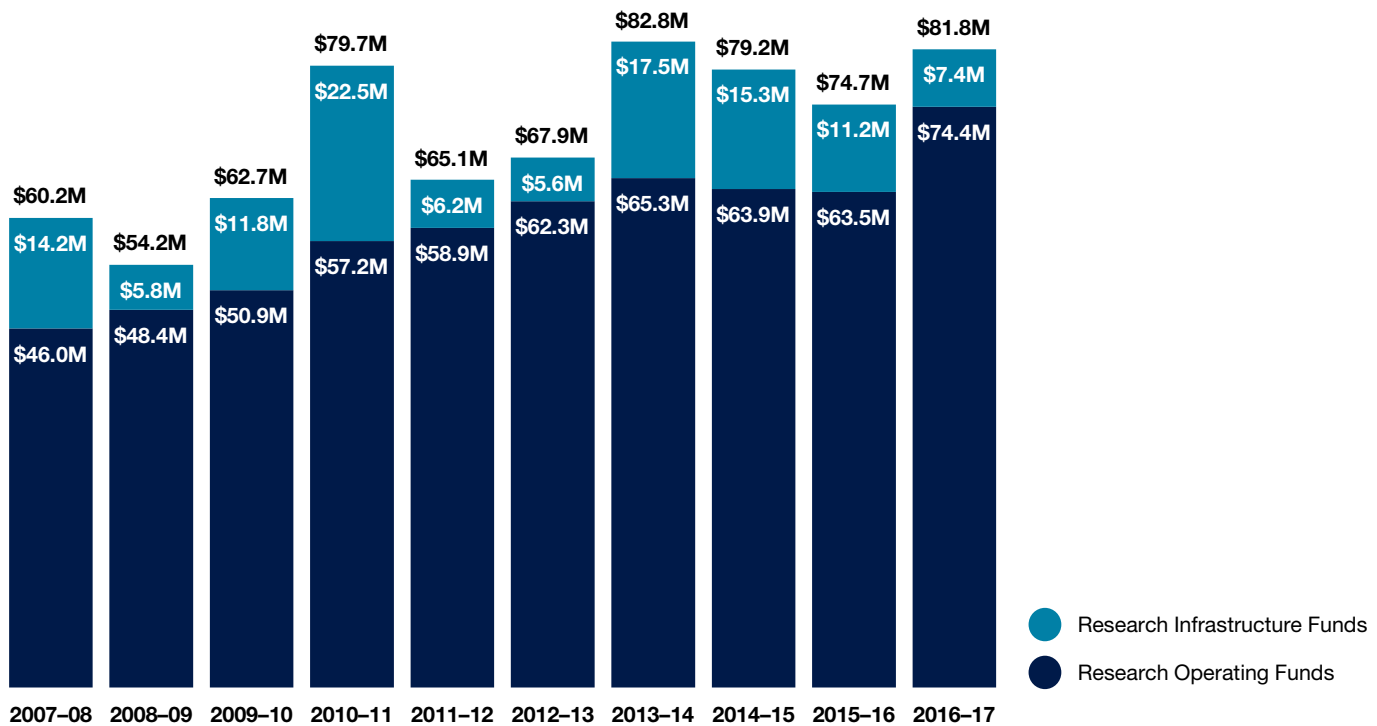
A team of U of T Engineering researchers has applied a hacker mentality to developing a portable, reconfigurable lab-on-a-chip diagnostic platform and field-tested the system in remote Kenya. Their validated platform can gauge the level of immunity to vaccine-preventable diseases among vulnerable populations. The work was done by Alphonsus Ng (IBBME PhD 1T5) and Ryan Fobel (IBBME PhD 1T6), who were supervised by Professor Aaron Wheeler (Chemistry, IBBME). It leverages digital microfluidics, a technique used to move, split, recombine and mix miniscule droplets of liquid, all on a tiny 'chip.' The chips are made using low-cost fabrication techniques such as ink-jet and 3D printing, and the droplets are controlled by applying electrical signals to different electrodes. In June 2016 four members of the Wheeler Lab travelled to the Kakuma refugee camp in northwestern Kenya to validate their platform, dubbed the MR Box — a desktop lab the size of a toaster oven configured to test for measles and rubella. They arrived in Kakuma following a massive public-health immunization campaign and tested hundreds of children and their caregivers for the presence of molecular markers indicating disease immunity. They sent their samples to the Kenyan Medical Research Institute national laboratory in Nairobi for validation. The final results were published in April 2018 in the journal *Science Translational Medicine*.

Research Funding and Partnerships

The amount of research funding we attract reflects the strength of our innovative and collaborative approach to research, including our industrial partnerships. In 2016–2017, the most recent year for which data is available, we earned research operating funds of \$74.4 million, our highest level to date. This is equivalent to \$326,344 per faculty member, a 17% increase over the previous year. Research funding per faculty member has grown 48% since 2008.

Our total combined research operating and infrastructure funding reached \$81.8 million. This funding came from a variety of sources, including federal and provincial granting councils and corporate partners.

Figure 3.1a Research Infrastructure Funding and Research Operating Funding, 2007–2008 to 2016–2017



As of the completion of Academic Plan 2011–2016, we had surpassed our revised federal funding (NSERC, CIHR, SSHRC and National Centres of Excellence) goal of \$32 million, reaching a total of \$35.3 million. The majority of our Tri-Agency funding continues to come from NSERC, and industrial partnership programs continue to account for a major proportion of this funding, comprising 42%. In particular, funding from collaborative research and development grants is 28.7% higher than the previous year, reflecting continued interest from industrial partners in our world-leading research.

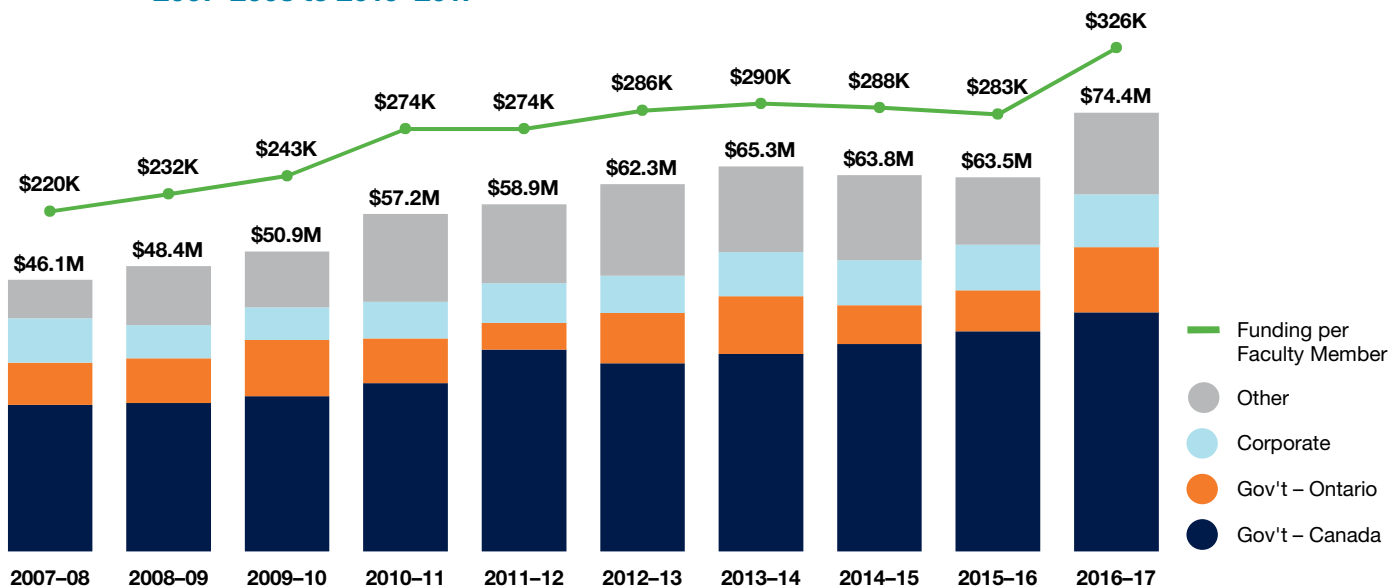
One hundred U of T Engineering researchers, including 65 professors and 35 graduate students and postdoctoral

researchers, received a total of \$12.8 million in research funding and scholarships awarded by NSERC, announced in September 2017. Three faculty members received prestigious Discovery Accelerator Supplements designed to maximize the impact of those researchers with highly original and innovative programs and who show strong potential to become international leaders in their field:

- Professor Brent Sleep (CivMin) — Thermally enhanced remediation of groundwater contamination
- Professor Roman Genov (ECE) — Transport-aware image sensors
- Professor Masayuki Yano (UTIAS) — Adaptive high-fidelity computational fluid dynamics

Note 3.1: The figures in this chapter report research funding the Faculty received in 2016–2017. Because it takes some time after the completion of a fiscal year for research funding data to become final, this is the most recent year for which data are available.

Figure 3.1b Research Operating Funding by Year, Source and Funding per Faculty Member, 2007–2008 to 2016–2017



	Funding per Faculty Member	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total
2007-08	\$220,370	\$24,841,761	\$7,168,950	\$7,520,781	\$6,525,854	\$46,057,346
2008-09	\$231,579	\$25,145,331	\$7,618,346	\$5,640,631	\$9,995,737	\$48,400,045
2009-10	\$243,390	\$26,302,896	\$9,562,402	\$5,540,382	\$9,462,900	\$50,868,580
2010-11	\$273,841	\$28,528,383	\$7,574,798	\$6,210,621	\$14,918,995	\$57,232,797
2011-12	\$273,861	\$34,238,056	\$4,538,965	\$6,702,822	\$13,400,263	\$58,880,106
2012-13	\$285,684	\$31,922,907	\$8,511,024	\$6,315,707	\$15,529,396	\$62,279,034
2013-14	\$290,218	\$33,470,711	\$9,814,984	\$7,490,891	\$14,522,410	\$65,298,996
2014-15	\$287,586	\$35,192,451	\$6,556,483	\$7,658,869	\$14,436,376	\$63,844,179
2015-16	\$283,319	\$37,328,850	\$6,955,835	\$7,731,492	\$11,447,261	\$63,463,438
2016-17	\$326,344	\$40,568,381	\$11,054,213	\$8,956,135	\$13,827,596	\$74,406,325

Figure 3.1c CIHR, NSERC and NCE Funding, 2007–2008 to 2016–2017

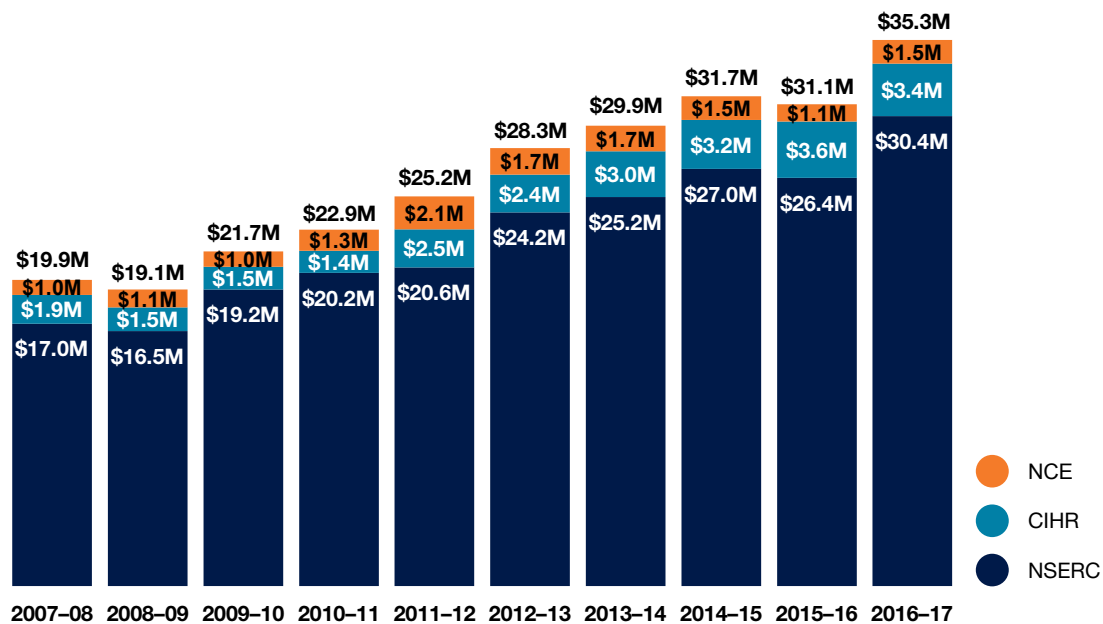
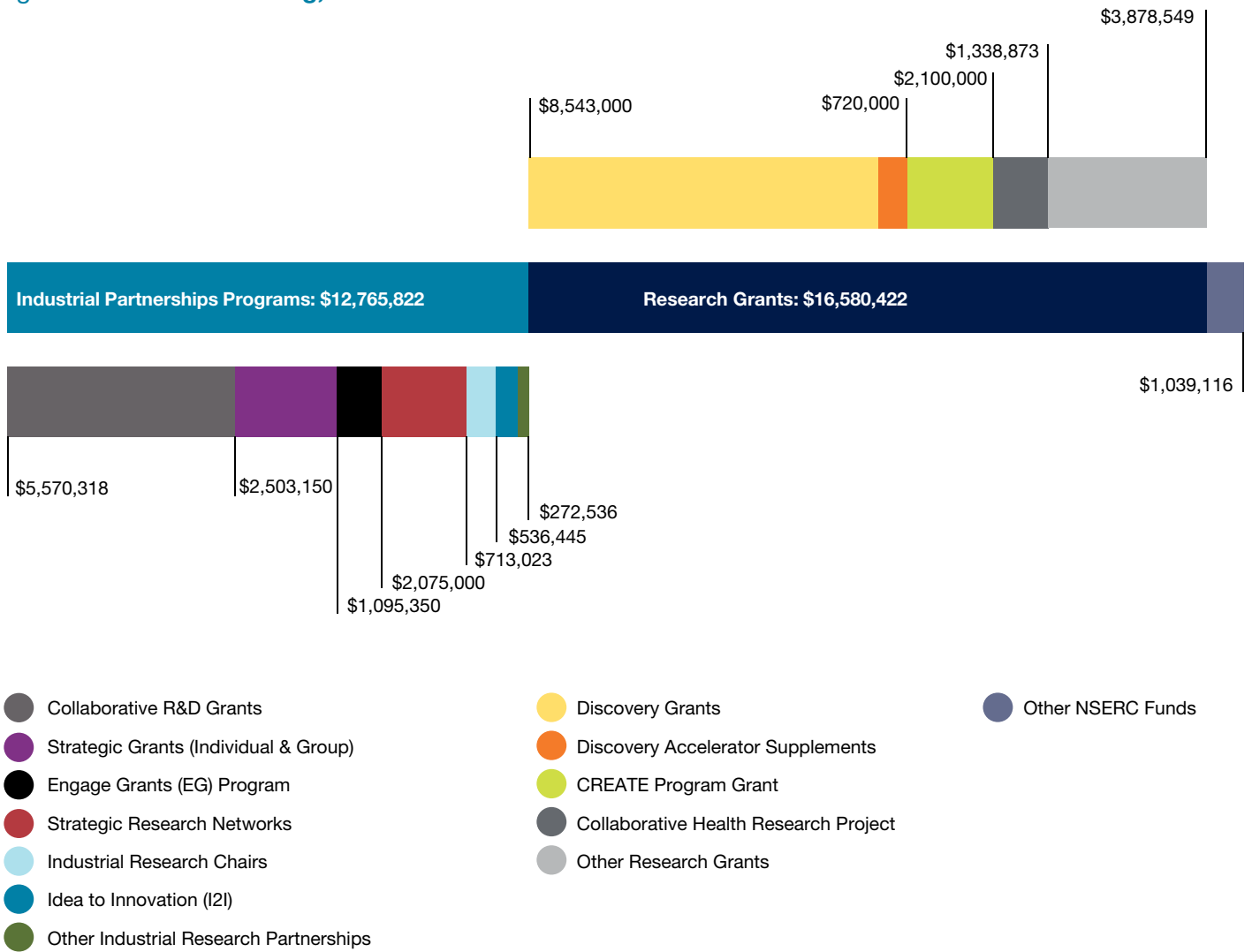
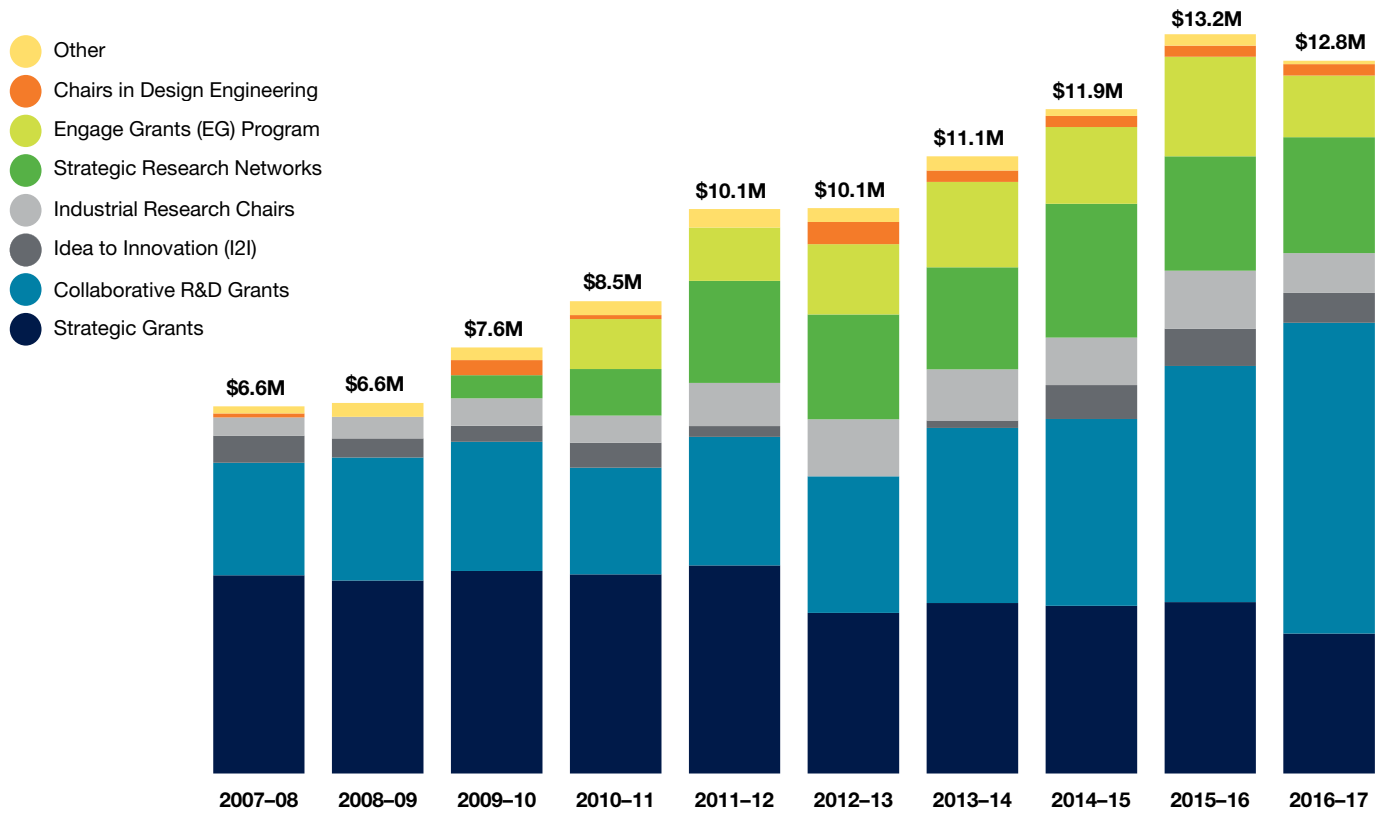


Figure 3.2a NSERC Funding, 2016–2017



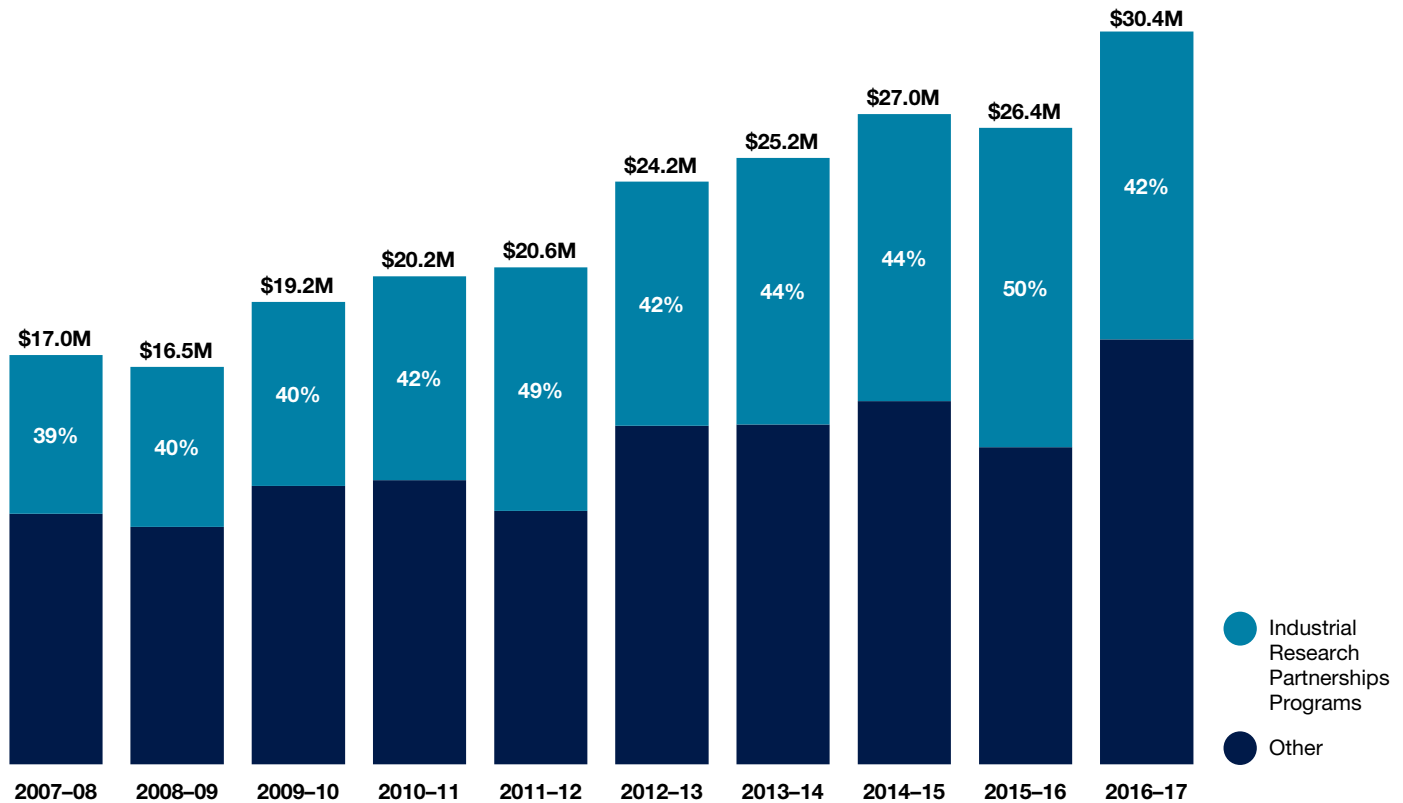
Note 3.2a: Data current as of May 2017 and based on grant year (April to March).

Figure 3.2b NSERC Industrial Partnership Funding by Program, 2007–2008 to 2016–2017



Other	\$130,000	\$247,392	\$230,000	\$251,770	\$328,780	\$246,790	\$258,882	\$119,531	\$203,803	\$61,036
Chairs in Design Engineering	\$69,076		\$267,173	\$69,076		\$400,000	\$200,000	\$200,000	\$200,000	\$200,000
Engage Grants (EG) Program				\$897,114	\$960,531	\$1,254,468	\$1,533,924	\$1,375,371	\$1,784,319	\$1,106,850
Strategic Research Networks			\$417,293	\$832,697	\$1,826,000	\$1,879,000	\$1,824,940	\$2,400,000	\$2,050,000	\$2,075,000
Industrial Research Chairs	\$329,834	\$390,667	\$493,197	\$485,711	\$773,964	\$1,025,031	\$918,349	\$847,278	\$1,040,762	\$713,023
Idea to Innovation (I2I)	\$483,200	\$339,200	\$287,417	\$448,612	\$195,000		\$133,750	\$608,417	\$669,364	\$536,445
Collaborative R&D Grants	\$2,015,904	\$2,203,103	\$2,313,127	\$1,909,431	\$2,301,643	\$2,445,210	\$3,137,628	\$3,347,888	\$4,226,332	\$5,570,318
Strategic Grants	\$3,549,374	\$3,457,330	\$3,625,317	\$3,567,277	\$3,725,049	\$2,875,127	\$3,050,467	\$3,001,610	\$3,070,314	\$2,503,150
Total	\$6,577,388	\$6,637,692	\$7,633,524	\$8,461,688	\$10,110,967	\$10,125,626	\$11,057,940	\$11,900,095	\$13,244,894	\$12,765,822

Figure 3.2c Industrial Partnerships as a Proportion of Total NSERC Funding, 2007–2008 to 2016–2017



Last year, our Faculty collaborated with more than 400 external research partners. In addition to these, many more companies hire our students through the Professional Experience Year Co-op Program, work with them on multidisciplinary capstone projects or provide philanthropic support.

Figure 3.2d Industry Partners, 2017–2018

- ABB Group
- Advanced Measurement and Analysis Group Inc.
- Advanced Micro Devices Inc.
- Advanis
- Aerodyne
- Afsan Engineering Co.
- AGFA
- Agnico-Eagle Mines Ltd.
- Agrium Inc.
- Airbus SAS
- AISC
- Alcan Aluminum International
- Alcohol Countermeasure Systems
- Altera Corp.
- AMAG Ltd.
- AMEC Foster Wheeler
- Americas Styrenics LLC
- Analog Devices Inc.
- Andec Manufacturing Ltd.
- Andritz Group
- Anemoi Technologies Inc.
- Angstrom Engineering Inc.
- Antex Western
- Apotex Inc.
- Applanix
- Apple
- Aquafor Beech
- ArcelorMittal Dofasco
- Armacell
- Artium Technologies
- Arup Canada Inc.
- Atomic Energy of Canada Ltd.
- AUG Signals Ltd.
- Autodesk
- AV Nackawic Group
- Avalon Rare Metals
- Avertus Epilepsy Technologies Inc.
- Babcock & Wilcox Ltd.
- BaoWu Steel Group Corp.
- Barrick Gold Corp.
- Bell Helicopter Textron Inc.

Note 3.2d: The list above includes companies from U of T’s Research Information System, along with collaborators that fund research through a number of industrial research consortia, including those associated with many of our Industrial Research Chairs. It does not include companies that hire our students through the Professional Experience Year Co-op program, work with them on Multidisciplinary Capstone Projects, or provide philanthropic support.

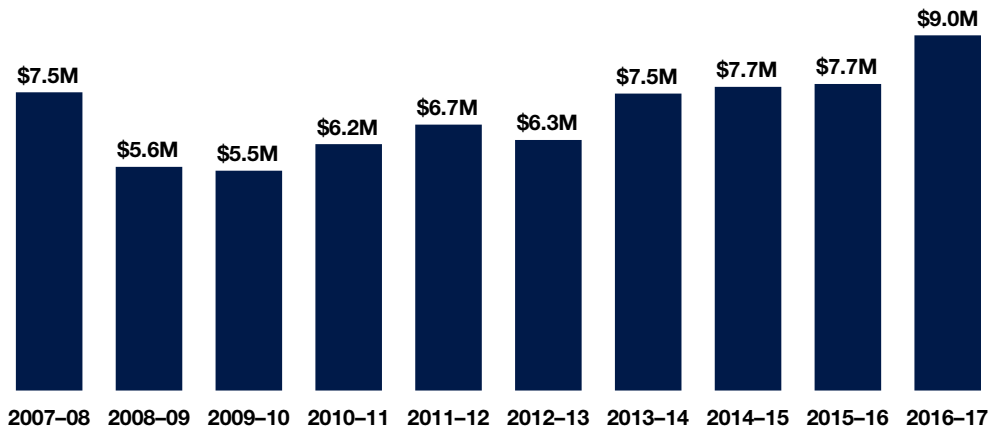
- Bickell Foundation (J. P. Bickell)
- BiomeRenewables
- Bio-Rad Laboratories Canada Ltd.
- Blackberry
- BMW
- Boeing
- Boise Cascade
- Bombardier Aerospace
- Bombardier Inc.
- Braskem
- Bresotec Inc.
- Brican Automated Systems Inc.
- Brigham & Women's Hospital
- Broadcom Corp.
- CAE
- Calera
- CalEnergy Generation
- Calgon Carbon Corp.
- Canadian Automobile Association
- Canadian Institute of Steel Construction
- Canadian Nuclear Safety Commission
- Candu Energy Inc.
- Candu Owners Group
- Candura Instruments
- CanSyn Chem Corp.
- Carbon Cure Technologies
- Cardinal Health
- Carter Holt Harvey Ltd.
- Cascades
- Cast Connex Corp.
- CD Nova
- Celestica
- CellScale Biomaterials Testing
- Celulose Nipo-Brasileira
- Cement Association of Canada
- Center for Automotive Materials and Manufacturing
- Centre Line Ltd.
- Chemetry
- Christie Digital Systems Canada Inc.
- Chrysler Canada Inc.
- Ciena Canada Inc.
- CIMA Canada Inc.
- Clearpath Robotics
- Clyde-Bergemann Inc.
- CMC Electronics
- Colibri Technologies
- COM DEV International Ltd.
- Commissariat à l'énergie atomique
- ConCast Pipe
- Connaught Foundation
- Cook Medical
- Coraltec Inc.
- CPCI
- Createx Technology (Suzhou) Co., Ltd.
- Crosswing Inc.
- Curiousitate
- Cyberworks Robotics
- Daishowa-Marubeni International (DMI) Ltd.
- Dana Canada Corp.
- Daniels Group
- Dasaerospace Inc.
- Datatrends Research Corp.
- DCL International
- Defence Science & Technology Lab (UK)
- Dell
- Detour Gold Corp.
- Deveron
- Dionex
- Diros Technology Inc.
- Dongwon Technology Co. Ltd.
- Dr. Robot Inc.
- Drone Delivery Canada
- Droplet Measurement Technologies
- DSO National Laboratories
- DuPont Canada Inc.
- eCamion Incorporated
- Eclipse Scientific Inc.
- Ecobee Inc.
- Ecosynthetix
- Eco-Tec Inc.
- Eldorado Brasil
- ElectroVaya Inc.
- Eli Lilly Research Laboratories
- EllisDon
- Enbridge Gas Distribution Inc.
- Energent Inc.
- Engineering Services Inc.
- ENMAX Power Corporation
- Ensyn Technologies Inc.
- ERCO Worldwide
- Ericsson Canada Inc.
- ESG Solutions
- exactEarth Inc.
- Exigence Technologies
- Expert Process Solutions (XPS)
- Explora Foundation
- Fibria Celulose
- Finisar Corp.
- Flight Safety International
- Food BioTek Corporation
- Ford Motor Company (USA)
- Ford Motor Company of Canada
- FP Innovations
- Fuji Electric Co. Ltd.
- Fujitsu Laboratories Ltd.
- Fujitsu Labs of America Inc.
- Futurebound Corp.
- Futurewei Technologies Inc.
- G. Cinelli – Esperia Corporation
- G. S. Dunn Dry Mustard Millers
- GE Energy
- GE Global Research
- GE Zenon
- Gedex Inc.
- Gener8 Inc.
- General Dynamics Canada
- General Electric Canada
- General Electric Inc.
- General Motors of Canada Ltd.
- Genpak
- Geosyntec Consultants
- Gerdau Long Steel North America
- GHGSat Inc.
- GlaxoSmithKline Inc.
- Glencore Canada Corp.
- Goodrich Landing Gear
- Grafoid Inc.
- Greencore Composites
- Groupe Mequaltech Inc.
- GTAA Toronto Pearson
- GVA Lighting
- Hanwha Solar Canada
- Hard Rock Innovations Inc.
- Hatch Ltd.
- Havelaar Canada
- Hawker Siddeley Canada
- HDR Corp.
- Hitachi High-Technologies
- Holcim Inc.
- Honeywell
- Huawei Technologies Co. Ltd.
- Hunch Manifest Inc.
- Huron Digital Pathology
- Hydro One Networks
- Hydro Quebec
- Hydrogenics
- Hyundai Motor Company
- IBI Group
- IBM Canada Ltd.
- IBM T. J. Watson Research Center
- iGEN Technologies Inc.
- IMAX Corp.
- Imperial Oil Ltd.
- Indian Oil Company
- Industrial Thermo Polymers Ltd.
- Ingenia Polymers Corp.
- Inphi Corp.
- Institute for Energy Technology (Norway)
- Integran Technologies Inc.
- Intel Corp.
- Interface Biologics Inc.
- International Business Machines
- International Paper Company
- Ionicon
- Ionics Mass Spectrometry Group Inc.
- IRISNDT Corp.
- Irving Pulp & Paper Ltd.
- JDS Uniphase Inc.
- JNE Chemicals
- Johnson Matthey
- Kapik Integration
- Kasai Kogyo Co. Ltd.
- Kevin Quan Studios
- Keysight Technologies Canada Inc.
- Kiln Flame Systems Ltd.
- Kimberly-Clark Corp.
- Kinetica Dynamics
- Kinross Gold Corp.
- Klabin
- KQS Inc
- Krauss Maffei Corp.
- Kumho Petrochemical R & D Center
- Laboratoire d'essai Mequaltech
- LaFarge Canada
- Lallemand Inc.
- Lattice Semiconductor Ltd.
- LG Chem
- Lisgar Construction Company
- Litens Automotove Group
- Lubrizol
- Lumentra Inc.
- MacDonald, Dettwiler and Associates (MDA) Ltd.
- Magellan Aerospace
- Magna Closures
- Magna Exteriors and Interiors
- Magna International Inc.
- Magna Powertrain
- Manitoba Hydro
- Mantech Inc.
- Marmak Information Technologies
- Materials & Manufacturing Ontario
- Maxim Integrated Products Inc.
- McEwen Mining Inc.
- MeadWestvaco (MWV) Corp.
- Mercedes-Benz Canada Inc.
- Messier-Bugatti-Dowty

- Messier-Dowty Inc.
- Metso Pulp, Paper and Power
- Microbonds Inc.
- Micropilot
- Millipore
- Mine Environment Neutral Drainage
- Mitsubishi Rayon Co. Ltd.
- Moldflow Corp.
- Monaghan Biosciences Ltd.
- Mr. Robot Inc.
- Nanowave
- NanoXplore Inc.
- National Aeronautical Establishment (USA)
- NatureWorks LLC
- NCK Engineering
- Nestle Canada
- New World Laboratories
- Newterra
- Nike Inc.
- Northern Yashi Engin, Const Ltd.
- NUCAP Global
- Nuclear Waste Management Organization
- NXP Semiconductors Netherlands BV
- OCMR
- Olympus Canada
- Olympus NDT Canada
- Ontario Clean Water Agency
- Ontario Power Generation Inc.
- Ontario Renal Network
- Opal-RT Technologies Inc.
- ORNGE Medical Transport
- Ossur Canada Inc.
- OtoSim
- Pall Corporation
- Perkin Elmer Canada
- Pfizer Inc. (New York)
- Philips Electronics North America Corp.
- Plasco Energy Group
- Platinum Unlimited Inc.
- Polaris Industries
- Polumiros Inc.
- Polycon Industries
- Porewater Solutions
- Potent Group Inc.
- Pratt & Whitney Canada Inc.
- PrecisionHawk
- Process Research Ortech Inc.
- Procter & Gamble
- Prothema Biosciences Inc.
- Purolator
- QD Solar Inc.
- Qualcomm Canada Inc.
- Qualcomm Technologies Inc.
- Quanser Inc.
- Quantum Dental Technologies (QDT) Inc.
- Questor Technologies Inc.
- Quorum Technologies Inc.
- RBC – Royal Bank of Canada
- Regeneron Pharmaceuticals
- RESCON
- Research in Motion Ltd.
- Resertrac Inc.
- Resonance Ltd.
- Resource Systems Group Inc.
- Rio Tinto Alcan Inc.
- Robert Bosch Corp.
- Rockwell International
- Rocscience Inc.
- Rolls Royce Canada Ltd.
- Rosellini Scientific LLC
- RWDI
- Safety Power Inc.
- Safran Electronics Canada
- Samsung Advanced Institute of Technology
- Samsung Electronics
- Sanofi Pasteur
- Saudi Basic Industries Corp. (SABIC)
- Sceye Inc.
- Schlumberger Canada Ltd.
- Sealed Air Corp.
- Semiconductor Research Corp.
- Sensor Technology Ltd.
- S-FRAME Software Inc.
- ShawCor
- Shinil Chemical Industry Co. Ltd.
- Side Effects Software
- Siemens ADGT
- Sinclair Interplanetary
- Sinclair Technologies Inc.
- Solantro Semiconductor Corp.
- Solar Ship Inc.
- Solvay Specialty Polymers
- Sony Corporation
- SPP Canada Aircraft Inc.
- St Mary's Cement Group
- Stackpole International
- Stantec Inc.
- Steel Structures Education Foundation
- StemCell Technologies Inc.
- StoraEnso
- Sulzer Metco
- Suncor Energy Inc.
- Sunnybrook Health Sciences Centre
- Sunwell Technologies
- Suzano Papel e Celulose
- Synbra
- Syncrude Canada Ltd.
- Teck Resources Ltd.
- Teledyne ISCO
- TELUS
- Telus Mobility
- Tembec Industries Inc.
- Tenova GoodFellow Inc.
- Tessonics Inc.
- Thales Canada Inc.
- The Iron Ore Company of Canada (IOC)
- The Miller Group
- Theralase Inc
- ThermoFisher Scientific
- Tolko Industries Ltd.
- Toronto Hydro
- Toshiba Corp.
- Total American Services Inc.
- Tower Automotive
- Tower Solutions
- Toyota Collaborative Safety Research Center (CSRC)
- Toyota Technical Center USA Inc.
- TransCanada
- Trapeze Software ULC
- TSI
- Ultrasonix
- Uncharted Software Inc.
- Unisearch Associates
- US Steel Canada
- VAC Aero International Inc.
- Vale Canada Ltd.
- Valmet Ltd.
- Vivicog
- VisImage Systems Inc.
- Volkswagen Canada Inc.
- VTT Technical Research Centre of Finland
- Westport Innovations
- Whitemud Resources
- WSP Canada Inc.
- Wugang Canada Resources Invest. Ltd.
- Wurth Elektronik eiSos GmbH & Co. KG
- Wuzhong Instrument Company
- Xilinx Inc.
- Xiphos Technologies Inc.
- XOR-Labs Toronto
- Zotefoams PLC

We received \$9.0 million in direct support from our corporate and industrial partners in 2016–2017. This represents a 16% increase over the previous year and is the highest total in our history. In 2017–2018 we hosted CEOs

of several international companies, some of whom signed agreements to strengthen our collaborations, including Fujitsu, Huawei and Tenova.

Figure 3.2e Industry Research Funding, 2007–2008 to 2016–2017



We partner with a number of industrial research consortia including many associated with NSERC programs or industrial research chairs (IRCs). We increased our total number of IRCs to 11 in 2017–2018 by adding four new chairs:

- Professor Nikolai DeMartini (ChemE) — NSERC Industrial Research Chair in the Role and Fate of Inorganics in the Industrial Processing of Woody Biomass
- Professor Giovanni Graselli (CivMin) — NSERC/Energi Simulation Industrial Research Chair in Fundamental Rock Physics and Rock Mechanics
- Professor Chul Park (MIE) — Senior NSERC/NanoXplore Industrial Research Chair in Multifunctional Graphene-based Nanocomposites and Foams
- Professor Frank Gu (ChemE) — NSERC Industrial Research Chair in Nanomaterials and Nanomedicine (with Johnson & Johnson Medical Products)

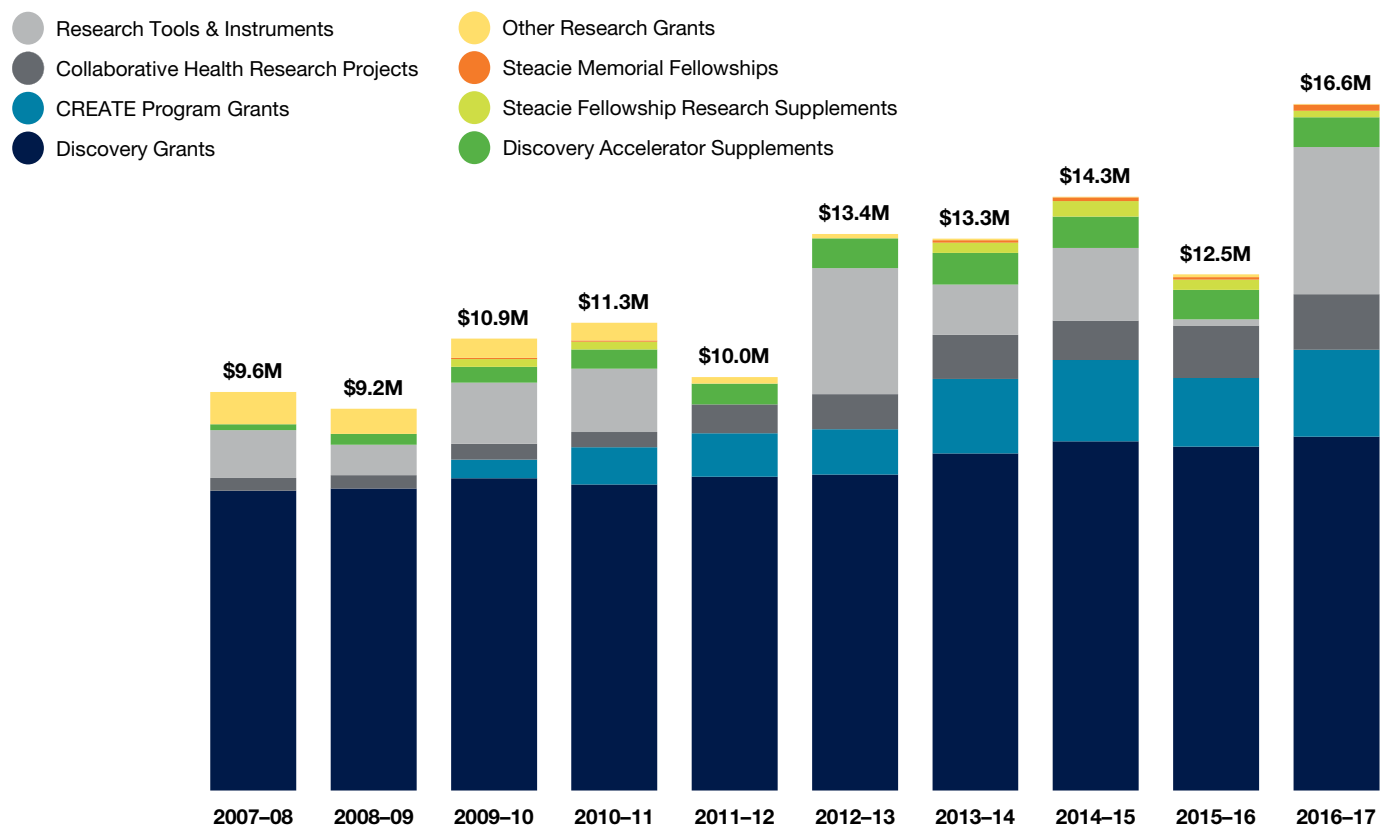
In February 2018, the Canadian federal government announced the results of its Innovation Superclusters Initiative, which provides \$950 million over five years to support business-led research clusters across Canada. Two of the five superclusters — Next Generation Manufacturing Canada and the AI-Powered Supply Chains Supercluster (SCALE.AI) — leverage U of T Engineering expertise in areas such as multifunctional composites, autonomous machines and systems optimization.

Through the Vector Institute, launched in the spring of 2017, we are leveraging partnerships with government and more than 30 technology companies — including Google, Uber and Shopify — to prepare a new generation of experts in machine learning and artificial intelligence.

We received more than \$6.5 million in support from the CFI Innovation Fund 2017 for the following professors and projects:

- Professor Peter Herman (ECE) — Lab-in-Fibre: Smart glass probing and distributed sensing microsystems
- Professor Alberto Leon-Garcia (ECE) — Smart city Internet of Things (IoT) testbed
- Professor Milica Radisic (IBBME, ChemE) — Ontario-Quebec centre for organ-on-a-chip engineering

Figure 3.2f NSERC Research Grant Funding by Program, 2007–2008 to 2016–2017



Other Research Grants	\$781,400	\$607,950	\$462,319	\$422,583	\$162,000	\$111,000	\$40,000	\$15,000	\$67,000	\$15,000
Steacie Memorial Fellowships			\$30,000	\$30,000			\$60,000	\$90,000	\$60,000	\$155,000
Steacie Fellowship Research Supplements			\$187,500	\$187,500			\$250,000	\$375,000	\$250,000	\$155,000
Discovery Accelerator Supplements	\$144,000	\$264,000	\$383,999	\$464,000	\$504,000	\$720,000	\$760,000	\$760,000	\$716,285	\$720,000
Research Tools & Instruments	\$1,150,928	\$734,572	\$1,477,018	\$1,533,781		\$3,043,030	\$1,218,077	\$1,750,224	\$146,900	\$3,553,549
Collaborative Health Research Projects	\$311,245	\$326,169	\$378,774	\$366,899	\$696,536	\$846,731	\$1,064,880	\$950,376	\$1,270,103	\$1,338,873
CREATE Program Grants			\$450,000	\$900,000	\$1,050,000	\$1,096,000	\$1,797,084	\$1,969,779	\$1,650,000	\$2,100,000
Discovery Grants	\$7,234,225	\$7,286,804	\$7,537,766	\$7,385,066	\$7,571,552	\$7,623,942	\$8,136,620	\$8,427,417	\$8,305,314	\$8,543,000
Total	\$9,621,798	\$9,219,495	\$10,907,376	\$11,289,829	\$9,984,088	\$13,440,703	\$13,326,661	\$14,337,796	\$12,465,602	\$16,580,422

U of T Engineering is home to 32 Canada Research Chairs, including the following added this year:

- Professor Arun Ramchandran (ChemE) — Canada Research Chair in Engineered Soft Materials and Interfaces
- Professor Warren Chan (IBBME) — Canada Research Chair in Nanobioengineering
- Professor Olivier Trescases (ECE) — Canada Research Chair in Power Electronic Converters

- Professor Zheng-Hong Lu (MSE) — Canada Research Chair in Organic Optoelectronics
- Professor Ted Sargent (ECE) — Canada Research Chair in Nanotechnology
- Professor Yu Sun (MIE) — Canada Research Chair in Micro and Nano Engineering Systems

Please see Appendix D for a complete listing of chairholders and professorships.

In addition, five faculty members had their chairs renewed or advanced this year, including:

- Professor Ashish Khisti (ECE) — Canada Research Chair in Information Processing
- Professor Glenn Hibbard (MSE) — Canada Research Chair in Multi-Scale Materials Dynamics

We continue to earn a larger five-year cumulative share of NSERC funding than any other engineering school in Canada. This proportion is significant as it is the metric used to determine our complement of Canada Research Chairs. In 2016–2017, we earned 9.9% of all NSERC funding in engineering, just behind the previous year’s record level of 10.0%.

Figure 3.3a Canadian Peer Universities vs. University of Toronto Share of NSERC Funding for Engineering Cumulative Five-Year Share, 2012–2013 to 2016–2017

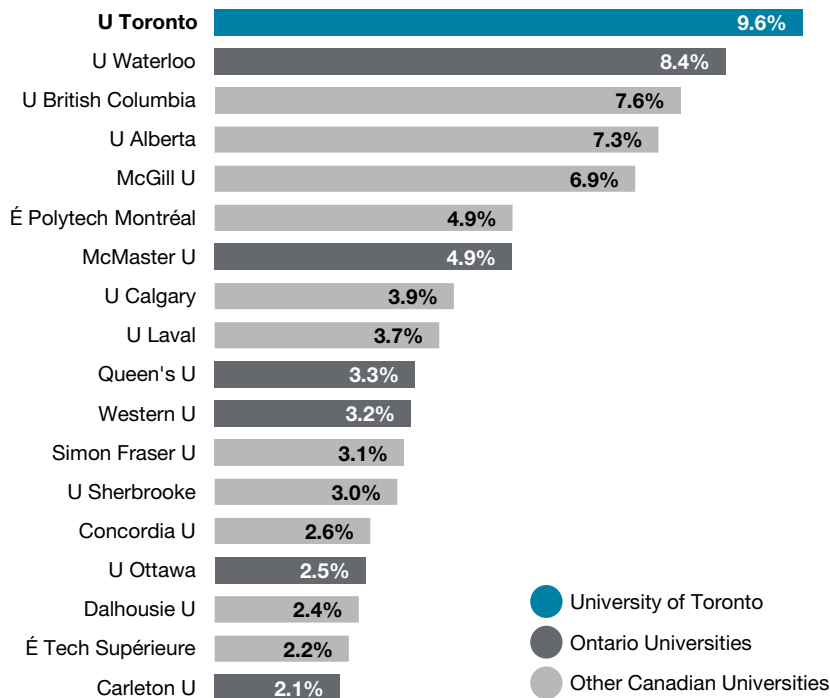


Figure 3.3b U of T Annual Share of NSERC Funding in Engineering, 2007–2008 to 2016–2017

Year	Share (%)
2007–08	9.2%
2008–09	8.5%
2009–10	9.4%
2010–11	9.0%
2011–12	9.5%
2012–13	9.0%
2013–14	9.6%
2014–15	9.5%
2015–16	10.0%
2016–17	9.9%

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 3.4a Engineering Invention Disclosures by Academic Area, 2013–2014 to 2017–2018

	2013–14	2014–15	2015–16	2016–17	2017–18	5-Yr Total
UTIAS	1.0		1.0	0.3	2.0	4.3
IBBME	5.9	6.5	7.8	5.9	4.4	30.5
ChemE	10.3	9.0	7.0	13.2	4.4	43.9
CivMin	5.0	5.0	5.0	1.7	4.0	20.7
ECE	16.5	41.6	23.5	34.8	38.5	154.9
EngSci	1.2		0.1	0.3	0.4	2.0
MIE	9.5	18.8	17.0	19.8	14.8	79.9
MSE	2.5	1.5	0.3	2.3	3.0	9.6
Annual Total	51.9	82.4	61.7	78.3	71.5	345.8
University Annual Total	147.1	174.0	162.7	209.0	153.1	845.9
Engineering Percentage	35%	47%	38%	37%	47%	41%

U of T Engineering continued to lead our institution in invention disclosures, as recorded by the Innovations and Partnerships Office. Our researchers accounted for 47% of these disclosures in 2017–2018 and 41% over the past five years. We also led the way in patent applications with 32 in 2017–2018, representing 54% of the University’s total.

Figure 3.4b U of T Invention Disclosures by Faculty, 2017–2018



Figure 3.4c U of T Patent Applications by Faculty, 2017–2018

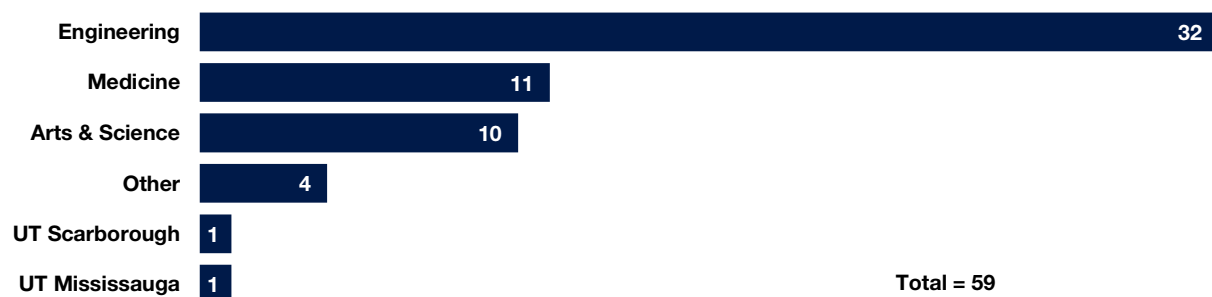
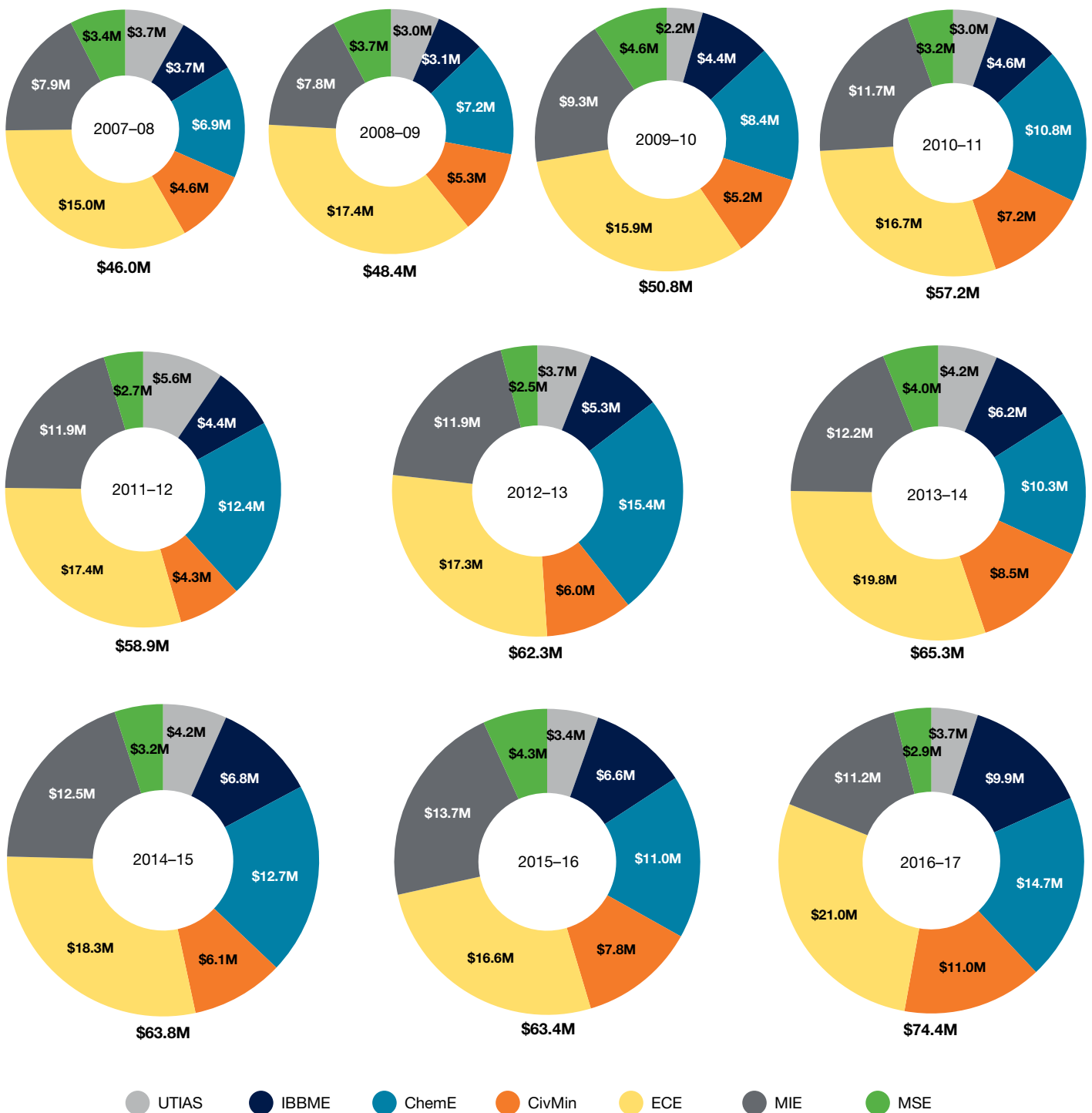


Figure 3.5 Distribution of Research Operating Funding by Academic Area, 2007–2008 to 2016–2017



Note 3.5: Totals include a small amount of additional funding not shown in the breakdown by academic areas. The research funding attributed to IBBME for 2016–17 represents 71% 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

We prepare the next generation of global engineering leaders to pursue their passions, discover their strengths and grow in new directions. Through curricular and co-curricular initiatives, we provide rich pathways for engineering students to develop competencies in cross-disciplinary collaboration, leadership and entrepreneurship.

Our students work in multidisciplinary teams and engage with industry starting in their first year through design courses such as Engineering Strategies & Practice and Praxis. This continues into upper years through projects facilitated by the Institute for Multidisciplinary Design & Innovation. Students may also choose to gain industry exposure through our Professional Experience Year Co-op Program (PEY Co-op). In 2017–2018, 779 students held PEY Co-op positions, including 66 outside of Canada.

In addition to working with existing companies and research organizations, many of our students are inspired to start their own businesses. U of T's rich entrepreneurial ecosystem includes our two campus-linked accelerators, Start@UTIAS and The Entrepreneurship Hatchery. Over the last five years, we have launched more than 65 startups, which have collectively raised approximately \$10 million in seed funding.

Whether our students choose to work in established industries or to create new ones, they all benefit from programs that enable them to maximize their leadership potential. Our Troost Institute for Leadership Education in Engineering draws on expertise from education, social science, business and engineering to support self-discovery among more than 1,000 students each year.

Several new programs and initiatives launched this year will expand the opportunities available to our students. Starting in 2018, we will offer a new cross-disciplinary minor in Music Performance and a certificate in Music Technology. We also created the Institute for Studies in Transdisciplinary Engineering Education and Practice (ISTEP) to bring together existing faculty, programming and initiatives in a number of areas, including technical communication, leadership, global fluency, business and multidisciplinary design. ISTEP will further strengthen our position as an innovator and leader in pedagogical innovation and engineering education.

Undergraduate Engineering Minors and Certificates, Complementary Courses and Inter-Divisional Collaboration

Our nine minors and 10 certificates enable students to customize their degrees and hone their technical and professional competencies in the areas of their personal interest. Minors and certificates are open to undergraduate students in any engineering discipline. When they come together around their shared interests, our students spark new and unexpected interactions that drive innovation.

Students must complete six half-courses to earn a minor, and three half-courses for a certificate. Our current offerings include:

Minors

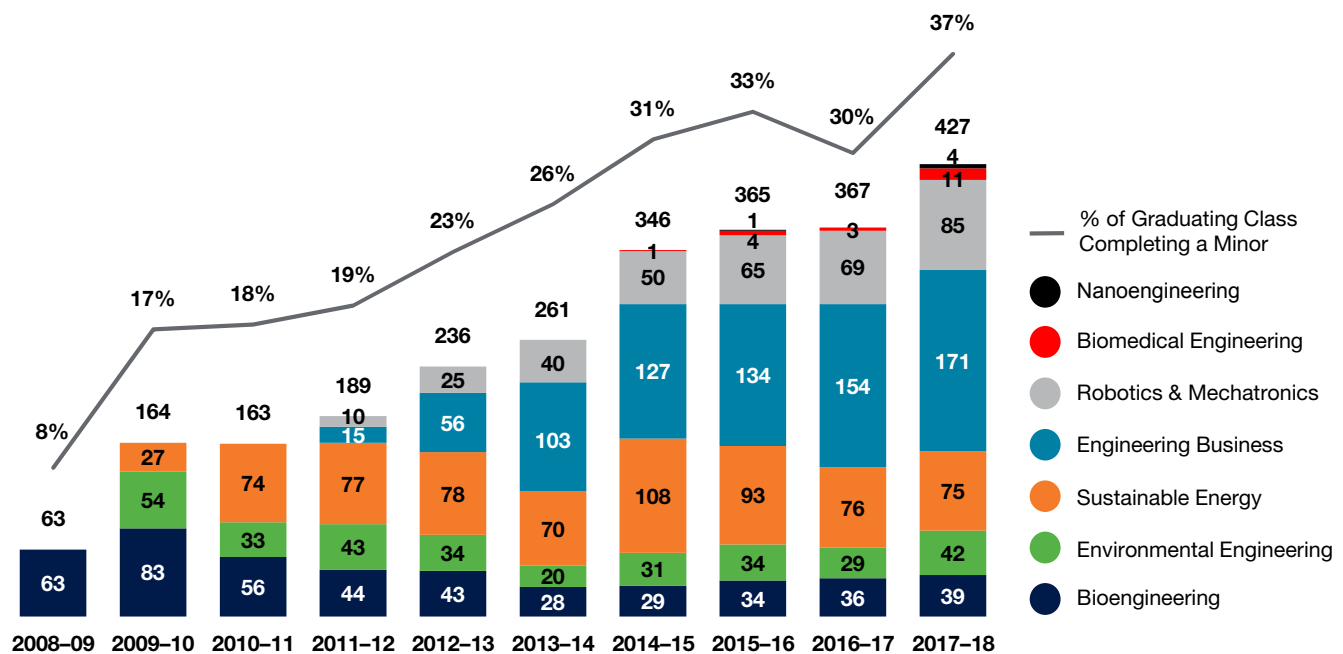
- Advanced Manufacturing (new in 2017)
- Bioengineering
- Biomedical Engineering
- Engineering Business
- Environmental Engineering
- Music Performance (starting in 2018, collaboration with Faculty of Music)
- Nanoengineering
- Robotics & Mechatronics
- Sustainable Energy

Certificates

- Communication
- Engineering Business
- Engineering Leadership
- Entrepreneurship
- Forensic Engineering (new in 2017)
- Global Engineering
- Mineral Resources
- Music Technology (starting in 2018, collaboration with Faculty of Music)
- Nuclear Engineering
- Renewable Resources

Engineering students may also complete minors through the Faculty of Arts & Science in areas such as economics, math, sociology, philosophy and history, among others.

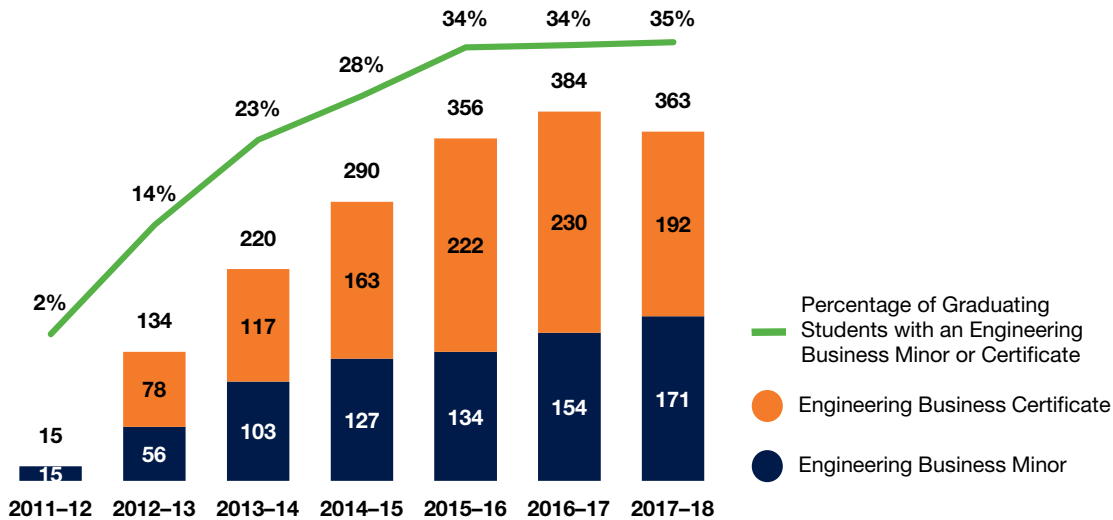
Figure 4.1a Number of Engineering Minors Completed with Percentage of Graduating Class Completing an Engineering Minor, 2008–2009 to 2017–2018



Data and highlights in this chapter are presented for the period from July 2017 to June 2018.

Note 4.1a: A total of 427 minors were completed by 390 students in 2017–2018, with many completing more than one minor.

Figure 4.1b Students Graduating with an Engineering Business Minor or Certificate, 2011–2012 to 2017–2018



In 2017–2018, 309 undergraduate students earned 427 engineering minors, comprising 37% of the graduating cohort, our highest proportion to date. The Engineering Business minor continues to have the strongest demand. For the last three years, more than one third of our students have completed either a certificate or a minor in Engineering Business.

Our minor in Advanced Manufacturing, launched in September 2017, draws on the Faculty’s strengths in several areas — including advanced materials, processing and logistics. The goal is to prepare tomorrow’s engineering leaders to design the products of the future, and the systems for fabricating their components to deliver them to customers.

We also launched a new certificate in Forensic Engineering in September 2017, which features courses covering the principles of investigation into product failure, automobile and aircraft accident reconstruction, and fire and explosion. The courses also engage renowned guest experts from Canada’s top forensic engineering firms and a mock trial, with lawyers from top firms participating in demonstrations of expert witness cross-examinations.

Starting in 2018, we will offer two new cross-disciplinary programs, administered collaboratively by U of T Engineering and the Faculty of Music: a minor in Music Performance and a certificate in Music Technology. The minor includes courses in music theory and a newly created music performance course. Led by Faculty of Music professors and doctoral candidates in performance, the performance course features weekly individual and group instruction and can be completed either as a soloist or as part of a small ensemble. The certificate will focus on the intersection between the technical and artistic aspects of sound, and will prepare graduates to make an impact in areas such as digital music distribution, music production or hardware/software development.

Undergraduate Design and Research

We embed engineering design throughout our undergraduate curriculum, enabling students to work with external partners, gain experience in building and testing prototypes and develop competencies in teamwork, leadership and effective communication.

First-Year Courses

All first-year students take engineering design courses: Praxis I and II are for students in Engineering Science, while Engineering Strategies & Practice I and II are for students in our TrackOne and Core 8 programs.

In 2017–2018, Praxis students were challenged to improve daily life in communities around the Greater Toronto Area. Designs presented at the Praxis showcase in April 2017 included:

- A new design for kits that can deliver naloxone, a drug that can reverse the effects of an opioid overdose, more quickly than current versions;
- A design to improve the privacy of a rooftop ceremony space at Native Child and Family Services of Toronto; and
- An improved system for tracking the usage of non-circulating materials at the Toronto Reference Library.

Upper-Year Courses

In their final year, all engineering undergraduate students complete design challenges as part of their capstone courses. Students may take discipline-specific capstone courses, or enrol in *APS490 Multidisciplinary Capstone Design Project (MCP)* through the University of Toronto Institute for Multidisciplinary Design & Innovation (UT-IMDI). In just five years since MCP's inception, more than 450 students from across the Faculty have collaborated on over than 100 projects for a wide range of industry clients.

In 2017–2018, 23 student teams worked with companies and organizations such as the Hospital for Sick Children, Drone Delivery Canada and Defence Research & Development Canada. Projects presented at the annual MCP Showcase in March 2018 included:

- A system of Internet of Things (IoT) sensors that can identify empty parking spots and allocate them via a mobile interface;
- A method to optimize the distribution of wave energy converters, devices that can create clean electricity by harvesting ocean waves; and
- A drone landing system that can be mounted on the roof of a delivery truck, enabling the use of UAVs for delivery of goods.

The Innovation, Hammers & Nails program connects students at the Institute of Biomaterials & Biomedical Engineering (IBBME) with clinicians, nurses, staff and fellows to design engineering solutions to challenges identified by experts at the Hospital for Sick Children. This initiative is available to undergraduate and graduate students through a range of courses and degree programs, including *BME498 Biomedical Engineering Capstone Design*, *BME 489 Biomedical Systems Engineering Design* and the MHS clinical internship.

In 2017–2018, a total of 30 students and eight IBBME faculty and SickKids researchers were involved in five *BME498/489* projects, including:

- A device to incentivize spirometer use in children recovering from surgery;
- A non-invasive device to train parents how to properly use a Pavlik harness to ensure infants do not suffer from hip dysplasia;
- An innovative control mechanism for a minimally invasive surgical tool;
- A device to measure the body mass of children in developing countries accurately; and
- A device to monitor and correct slouching and abnormal spinal posture.

Undergraduate Research Opportunities

We create rich opportunities for undergraduates across all years to engage in research that advances the frontiers of engineering, both within the Faculty and around the world. Through the Engineering Science Research Opportunities Program (ESROP), first- and second-year Engineering Science students work with faculty members each summer on research collaborations. In the summer of 2016, we created the First-Year Summer Research Fellowship, which provides \$5,000 in support to students seeking to gain research experience immediately after their first year of study. Nine students participated in this program in the summer of 2017.

In August 2017, undergraduates across all programs presented their summer research findings at the Undergraduate Engineering Research Day (UnERD), which celebrated its 10th anniversary this year. The event featured more than 100 posters and podium presentations and, new this year, a video competition which challenged students to creatively capture the essence of their research in 90 seconds or less. The winners described how they used a driving simulator to study how additional tasks and information screens, including smartphones, impact driving behavior.

U of T Engineering students also have opportunities to conduct research abroad through programs administered by the Division of Engineering Science and U of T's Centre for International Experience. Partner institutions include the National University of Singapore, Hong Kong University of Science & Technology and the University of Stuttgart.

Figure 4.2a Undergraduate Participation in Summer Research Opportunities, 2010 to 2018

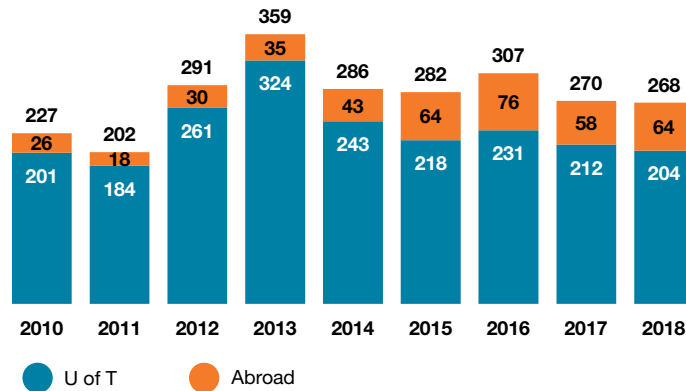


Figure 4.2b Undergraduate Participation in Summer Research Opportunities, by Academic Area, 2018

Research Participation:	U of T	Abroad	Total
ChemE	20	2	22
CivMin	24	2	26
ECE	45	8	53
EngSci	68	36	104
MIE	28	12	40
MSE	19	4	23
Total	204	64	268

Professional Experience

We provide a number of pathways for our undergraduate students to gain valuable work experience and enhance their technical and professional competencies before they graduate.

For 40 years, our flagship Professional Experience Year Co-op Program (PEY Co-op) has enabled the next generation of engineering talent to spend 12 to 16 months working for a wide range of companies around the world, from local startups such as ModiFace to global brands such as Airbus.

In 2017–2018, 779 engineering undergraduates held PEY Co-op positions, including 66 who worked outside of Canada. More than 300 employers hired through with the program, and the average annual salary for 2017–2018 was \$48,620 with individual salaries reaching as high as \$89,895.

PEY Co-op students who recently completed their work terms in August 2017 had the opportunity to share their insights and lessons learned at the inaugural PEY EDGE Engineering Student Conference in September 2017.

U of T Engineering students gained new perspectives from 23 recent PEY Co-op students from across all disciplines who worked in various engineering industries. Topics of discussion included leadership development, corporate culture and preparation for working abroad, among others. These insights were collected and published in the June 2018 PEY edition of the *Galbraith Society Undergraduate Engineering Journal*.

Students also participate in the Engineering Summer Internship Program (ESIP), a paid, four-month summer work term that is open to second- and third-year U of T Engineering undergraduates. In summer 2017, 51 students pursued ESIP opportunities.

The Engineering Career Centre (ECC) provides professional development opportunities to students, facilitating the employment process and a positive transition to the workplace. The ECC is currently reviewing its programming to enhance industry relations and services to students. Some current initiatives include:

- Establishing employer relationships to access innovative student work opportunities at industry-leading companies and niche areas of the market;

- Exploring internship services for graduate students;
- Developing a strategy for international employment opportunities;
- Enhancing the market presence of the ECC through targeted outreach and industry engagement; and
- Building a student development program that leverages relationships with industry, alumni, students and academic units.

Figure 4.3a Number of Engineering Undergraduate Students Participating in PEY Co-op with Percentage Participation, 2008–2009 to 2017–2018

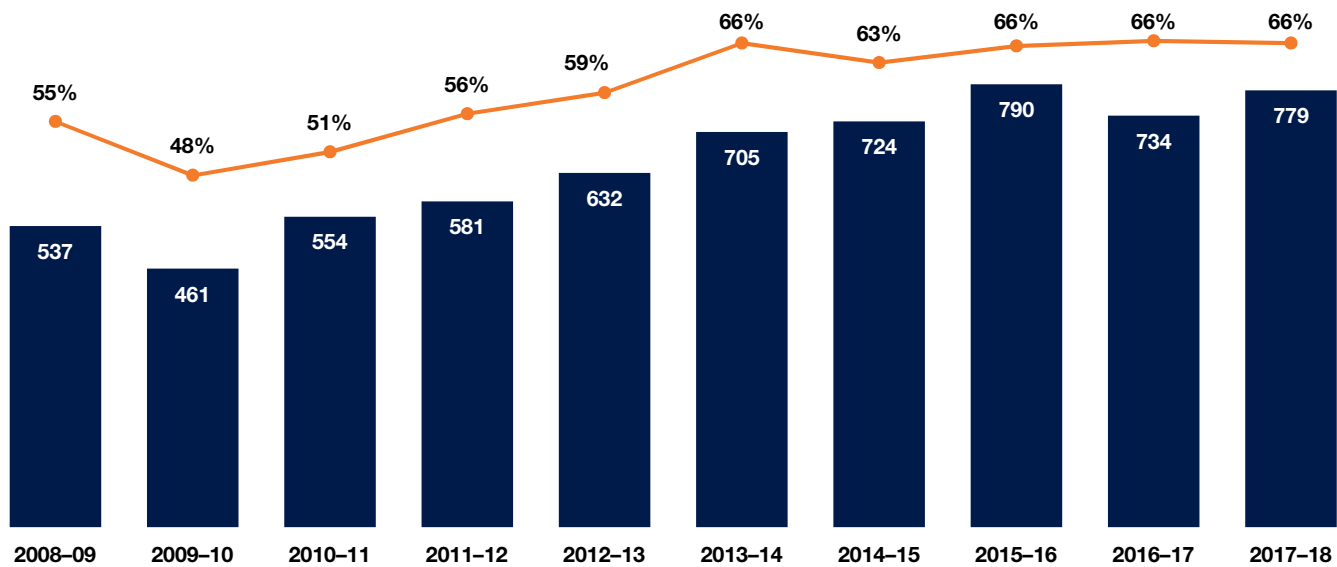


Figure 4.3b Number of Canadian and International PEY Co-op Positions, 2008–2009 to 2017–2018

	Canadian Positions	U.S. Positions	Other International Positions	Total Positions
2008–09	490	31	16	537
2009–10	426	24	11	461
2010–11	530	11	13	554
2011–12	547	26	8	581
2012–13	592	24	16	632
2013–14	644	36	25	705
2014–15	663	42	19	724
2015–16	711	50	29	790
2016–17	669	49	16	734
2017–18	713	48	18	779

Figure 4.3c PEY Co-op Employers, 2008–2009 to 2017–2018

	PEY Co-op Employers who Hired Engineering Students
2008–09	193
2009–10	158
2010–11	185
2011–12	221
2012–13	241
2013–14	304
2014–15	317
2015–16	310
2016–17	337
2017–18	318

Note 4.3a: Percentage participation is calculated by dividing the number of completed PEY Co-op positions by the number of eligible students (i.e. the third-year cohort from the previous year).

Student Entrepreneurship

Our Faculty is an essential component of U of T's rich entrepreneurial ecosystem. Through both curricular and co-curricular programs, our students, researchers and faculty members have access to mentorship, fabrication facilities, seed funding and space, enabling them to bring their ideas from the lab to the marketplace.

Curricular Programs

Entrepreneurship is embedded into our undergraduate programs. Students in our Core 8 streams can complement their technical studies with an Engineering Business Minor or Certificate, or a Certificate in Entrepreneurship, Innovation & Small Business. For MEng students, the Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) emphasis prepares students to lead in business and entrepreneurial activities.

The Entrepreneurship Hatchery

The Entrepreneurship Hatchery, established in 2012, provides a comprehensive suite of programs and services to nurture a culture of entrepreneurship across the Faculty. Events such as the weekly Idea Markets, Hatchery Speaker Series, Accelerator Weekend and the Hatchery Hackathon enable students with a passion for startups to meet and interact with each other and with experienced mentors from a variety of fields. These experiences spark collaborations and help form teams that enter the Hatchery Nest.

Hatchery Nest

This rigorous summer program helps teams of students turn their business ideas into companies, including, where applicable, the creation of prototypes or minimum viable products. Over four months, students receive mentorship and advice from seasoned professionals in intellectual property, marketing, finance and other areas of business development. They also have access to seed funding, office or lab space and prototyping facilities such as 3D printers. Over the last five years, the Hatchery has launched more than 65 startups, including many based on U of T Engineering research. To date, these companies have collectively raised more than \$10 million in seed funding.

In 2017, Hatchery Nest received 152 applications and accepted 35 teams, 12 of which competed at the Hatchery Demo Day in September 2017, where they pitched their startups to investors and the U of T community. The winners included:

- **Genecis:** This company's technology is based on proprietary cultures of microorganisms capable of breaking down food waste from restaurants and turning them into a form of biodegradable plastic.
- **Xpan:** Laparoscopic or "keyhole" surgery depends on devices called trocars, which create an opening into the body that can accommodate cameras and surgical tools. Xpan has developed an expandable trocar that can be made smaller or larger during surgery. By eliminating the need to remove one trocar and insert a larger one, the company aims to reduce the risk to patients.
- **Tejo:** Combining machine learning with retail and marketing, Tejo enables customers to quickly select the brand of makeup that is right for them. Users simply take a selfie, which is then fed into a proprietary algorithm that accounts for ambient lighting conditions and determines a user's precise skin tone, recommending the appropriate brand. If the customer chooses to buy, Tejo collects a small commission on the sale.
- **enginehire:** This company is built around an online database that uses artificial intelligence to match the profiles of young engineers to potential employers.

Hatchery LaunchLab

Established in fall 2016, the Hatchery LaunchLab provides support for graduate student- and faculty-led research-based startups. Teams benefit from enriched support, including legal counsel, accounting and marketing services, an advisory board comprised of experts in technical and business development, mentors with experience in the industries in which the startups hope to compete and funding for an extended incubation period of one to two years. The goal is to enable these teams to sustain themselves while they complete the steps necessary to provide proof-of-concept for their technology and attract investment from venture capitalists.

Two teams are currently part of Hatchery LaunchLab:

- **Aurorem:** Provides lighting solutions that mimic the spectrum of natural sunlight, with the goal of improving the physical and mental health of people who work indoors.
- **Trexo Robotics:** Builds robotic exoskeletons that could be used to ease physiotherapy treatment for children with cerebral palsy or other physical disabilities.

Start@UTIAS

Start@UTIAS was established in 2014 with a \$1-million donation from entrepreneur Francis Shen (EngSci 8T1, UTIAS MSc 8T3). It provides UTIAS graduate students with mentorship, networking opportunities, seed funding and other resources to translate the knowledge and competencies they have gained through their education into successful startups.

Institute for Studies in Transdisciplinary Engineering Education and Practice (ISTEP)

Created July 1, 2018, the Institute for Studies in Transdisciplinary Engineering Education and Practice (ISTEP) is our newest extra-departmental unit. It brings together faculty members, programing and initiatives to:

- Deliver existing graduate and undergraduate academic programming in technical communication, leadership, business, multidisciplinary design and engineering education;
- Provide leadership through the development of innovative models of effective teaching in engineering;
- Engage in the scholarship of teaching and learning;
- Enhance understanding of how the practice of engineering is changing and adapt classroom practice to instill competencies that graduates will need to be successful; and,
- Bring together colleagues within and beyond U of T Engineering to foster community and inter-disciplinary scholarly conversation.

ISTEP also helps strengthen cross-departmental collaboration, and promote our Faculty's reputation as an innovator and leader in engineering education and related scholarship. Professor Greg Evans (ChemE) serves as ISTEP's interim director. Existing initiatives that will be incorporated into ISTEP include:

- Engineering Business Minor (see earlier section on *Undergraduate Engineering Minors and Certificates, Complementary Courses and Inter-Divisional Collaboration*)
- Engineering Communication Program (ECP)
- Troost Institute for Leadership Education in Engineering (Troost ILead)
- Collaborative Specialization in Engineering Education (EngEd)

Engineering Communication Program (ECP)

ECP provides support to all students and is a hub for teaching, research and professional communication in engineering best practices. Its programming is integrated into courses across the curriculum from first to fourth year. Writing and communication workshops and one-to-one tutoring are also available to students through ECP.

The ECP team includes five teaching-stream faculty members, 21 sessional lecturers and writing instructors, and 18 teaching assistants. ECP collaborates with many other units across the Faculty, including ESIP and PEY Co-op, the Engineering & Computer Science Library, the Educational Technology Office, the Collaborative Program in Engineering Education and Troost ILead.

In 2017–2018, 1,065 students received communication support through ECP's tutoring service, an increase of 12% from the previous year. ECP also coordinates the undergraduate Certificate in Communication, launched in 2015–2016, which leverages eight humanities and social sciences electives offered by ECP faculty since 2008.

ECP continues to develop our professional language support for multilingual students. In 2015–2016, we piloted the Diagnostic English Language Needs Assessment (DELNA) for all incoming first-year students, enabling us to identify those who may experience challenges participating in their lectures, tutorials or team projects. We developed a suite of assignment-specific workshops, increased the capacity of the Tutoring Centre to work with multilingual students and began to track student progress in second and third year. Together with Queen's University, the DELNA project received a \$15,000 grant from the Engineering Information Foundation to develop additional resources for multilingual engineering students.

ECP's commitment to engineering education is highlighted by its leadership in running the highly successful Canadian Engineering Education Association conference in June 2017. ECP also hosted the IEEE Professional Communication Conference in July 2018. Attendees came from all over North America and Europe to participate in sessions on plain language, communication in the workplace, research and practice, communication in project management, women in engineering and the evolution of writing across the curriculum.

Troost Institute for Leadership Education in Engineering (Troost ILead)

Troost ILead prepares students to maximize their impact as engineers, innovators and leaders by providing transformative curricular and co-curricular learning opportunities. Troost ILead also conducts academic and industry-focused research and outreach to engineering leadership educators and engineering-intensive enterprises.

In August 2017, Troost ILead hosted the second annual meeting of the National Initiative on Capacity Building and Knowledge Creation for Engineering Leaders (NICKEL). Nearly 40 professors and instructors from engineering schools across Canada, as well as representatives from industry and Engineers Canada, came to U of T to discuss best practices and continue building a strong community of practice dedicated to engineering leadership education.

Troost ILead offered eight undergraduate and nine graduate courses in 2017–2018, in areas ranging from leadership in project management to the science of emotional intelligence. One of the newest is a complementary studies course open to students in any discipline called *The Art of Ethical and Equitable Decision-Making*, which launched in winter 2018. This course draws on case studies from the careers of Canadian engineers, allowing students to gain exposure to the legal context of engineering ethics and practice in applying a range of ethical theories, decision-making frameworks and the Professional Engineers Ontario (PEO) code of ethics.

MEng students can count these courses toward the Entrepreneurship, Leadership, Innovation & Technology in Engineering (ELITE) certificate, while undergraduate students can earn credits toward the Minor in Engineering Business or the Certificate in Engineering Leadership. Demand for these courses was strong, with overall enrolment reaching 591, a 24% increase from the previous year.

In 2017–2018, instructors from Troost ILead partnered with other faculty members to offer team-based learning and leadership activities in 18 courses across the Faculty, including:

- APS100 Orientation to Engineering
- APS111 Engineering Strategies & Practice I
- APS112 Engineering Strategies & Practice II
- APS305 Energy Policy
- APS490 Multidisciplinary Capstone Design Project
- ESC101 Praxis I
- ESC102 Praxis II
- ESC203 Engineering and Society
- CHE210 Heat and Mass Transfer
- CHE222 Applied Differential Equations
- CHE230 Environmental Chemistry
- MIE191 Mechanical and Industrial Engineering Seminar
- MIE240 Human-Centred Systems Design
- MIE243 Mechanical Engineering Design
- MIE303 Mechanical and Thermal Energy Conversion Processes
- MIE315 Design for the Environment
- MIE350 Design and Analysis of Information
- BME498 Biomedical Engineering Capstone Design

Engineering students also have opportunities to hone their leadership competencies and self-development through Troost ILead’s innovative co-curricular programs:

- **Leadership Labs:** Experiential workshops ranging from evening sessions on project management, team conflict, public speaking, team culture, emotional intelligence and feedback to full-day labs on teamwork development and

workplace readiness. In 2017–2018, Troost ILead offered 24 co-curricular labs that reached more than 1,000 students. Attendance at four Leadership Labs is recognized on students’ Co-Curricular Records. These labs also provided work experience for five students who were trained as co-facilitators.

- **The Game:** A six-month program that challenges student teams to hone their leadership competencies by developing solutions to large-scale social problems. The program, which begins in September and culminates in a project showcase in March, attracted seven teams in 2017–2018. This year’s projects addressed issues such as bicycle theft in the Greater Toronto Area and the high number of dogs euthanized at shelters across the city.
- **Troost ILead Summer Fellowship:** A 16-week program for highly engaged engineering students who want to increase the impact of their student organizations and their leadership competencies. The program includes strategies for organizational development, peer learning and individual coaching. Troost ILead had 13 summer fellows in 2017.
- **Faculty-wide Summer Leadership Program:** The eight-week course provides students with opportunities to better understand their strengths and values, gain new perspectives on engineering and its impact on society, and be part of a vibrant and diverse community. Forty students participated in the program in the summer of 2017.
- **OPTIONS Program (Opportunities for PhDs: Transitions, Industry Options, Networking and Skills):** An initiative led jointly by the Vice-Dean, Graduate Studies and Troost ILead, which prepares PhD students and postdoctoral fellows for careers outside academia, from industry research and development to government policy. Twenty-six students enrolled in the first cohort starting in September 2017, and 30 enrolled in the winter semester, starting January 2018. (*For more information on OPTIONS, see Chapter 2: Enriching the Graduate Student Experience*)

Troost ILead’s research efforts for the 2017–2018 academic year have involved three different project types: insight research, pedagogical and programmatic innovation research, and secondary analyses of large-scale data sets.

Insight Research:

- **Engineering Leadership Project:** Examines how engineers think about leadership, how they lead and how they learn to lead at all stages of their careers. In 2017–2018 the Troost ILead team completed its analysis of the school-to-work transition phase and began examining the leadership learning experiences of senior engineers.
- **PEY Co-op Project:** In collaboration with the Engineering Career Centre, this project aims to enhance the PEY Co-op Program, starting with a review of the academic and programmatic literature, learning objectives and student evaluation data.

Pedagogical & Programmatic Innovation Research:

- **Ethics and Equity in Engineering:** Involves generating and testing case studies on ethical and equity-based dilemmas faced by engineers, and using the completed resources to support ethics education in the faculty. Fifteen case studies have been analyzed, with results presented at workshops to several engineering classes as well as industry and academic audiences.
- **Research on Engineering Leadership Programs:** This project includes the development of a comparative framework for analyzing engineering leadership programs in universities across Canada.
- **Teamworks:** Following the continued success of the Team-effectiveness Learning System developed in 2014, Troost ILead partnered with Cherniak Software to commercialize the technology and make it available to instructors at other universities. Teamworks has now been piloted at two other universities across Canada and is in the process of being refined for a full launch to other sites in the Fall.

Secondary Analyses of Large-scale Data:

- **Examining Trajectories:** Using the most recent data set of Statistics Canada's National Graduates Survey (NGS), Troost ILead is examining career and education trajectories of engineering graduates across disciplines, genders, ethnicities and provinces. The study aims to provide a national perspective on the transition of engineering graduates from university to the workforce.
- **Collaboration with Engineers Canada:** Troost ILead has collaborated with Engineers Canada to include in its Final Year Student Exit Survey a set of questions assessing leadership skills and traits of engineering students. The project aims to provide a national snapshot of the leadership competencies of engineering graduates.

Student Clubs and Teams

Our students nurture their passions and interests through more than 100 U of T Engineering student clubs and teams, from the Spark Design Club to the University of Toronto Aerospace Team. Students can document their co-curricular activities in the U of T Co-Curricular Record, an official report that offers recognition for competencies gained through athletic teams, student government, cultural clubs, design teams and other campus organizations.

The Centralized Process for Student Initiative Funding (CPSIF) allows student groups to apply to various funding sources within the Faculty via a single application. For 2017–2018, 103 undergraduate and graduate engineering student groups and initiatives received \$331,896 through CPSIF.

A complete list of student clubs and teams is provided in Appendix B.

5

Our faculty, staff and alumni continue to earn widespread recognition for outstanding achievements in research, teaching, professional endeavours and community service.

In 2017, we received more than 20% of major national and international awards won by engineering professors nationwide, while making up less than 6% of the engineering faculty in Canada. These awards include fellowships of the American Association for the Advancement of Science, the Canadian Academy of Engineering and the Engineering Institute of Canada.

Several professors were recognized for a lifetime of notable achievement. Paul Santerre (IBBME) earned a Governor General's Innovation Award, celebrating innovations that are exceptional, transformative and positive in their impact on quality of life in Canada. Both Molly Shoichet (ChemE, IBBME) and Michael Sefton (ChemE, IBBME) were named officers of the Order of Canada, one of the country's highest honours.

U of T Engineering professors in the early stages of their careers earned a number of prestigious awards. Angela Schoellig (UTIAS) was named to MIT Technology Review's list of *Innovators Under 35*, while Milica Radisic (IBBME, ChemE) earned the Steacie Prize, awarded each year to one engineer or scientist 40 years of age or younger who has made notable contributions to research in Canada. Wei Yu (ECE) was elected to the Royal Society of Canada's College of New Scholars, Artists and Scientists. Our faculty also garnered awards for innovation in teaching, such as the Joan E. Foley Quality of Student Experience Award earned by Jason Foster (EngSci).

The Faculty's achievements in communications and outreach were recognized with national and international awards from the Canadian Council for the Advancement of Education, the Council for Advancement and Support of Education and the International Association of Business Communicators.

Measuring Excellence

In 2017, U of T Engineering faculty members were recognized with 19 major awards and honours in recognition of their excellence in research, teaching and contributions to the engineering profession. Of the prestigious national and international awards that are presented annually to Canadian engineering professors, U of T Engineering professors earned 16, or 21.3% of the total, while representing just 5.8% of engineering faculty members nationally.

Figure 5.1 Summary of Major International, National and Provincial Awards and Honours, 2008 to 2017

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
International										
AAAS Fellowships (Engineering Section)	4	4	6	5	3			1	4	1
MIT Top 35 Under 35	1				1					1
U.S. National Academies*			1	1			1		1	
National										
Brockhouse Prize									1	
Canadian Academy of Engineering Fellowship	3	9	8	1	7	6	3	5	5	5
Engineering Institute of Canada Fellowship	3	4	3	3	3	3	3	2	3	1
Engineering Institute of Canada Awards			1	2	1	2		1	1	2
Engineers Canada Awards		1	3		1	1	1	1		1
Killam Research Fellowship*	2		2							
Killam Prize*	1						1		1	1
Manning Innovation Award							1			
Royal Society of Canada Fellowship*	1	1	2	4	3		2	2	1	2
Royal Society of Canada College of New Scholars, Artists and Scientists							1	1	1	1
Steacie Fellowship*		1			2	1	1	1	1	
Steacie Prize*					1					1
Synergy Award for Innovation		1			1					
Provincial										
Ontario Professional Engineers Awards	3	4	4	5	3	2	2	1	2	3
OCUFA Teaching Award			1					1	1	
Total	18	25	31	21	26	15	16	16	22	19

Data in this chapter are presented for the 2017 calendar year (January to December). Selected faculty, alumni and staff awards were received between summer 2017 and summer 2018.

Note 5.1: (*) denotes U of T performance indicator. Data shown are by calendar year (January to December) and include faculty award recipients only. Please see Appendix G to read descriptions of the listed awards and honours.

Figure 5.2a Number of Major National and International Awards Received by U of T Engineering Compared to Other Canadian Engineering Faculties, 2017

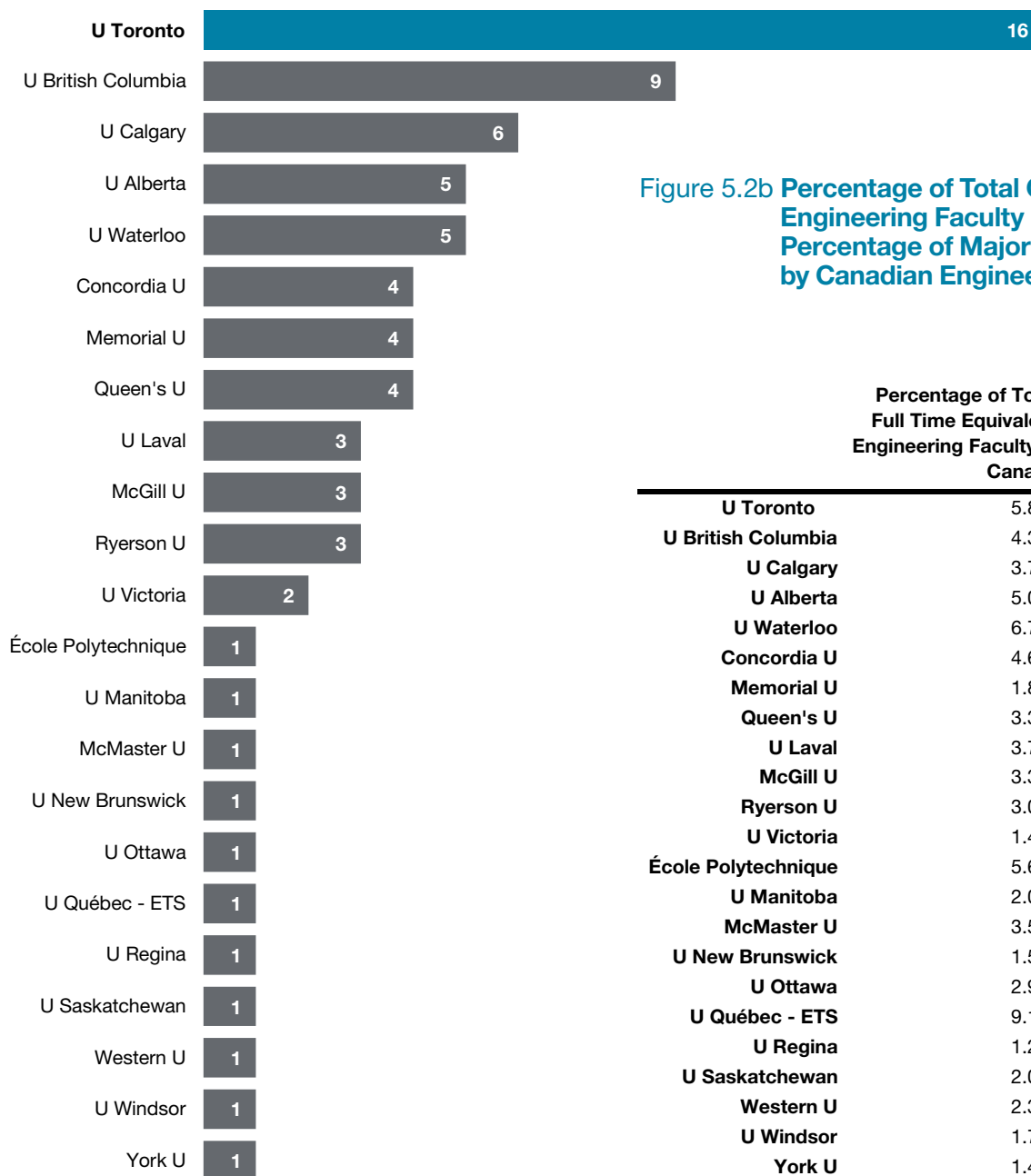
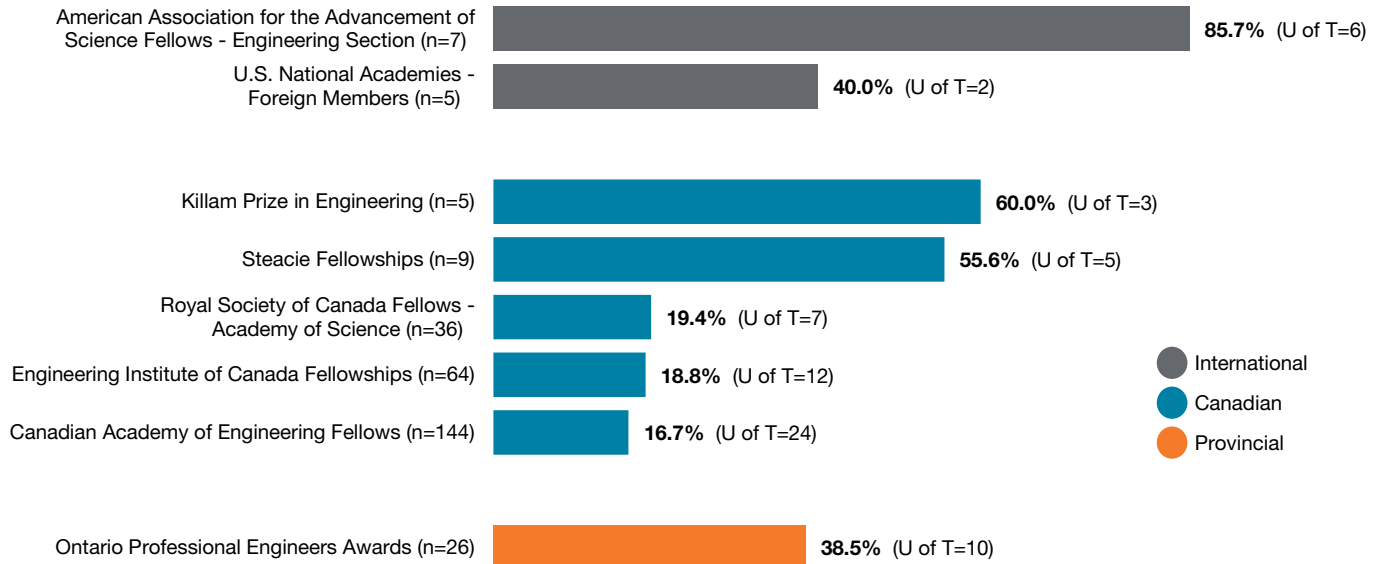


Figure 5.2b Percentage of Total Canadian Engineering Faculty Members and Percentage of Major Awards Received by Canadian Engineering Faculties, 2017

	Percentage of Total Full Time Equivalent Engineering Faculty in Canada	Percentage of Total Major Awards Received by Engineering Faculties
U Toronto	5.8%	21.3%
U British Columbia	4.3%	12.0%
U Calgary	3.7%	8.0%
U Alberta	5.0%	6.7%
U Waterloo	6.7%	6.7%
Concordia U	4.6%	5.3%
Memorial U	1.8%	5.3%
Queen's U	3.3%	5.3%
U Laval	3.7%	4.0%
McGill U	3.3%	4.0%
Ryerson U	3.0%	4.0%
U Victoria	1.4%	2.7%
École Polytechnique	5.6%	1.3%
U Manitoba	2.0%	1.3%
McMaster U	3.5%	1.3%
U New Brunswick	1.5%	1.3%
U Ottawa	2.9%	1.3%
U Québec - ETS	9.1%	1.3%
U Regina	1.2%	1.3%
U Saskatchewan	2.0%	1.3%
Western U	2.3%	1.3%
U Windsor	1.7%	1.3%
York U	1.4%	1.3%

Note 5.2a, b: Data shown are by calendar year (January to December) and include faculty award recipients only. The following major awards are included: International – American Association for the Advancement of Science Fellowship (Engineering Section), MIT Top 35 under 35, U.S. National Academies; National – Alan Blizzard Award, Brookhouse Prize, Canadian Academy of Engineering Fellowship, Engineering Institute of Canada Awards, Engineering Institute of Canada Fellowship, Engineers Canada Awards, Killam Prize (Engineering), Killam Research Fellowship, Manning Innovation Award, Royal Society of Canada Fellowship (Engineering/Physical Sciences), Royal Society of Canada College of New Scholars, Artists and Scientists, Steacie Fellowship, Steacie Prize and Synergy Awards for Innovation.

Figure 5.3 Number of Awards Received by U of T Engineering Faculty Compared to Other Canadian Engineering Faculties, 2013 to 2017



Selected Awards Received by Faculty

The following is a selected list of awards U of T Engineering faculty received between summer 2017 and summer 2018.

INTERNATIONAL

American Association for the Advancement of Science: *Fellow*

David Sinton (MIE)

American Institute for Aeronautics and Astronautics: *Associate Fellow*

Clinton Groth (UTIAS)

American Institute for Medical and Biological Engineering: *Fellow*

Craig Simmons (MIE, IBBME)

Biochemical Engineering Journal: *Young Investigator Award*

Radhakrishnan Mahadevan (ChemE)

The Combustion Institute: *Fellow*

Omer Gulder (UTIAS)
Murray Thomson (MIE)

Institute of Electrical and Electronics Engineers: *Fellow*

Ben Liang (ECE)

MIT Technology Review: *Top 35 Innovators Under 35*

Angela Schoellig (UTIAS)

Optical Society of America: *Fellow*

Mo Mojahedi (ECE)
Joyce Poon (ECE)

Paper Industry International Hall of Fame

Honghi Tran (ChemE)

Note 5.3: Data shown are by calendar year (January to December) and include faculty award recipients only.

NATIONAL

Canada Council for the Arts: *Killam Prize in Engineering*

Molly Shoichet (ChemE, IBBME)

Canadian Academy of Engineering: *Fellow*

Robert Andrews (CivMin)
Sanjeev Chandra (MIE)
Tom Chau (IBBME)
Heather MacLean (CivMin)
Wei Yu (ECE)

Canadian Society for Chemical Engineering:

Hatch Innovation Award

Alison McGuigan (ChemE)

Canadian Society for Civil Engineering:

Horst Leipholtz Medal

Shamim Sheikh (CivMin)

Canadian Society of Civil Engineering:

Sandford Fleming Award

Baher Abdulhai (CivMin)

Canadian Society for Mechanical Engineering: *Fellow*

Sanjeev Chandra (MIE)

Engineering Institute of Canada: *Fellow*

Brenda McCabe (CivMin)

Engineers Canada: *Gold Medal Award*

Levente Diosady (ChemE)

E.W.R. Steacie Memorial Fund: *Steacie Prize*

Milica Radisic (IBBME, ChemE)

IEEE Canada: *C.C. Gotlieb Computer Award*

Yu Sun (MIE)

Office of the Governor General:

Governor General's Innovation Award

Paul Santerre (IBBME)

Office of the Governor General:

Governor General's Meritorious Service Cross

Tom Chau (IBBME)

Order of Canada: *Officer*

Michael Sefton (ChemE, IBBME)

Molly Shoichet (ChemE, IBBME)

Royal Society of Canada: *Fellow*

Reza Iravani (ECE)

Milica Radisic (IBBME, ChemE)

Royal Society of Canada College of New Scholars, Artists and Scientists: *Member*

Wei Yu (ECE)

PROVINCIAL

Ontario Professional Engineers Awards:

Entrepreneurship Medal

Paul Santerre (IBBME)

Ontario Professional Engineers Awards:

Research and Development Medal

Jan Andrysek (IBBME)

Craig Simmons (MIE, IBBME)

Ontario Professional Engineers Awards:

Young Engineer Medal

Jennifer Drake (CivMin)

Order of Ontario

Tom Chau (IBBME)

TORONTO/U of T

Distinguished Professor in Forest

Materials Bioengineering

Ning Yan (ChemE)

Joan E. Foley Quality of Student Experience Award

Jason Foster (EngSci)

Massey College Fellow

Stewart Aitchison (ECE)

YWCA Toronto Woman of Distinction

Milica Radisic (IBBME, ChemE)

Selected Awards Received by Staff, April 2017 to April 2018

INTERNATIONAL

International Association of Business Communicators (IABC) Gold Quill Award of Excellence, *Innovate U outreach event*
Engineering Strategic Communications,
Engineering Outreach Office

IABC Gold Quill Award of Merit, *Story: Toronto's subways expose passengers to more air pollution than Montreal, Vancouver systems*
Engineering Strategic Communications

NATIONAL

Council for Advancement and Support of Education (CASE) District II Bronze Award, *#EveryDropMatters CNE activation*
Engineering Strategic Communications

IABC Silver Leaf Award of Excellence, *Innovate U outreach event*
Engineering Strategic Communications,
Engineering Outreach Office

TORONTO

IABC Ovation Award of Excellence, *#EveryDropMatters CNE activation*
Engineering Strategic Communications

IABC Ovation Award of Merit, *She Inspires Us video*
Engineering Strategic Communications,
Engineering Outreach Office

U of T

True Blue Award
Carla Baptista (MIE)

U of T Engineering Staff and Faculty Awards, 2014–2015 to 2017–2018

Each year, U of T Engineering recognizes the excellence of our staff and faculty through a number of awards for research, teaching, leadership and dedication to improving the student experience.

Agnes Kaneko Citizenship Award

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

2017–18: Mary Butera (ChemE)
2016–17: Joan DaCosta (UTIAS)
2015–16: Matthew Chow (ECE)
2014–15: Belinda Li (ECE)

Early Career Teaching Award

Presented in recognition of exceptional teaching by a faculty member who has taught at U of T for less than six years.

2017–18: Vaughn Betz (ECE)
2016–17: Matthew Mackay (MIE)
2014–15: Scott Ramsay (MSE)

Faculty Teaching Award

Recognizes a faculty member who demonstrates outstanding classroom instruction and develops innovative teaching methods.

2017–18: Manfredi Maggiore (ECE)
2016–17: Craig Simmons (MIE, IBBME)
2014–15: Jason Foster (EngSci)

Harpreet Dhariwal Emerging Leader Award

Presented to a staff member who leads by example in their dedication to the Faculty's mission. Recipients are held in high regard by colleagues and demonstrate potential to assume more senior leadership roles within the Faculty. This award was renamed in memory of an esteemed staff member who received this honour in 2011–2012.

2017–18: Shawn Mitchell (ECE)
2016–17: Andrey Shukalyuk (IBBME)
2015–16: Bruno Korst (ECE)
2014–15: Kelly Hayward (ECE)

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.

2017–18: Sarah Steed (Office of Advancement)
2016–17: Pauline Martini (ChemE)
2015–16: Roberta Baker, Raymond Cheah, Shilpa Gantotti and Catherine Riddell (Engineering Strategic Communications)
2014–15: Darlene Gorzo, Jaro Pristupa and Joe Wong (ECE)

McCharles Prize for Distinction in Early Career Research

The McCharles Prize was originally established in 1907 by Aeneas McCharles through a gift to the Faculty of Applied Science & Engineering at the University of Toronto. In 2007, the Faculty and the University re-established the McCharles Prize as an award for exceptional performance and distinction in early career research, typically on the part of a pre-tenure member of the Faculty of Applied Science & Engineering.

2017–18: Ding Yuan (ECE)
2015–16: Adam Steinberg (UTIAS)

Quality of Student Experience Award (Behind-the-scenes staff)

Presented to a staff member who has made significant improvements to the quality of student experience.

2017–18: Scott Sleeth (EngSci)

Quality of Student Experience Award (Frontline staff)

Presented to a staff member who has made significant improvements to the quality of student experience.

2017–18: Jennifer Fabro (Office of the Registrar)
2016–17: Cori Hanson (Office of the Registrar)
Endang (Susie) Susilawati (ChemE)
2015–16: Carla Baptista (MIE)
2014–15: Mike Mehramiz (ECE)

Safwat Zaky Research Leader Award

Presented to a faculty member or team who has shown leadership in innovative, interdisciplinary and/or collaborative research initiatives that have enhanced the Faculty's research profile within the broader community.

2017–18: George Eleftheriades (ECE)
2016–17: Greg Evans (ChemE)
2015–16: Alberto Leon-Garcia (ECE)
2014–15: Honghi Tran (ChemE)

Sustained Excellence in Leadership Award

Presented to a staff member who has demonstrated leadership in supporting the Faculty's education and/or research endeavors over a sustained period (typically 10 years or more). (This award replaces the Influential Leader Award, which was last presented in 2015–16).

2017–18: Kelly Chan (ECE)
2015–16: Leslie Grife (First Year Office)
2014–15: Joe Baptista (MIE)

Sustained Excellence in Teaching Award

Recognizes a faculty member who has demonstrated excellence in teaching over the course of at least 15 years.

2017–18: Graeme Norval (ChemE)
2016–17: Will Cluett (ChemE)
2014–15: Jonathan Rose (ECE)

Engineering Alumni Network Awards, 2014–2015 to 2017–2018

The Engineering Alumni Network's annual awards honour graduates for outstanding contributions to U of T Engineering and to the profession.

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.

2017–18: Reena Cabanilla (ChemE 1T8)
2016–17: Allan Kuan (EngSci 1T4 + PEY, CivE MASc 1T7);
Alex Perelgut (EngSci 1T6 + PEY)
2015–16: Xiao Fionna Gan (EngSci 1T6)
2014–15: Luca Casciato (MechE 1T5); Haruna Monri (CivE 1T5)

7T6 Early Career Award

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

2017–18: Huda Idrees (IndE 1T3); Cameron Robertson
(EngSci 0T8, UTIAS MASc 0T9)
2016–17: Andrew Gillies (MechE 0T7); Christopher Wilmer
(EngSci 0T7)
2015–16: Gimmy Chu (ElecE 0T6)
2014–15: Stefanie Blain-Moraes (EngSci 0T5); Todd Reichert
(EngSci 0T5, UTIAS PhD 1T1)

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.

2017–18: Alvin Mok (EngSci 0T3)
2016–17: Tom Chau (EngSci 9T2)
2015–16: Raffaello D'Andrea (EngSci 9T1)
2014–15: Janet Elliot (EngSci 9T0); Suneet Tuli (CivE 9T0)

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 greater community.

2017–18: Elias Kyriacou (ChemE 7T6)
2016–17: Don Andrew (CivE 5T4)
2015–16: Ross Pitman (GeoE 7T4)
2014–15: R. Christopher Hinde (CivE 5T0)

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.

2017–18:
Alfred Aho (EngPhys 6T3)
Janis Chodas (EngSci 7T8, UTIAS MASc 8T0)
Bob Howard (IndE 7T2)
Brian Kernighan (EngPhys 6T4)
Catherine Lacavera (ECE 9T7)

2016–17:
Rocco Martino (Physics 5T1, Astrophysics MASc 5T2,
UTIAS PhD 5T6)
Kathy Milsom (CivE 8T3)
Jonathan Rose (EngSci 8T0, ECE MASc 8T2, PhD 8T6)
The Honourable Tom Siddon (UTIAS MASc 6T6, PhD 6T9)

2015–16:
Paul Henderson (EngBus 5T7)
Ali Khademhosseini (ChemE 9T9, IBBME MASc 0T1)
Ronald Sidon (IndE 6T6)
John Weber (MechE 7T9)

2014–15:
William Breukelman (ChemE 5T5)
Jan Carr (ElecE 6T8)
Jay Cross (EngSci 7T5)
Emil Frind (CivE 6T6)

Engineering Alumni Medal

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

2017–18: Larry Seeley (ChemE 6T6, MASc 6T8, PhD 7T2)
2015–16: David Colcleugh (ChemE 5T9, MASc 6T0, PhD 6T2)
2014–15: Frank Dottori (ChemE 6T3)

6

We evaluate our position among global leaders in engineering research and education through a comprehensive series of metrics that include the quality of applicants to our programs and the awards and honours earned by our faculty members. International rankings are another measure of excellence, capturing our performance in terms of research influence, learning environment, knowledge transfer and other factors.

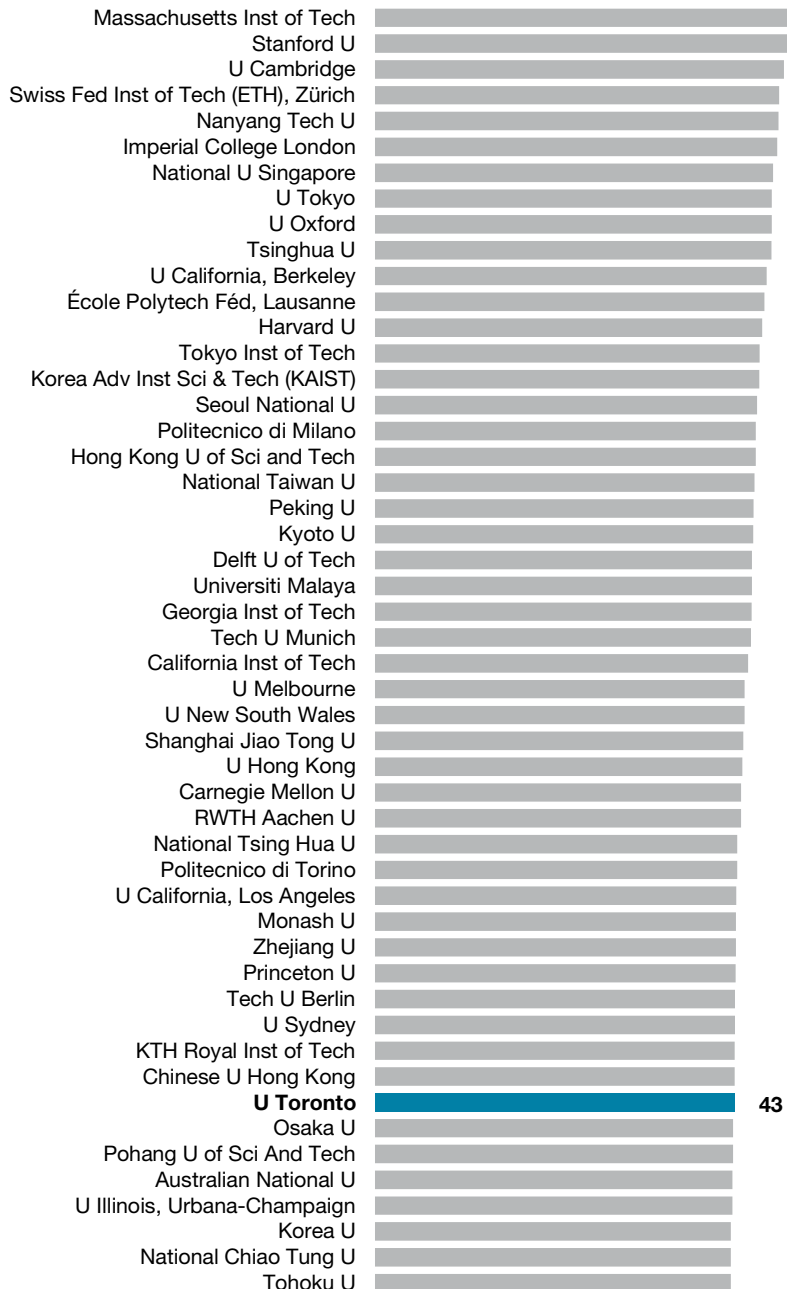
U of T Engineering has consistently ranked as the top engineering school in Canada across four organizations that have been producing world university rankings specific to engineering for 10 years or more: the Quacquarelli Symonds World University Rankings (QS), the Times Higher Education World University Rankings (THE), Academic Ranking of World Universities (ARWU) and the National Taiwan University Performance Ranking of Engineering Papers (NTU; formerly HEEACT). Our Faculty also ranks in the top 10 of North American public universities and is the only Canadian university to appear within the top 50 in the three rankings for which metrics specific to engineering are published.

While each organization's assessments are unique and often distinct from the others, our high standing across all major rankings is one of the factors that enables us to attract top students, faculty and industry collaborators. We are focused on maintaining and enhancing our global reputation in the years to come.

Comprehensive University Rankings

QS World University Rankings for Engineering and Information Technology

Figure 6.1a QS Top 50 World Universities, 2018



U of T Engineering ranked 43rd in the most recent QS World University Rankings for Engineering and Information Technology. As in past years, ours was the only Canadian university to make the QS top 50. Shown in Figure 6.1b, our standing among North American public universities, our closest peers, remained in fourth place.

We continue to rank as the top Canadian engineering school in four of the seven engineering and information technology subjects (Chemical Engineering, Civil & Structural Engineering, Computer Science & Information Systems, Electrical & Electronic Engineering) and second in two of the others (Materials Sciences, Mechanical, Aeronautical & Manufacturing Engineering) demonstrating our strength across a range of disciplines.

Data in this chapter include rankings published between August 2017 and July 2018.

Figure 6.1b QS Top North American Public Universities, 2018

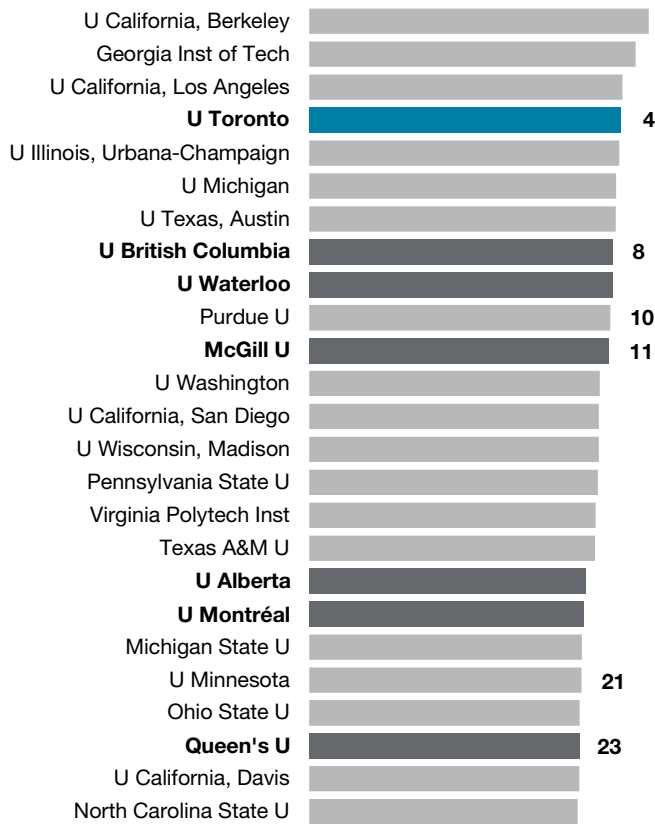


Figure 6.1c Canadian U15 Universities in QS Top 200, 2018

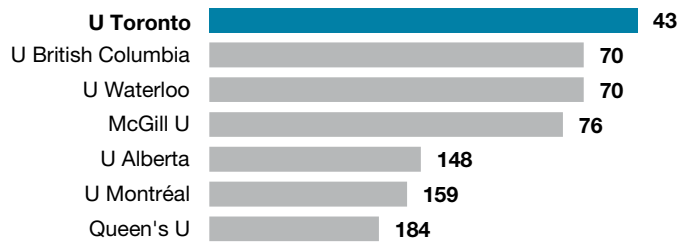
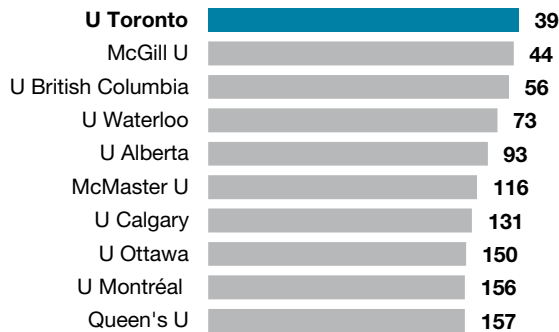
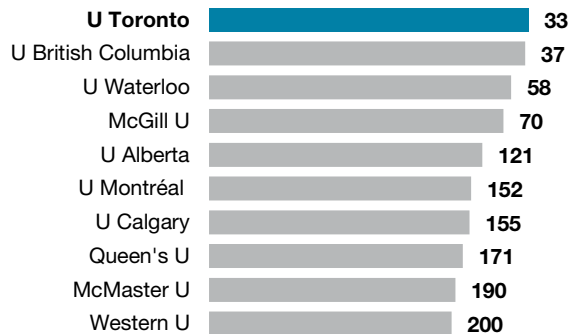


Figure 6.1d Canadian Universities in QS by Subject, 2018

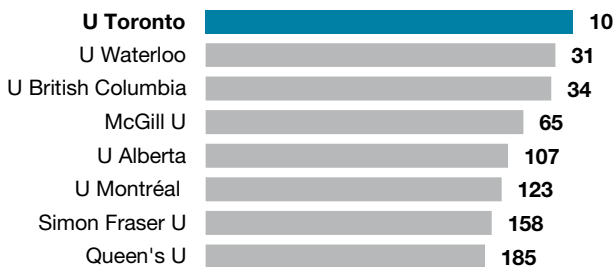
Chemical Engineering



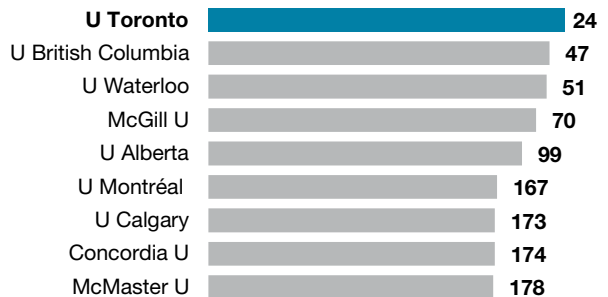
Civil & Structural Engineering



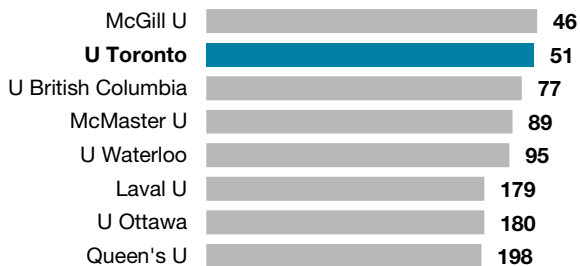
Computer Science & Information Systems



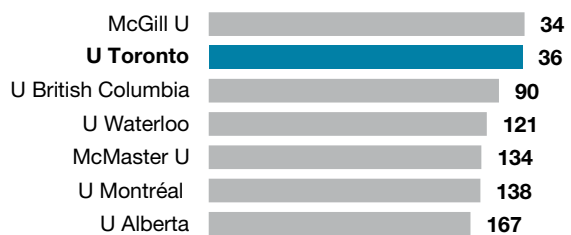
Electrical & Electronic Engineering



Materials Sciences



Mechanical, Aeronautical & Manufacturing Engineering

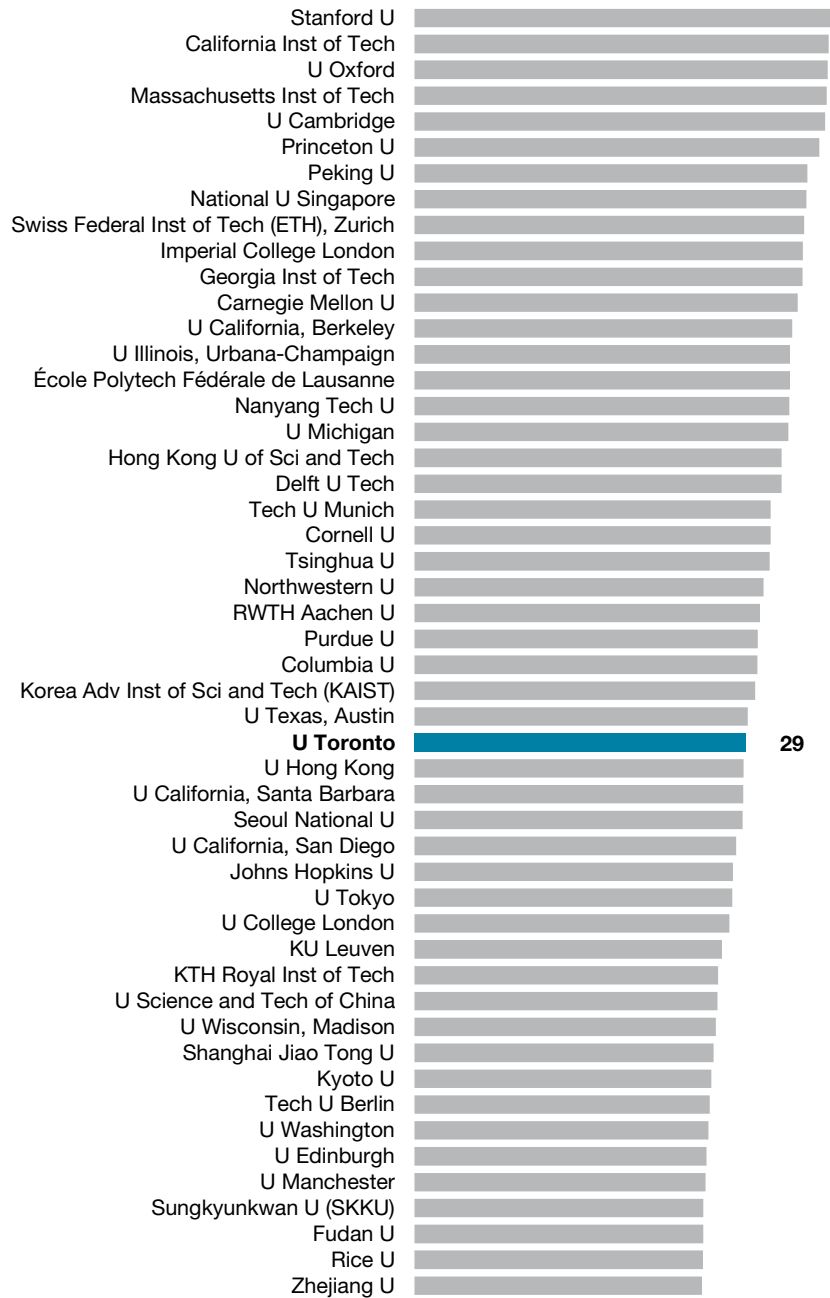


Mineral & Mining Engineering



Times Higher Education (THE)–Elsevier World University Ranking for Engineering and Technology

Figure 6.2a THE Top 50 World Universities, 2017



In the 12 years that Times Higher Education (THE) has published rankings in Engineering and Information Technology, our Faculty has consistently been ranked the top Canadian school and among the top 10 North American public universities, this year placing seventh.

THE is the second-longest-running survey of its kind after ARWU. What sets it apart as an influential assessment of global, research-intensive universities is the breadth of its evaluation, which aims to measure institutions across all their core missions: teaching, research, knowledge transfer and international outlook. The THE ranking uses 13 performance indicators in five weighted categories:

- Teaching: the learning environment (30%)
- Research: volume, income and reputation (30%)
- Citations: research influence (30%)
- International outlook: staff, students and research (7.5%)
- Industry income and innovation (2.5%)

Figure 6.2b THE Top North American Public Universities, 2017

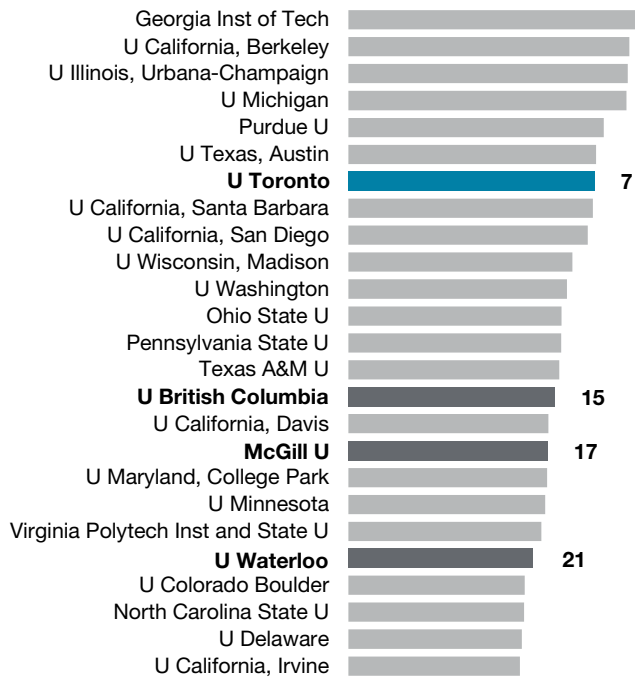
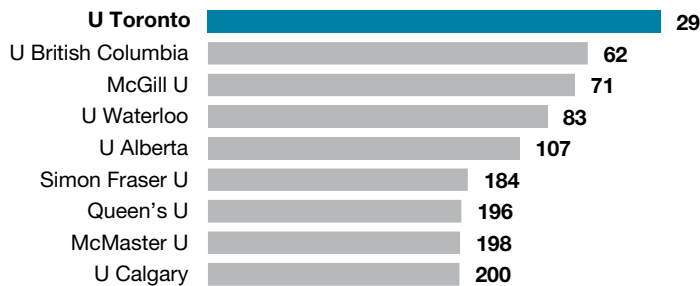


Figure 6.2c Canadian U15 Universities in THE Top 200, 2017



Academic Ranking of World Universities (ARWU) for Engineering Subjects

U of T Engineering is Canada's top school across six of the engineering subject-level rankings provided by ARWU, including Aerospace Engineering, Biomedical Engineering, Computer Science & Engineering, Electrical & Electronic Engineering, Materials Science & Engineering and Mining & Mineral Engineering. We rank second in Canada in two more: Mechanical Engineering and Civil & Structural Engineering.

ARWU has provided university-level rankings since 2003 and provided field-level rankings (e.g. Engineering, Science, Medicine) from 2007 to 2016. In 2016, ARWU first introduced subject-level rankings for engineering disciplines (e.g. Mechanical Engineering, Aerospace Engineering). In the most recent data, ARWU discontinued the field-level rankings that have formed the basis of our previous reporting in favour of an expanded set of subject-level rankings. These included 22 engineering-related fields, of which we have chosen to report the nine most relevant to our programs (See list at right). In the final ARWU field-level rankings for engineering (2016) we remained Canada's top school and ranked 50th worldwide.

The ARWU's methodology has changed over the years, and is currently based on five scoring measures:

- **PUB** – The number of papers authored by an institution in an academic subject during 2011-2015, as indexed in Clarivate's InCites report.
- **CNCI** – Category Normalized Citation Impact: The ratio of citation of papers published by an institution in an academic subject during the period of 2011-2015 to the average citation of papers in the same category, of the same year and same type.
- **IC** – The extent of international co-authorship.
- **TOP** – The number of papers published in top journals.
- **AWARD** – The number of faculty members winning a significant award

Below is the complete list of ARWU Subject Rankings in Engineering, with those relevant to our programs in bold:

Mechanical Engineering
Electrical & Electronic Engineering
Automation & Control
Telecommunication Engineering
Instruments Science & Technology
Biomedical Engineering
Computer Science & Engineering
Civil Engineering
Chemical Engineering
Materials Science & Engineering
Nanoscience & Nanotechnology
Energy Science & Engineering
Environmental Science & Engineering
Water Resources
Food Science & Technology
Biotechnology
Aerospace Engineering
Marine/Ocean Engineering
Transportation Science & Technology
Remote Sensing
Mining & Mineral Engineering
Metallurgical Engineering

Figure 6.3 Top 200 Canadian Universities in the Academic Ranking of World Universities (ARWU) by Subject, 2017

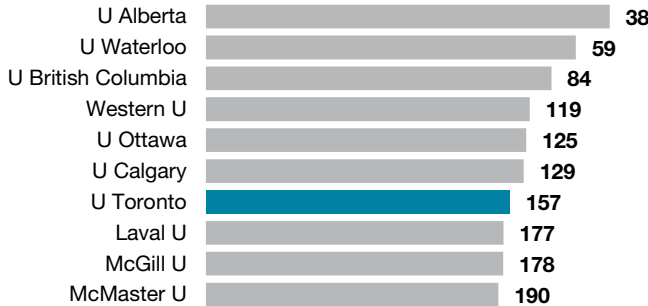
Aerospace Engineering



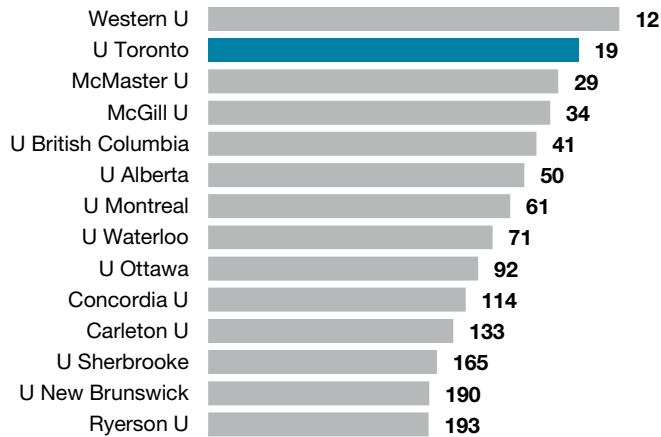
Biomedical Engineering



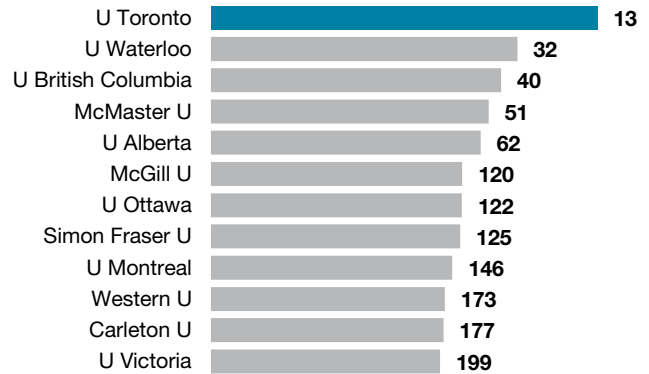
Chemical Engineering



Civil & Structural Engineering



Computer Science & Engineering



Electrical Engineering



Materials Science & Engineering



Mechanical Engineering



Mineral Engineering



National Taiwan University (NTU) Performance Ranking of Engineering Papers

U of T Engineering ranked first in Canada, ninth among top-tier North American public universities, and 50th in the National Taiwan University (NTU) Performance Ranking of Engineering Papers.

The NTU ranking differs from the others in this section in that it is based entirely on bibliometrics. It compares the top 200 universities in the world by subject, using eight weighted criteria grouped into three broad categories:

Research Productivity

- Total number of articles published in the past 11 years (2006–16) [10%]
- Total number of articles published in the most recent year reported (2016) [15%]

Research Impact

- Total number of citations in the past 11 years (2006–16) [15%]
- Total number of citations in the past two years (2015–16) [10%]
- Average annual number of citations over the past 11 years (2006–16) [10%]

Research Excellence

- H-index (measures productivity and impact of published work) of the past two years (2015–16) [10%]
- Number of highly cited papers in the past 11 years (2006–16) [15%]
- Number of papers published in high-impact journals in the current year (2016) [15%]

Figure 6.4a NTU Top 50 World Universities, 2017

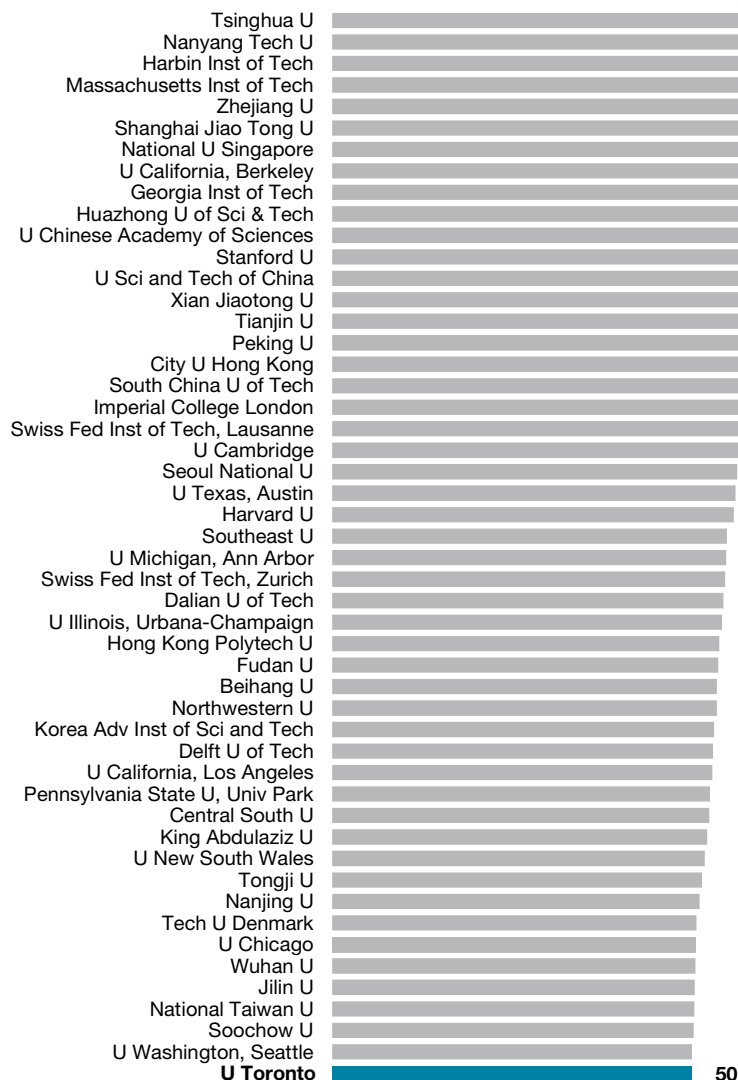
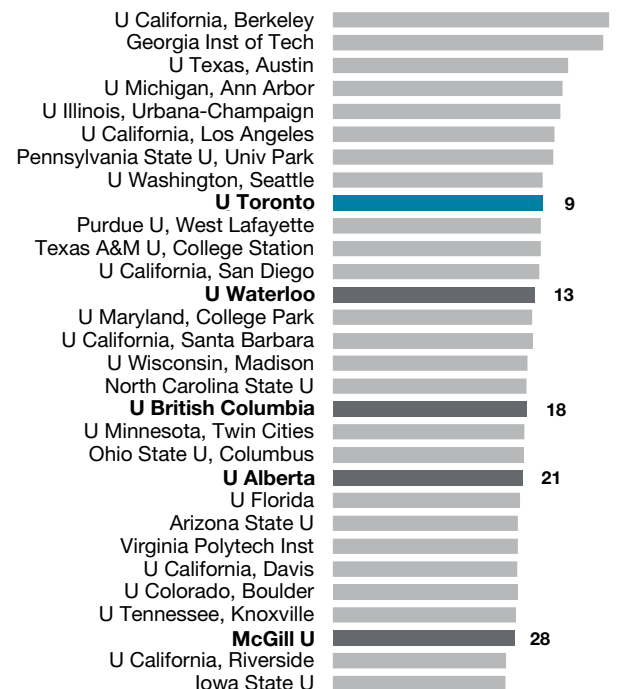


Figure 6.4b NTU Top North American Public Universities, 2017



In NTU's rankings of engineering and information technology subject areas, U of T Engineering placed first among Canadian institutions in three out of six subject rankings, as shown in Figure 6.4d. We are among the top 50 globally in Computer Science, Civil Engineering and Electrical Engineering.

Figure 6.4c Canadian U15 Universities in NTU Top 200, 2017



Figure 6.4d Canadian Universities in NTU by Subject, 2017

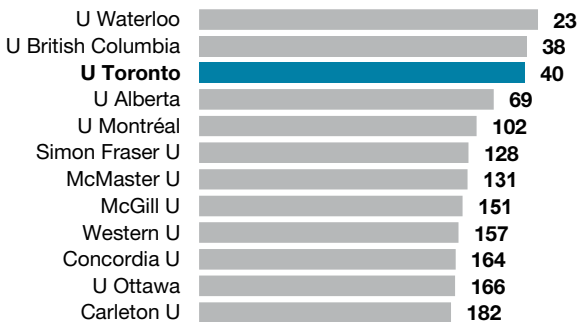
Chemical Engineering



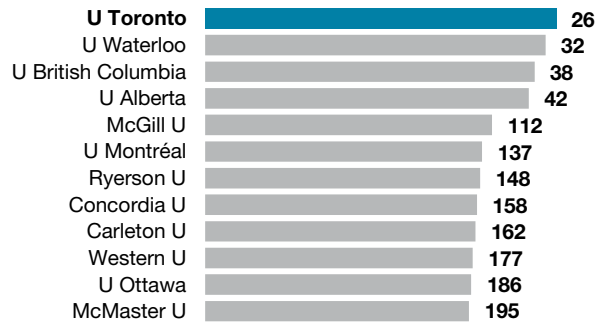
Civil Engineering



Computer Science



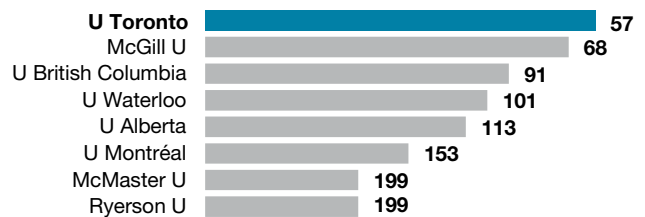
Electrical Engineering



Materials Science



Mechanical Engineering



Rankings Based on Publications and Citations

The Association of American Universities (AAU) index measures research output, productivity and intensity based on publication counts. Once again, U of T Engineering ranked 10th in North America and second in Canada, based on a total publication count of 2,805 papers between 2012 and 2016.

Figure 6.5a Number of Engineering Publications Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2012 to 2016

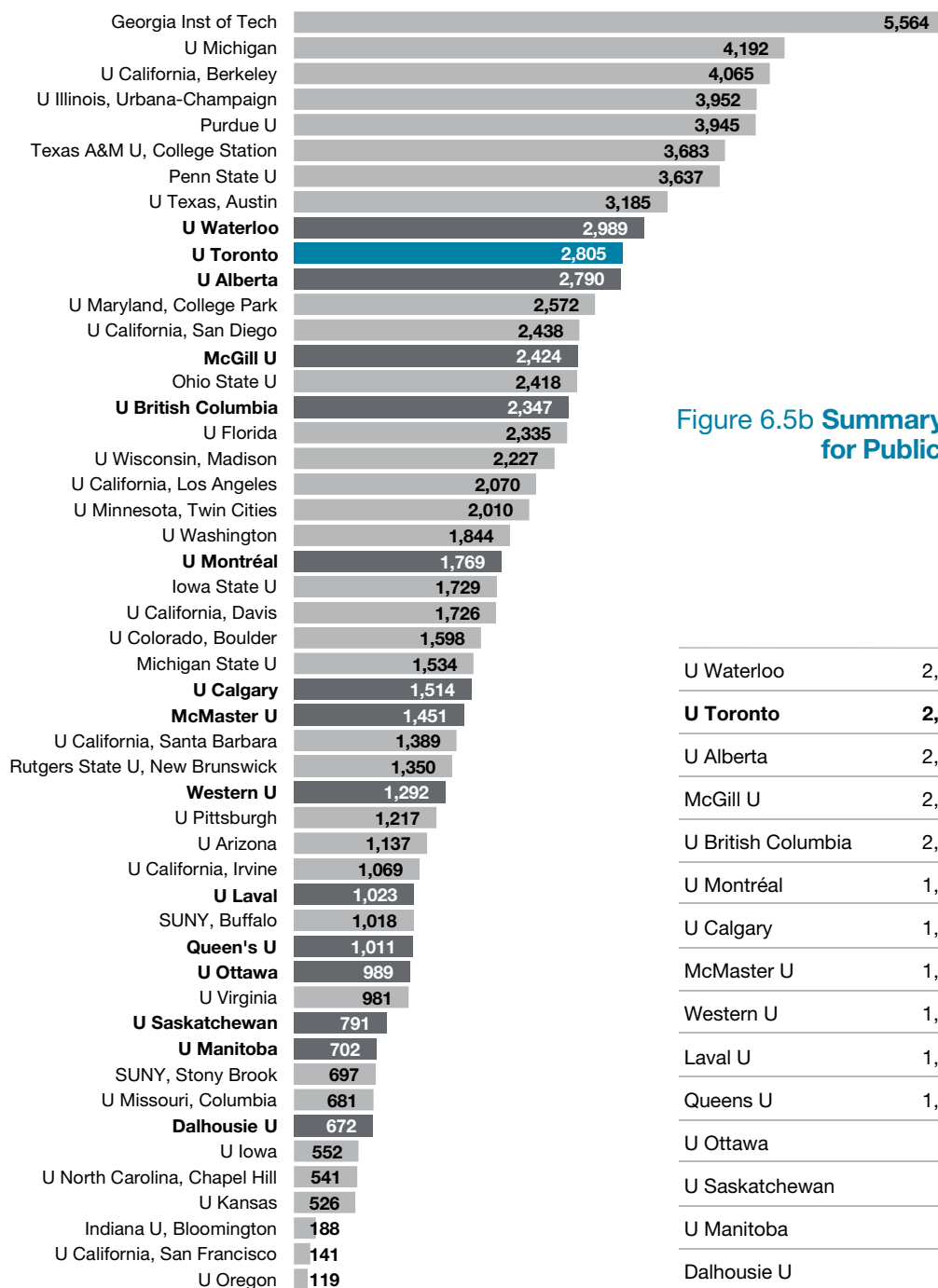


Figure 6.5b Summary of U15 Bibliometrics for Publications

	Publications	Faculty Count	Publications per Faculty	Rank on Pub per Faculty
U Waterloo	2,989	292	10.2	6
U Toronto	2,805	256	11.0	5
U Alberta	2,790	218	12.8	2
McGill U	2,424	145	16.7	1
U British Columbia	2,347	188	12.5	4
U Montréal	1,769	246	7.2	12
U Calgary	1,514	162	9.3	8
McMaster U	1,451	152	9.5	7
Western U	1,292	102	12.7	3
Laval U	1,023	162	6.3	15
Queens U	1,011	146	6.9	13
U Ottawa	989	125	7.9	11
U Saskatchewan	791	86	9.2	9
U Manitoba	702	87	8.1	10
Dalhousie U	672	103	6.5	14

Note 6.5 and 6.6: Faculty counts are based on data from the Engineers Canada Resources Report (2016) Publication and citation data from Thomson Reuters InCites™, updated April 20, 2018.

The AAU index citation counts are based on the total number of papers cited over a five-year period, as well as the frequency of citations per faculty member and article. U of T Engineering placed first in Canada and ninth among North American public institutions in the total number of citations.

As in the past three years we ranked third in Canada for citations per faculty after McGill University and Western University and retained the lead among Canadian universities in the number of citations per publication, which is the metric representing the relevance of our publications as cited by other researchers.

Figure 6.6a Number of Engineering Citations Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2012-2016

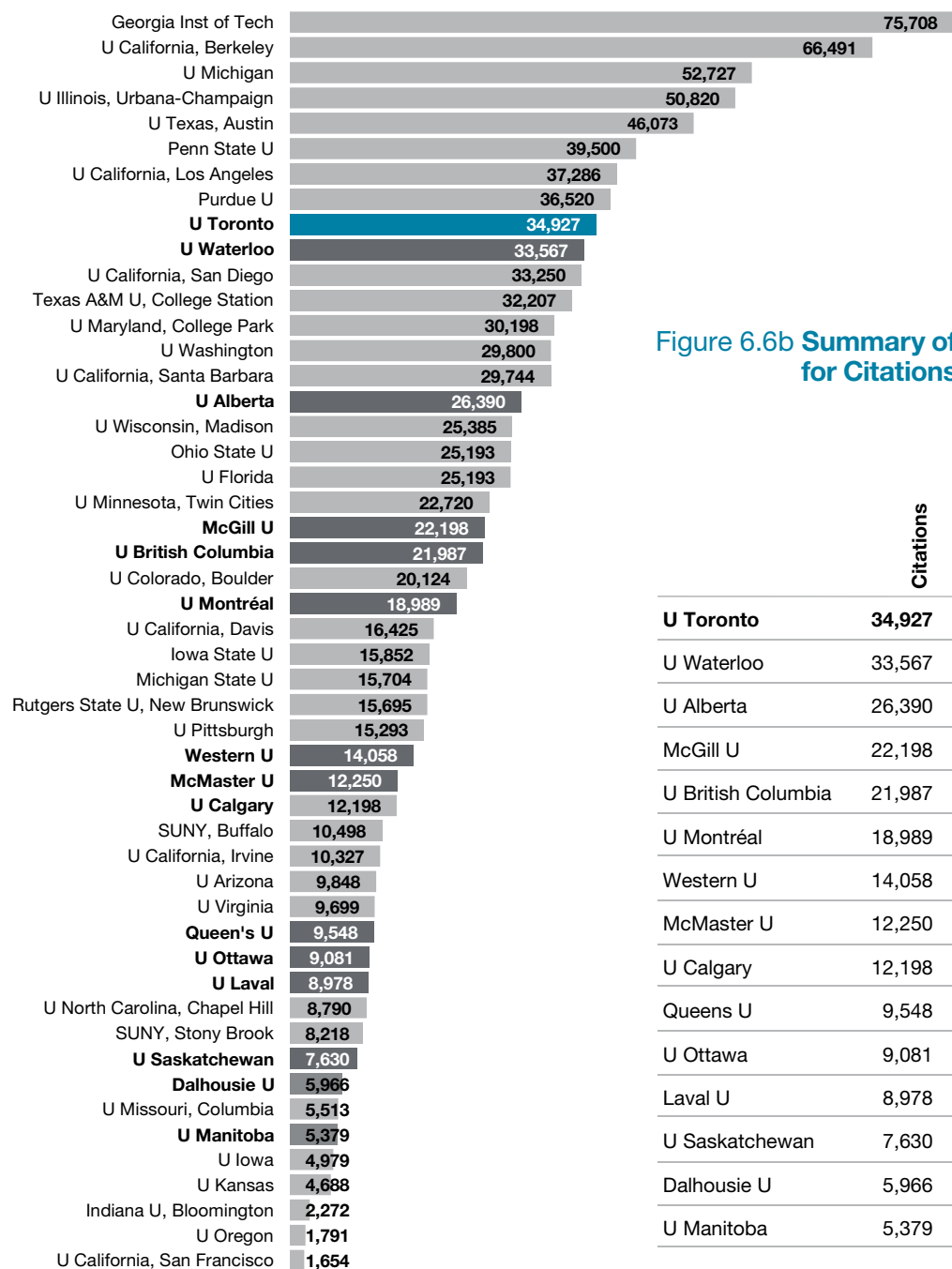


Figure 6.6b Summary of U15 Bibliometrics for Citations

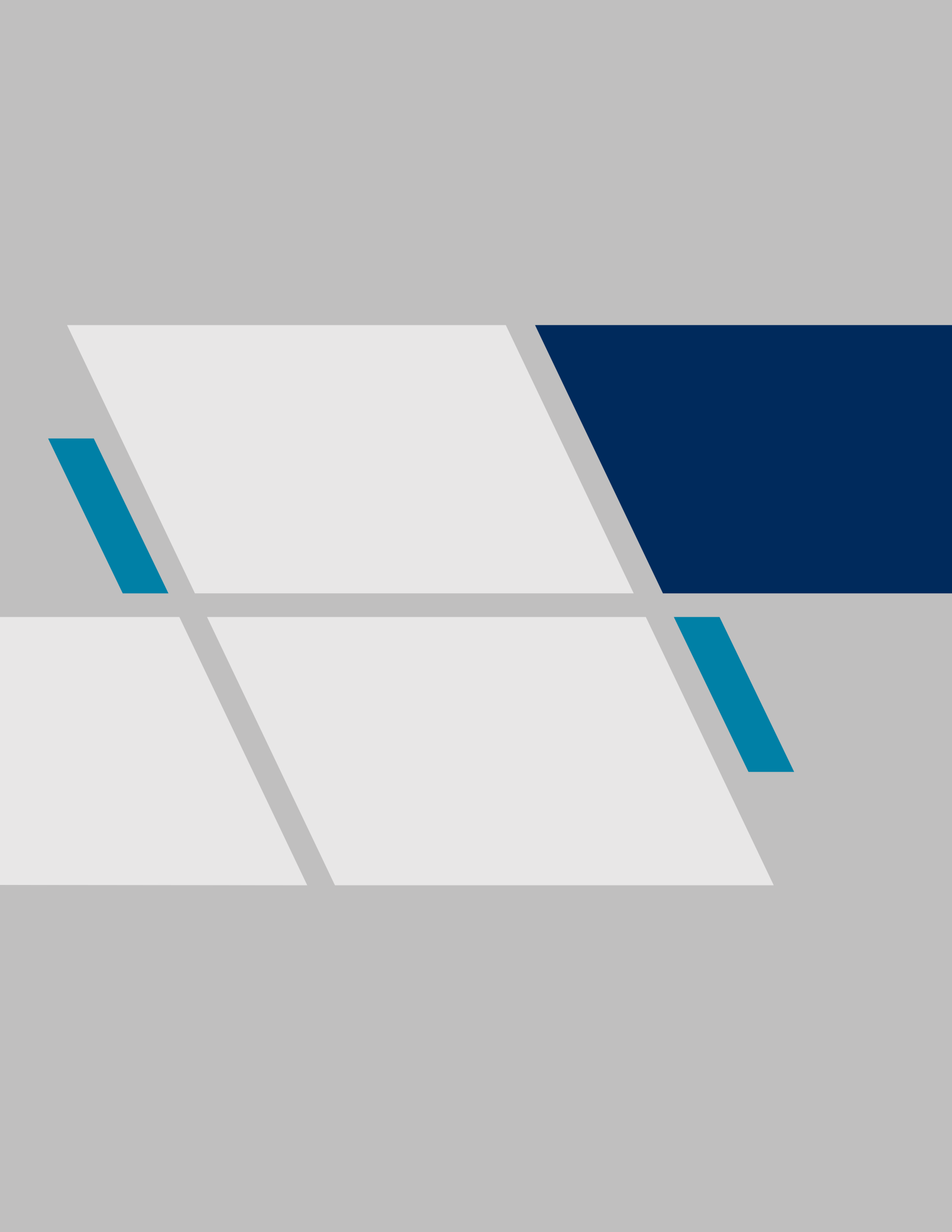
	Citations	Faculty Count	Citations per Faculty	Rank on Citations per Faculty	Citations per Publication	Rank on Citations per Publication
U Toronto	34,927	256	136.5	3	12.5	1
U Waterloo	33,567	292	115.0	6	11.2	2
U Alberta	26,390	218	121.3	4	9.5	6
McGill U	22,198	145	153.1	1	9.2	10
U British Columbia	21,987	188	117.2	5	9.4	8
U Montréal	18,989	246	77.2	9	10.7	4
Western U	14,058	102	138.5	2	10.9	3
McMaster U	12,250	152	80.5	8	8.4	13
U Calgary	12,198	162	75.3	10	8.1	14
Queens U	9,548	146	65.4	12	9.4	7
U Ottawa	9,081	125	72.6	11	9.2	9
Laval U	8,978	162	55.4	15	8.8	12
U Saskatchewan	7,630	86	89.1	7	9.6	5
Dalhousie U	5,966	103	58.0	14	8.9	11
U Manitoba	5,379	87	61.8	13	7.7	15

Summary of Ranking Results

In the most recent results available, U of T Engineering remained the top Canadian university across all rankings, and the only Canadian institution within the global top 50. Among North American public universities, we ranked in the top 10 in three of the four ranking systems. Although no ranking can decisively illustrate a school's performance, our high rankings enhance our ability to attract top students, faculty and collaborators from around the world.

Figure 6.7 Summary of University of Toronto Engineering Performance in World Rankings

Ranking Organization	Release Date	Canada	North American Public	World
QS World University Rankings for Engineering and Information Technology	February 2018	1	4	43
QS World University Rankings by Subject	February 2018			
• Chemical Engineering		1	9	39
• Civil & Structural Engineering		1	7	33
• Electrical & Electronic Engineering		1	5	24
• Materials Science		2	11	51
• Mechanical, Aeronautical & Manufacturing Engineering		2	7	36
• Mineral & Mining Engineering		6	9	25
• Computer Science & Information Systems		1	2	10
Times Higher Education (THE) – Elsevier World University Ranking for Engineering & Technology	October 2017	1	7	29
Academic Ranking of World Universities (ARWU) for Engineering Subjects	August 2017			
• Aerospace Engineering		1	9	18
• Biomedical Engineering		1	5	17
• Chemical Engineering		7	28	157
• Civil Engineering		2	9	19
• Computer Science and Engineering		1	3	13
• Electrical & Electronic Engineering		1	15	46
• Mechanical Engineering		2	18	64
• Materials Science & Engineering		1	13	70
• Environmental Science & Engineering		1	1	9
National Taiwan University (NTU) Performance Ranking of Scientific Papers for World Universities by Subject	October 2017	1	9	50
NTU Performance Ranking by Subject	October 2017			
• Chemical Engineering		4	20	136
• Civil Engineering		2	12	48
• Electrical Engineering		1	6	26
• Materials Science		1	11	74
• Mechanical Engineering		1	12	57
• Computer Science		3	9	40



7

At the heart of the U of T Engineering community is our vibrant, global network of more than 50,000 alumni. Engineering alumni provide our current students with mentorship and connections that can help advance their careers, and our researchers with well-placed partners in academia, industry and government. Their generous support enables us to enhance our world-class research programs, improve our infrastructure, strengthen our support for undergraduate and graduate students, and develop new educational programs that enrich the learning environment.

The Myhal Centre for Engineering Innovation & Entrepreneurship is a shining example of what can be accomplished when our alumni and friends come together to support the Faculty's excellence. A cornerstone of our Boundless fundraising campaign, the Myhal Centre is home to more than 40 named spaces, including technology enhanced active learning spaces, design studios, meeting rooms, fabrication facilities, event spaces and multidisciplinary centres and institutes. The Myhal Centre will serve as a home on campus for our alumni and industry partners to meet with student teams, researchers and advisory boards.

We continue to engage our alumni in innovative ways, no matter where in the world they are located. In 2017–2018, we reached more than 3,500 of them through 163 events, including our popular BizSkule speaker series, held in Toronto, Calgary and Silicon Valley. Our online community, U of T Engineering CONNECT, has exceeded 7,000 active users in less than a year, with membership representing 66 countries around the world.

With each graduating class, our alumni network grows larger and more diverse. We will continue to strengthen relationships between all members of our community – students, faculty, staff, alumni and industry partners – to achieve our strategic goals and to build a better, more prosperous world.

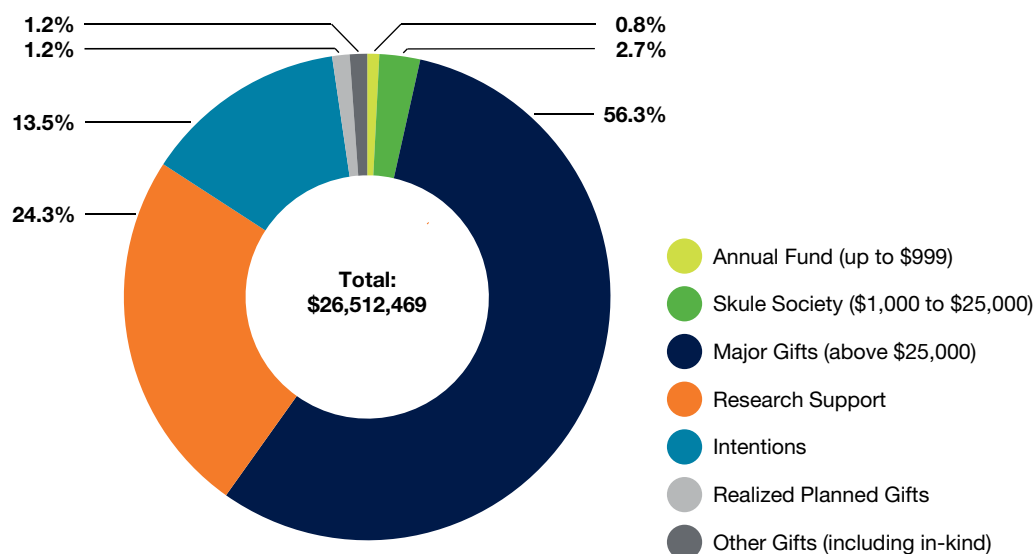
Philanthropic Support

The philanthropic support we attract — from our alumni, corporate donors, students, faculty and staff — enables us to strengthen our infrastructure, expand our programs and offer enhanced financial support for students.

In 2017–2018, we achieved \$26.5 million in philanthropic support, a 20.1% increase over the previous year. This includes \$6.5 million dedicated to research and \$20 million for other projects, including teaching fellowships, student scholarships and facilities within the new Myhal Centre for Engineering Innovation & Entrepreneurship.

Our Gratitude campaign offers graduating students — as well as faculty, staff, alumni and friends — an opportunity to give back to Skule™ and enhance the experience of students. In 2017–2018, Gratitude engaged one in four graduating students, including 100% of those graduating from the Lassonde Mineral Engineering program.

Figure 7.1a Philanthropic Support, 2017–2018



Data in this chapter is by fiscal year, May 1, 2017 to April 30, 2018. Gifts and other highlights are from July 2017 to June 2018.

Note 7.1a: Starting in 2017–2018, advancement offices across the University have adopted new practices for reporting on bequests. “Intentions” refers to new planned gifts that have been agreed to but not yet realized. “Realized planned gifts” includes all realized donations by bequest, excluding those previously reported as intentions.

Figure 7.1b Philanthropic Support, 2008–2009 to 2017–2018

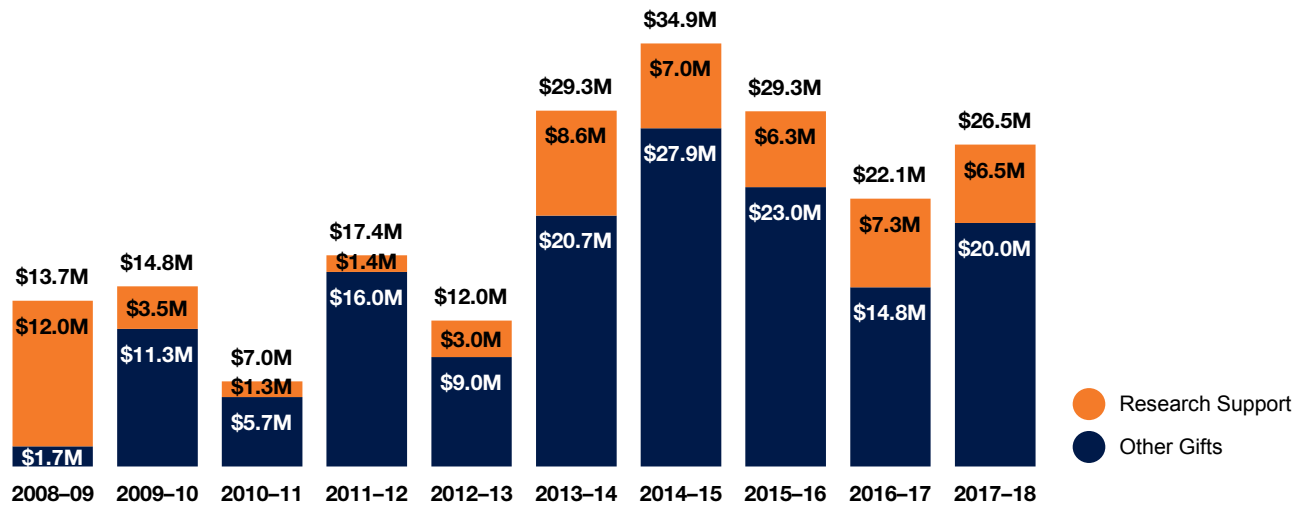


Figure 7.1c Gift Designation, 2017–2018

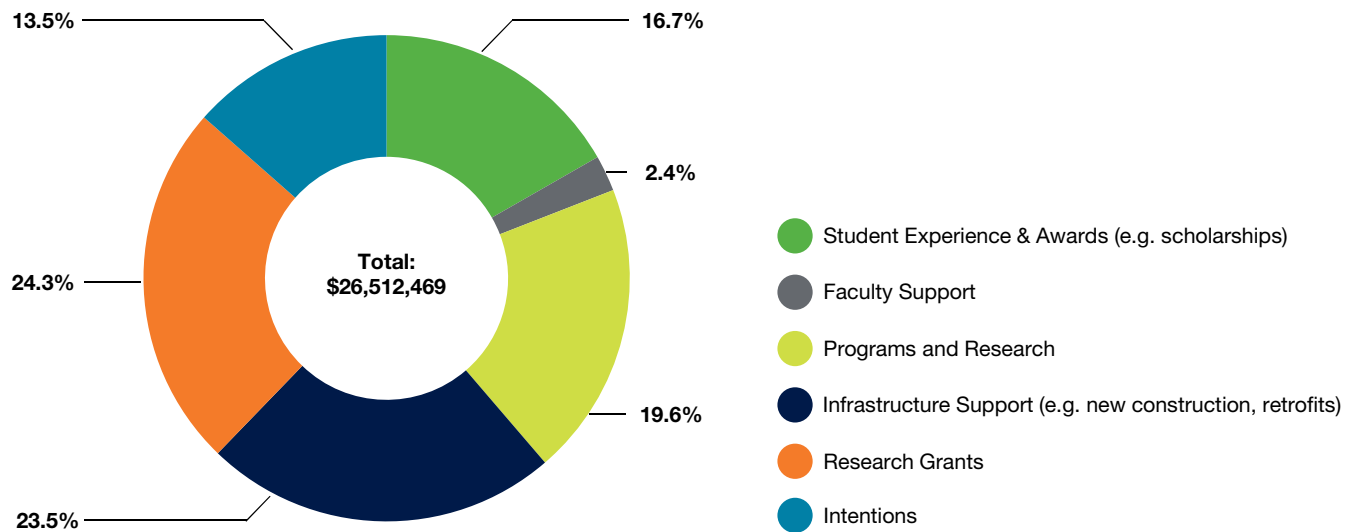
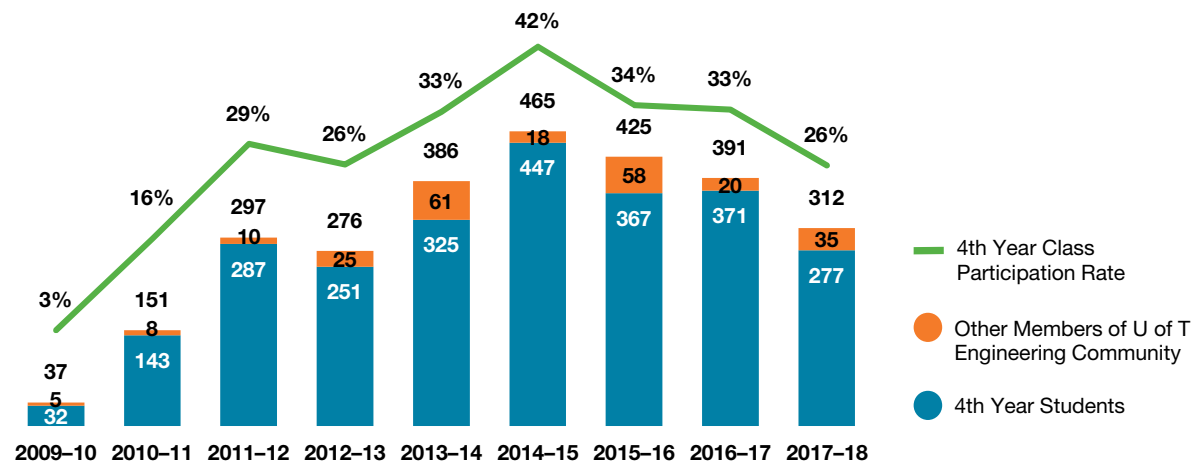


Figure 7.1d Gratitude Participation, 2009–2010 to 2017–2018



Gift Highlights

George and Rayla Myhal — Myhal Centre for Engineering Innovation & Entrepreneurship

George Myhal (IndE 7T8) and his wife, Rayla, bolstered their long-standing commitment to U of T Engineering with a generous gift to name the Myhal Centre for Engineering Innovation & Entrepreneurship. The Myhals are passionate volunteers and advocates for Engineering and the University of Toronto: George Myhal served for more than a decade on the University's Governing Council, and continues to advise the Faculty through the Dean's Strategic Council. George and Rayla have championed Dean Amon's vision for the new building from its inception. In June 2017, George Myhal was named a member of the Order of Canada for his achievements as an investment and finance leader, and for his philanthropic contributions, notably in support of innovation in engineering. In fall 2018, he will be recognized with an honorary degree from the University of Toronto. *(For more information, please see page 7.)*

Bill and Kathleen Troost — Troost Institute for Leadership Education in Engineering

The Troost Institute for Leadership Education in Engineering (Troost ILead) enables engineering students in all years and disciplines to maximize their leadership potential through workshops and experiential learning activities, many of which are integrated into the core curriculum. Troost ILead is one of the many multidisciplinary institutes and centres that now have a new home in the Myhal Centre. Bill Troost (ChemE 6T7) and his wife, Kathleen, are long-standing supporters of the Faculty and student leadership education, having made a foundational donation to the Department of Chemical Engineering & Applied Chemistry's Unit Ops Lab, created the J. Edgar McAllister Foundation-Troost Family Award for Engineering for undergraduate students and supported ILead since 2012.

Gerald and Geraldine Heffernan — Heffernan Hatchery Suite

Strengthening engineering entrepreneurship has been a major theme of Gerald Heffernan (MMS 4T3) and his wife Geraldine's support for our Faculty for more than 20 years. The Heffernan Commercialization Fellowships, which they established in 1995, focus on enabling graduate students to translate their leading-edge research into commercial opportunities. To date there have been more than 100 Heffernan Fellows and many successful startups, including Cast Connex Corp, an industry leader in the structural design and construction of buildings and bridges. Another startup success is SensOr Medical, which has developed a force-sensing film to enhance minimally invasive surgery.

Many times over the years, the Heffernans have expanded their support with additional gifts, including to the Gerald R. Heffernan Chair in Materials Processing. Their latest gift of \$3 million expands post-graduate fellowships and brings the Heffernans' giving to the Faculty to a remarkable \$9.6 million. Their generosity also provides space for The Entrepreneurship Hatchery within the Myhal Centre.

Ajax Alumni Attractor

Alumni of the Faculty's former Ajax campus contributed toward the Ajax Alumni Attractor, a space within the Myhal Centre that provides a home base for alumni visiting campus to deliver guest lectures, work with student teams or meet with faculty members to design new initiatives. Established to accommodate a surge in enrolment after the Second World War, U of T Engineering's Ajax campus was created by converting an abandoned munitions plant. Between 1946 and 1949, more than 5,500 students took courses at the Ajax campus, and the experience has knit these alumni into an extraordinarily dedicated group of Faculty supporters. Under the leadership of Don King (ChemE 5T0) the group has made many significant contributions to U of T Engineering.

Jean and Lauri Hiivala

Lauri (ElecE 6T5) and Jean Hiivala, annual supporters since 1981, made their largest gift to date in 2017–2018. Their generous gift supports students, capital projects and research in electrical and computer engineering. It establishes the creation of the Jean & Lauri Hiivala ECE Undergraduate Award to support talented students, the DC Microgrid Fund, which will be used to purchase a large advanced battery for ECE's Energy Systems Laboratory, and the Jean & Laurie Hiivala Research Fund for Heart Health to support research combining electrical engineering and health care — honouring Jean's career as a nurse.

Chris and Anne Twigge-Molecey

In honour of Chris Twigge-Molecey's (MIE MASc 6T9, PhD 7T2) 65th birthday, his wife, Anne, established a scholarship in his name to be awarded to talented mechanical engineering students with an interest in sustainable energy. They aim to inspire the next generation of engineers to advance renewable energy technologies and work toward more sustainable practices in industry, where Chris spent his long and successful career at Hatch Ltd. This year, the couple extended their gift, enabling the scholarship to be continued for another five years. To date, six students have received the Dr. Chris Twigge-Molecey Scholarship in Mechanical Engineering, and Anne and Chris have met each of them personally.

Initiatives and Projects

U of T Engineering CONNECT

Our Faculty's dedicated social media platform, U of T Engineering CONNECT, is a powerful tool for engaging with our global community of alumni. Following an initial pilot project in Engineering Science, CONNECT was rolled out across all departments on June 1, 2017. As of April 30, 2018, we had more than 7,000 active members, of whom approximately 66% are alumni, 30% students and 4% other designations (such as faculty, staff and emeritus professors).

By keeping the barriers to entry low — the platform is free and pulls data from LinkedIn, so creating a profile takes very little time — and by providing useful, relevant content, we have been able to grow our membership by approximately 40% over the past year. CONNECT users live in 66 different countries and include more than 1,300 (28%) who are alumni in industry leadership positions. More than 550 jobs have been posted on the platform since inception, and 74% of alumni have indicated they are willing to help current students or alumni launch their careers, either

through mentorship or by opening doors at their workplace. The platform also provides more accurate and up-to-date information about our alumni, including contact information and employment status, than our existing channels.

Annual Giving and Leadership Giving

Annual gifts of between \$1,000 and \$25,000 enhance our research and educational programs in many ways, providing support for improvements to laboratory facilities, scholarships, and extracurricular activities for students.

In 2017–2018, 318 Leadership Annual Giving donors made contributions amounting to \$721,619, which represents 78% of all annual giving to the Faculty.

In spring 2018, we launched the Faculty & Staff Giving Campaign, a month-long fundraising initiative. We achieved 108 donations, and 30% of donors chose to give regularly on a monthly basis.

Alumni Events and Engagement

Our many alumni events enhance engagement by creating an open atmosphere that enables both new and seasoned alumni to meet and exchange ideas, sparking new partnerships and initiatives. Reunions, receptions and learning events also showcase our Faculty's commitment to excellence and leadership in key areas, inspiring further support from attendees.

In 2017–2018, we engaged more than 3,500 alumni around the world through 163 events and activities, ranging from academic lectures to networking and professional development events. These included:

- **Official Opening, Myhal Centre for Engineering Innovation & Entrepreneurship:** On April 27, 2018, more than 300 donors, alumni, faculty, staff and students joined us to celebrate the official opening of the Myhal Centre with a ribbon cutting ceremony. The event was an opportunity to thank the Myhal family for their contribution to the campaign and their commitment to the Faculty.
- **BizSkule:** This popular lecture series continued in 2017–2018 with five events: one in Calgary, one in Silicon Valley and three in Toronto. Topics included cybersecurity, blockchain technology and the future of work. Total attendance for all five lectures was 306, with an additional 485 joining via live-streams and online viewing of the recorded events.
- **From Engineer to Aliebn: A Chat with Pop Culture Phenom Jonny Sun:** Jonathan Sun (EngSci 1T1 + PEY) is an interdisciplinary architect, visual artist, writer, performer and comedian. Following the launch of his latest book, *Everyone's a Aliebn When Ur a Aliebn Too*, Sun came to campus in September to give a reading and talk with 75 current students and alumni about how his engineering training influenced his career.
- **Alumni Reunion:** Our signature event, held May 30 – June 3, 2018, engaged more than 280 alumni from all disciplines who graduated in a year ending in 3 or 8. They attended stress-free degree lectures, department lunches, receptions and a celebration of the CONNECT platform's first anniversary, at which more than 110 new members joined.



8

Effectively communicating our Faculty's strengths and accomplishments enhances our ability to attract top students and faculty members from around the world, spark new collaborations and inspire our supporters to deepen their engagement.

Our award-winning Engineering Strategic Communications office collaborates closely with University of Toronto Communications and nearly 30 colleagues across the Faculty who constitute our Engineering Communications Network. We leverage a comprehensive suite of owned channels to effectively engage our audiences. Through strategic relationships with external media and targeted pitching, U of T Engineering earns a larger share of national engineering-related coverage than any other school in Canada.

Through targeted messages and customized tactics, we advance key strategic priorities for the Faculty. Major areas of focus for 2017–2018 included:

- **Water Research:** Our #EveryDropMatters campaign, carried out during the Canadian National Exhibition (CNE), invited thousands of people to discover how U of T Engineering researchers are addressing global water challenges.
- **Myhal Centre for Engineering Innovation & Entrepreneurship:** Through events, digital media and sponsored content, we raised awareness of the ways our newest building launched a new era in engineering education and research.
- **Diversity:** We published stories that underscored our Faculty's continuing commitment to increasing diversity in all its forms, including the record-setting numbers of women in our programs, active outreach to increase representation and inclusion of Black students, and the *Blueprint for Action* created by our Eagles' Longhouse to enhance the Faculty's relationship with Indigenous peoples.
- **Entrepreneurship:** We shared stories about U of T Engineering startups and spinoffs to inspire further support for entrepreneurship and commercialization.
- **Domestic PhD Recruitment:** A relaunched graduate studies website and targeted social media advertising campaign were among the tactics aimed at growing our domestic graduate student population.

U of T Engineering has a global reputation for excellence in research and education, a vibrant student body growing in its diversity, and a track record of success in bringing innovations to market through commercialization and entrepreneurship. Strategic communications initiatives bring this story to the world.

Selected Communication Projects

CNE #EveryDropMatters Activation

The University of Toronto's Faculty of Applied Science & Engineering unites a critical mass of leading researchers in a wide range of fields working to address global water challenges. To celebrate and elevate our profile of excellence in this area, the Faculty launched a targeted awareness campaign in summer 2017. Our central tactic was to engage directly with the general public through the Canadian National Exhibition (CNE) for two weekends (August 18-20 and 25-27) with an experiential, water-themed initiative titled #EveryDropMatters. We partnered with a local firm to create vending machines activated by social media posts. In exchange for following us and sharing our social content about our water research on Twitter or Facebook, visitors received a reusable U of T Engineering-branded flatpack water bottle from the vending machine, which they could fill at U of T Engineering-branded refill stations across the CNE grounds. The booth was staffed by engineering students and staff who shared information about our water research with visitors and distributed "Future Engineer" waterless temporary tattoos to children. Over the two weekends of the event, we vended more than 4,400 bottles, distributed 2,500 temporary tattoos, and generated 256,000 impressions across our Facebook and Twitter feeds. The number of new followers gained over the two weeks was four times the average monthly gain for Twitter and 20 times the average monthly gain for Facebook. This campaign earned an award of excellence from the Toronto Chapter of the International Association of Business Communicators (IABC) and a bronze award from the Council for Advancement and Support of Education, District II.

Thought Leadership through Opinion Pieces

We work closely with faculty members and key staff to create and pitch opinion pieces to major publications in alignment with our strategic priorities. Our goal is to strengthen our voice within national and international conversations on issues such as innovation policy, engineering education and entrepreneurship. We collaborate with external groups such as *The Conversation*, a non-profit organization that aims to leverage the expertise of researchers and academics to provide the public with insight into society's greatest challenges. Pieces published in the past year include:

- "How green roofs can help cities sponge away excess stormwater" by Professor Jennifer Drake (CivMin) (*National Post*, August 22, 2017, via *The Conversation*)
- "Canada helps train the world's tech talent – now it has to keep it here" by Illan Kramer (ECE PhD 1T3), Director,

International Research Partnerships (*The Globe and Mail*, October 31, 2017)

- "How engineers are engineering change on the gender gap" by Professor Deepa Kundur (ECE) (*Maclean's*, December 7, 2017)
- "It's time to bring entrepreneurs out of the garage" by Joseph Orozco, Executive Director of The Entrepreneurship Hatchery (*The Globe and Mail*, December 26, 2017)
- "Flying blind: The future of work in Canada depends on better research" by Professor Greg Evans (ChemE) (*The Globe and Mail*, April 5, 2018)

She Inspires Us – Social Media Campaign

In July 2017, the federal government announced that U of T Engineering alumna and astronaut Julie Payette (ECE MASc 9T0) would be the next Governor General of Canada. We leveraged this significant announcement to produce a social media campaign that celebrated Payette's achievements while drawing focus to the leadership role U of T Engineering plays in fostering diversity within engineering. The primary target audience was prospective undergraduate students (high school and elementary school students) and their influencers – parents, teachers and family. We rapidly produced a video featuring several girls in our pre-university outreach programs sharing their aspirations and congratulating Payette. The video was embedded in stories on our U of T Engineering news website and shared on social media channels using the hashtag #aweSTEM to access the STEM-outreach community. We further amplified the message in October 2017, when Payette officially took office. Our initial goals were to generate 2,000 views on Facebook and 200 more across the secondary channels of Instagram, Twitter and YouTube. The video ultimately reached 4,335 views on Facebook and 508 across the other channels, more than double the targets. This project earned an award of merit from the Toronto Chapter of the IABC.

Faculty & Staff Hub (Intranet)

In September 2017, we launched the Faculty & Staff Hub (www.hub.engineering.utoronto.ca), an intranet dedicated to helping faculty and staff find administrative information and resources, learn about events and connect with our community through an online bulletin board. The Hub includes material on branding; employee benefits; mental health and wellness; research services, grants and opportunities; teaching resources; and IT services. Baseline analytics will be generated in September 2018.

Unless otherwise noted, the reporting period for this chapter is May 1, 2017 to April 30, 2018.

Note: Impressions are the estimated number of people who may have interacted with a story, based on circulation (newspapers/magazines), viewers (TV), listeners (radio) and unique monthly visitors (online).

New and Relunched Websites

In 2017–2018 we created two microsites specific to communications campaigns:

- The Water Campaign microsite (www.water.engineering.utoronto.ca) highlights our Faculty's water-related research projects and expertise. Featuring photos, videos and an interactive quiz, this website was a central pillar of our #EveryDropMatters campaign.
- The Myhal Centre microsite (www.uoft.me/myhalcentre) features visuals and information on all aspects of the new building, including the multidisciplinary institutes, centres and experiential learning facilities housed on each floor, renderings and links to news stories. This site received more than 20,000 page views during the reporting period.

In addition to campaign-specific microsites, we launched a major overhaul of the Engineering Graduate Studies website (www.gradstudies.engineering.utoronto.ca), which included reorganizing the information architecture, updating the design and refreshing the content with new photos and text.

We also streamlined many of the back-end web processes across U of T Engineering's multisite network, which now includes 17 individual websites. We implemented improvements such as code deployment and site monitoring; improved site infrastructure; and added new features and accessibility upgrades.

Myhal Centre for Engineering Innovation & Entrepreneurship – Official Opening

The official opening of our Faculty's newest building took place on April 27, 2018. Ahead of the event, we leveraged a wide range of tactics to demonstrate to our key audiences — including donors and alumni, key influencers in industry, government, current and prospective students, and the media — the scale and scope of the changes in engineering education and research that the new building will bring about. These tactics included:

- **Website, media kit and key messages:** We created a visually appealing, dynamic website (www.uoft.me/myhalcentre) with comprehensive information on every aspect of the building and renderings depicting each space. This was embedded into all relevant web news stories and social media posts. It was also distilled into a briefing note to prepare key faculty and staff to speak knowledgeably about the building, and into one-page print materials that were distributed at events with media presence.
- **Advertorial:** We participated in a special section in *The Globe and Mail* on the theme of a 'Sustainable Future.' This sponsored content featured several of the Myhal Centre's research institutes, and a sidebar on the building's sustainable features. The piece ran on October 11, 2017 and reached approximately 330,000 through daily circulation.
- **Cake Day:** In celebration of National Cake Day on November 22, 2017, we served a giant cake in the shape of the Myhal Centre to approximately 300 students, staff and faculty and shared photos and video on social media, generating 82,000 impressions. This event helped to build anticipation for the official opening.
- **Time Capsule:** We created a time capsule to be sealed inside the building and opened in the year 2073 to mark the Faculty's 200th anniversary. The contents were selected to represent many aspects of our community, and included an Iron Ring, a Métis Fire Bag (contributed by the Eagles' Longhouse, our Indigenous Initiatives Steering Committee), a Skule™ leather jacket, a postcard from Governor General Julie Payette (ECE MASc 9T0), a Telehex tool invented by alumnus Peter Wen (MechE 1T8), a tissue patch from the lab of Professor Milica Radisic (IBBME, ChemE) and a recent issue of *The Cannon* newspaper, among many other items. (For more on the time capsule, see page 12.)
- **Official Opening:** More than 300 people attended the official opening of the Myhal Centre, including industry partners, donors, university leadership, faculty, students and staff. The speeches and ribbon-cutting were webcast live via our social media feeds to engage those who could not attend in person. A two-minute video showcasing the Faculty's excellence in research and education was shown at the event and shared on social media.

Media Coverage

By leveraging online communications channels, strategic pitching and building strong relationships with journalists, we generate research and education news coverage in major publications around the world. Our goal is to reinforce and elevate the profile of U of T Engineering in strategic priority areas: Bioengineering & Health, Sustainability, Information & Communications Technology, Entrepreneurship & Commercialization, and Engineering Education. Across these strategic themes, we pitch stories that showcase the rich diversity of our community and the innovative ways we actively promote a culture of inclusivity through community engagement and outreach.

We use professional media monitoring services to measure the impact and tone of the media coverage we receive, and to inform our future strategies to enhance our earned media performance. On July 1, 2017, we contracted Cormex Research to replace our previous vendor, Agility PR. Cormex was selected in a University-wide RFP process, and brings a unique approach to media monitoring including a greater focus on contextualizing results.

Between May 1, 2017 and April 30, 2018, we earned 2,484 external media stories, generating a total of more than 771 million impressions — an indicator of impact measured by the number of people who may have interacted with a story. This represents a 15.4% increase over the previous year. More than half (58.0%) of impressions were earned outside of Canada. The coverage was distributed across digital, broadcast and print media, including mainstream, specialty and industry-targeted outlets.

Selected earned media highlights included:

Bioengineering & Health

- Molly Shoichet receives Killam Prize in Engineering (*CBC.ca, CTVNews.ca, The Globe and Mail, Toronto Star*)
- U of T Engineering researchers search for toxins in the aftermath of Fort McMurray wildfire (*Toronto Star, CBC.ca*)
- U of T Engineering researchers uncover mechanism of scar-free wound healing in fruit fly embryos (*CBC.ca, Phys.org*)
- Lab-on-a-chip delivers critical immunity data for vulnerable populations (*Scientific American, U.S. News & World Report, Business Insider, National Post, CTVNews.ca, City News*)
- U of T Engineering researchers develop handheld 3D skin printer (*Hindustan Times, Sky News (UK), Tech Times, Daily Mail (UK), GlobalNews.ca, Biotechnology Focus*)

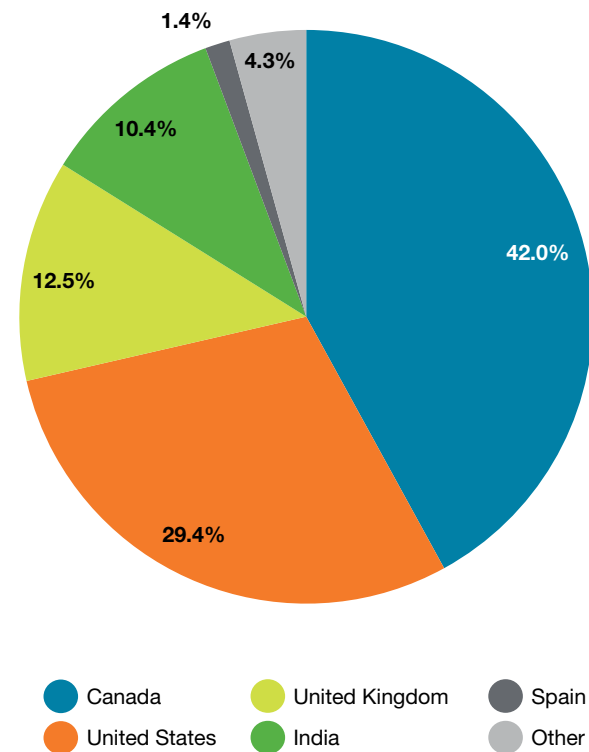
Sustainability

- Better transportation planning? There's an app for that — and it needs your help (*CTVNews.ca, GlobalNews.ca, National Post, Penticton Herald*)
- CERT team advances to finals of Carbon XPRIZE (*Thomson Reuters, Finanz Nachrichten, Plant (Advanced Canadian Manufacturing), Halifax Chronicle-Herald*)
- U of T Engineering researchers propose how we could use climate-warming CO₂ for good (*Space Daily*)

Information & Communications Technology

- Engineering the perfect NHL team: U of T Engineering researchers create draft optimizer for new Las Vegas expansion (*Boston Globe, CBC.ca, NBC.com, Toronto Star*)
- Wheelchairs get robotic retrofit to become self-driving (*Reuters, Washington Post, CBC.ca, Toronto Star, WiReD*)
- How self-driving cars could shrink parking lots (*Global News, Forbes*)

Figure 8.1a Proportion of U of T Engineering Media Stories by Outlet Location, 2017–2018



Note 8.1a: The impressions for one story may be included in the counts of multiple countries.

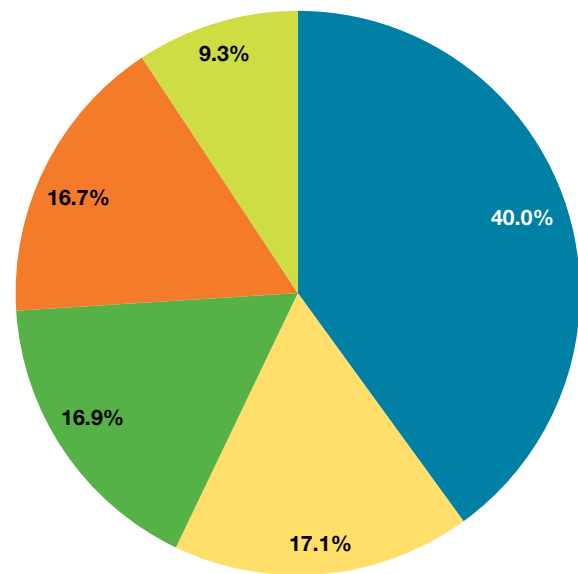
Entrepreneurship & Commercialization

- U of T Engineering spin-off ModiFace acquired by French cosmetics giant L'Oreal (*The Globe and Mail, Toronto Star, CTVNews.ca, Canadian Business, News 1130*)
- U of T Engineering spinoff Deep Genomics raises US\$13 million to fund expansion (*The Globe and Mail, BetaKit*)
- U of T Engineering spinoff LegUp Computing secures seed funding from Intel Capital (*StartUp Here Toronto, IT News Online*)

Engineering Education

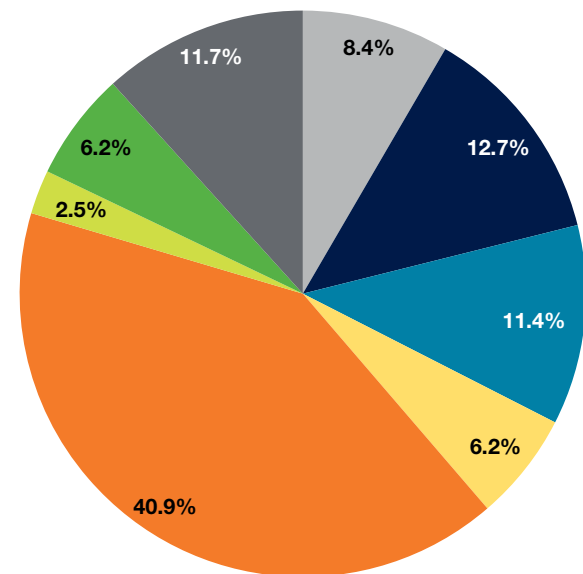
- Go North inspires more than 1,200 future innovators (*Financial Post*)
- Sandro Young named U of T's top student (*CBC.ca, Business News Network*)
- First-year students bring engineering solutions to Toronto communities (*Toronto Star*)
- The Top Science & Technology Colleges (*Popular Mechanics*)
- aUToronto team wins first AutoDrive Challenge (*CBC.ca, Vice Motherboard, Invest in Ontario*)

Figure 8.1b Proportion of U of T Engineering Impressions by Strategic Priority Area, 2017–2018



- Engineering Education
- Information & Communications Technology (ICT)
- Entrepreneurship & Commercialization
- Sustainability
- Bioengineering & Health

Figure 8.1c Proportion of U of T Engineering Impressions by Academic Area, 2017–2018



- UTIAS
- IBBME
- ChemE
- CivMin
- ECE
- EngSci
- MIE
- MSE

Note 8.1b: One media story can reference multiple strategic priority areas. In those cases, the impressions are included in the counts for both areas.
Note 8.1c: One media story can reference multiple academic areas. In those cases, the impressions are included in the counts for both areas.

Social Media

U of T Engineering integrates current best practices in social media into its storytelling approaches and daily processes. We leverage social media to augment and amplify our messages to target audiences, including peer institutions, prospective and current students, alumni, policymakers and select influencers, as well as staff and faculty. Social media evolves swiftly, and we leverage key metrics to continuously inform our strategy and effectiveness at reaching these audiences. A well-crafted social media post has the potential to reach just as many – or more – viewers as any story in traditional media.

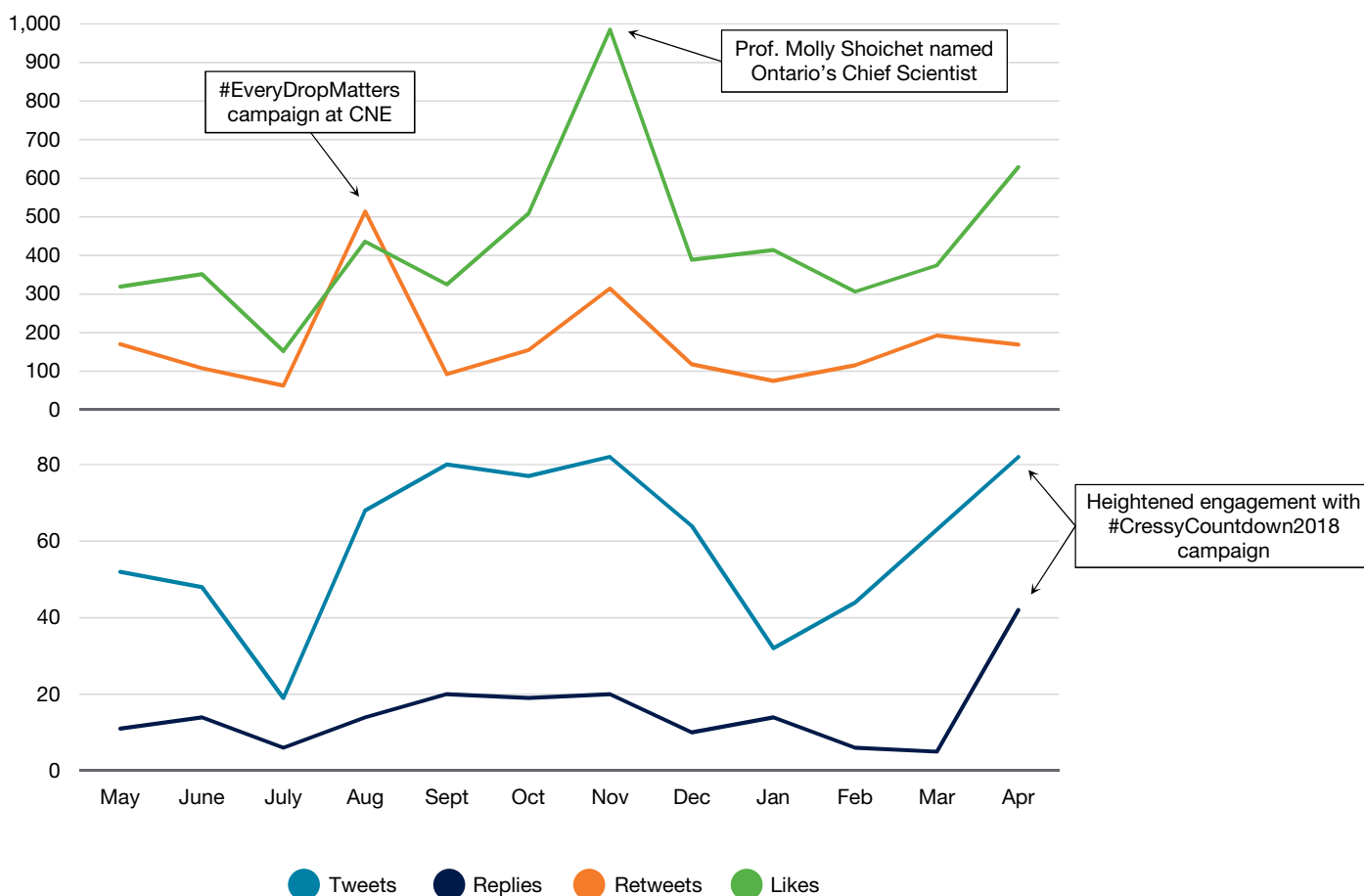
Our Faculty maintains dedicated channels on three social media platforms: Facebook (www.facebook.com/uoftengineering), Twitter (www.twitter.com/uoftengineering) and Instagram (www.instagram.com/uoftengineering). These are supplemented and reinforced by more than 25 related feeds maintained by our departments, divisions, research centres and institutes, and at the University level. We also

use a fourth, proprietary platform – U of T Engineering CONNECT (www.uoftengineeringconnect.ca) – to build strong connections between current students and our vibrant, global network of alumni (*for more on CONNECT, see Chapter 7 – Advancement*). The following sections outline activity on the three main channels in the period from May 1, 2017 to April 30, 2018 as reported by our monitoring service, Sprout Social.

Twitter

We gained 1,168 new followers on Twitter in the reporting period, bringing our total to 9,717. Our target audiences on Twitter include academics, government officials and agencies, professional associations and peer institutions. Some of our most influential followers include Kirsty Duncan (MP, Minister of Science), Chrystia Freeland (MP, Minister of Foreign Affairs) and NSERC, all of whom have engaged with or shared our content over the past year.

Figure 8.2a Audience Engagement on Twitter from May 1, 2017 to April 30, 2018



In 2017–2018, we shared 711 tweets, achieving a total engagement — including likes, retweets, clicks on U of T Engineering content and viewing of embedded videos — of approximately 41,200. Total impressions (the number of views on posts from the U of T Engineering Twitter channel) reached 1.5 million over the reporting period. Twitter referred 3,979 users to the Faculty’s news site in 2017–2018.

Figure 8.2a represents engagement over the reporting period. The August spike in retweets was due to elevated engagement during the #EveryDropMatters campaign, while the large number of likes and retweets in November represents engagement with the news of Professor Molly Shoichet (ChemE, IBBME) being named Ontario’s new Chief Scientist. The rise in tweets and replies from March into April reflects engagement with our #CressyCountdown2018 campaign, which highlighted the Gordon Cressy Student Leadership Awards.

Facebook

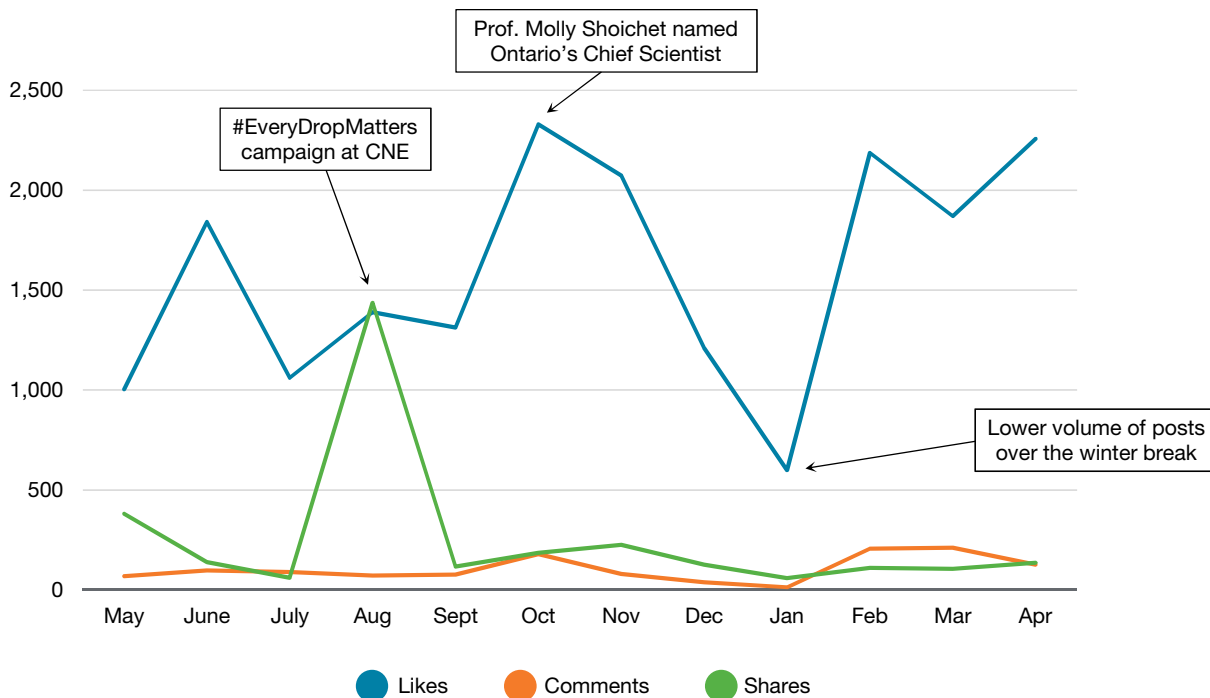
As of April 30, 2018, we had 7,317 followers on Facebook, a gain of 2,648 (57.6%) over the reporting period. Of these,

1,207 (45.6%) joined during the #EveryDropMatters campaign. Our audience on Facebook represents primarily students and alumni.

We shared 382 posts on Facebook in 2017–2018. Total engagement with these posts — including shares, comments and reactions — reached approximately 23,500, a 48.5% increase over the previous reporting period. Total impressions reached 2.3 million, the highest for any of our social media channels, and the daily average was more than 3,300. Our top-performing post was a 30-second video of Professor Scott Ramsay (MSE) performing a “bed of nails” demonstration for a group of students. It garnered 995 reactions, 143 comments and reached 58,500 Facebook users. Facebook referred 15,716 users to our Faculty’s news site in 2017–2018.

Figure 8.2b represents engagement over the reporting period. The large spike in shares in August is due to the #EveryDropMatters campaign. Reactions reached a peak in October due to the news of Professor Molly Shoichet (ChemE, IBBME) being named Ontario’s new Chief Scientist, and a low in December/January due to a lower volume of posts over the winter break.

Figure 8.2b Audience Engagement on Facebook from May 1, 2017 to April 30, 2018



Instagram

Our audience on Instagram is primarily current students, and our best-performing posts depict the student experience. As of April 30, 2018, we had 4,129 followers on Instagram, of whom 1,810 joined during the reporting period, representing a 78.1% increase since May 1, 2017. Our long-term goal is to increase our follower count to 10,000, which will enable us to unlock the Instagram Stories ‘swipe up’ feature for even more engaging multi-platform storytelling.

We shared 103 posts on Instagram during the reporting period. The total engagement — including likes and comments — was approximately 24,600, a 25.6% increase on the previous year. Total impressions reached approximately 380,500.

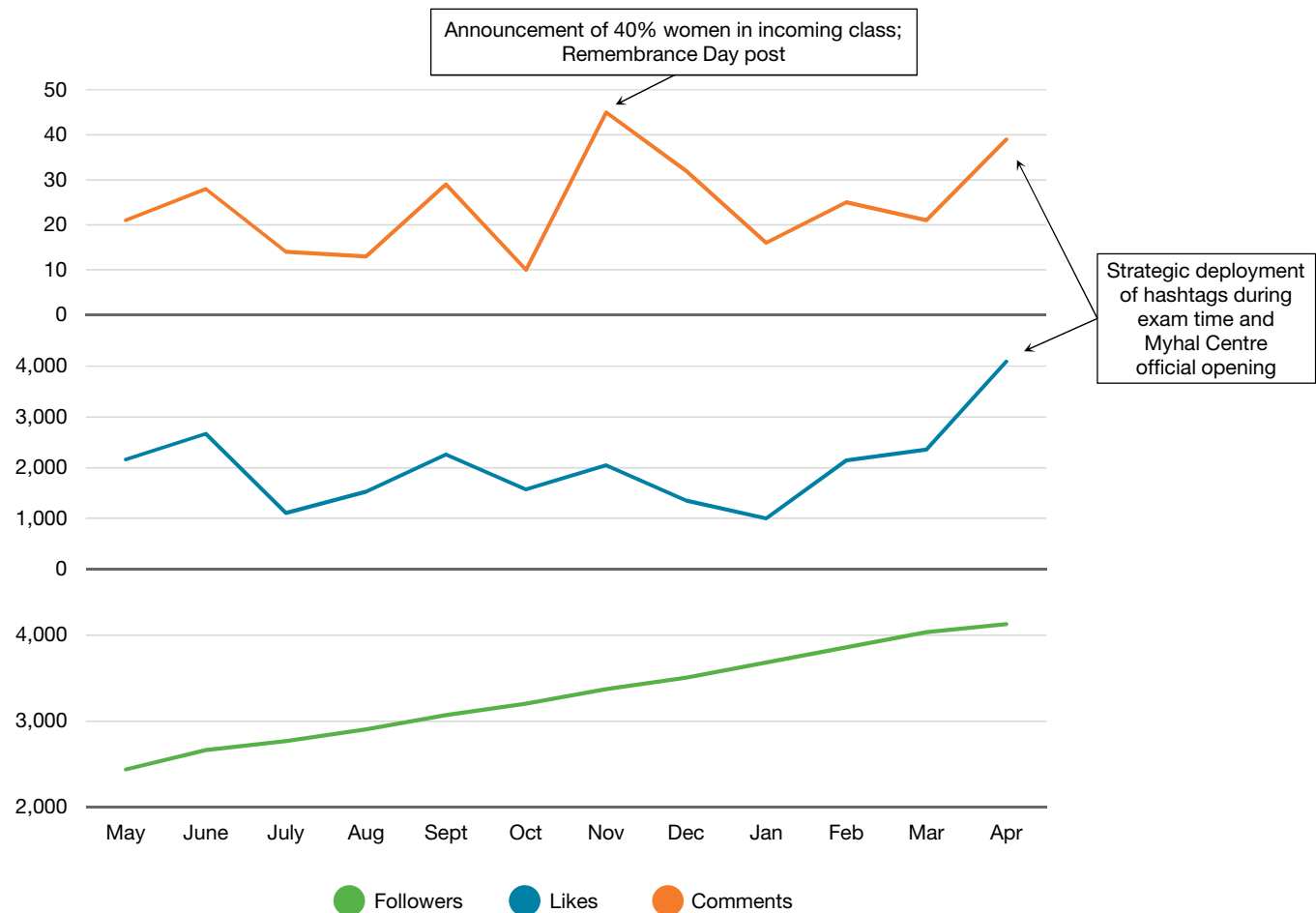
Engagement and audience growth on Instagram have been relatively consistent throughout the year. On November 7, 2017, we posted a photo announcing that our incoming first-year class had once again reached more than 40%

women; this post, in combination with one commemorating Remembrance Day, drew many positive comments, as seen in Figure 8.2c. In March and April of 2018, we created a surge in engagement through strategic deployment of hashtags as well as a number of strong posts, including images of students preparing for exams and of the official opening of the Myhal Centre.

U of T Engineering CONNECT

This proprietary social media platform is designed to facilitate meaningful connections between alumni and current students, encouraging networking, mentorship and engagement with various professional development events. As of April 30, 2018, we had more than 7,000 active members, of whom approximately 66% are alumni, 30% students and 4% other designations such as faculty, staff and professor emeriti. (For more on U of T Engineering CONNECT, see Chapter 7: Advancement.)

Figure 8.2c Audience Engagement on Instagram from May 1, 2017 to April 30, 2018



Engineering News at U of T

The U of T Engineering News website (www.news.engineering.utoronto.ca) is a critical component of our communications efforts. Updated daily, it is the first place that most new content is published, and the primary source of material for social media, U of T Engineering CONNECT, print publications and reports. It is both a snapshot of what is happening in our Faculty at any given moment, and a robust archive of our accomplishments over the past several years.

We use Google Analytics to monitor traffic and other data on our websites. From May 1, 2017 to April 30, 2018, our U of T Engineering News website received 231,984 pageviews (average 9,332 per month) representing a 10.7% increase over the previous year.

Figure 8.3 Summary of Analytics for U of T Engineering Faculty site and U of T Engineering News site, 2017–2018

	Faculty site (engineering.utoronto.ca)	U of T Engineering News site (news.engineering.utoronto.ca)
Pageviews	328,808	231,984
Unique visitors	129,716	124,995
Average number of pageviews per session	1.53	1.40
Average amount of time spent on site	2:01 min	0:51 min
Cities of origin	5,295	6,129
Countries of origin	197	193

Figure 8.4 Social Media Referrals for U of T Engineering News, 2017–2018

Social Media Platform	Unique Users	Sessions
Facebook	15,716	21,928
Twitter	3,979	6,159
Instagram	97	97

Note 8.4: A session is the period of time a user was actively engaged with our website. All usage data (pageviews, events, etc.) are associated with a session.

In addition to the traffic from our own site, many of our stories are cross-posted to the central U of T News website (www.news.utoronto.ca). The best-performing stories from the past year across both of these sites are illustrated in Figure 8.5.

Figure 8.5 Top Stories on the Engineering News and U of T News Websites, 2017–2018

Page Title	Date Posted	Pageviews (U of T Engineering News)	Pageviews (U of T News)	Total
Sandro Young named U of T's top student	Jun. 13, 2017	2,611	7,448	10,059
Out of this world: Student's SpaceX internship involved working on Falcon Heavy's engines	Feb. 20, 2018	5,817	1,075	6,892
Julie Payette, astronaut and U of T Engineering alumna, named next Governor General	Jul. 13, 2017	2,558	3,985	6,543
U of T Engineering spin-off ModiFace acquired by French cosmetics giant L'Oreal	Mar. 16, 2018	295	5,497	5,792
Grads to Watch: Meet 14 global engineering leaders	May 24, 2017	4,703		4,703
One small step for man, one giant leap for these U of T Engineering students	May 25, 2017	623	3,648	4,271
Molly Shoichet named Ontario's first Chief Scientist	Nov. 17, 2017	817	2,365	3,182
U of T Engineering Holiday Gift Guide 2017	Nov. 28, 2017	1,967	871	2,838
Engineering the perfect NHL team: U of T Engineering researchers create draft optimizer for new Las Vegas expansion	Jun. 12, 2017	644	2,162	2,806
Four startups to watch from U of T Engineering's Hatchery Demo Day	Sep. 13, 2017	1,646	1,054	2,700
Remembering victims of the Montreal Massacre: Commemorating the National Day of Remembrance and Action on Violence Against Women	Dec. 5, 2017	1,099	1,598	2,697
Polaris: Blue Sky Solar Racing team unveils its newest vehicle	Aug. 14, 2017	420	2,023	2,443
U of T attracts Fujitsu Laboratories R&D centre to Toronto	Sep. 20, 2017	315	2,117	2,432
Injectable tissue patch could help repair damaged organs	Aug. 14, 2017	1,537	792	2,329
No typical engineers: Q&A with Miss Universe Canada Lauren Howe	Oct. 31, 2017	2,260		2,260
U of T Engineering professors appear in Downsizing film	Dec. 12, 2017	2,254		2,254
CERT team advances to finals of Carbon XPRIZE	Apr. 9, 2018	1,232	1,018	2,250
U of T Engineering student's work featured in Oscar-winning film	Mar. 7, 2018	2,237		2,237
U of T Engineering opens the Myhal Centre for Engineering Innovation & Entrepreneurship	Apr. 27, 2018	1,615	490	2,105
Deep Genomics applies machine learning to develop new genetic medicines	May 3, 2017	692	1,368	2,060
Hatchery startup builds exoskeletons to help children with disabilities walk	Jun. 19, 2017	385	1,610	1,995
Tour the stunning student spaces in the Myhal Centre: Floors 1 to 4	Jan. 31, 2018	1,935		1,935
Artificial photosynthesis gets big boost from new catalyst	Nov. 20, 2017	1,251	594	1,845
Green infrastructure: New tool to help construction industry reduce carbon footprint	Dec. 8, 2017	968	706	1,674
Engineering student and alumnus named to list of future aerospace leaders	Jan. 9, 2018	1,671		1,671
Mysteries of the heart: U of T Engineering professor developing solutions for coronary artery disease with mathematical models	Feb. 8, 2018	259	1,390	1,649
Wheelchairs get robotic retrofit to become self-driving	Jul. 13, 2017	716	898	1,614
Professor Angela Schoellig named to MIT Technology Review's Innovators Under 35	Aug. 26, 2017	836	731	1,567
Myhal family champions next-generation engineering innovation and entrepreneurship	Apr. 5, 2018	1,524		1,524

Note 8.5: Data shown is as of May 1, 2018.

Recruitment and Admissions Websites

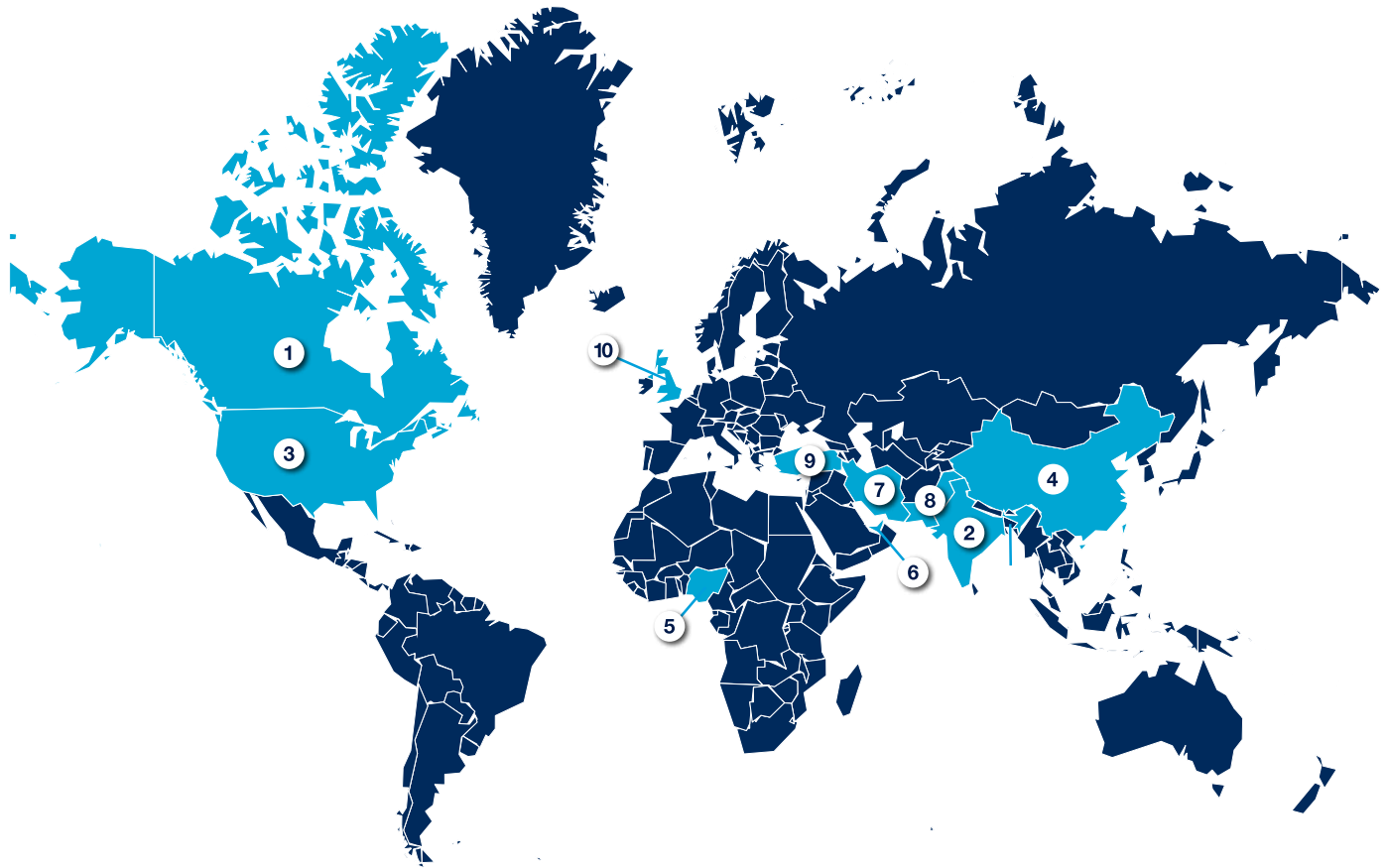
Our Discover Engineering website (www.discover.engineering.utoronto.ca) is the first destination for prospective students and their families seeking information about U of T Engineering programs, student culture and offerings. It is our first impression to this critical audience. This year, unique visitors to the site increased from 217,061 to 263,717, a jump of 21.5% over the same period in 2016–2017. Pageviews climbed 9.7%, from 886,128 to 971,812. The proportion of users visiting the site from mobile devices almost doubled over the previous year. Visitors to the site came from 213 countries, illustrating the strong international draw of our programs.

Once students receive an offer of admission, they are provided exclusive access to our You Belong Here microsite (www.uoft.me/YouBelongHere). This dynamic site presents positive and congratulatory imagery and key messaging, as well as information on next steps for students to accept their offers. The You Belong Here site is not indexed by Google, and is therefore exclusively viewed by admitted students, providing valuable insight into students' actions and decision-making processes post-offer. In the 2017–2018 reporting period, this site received 29,608 pageviews, an 11.6% increase from the previous year. Women represent more than 40% of visitors to the site.

Figure 8.6 Summary of Analytics for Discover Engineering and You Belong Here, 2017–2018

	Discover Engineering (discover.engineering.utoronto.ca)	You Belong Here (uoft.me/YouBelongHere)
Pageviews	971,812	29,608
Unique visitors	263,717	5,415
Average number of pageviews per session	2.44	2.81
Average amount of time spent on site	2:01 min	2:43 min
Cities of origin	77,874	983
Countries of origin	213	119

Figure 8.7 Top 10 Countries of Origin for Visitors to Discover Engineering, 2017–2018



Country	Visits
1. Canada	134,382 (50.3%)
2. India	25,044 (9.4%)
3. United States	21,698 (8.1%)
4. China	8,745 (3.3%)
5. Nigeria	6,819 (2.6%)
6. United Arab Emirates	4,470 (1.7%)
7. Iran	4,151 (1.6%)
8. Pakistan	3,895 (1.5%)
9. Turkey	3,200 (1.2%)
10. United Kingdom	3,035 (1.1%)

9

The ability to work seamlessly across cultures and borders is an essential competency of the 21st century engineer. At U of T Engineering, our outlook and impact are global.

We attract a diverse range of students from Canada and around the world and provide boundless opportunities for them to study, work or pursue research both within and outside of Canada. These include exchanges arranged either through the Centre for International Experience or through our many reciprocal agreements with partner institutions around the globe. Each year, our students work in full-time positions with leading companies worldwide through the Professional Experience Year Co-op Program. We also provide cross-cultural educational opportunities, such as MIE's international capstone course, which enables our students to collaborate closely with teams from peer institutions in China on projects brought forward by external sponsors.

Our Centre for Global Engineering (CGEN) inspires students to think critically about the global context in which new technologies must be deployed. Through undergraduate and graduate courses, cross-disciplinary certificates, research fellowships and embedded projects, CGEN emphasizes the need to develop engineering approaches to meet the needs of local communities. With a new home in the Myhal Centre for Engineering Innovation & Entrepreneurship, CGEN will continue to catalyze research and educational initiatives that provide global perspectives for students across all of our programs.

Through these initiatives and many others, we prepare our graduates to lead in the international marketplace and to ensure that the new products, industries and businesses make positive and lasting contributions in Canada, and around the world.

International Students and Exchanges

In addition to our outstanding international reputation for excellence in research and education, our strategic initiatives attract top students from around the world to U of T Engineering. These include scholarships and structured degree partnerships with specific institutions, countries or regions. In 2017–2018, our international applications for undergraduate studies rose 16.5% over the previous year. International applications for our MAsC programs increased by 24.8%, and those for PhD programs increased by 34.3%. Currently, 28.6% of our undergraduate students and 32.4% of our graduate students come from outside of Canada.

Some of our strategic international initiatives include:

- **International Foundations Program (IFP):** IFP enables academically strong students who do not meet the University's minimum English proficiency requirements to receive conditional offers of admission as non-degree students. After completing an intensive, eight-month English language program as well as our Engineering Strategies & Practice course, these students continue into a Core 8 engineering program. Sixteen students joined our Faculty through this program in 2017–2018.
- **MasterCard Foundation Scholars Program:** Funded by the MasterCard Foundation, this program provides talented students from economically disadvantaged communities, primarily in Sub-Saharan Africa, with access to quality and relevant education. Five MasterCard Foundation Scholars joined the entering class at U of T Engineering in 2017–2018, bringing the total number of recipients in our Faculty to 28 since 2013.
- **U of T Engineering International Scholar Award:** Established in 2014, this award provides full support over four years for academically accomplished international undergraduate students with demonstrated leadership. In the fall of 2017, the three newest recipients of this award joined the Faculty from schools in India, Trinidad and Tobago

and the United States. They joined five other recipients, representing Jordan, New Zealand, Singapore and Turkey. Following the establishment of the Lester B. Pearson International Scholarships, this award has been redesigned to support a larger number of international students from underrepresented regions in Latin America and Sub-Saharan Africa, with the initial targeted cohort set at 17 students for fall 2018.

- **Lester B. Pearson International Scholarship:** Established in 2017, this university-wide, four-year undergraduate scholarship recognizes exceptional academic achievement, creativity, leadership potential and community involvement. Four students in our Faculty received this award in its initial cohort, representing Bangladesh, India, Malaysia and Trinidad and Tobago.

U of T Engineering also offers numerous opportunities for our students to gain international experience, through such initiatives as:

- **Professional Experience Year Co-op Program (PEY Co-op):** PEY Co-op students work for 12 to 16 months in companies across Canada and the world after second or third year. In 2017–2018, our students undertook 66 international placements — 48 in the United States and 18 in other countries, including Belgium, Botswana, China, Japan, Switzerland and the United Kingdom. (*For more information on PEY Co-op, see Chapter 4: Cross-Faculty Education & Experiential Learning.*)
- **Summer Research Abroad, Structured Exchange Pathways and other exchange programs:** These programs are administered by U of T's Centre for International Experience or coordinated by the Faculty, and enable students to conduct research internships or pursue academic courses at partner institutions abroad. In 2017–2018, 74 students participated in these exchange programs.

Data and highlights in this chapter are presented by academic year (September to August).

International Agreements

Strategic partnerships with our peer institutions around the world enable us to create pathways for students to gain international experience and enhance their global fluency. These include course-based and research exchanges, as well as cross-cultural engineering design courses, dual-degree programs and opportunities for international students to streamline their applications to our graduate programs, such as the MEng.

As of June 2018, our Faculty had more than 25 active international agreements, with access to other top institutions through University-wide partnerships.

In 2017–2018, we entered into new agreements to create International Doctoral Clusters (IDCs) with two institutions:

- National University of Singapore — IDC on cybersecurity
- Hong Kong University of Science & Technology — IDC on semiconductor devices and integrated circuits

We also signed reciprocal agreements on both undergraduate and graduate research exchanges with the following institutions:

- Institut supérieur de l'aéronautique et de l'espace (ISAE-SUPAERO, France) — includes four exchange spaces, signed April 2018
- Technical University of Denmark — includes five exchange spaces, signed February 2018

Global Engineering

Our Centre for Global Engineering (CGEN), established in 2009, encourages students to engage with global challenges in sanitation, alternative energy, health costs and clean water — especially in developing countries where solutions can have the greatest impact. CGEN provides courses at the undergraduate and graduate levels, facilitates international engineering projects and offers fellowships for research with global impact.

One of CGEN's flagship courses is *JCR1000Y: An Interdisciplinary Approach to Addressing Global Challenges*, which is open to students from U of T Engineering, the Munk School of Global Affairs, the Rotman School of Management and the Dalla Lana School of Public Health. This year, a team of students in the course travelled to India to meet with stakeholders and organizations related to a project on food security through a partnership with the Public Health Foundation of India.

With the support of the Dean's Strategic Fund (DSF), CGEN is expanding international partnerships into courses across all years and disciplines. Examples include:

- Ongoing work in the course *MIE 490: Capstone Design* to implement locally appropriate technologies, including a windmill and a passive water regulator, to improve crop irrigation in Pedro Arauz, Nicaragua. Partner organizations include Winds of Change and Seeds of Learning.
- Two further projects in *MIE 490: Capstone Design* based in Kenya, including developing a power system for a small, mobile classroom. World Vision is a partner on both projects.
- Potential future collaborations with Asheshi University in Ghana, ACF Canada in Guatemala and Global Medic in the Philippines.

CGEN is one of several institutes that have new homes in the Myhal Centre for Engineering Innovation & Entrepreneurship.

Selected International Education and Research Partnerships

U of T Engineering spinoff ModiFace acquired by French cosmetics giant L'Oréal

U of T Engineering spinoff company ModiFace has been acquired by the world's biggest cosmetics company — a move that could result in Toronto becoming a hub for “beauty tech” research. ModiFace uses augmented reality (AR) and artificial intelligence (AI) to build advanced facial visualization software for the beauty and medical industries. Professor Parham Aarabi (ECE) founded ModiFace 11 years ago after he realized his research into computer vision and facial tracking could be applied to the cosmetics industry, allowing people to see what they look like wearing different shades of makeup and other beauty products. In March, French company L'Oréal announced its purchase of ModiFace, demonstrating how important technology has become to the US\$460-billion global cosmetics industry. Aarabi will remain ModiFace's CEO, and the company will continue to be based in Toronto after the deal is completed. Of the company's 70 employees, 60 have a connection to U of T. In 2017, ModiFace announced it was investing \$4 million in new undergraduate and graduate internships, as well as support for U of T Engineering research. The company plans to tap the University's vast pool of engineering and computer science talent as it continues to grow under its new owner.

Engineering students experience cross-cultural design with international capstone course

In October 2017, Ashley McIlvena (MechE 1T7 + PEY) boarded a plane for her first-ever trip to China. Along with her teammates — Milan Yang, Alice Wolfe and Jelica Bornath (all MechE 1T7 + PEY) — McIlvena met with a team of engineering students from Beihang University in Beijing, with whom they had been collaborating for the last three months. They were among four teams totaling 16 students that participated in this year's international capstone course from the Department of Mechanical & Industrial Engineering. In addition to Beihang University, partner institutions include Shanghai Jiao Tong University and Tsinghua University. McIlvena and her collaborators designed a pod for a Hyperloop, a high-speed train operating in a tube from which air has been partially evacuated, enabling speeds of up to 1,200 kilometres per hour. After the trip to China, U of T hosted the partner teams in Toronto in February 2018, providing valuable experiences for students on both ends of the partnership.

U of T Engineering celebrates Global Engineering Week

On March 12–16, 2018, U of T Engineering celebrated Global Engineering Week. The event series was organized by alumnus Malik Ismail (EngSci 1T6 + PEY) in partnership with the Centre for Global Engineering (CGEN) and the U of T Engineering student chapter of Engineers Without Borders. It launched with a double-header guest lecture featuring Dan Frey, the Faculty Director for Research at MIT's D-Lab, and Paul Cadario (CivE 7T3), Distinguished Fellow in Global Innovation at U of T Engineering and the Munk School of Global Affairs. Throughout the week, professors in 16 classes — including Engineering Strategies & Practice, taken by all first-year students in the Core 8 disciplines — incorporated case studies about global engineering projects into their lesson plans. The week also included a case competition and wrapped up with a global engineering fair, where students could see examples of past projects facilitated by CGEN and ask questions of the students involved. Overall, the goal was to engage students inside and outside the classroom, and to raise awareness about challenges that transcend borders and the need to ensure that solutions are appropriate for the needs of local communities around the world.

Data-driven farming: U of T Engineering spinoff develops low-cost sensors for Nepal

An unassuming grey box about the size of a coffee mug could be the key to significant improvements in crop yields for farmers in Nepal and around the world. The device, developed by alumni Ahmed Mahmoud (MechE 1T1, MIE MAsc 1T6) and Donn Pasiliao (MechE 1T1, MIE MAsc 1T4) is attached to a metal probe that measures the moisture content of any soil into which it is inserted. This information is then made available online through an Internet of Things (IoT) controller or through radio frequency signals. Professor Amy Bilton (MIE) worked with Mahmoud and Pasiliao to propose the technology for the Data Driven Farming Prize, an international competition that seeks to create new tools for generating data and translating it into actionable information that can help farmers. The competition is sponsored by Feed the Future, a U.S. government initiative designed to combat global hunger and poverty, and the non-profit Challenge Prize Centre. In September 2017, the team earned a \$50,000 runner-up prize in the competition, and used the money to develop a network of 30 devices, currently being piloted in Nepal via a trial conducted by the Mexico-based agricultural research organization CIMMYT and the Himalayan knowledge-sharing network ICIMOD.

10

Diversity deepens the engineering creative process, accelerating innovation and enriching our profession with new ideas and perspectives. We are committed to ensuring that our Faculty reflects the diversity of our society, and provides an environment that inspires our students to consider how engineers' contributions impact people of all backgrounds and abilities.

We are fostering a diverse, inclusive and respectful environment where these values are incorporated into the policies, guidelines and procedures of our Faculty. For the last two years, women have made up more than 40% of our incoming undergraduate cohort, the highest proportion of any Canadian engineering school. We expect a similar proportion in September 2018. Across all years of study, our undergraduate body is now more than 33% women, compared to the Canadian average of 20.7%*, which demonstrates our leadership in Engineers Canada's efforts to raise the percentage of newly licensed women engineers to 30% by the year 2030.

Our proportion of women professors in engineering has doubled over the last decade and is now more than 20%, the highest for any Canadian university in the U15 group of research-intensive institutions*. More than one third of our Canada Research Chairs are women, and women engineers lead many of our multidisciplinary research centres and institutes. They also hold positions of senior leadership at the University level.

The Eagles' Longhouse Indigenous Initiatives Steering Committee, chaired by Professor Jason Bazylak, our newly appointed Dean's Advisor on Indigenous Initiatives, has created a *Blueprint for Action* which outlines how we will increase Indigenous peoples' participation in engineering education. This year we also introduced a Dean's Advisor on Black Inclusivity Initiatives and Student Inclusion & Transition Mentor to enrich all students' experiences in our Faculty and to guide our efforts in increasing Black representation within our programs and the engineering profession. In addition, the Engineering Equity, Diversity and Inclusion Action Group (EEDIAG) was formed to bring together a variety of Faculty-wide diversity and inclusivity initiatives. It aims to ensure all members of our community support the shared mission of an enriching, inclusive learning and working environment.

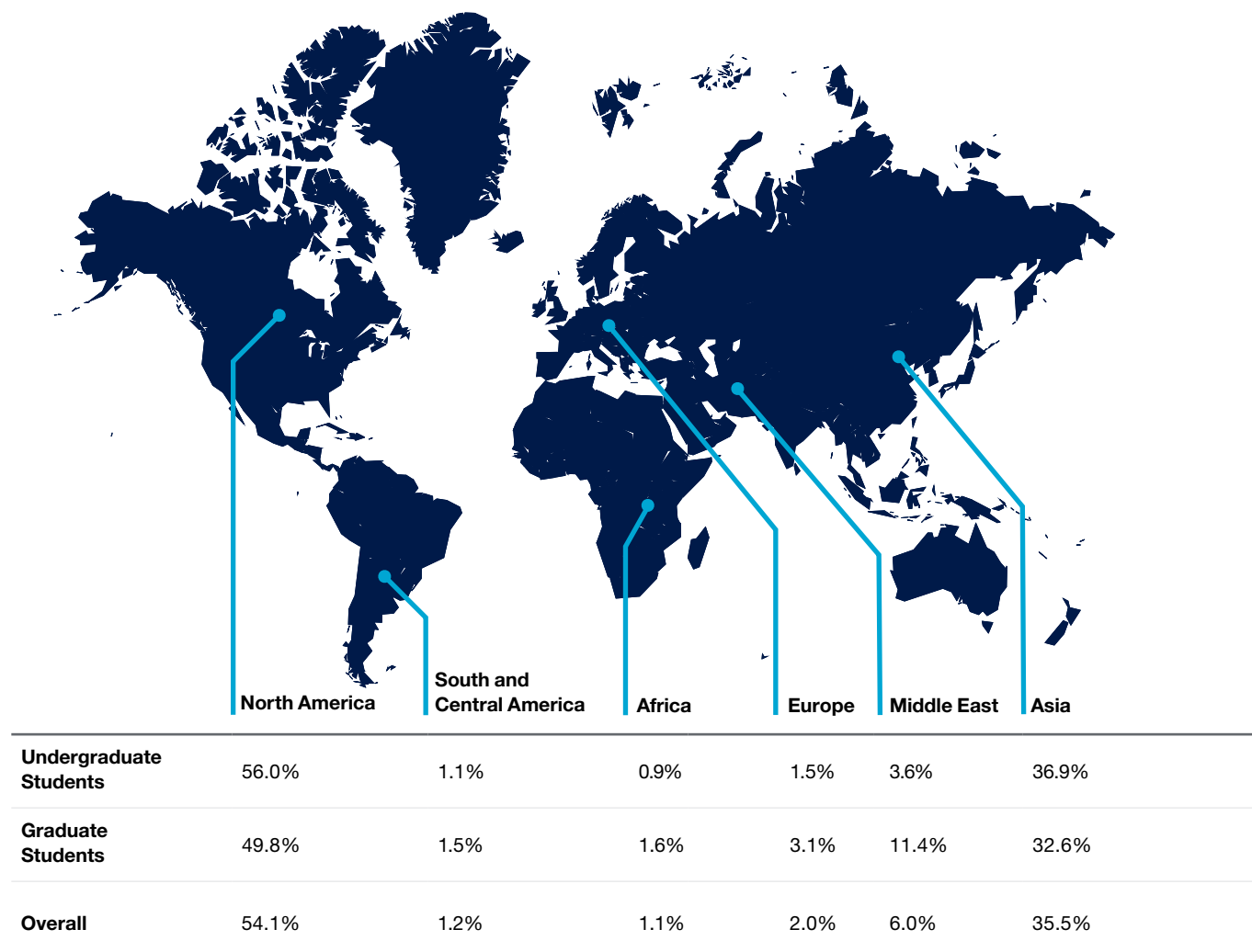
* Canadian Engineers for Tomorrow: Trends in Engineering Enrolment and Degrees Awarded, Engineers Canada, 2016

Diversity: Measures of Progress

International Diversity

Over the last 10 years, the number of international students has doubled, comprising 28.6% of all undergraduates in 2017–2018. Among graduate students, 32.4% hail from outside of Canada, up from 16.8% in 2008–2009. Not only are more international students choosing U of T Engineering, but they are also coming from a wider range of countries than ever before. This is due in part to strategic recruitment efforts in key regions, including Brazil, Colombia, Costa Rica, Ecuador, India, Malaysia, Mexico, Peru, Singapore, Trinidad & Tobago, Turkey, the United Arab Emirates and the United States. *(For more information about our international recruitment initiatives, please see Chapter 9: International Initiatives.)*

Figure 10.1 Continent of Origin: Undergraduate and Graduate Students, Fall 2017



Data and highlights in this chapter are from September 2017 to August 2018.

Note 10.1: Not shown—0.1% of undergraduate and graduate students from Oceania, which includes Australia, New Zealand and other countries in the Pacific Ocean. Country of origin is derived from a combination of citizenship, location(s) of previous studies (e.g., elementary school, high school and university) and permanent address. This information does not indicate current Canadian immigration status, which is used to determine domestic/international student status for tuition and funding purposes.

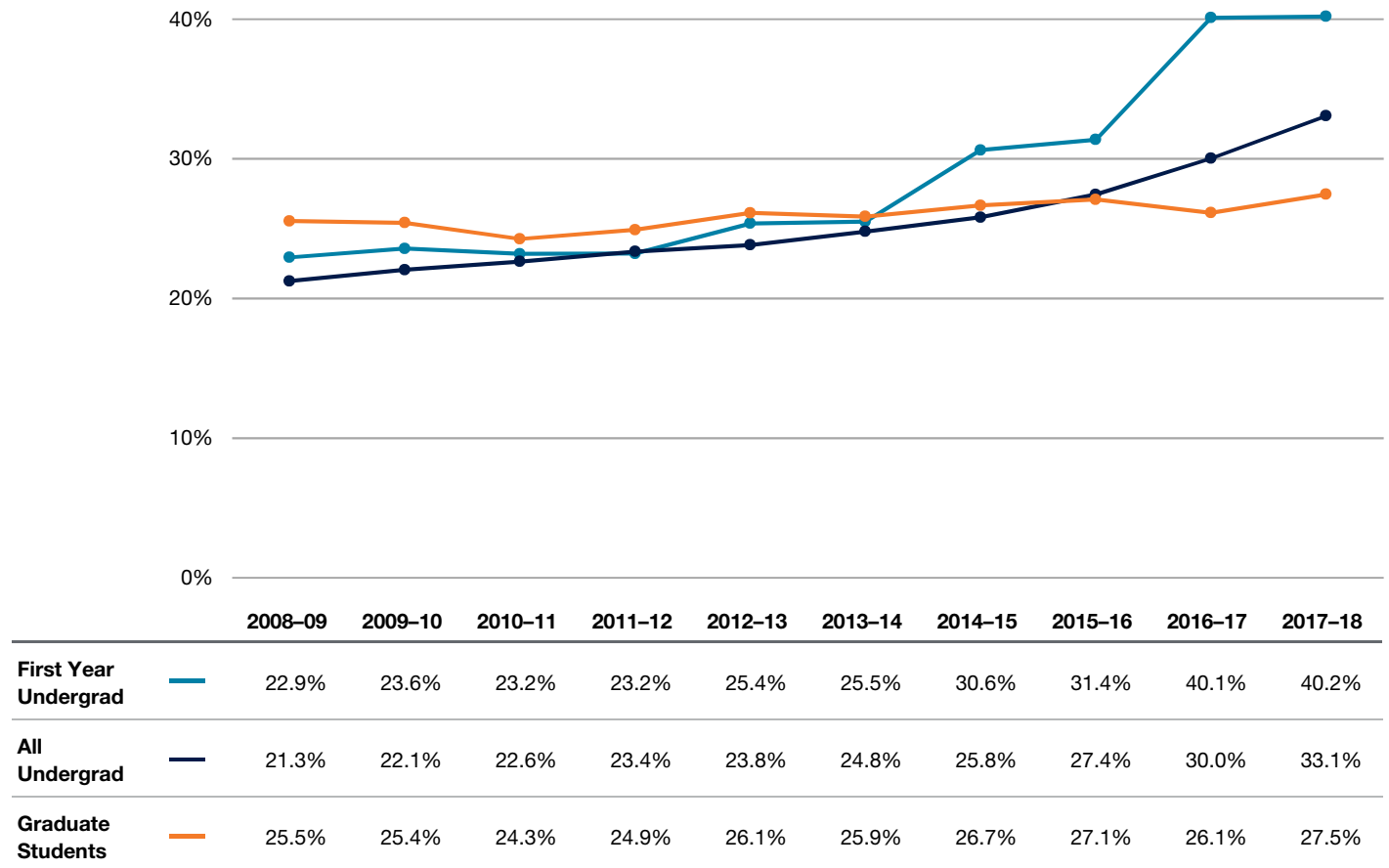
Outreach and Inclusivity

Across all of our programs, the proportion of women undergraduate students now stands at 33.1%, the highest in Canada. Our strategic approach to outreach and recruitment recognizes that talented women who would excel in other science disciplines would also excel as engineers. We aim to inspire these students by increasing awareness of the engineering profession and demonstrating the positive impact they can make as engineers.

Events such as the Young Women in Engineering Symposium (YWIES) and the Girls' Leadership in Engineering Experience (GLEE) provide this inspiration, and also enable prospective students to meet with the Dean, professors, alumni and current students and to learn about their experiences studying and working in engineering.

For the fourth annual YWIES event, we shifted our focus from young women in Grade 12 to those in Grade 11, enabling us to connect with students earlier in their decision-making process. In May 2017, we attracted 76 top female students from across the Greater Toronto Area to U of T where they learned more about engineering, participated in hands-on workshops and met students, faculty and alumni. Twenty-nine of the attendees ultimately applied to U of T Engineering. For our fifth annual symposium in May 2018, we attracted 84 students.

Figure 10.2 Percentage of Women Students, 2008–2009 to 2017–2018



The annual, weekend-long GLEE program inspires and empowers women who have received offers of admission to our undergraduate programs by connecting them with women faculty members, students and alumnae. It includes a dinner and reception, hosted by the Dean, as well as a keynote address from one of our women professors. Ninety-nine of the 115 students participating in GLEE 2017 accepted our offers of admission. Two events were held in 2018: one in March that attracted 12 students from outside Ontario, and one in May that saw 105 students from within Ontario.

In 2017–2018, we engaged more than 7,500 pre-university students, approximately half of whom are girls, through our innovative outreach programs, such as:

- Da Vinci Engineering Enrichment Program (DEEP) Summer Academy, which provides high school students from around the world with the opportunity to engage in experiential learning activities in a variety of engineering, technology, business and science disciplines;
- Jr. DEEP and Girls' Jr. DEEP summer day camps and Saturday programs, which enable students in Grades 3 to 8 to explore engineering; and
- Go Eng Girl and Go CODE Girl workshops, which enable girls in middle and high school to explore engineering and computer coding.

Since 2010, we have partnered with the U of T chapter of the National Society of Black Engineers (NSBE) to deliver ENGage, a week-long day camp for students in Grades 3 to 8 that provides participants with on-campus activities that demonstrate engineering principles and practices.

In 2016–2017, we piloted ENGage Community Camp, which offers one-week camps in schools and community centres in areas identified as under-served. While not limited to Black participants, this program, like all ENGage programs, operates on a barrier-breaking model and all participants come from underrepresented communities. In 2018, this program was renamed LAUNCH: Science & Engineering Community Camps. We expect approximately 140 participants this year. The engaging week-long program is based on popular activities, experiments and projects from our 30-year history of STEM outreach on the St. George campus, now offered in schools throughout Ontario.

In addition to ENGage programs offered through our Engineering Outreach Office, the Faculty delivers the Urban In-School Workshop program (ISW), which has been running for more than 20 years. The program provides more than 100 STEM-related workshops each May and June that are delivered in schools within at-risk communities by U of T Engineering students.

In February 2018, we partnered with the U of T NSBE chapter and two other chapters to host the NSBE Region 1 East Canada Zone conference. Held during Black History Month, the conference aimed to both inspire high school students to consider pursuing STEM fields in college and university, and strengthen the NSBE pipeline that will help those students successfully transition into their careers and excel in leadership positions. The theme of the one-day event was 'Ignite, Imagine, Innovate'. It included engineering activities, networking sessions and panel discussions around career development and diversity in the workplace.

We also partner with U of T Engineering undergraduate students, including members of the Engineering Society's Hi-Skule outreach group and Women in Science and Engineering (WISE), to visit schools throughout the province each year. These STEM ambassadors lead students in immersive workshops on engineering topics, acting as mentors and sharing the boundless possibilities of an engineering education with students of all backgrounds.

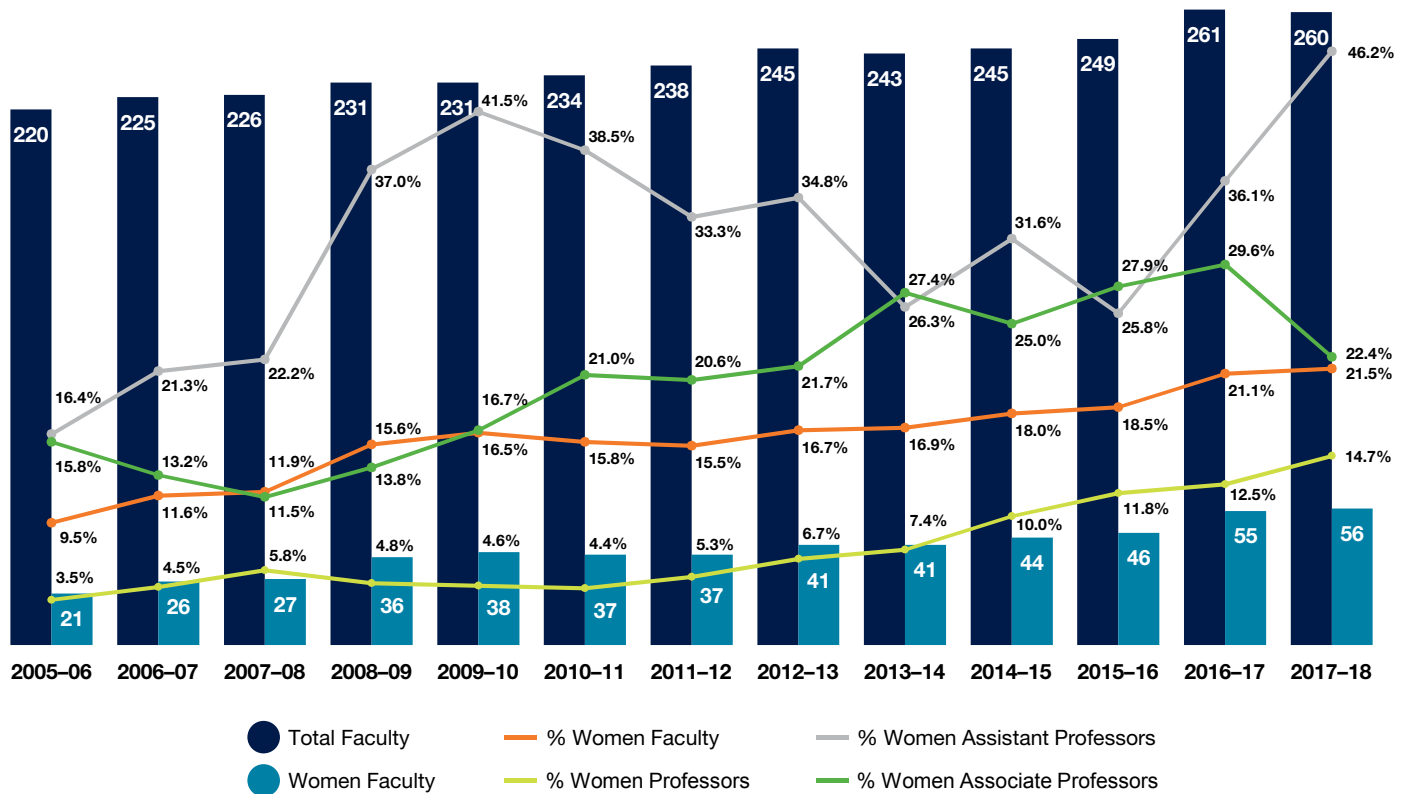
- In 2017–2018, Hi-Skule visited 15 schools in the Greater Toronto Area, reaching more than 500 students. They interacted with approximately 500 more through five additional outreach events, including a Welcome to Engineering event on campus, a Mentorship Coffee House, the University of Toronto High School Design Competition and Designapalooza, a new event focused on students in Grades 5 through 8.
- WISE recruited 17 student ambassadors and delivered a total of 26 presentations through high schools and organizations such as Big Brothers/Big Sisters. WISE also led a successful high school mentorship program and organized events such as the on-campus event "STEM Student for a Day," a high school conference and design challenge. In total, WISE reached more than 1,700 students in 2017–2018.

Building a Diverse Professoriate

Increasing gender diversity among our faculty is an important effort toward creating a culture of inclusivity at U of T Engineering. The proportion of women among our faculty population has increased over the last decade and now stands at 21.5%. This is higher than any other Canadian engineering school in the U15 group of research-

intensive institutions*. Nine women working at the forefront of engineering education and research were among the 14 professors who joined our Faculty in 2016–2017. Each brings a unique passion for experiential engineering education and research expertise that addresses important engineering challenges around the world, from sustainability in the mining sector to optimizing health-care systems.

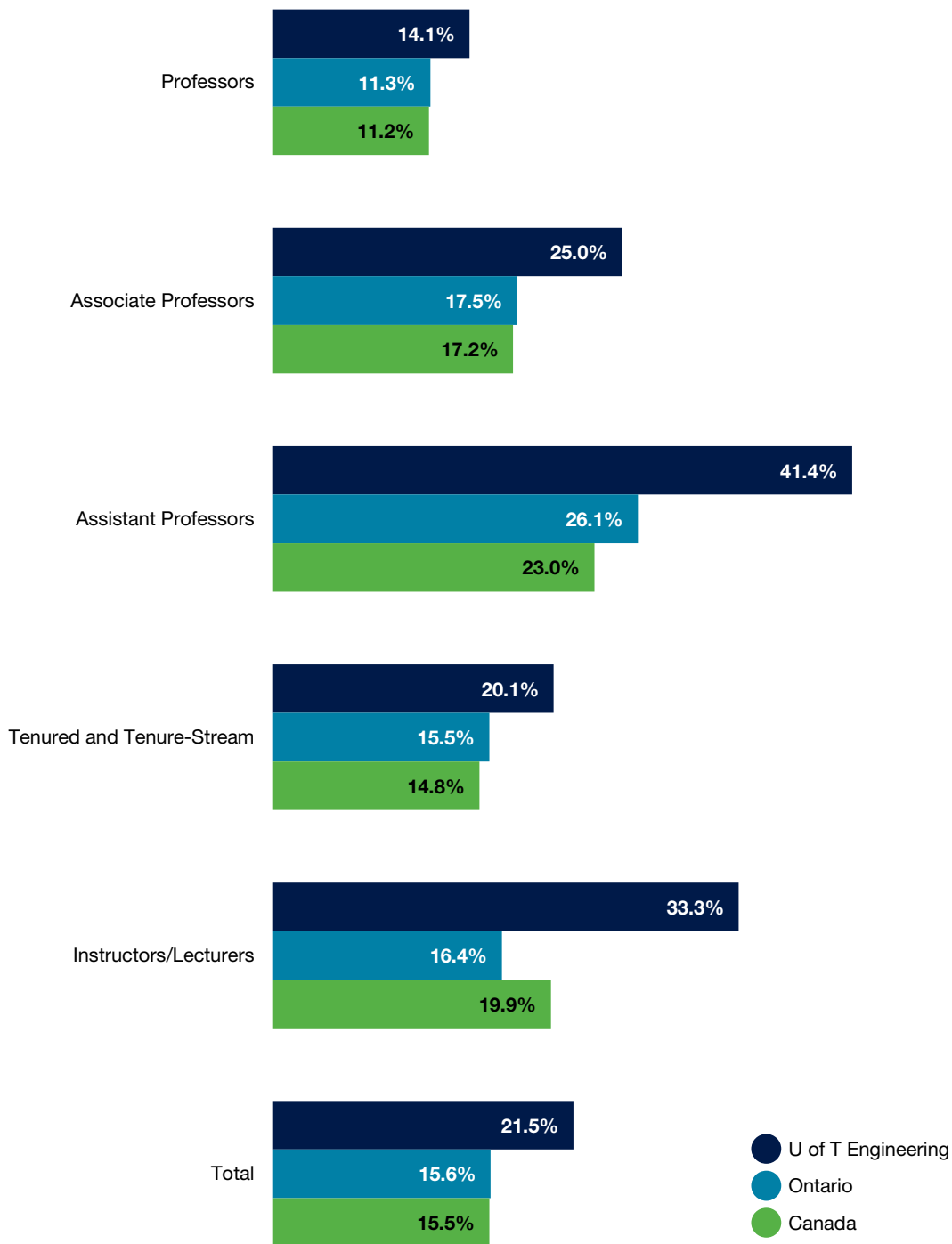
Figure 10.3 Total Number of Faculty with Percentage of Women Overall and by Academic Rank, 2005–2006 to 2017–2018



Note 10.3: Data for this figure are based on headcount.

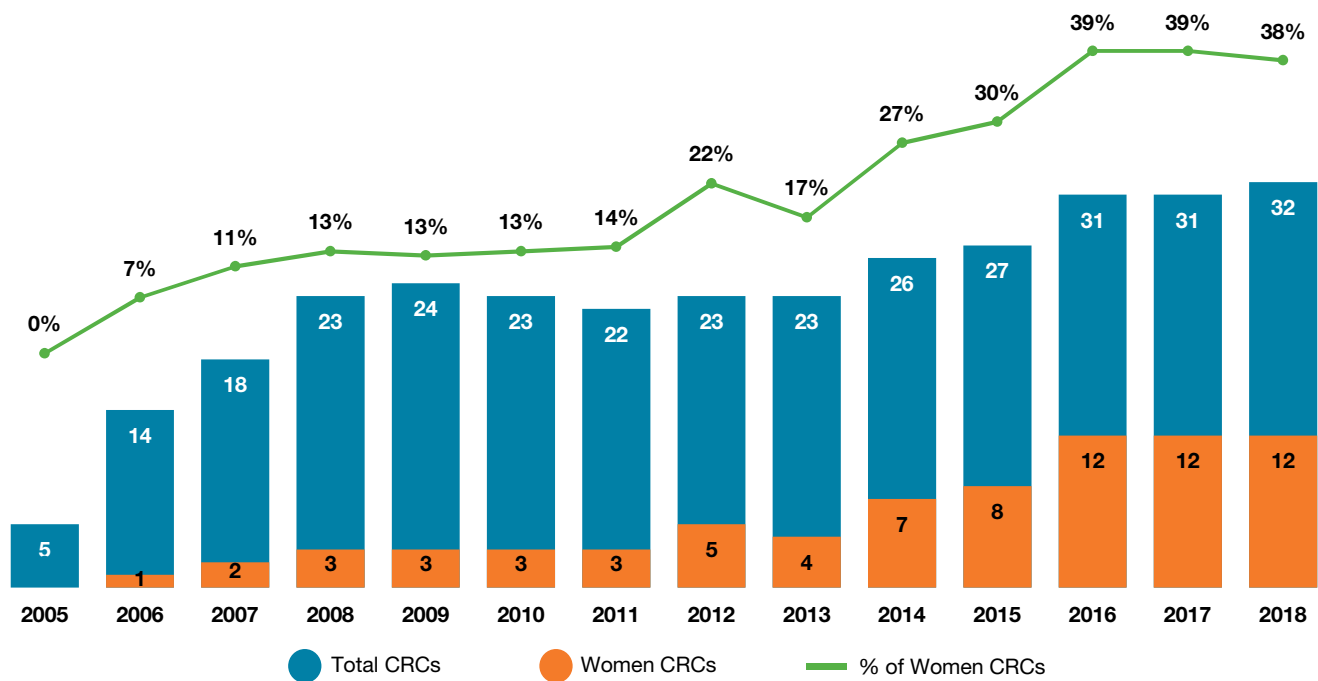
* Canadian Engineers for Tomorrow: Trends in Engineering Enrolment and Degrees Awarded, Engineers Canada, 2016

Figure 10.4 Percentage of Women Faculty at U of T Engineering Compared with Women Faculty in Ontario and Canadian Engineering Faculties, 2017



Note 10.4: Data in this figure comes from Engineers Canada. Counts are based on full-time equivalent (FTE) faculty as of November 15, 2017.

Figure 10.5 Canada Research Chairs with Number and Percentage of Women Chairholders, 2005 to 2018



Indigenous Youth and STEM

We are working with U of T's First Nations House and with Indigenous peoples and communities to increase the number of Indigenous students who apply to and enrol in U of T Engineering programs, and to ensure a welcoming, supportive and inclusive environment for all students, faculty and staff.

Following the Truth and Reconciliation Commission of Canada's call to eliminate educational gaps between Indigenous and non-Indigenous peoples, the University of Toronto published a report, *Answering the Call: Wechehetowin*, which outlined proposed actions in six key areas: Indigenous spaces, Indigenous faculty and staff, Indigenous curricula, Indigenous research ethics and community relationships, Indigenous students and co-curricular education, and institutional leadership and implementation.

In 2017, we established the Eagles' Longhouse, our Engineering Indigenous Initiatives Steering Committee, with members from across our Faculty and the Oneida Nation. The mandate of the Eagles' Longhouse is to engage Indigenous representatives and engineering educators to design a *Blueprint for Action* to ensure a welcoming and supportive environment and to intensify engineering outreach to these underrepresented communities. The committee is chaired by Professor Jason Bazylak (MIE), who was also appointed to the newly created role of Dean's Advisor on Indigenous Initiatives.

The *Blueprint for Action* was delivered in June 2018 and is available online (www.uoft.me/BlueprintforAction). Its recommendations are divided into four areas with immediate, short-term and long-term actions, including:

- **Indigenous Spaces:** Form an ongoing Indigenous Space Committee, involving Indigenous community members, to develop or redevelop existing spaces as Indigenous spaces, commission Indigenous artwork and create educational installations.
- **Indigenous Curriculum:** Integrate Indigenous content into existing curricula.
- **Indigenous Student Access:**
 - Tailor recruitment activities to Indigenous students, including scholarship opportunities and a website with specific content for Indigenous students.
 - Create a network of Indigenous engineers and educators to support mentorship and outreach programs.
 - Initiate an engineering outreach program for Indigenous high school students, and create a transition program for Indigenous students in Grade 10 math to enter engineering at U of T.
- **Indigenous Faculty and Staff Recruitment and Hiring:** Support a program focused on the recruitment and hiring of Indigenous faculty and staff.

Diversity: Selected Highlights

Dean's Advisor on Black Inclusivity Initiatives and Student Inclusion & Transition Mentor

In March 2018, Mikhail Burke (MSE 1T2, IBBME PhD 1T8) was appointed to the new role of Dean's Advisor on Black Inclusivity Initiatives and Student Inclusion & Transition Mentor at U of T Engineering. As a student, he was instrumental in founding the ENGage outreach program and served as president of the National Society of Black Engineers' U of T chapter. The new role is an important part of our Faculty's commitment to addressing the local and systemic issues that result in overt and subtle racism, which impact the welcoming and respectful nature of our community. Burke is leading our effort to develop a plan for creating a more inclusive learning environment, serving on a steering committee that has a mandate to improve the experience of Black students, and acting as a Faculty liaison for relevant internal and external groups to ensure good communication of shared efforts and priorities. He is a supportive contact within our Faculty in a mentorship capacity for all students that may be facing difficulties in their transition into the community.

Indigenous Community Outreach Projects

U of T Engineering is spearheading three Indigenous community outreach projects, with support through the Dean's Strategic Fund (DSF).

- **Engineering outreach in Labrador:** Led by professors Erin Bobicki (MSE, ChEM) and Naomi Matsuura (IBBME, MSE), this project aims to alleviate the geographic, financial and cultural challenges faced by Indigenous students in accessing engineering education in Labrador, and to spark interest in engineering as a career path. The week-long program will be offered in five local schools for students ages 13 to 18, who will work on design projects that address engineering challenges relevant to their communities.
- **Drone design at high schools:** Partnering with the Dennis Franklin Cromarty High School in Thunder Bay, this project aims to teach science students to design and build drones, providing insight into the many applications that could benefit their communities. The project is led by UTIAS professors Craig Steeves and Jonathan Kelly.
- **Reconciliation Through Engineering Initiative (RTEI):** This project, led by the Centre for Global Engineering (CGEN), aims to identify pressing engineering challenges facing geographically disparate Indigenous communities across Canada; work to co-design sustainable solutions and help build the technical capacity to support them; and enable pathways for future research. Researchers will spend time embedded within a number of Indigenous communities and work collaboratively with their members and elders.

Diversity Climate Survey

The Community Affairs and Gender Issues (CAGI) of Faculty Council is developing a Diversity Climate Survey. The goal of this initiative is to assess diversity and inclusion within our community along various dimensions, including ethnicity, gender and sexual orientation, religion, age, ability, legal status and socioeconomic background. By providing baseline data, the survey will serve as an important first step to identify underrepresented groups and issues of marginalization, discrimination, disparagement or alienation and to inform policies and initiatives as needed to support these groups.

Throughout 2017–2018, CAGI consulted widely with faculty, staff and students on the scope of the questions asked. The final survey is expected to be ready for implementation during the 2018–2019 academic year.

Symposium on Inclusive Learning Environments for First-Year Students

On June 26, 2018, U of T Engineering hosted the second annual Ontario First Year Engineering Experience Symposium (OFEE). Created at U of T Engineering and unique in Canada, OFEE brings together students, academic advisors, faculty, student support professionals and administrators to discuss enhancements to the experience of first-year engineering students. This year's event focused on co-creating inclusive learning environments that enable students to develop their professional engineering identities. Attendees discussed strategies for acknowledging and celebrating the diverse experiences of students, adopting inclusive classroom practices, strengthening student support and building communities to share knowledge across institutions. More than 60 people from 11 Ontario engineering schools attended. The long-term goal is to expand this annual conference into a national event.

WISE Conference Highlights Professional and Personal Development

More than 300 leading academics, industry professionals and students from universities across Canada convened at U of T Engineering in February 2018 for the sixth annual Women in Science and Engineering (WISE) national conference. The two-day event serves as a catalyst to inspire and empower young women to pursue their passions, broaden their horizons and form meaningful connections. This year's theme was Transcend Boundaries, and the organizing team doubled both the number of sponsor companies and the number of workshops, which covered topics ranging from energy and automation to blockchain technology, bioinformatics and career building.

U of T Engineering Partners with SOAR Indigenous Youth Gathering

Since 2009, U of T's Faculty of Kinesiology & Physical Education has invited approximately 20 Indigenous youth aged 14 to 17 to the University during March Break for SOAR Indigenous Youth Gathering. The event enables these students to experience life at U of T, visit Toronto landmarks, and participate in a series of recreational and Indigenous-focused events and activities. This year, Professor Jason Bazylak (MIE) partnered with the program to deliver a workshop that introduced key concepts of the engineering design method. The workshop ended with a discussion about the need for more Indigenous engineers to help build stronger Indigenous communities.

Engineering Equity, Diversity and Inclusion Action Group (EEDIAG)

The newly created Engineering Equity, Diversity and Inclusion Action Group (EEDIAG) is committed to creating a culture of diversity, equity and inclusion that represents, acknowledges and respects all members of our community.

With representation from students, staff and faculty, the group will work to accomplish the goals related to equity, diversity and inclusion in our Academic Plan for 2017–2022 by identifying barriers to access and inclusion of underrepresented groups in engineering, as well as fostering more inclusive spaces within our Faculty.

We are liaising with our counterparts across the University – including peers at Rotman Commerce, Kinesiology & Physical Education, the Centre for Teaching Support and Innovation, and the Sexual and Gender Diversity Office – to develop EEDIAG's mission and values. We will also consult with others working on equity, diversity and inclusion initiatives in the broader engineering profession.

Rainbow Railroad Fundraiser and Pink Shirt Day

Our Faculty continues to raise awareness of LGBTQ+ perspectives and experiences, and has been represented on the U of T Positive Space Committee since its inception in 1996. The committee promotes safe and inclusive spaces for LGBTQ+ students, staff, faculty, alumni and allies. These spaces are marked by rainbow triangle stickers posted on doors and in offices across campus. U of T Engineering is also home to Queer Sphere, the student chapter of EngiQueers Canada, which promotes and advocates for the inclusion of LGBTQ+ students (and their allies) in engineering schools across Canada. On February 14, 2018, Queer Sphere hosted

an event in the Sandford Fleming Atrium to raise money for Rainbow Railroad, an organization that supports and assists LGBTQ+ people who have faced physical violence, threats of violence or imprisonment in their current country of residence, including helping these individuals find safe local resources and routes for escape if the situation becomes dire. Queer Sphere and the Engineering Positive Space Committee also led the celebration of Pink Shirt Day on February 28, 2018. The annual event, which aims to end bullying, began after students at a Nova Scotia high school wore pink shirts to support a boy who had been bullied for wearing a pink shirt. Members of the U of T Engineering community posted photos of themselves wearing pink shirts on social media using the hashtag #pinkskule.

New Verses for Godiva's Hymn

The song known as “Godiva's Hymn” is a long-standing tradition in Skule™ and at many other engineering schools across Canada and around the world. The Godiva's Hymn contest, held by U of T's Engineering Society (EngSoc) for the last two years, encourages students to contribute verses that echo the spirit of the 21st-century engineer. This year's winning verse, contributed by MSE student Calvin Huynh, was:

*At Frosh Week Does It All Begin, With Cheers and Purple Dye /
And Then Before We Know It We've Returned From PEY /
We Made It Through The Many Years With Blood And Sweat And Tears /
Though Time May Pass We Shan't Forget – I Am An Engineer!*



11

Strategic management of our financial and physical resources — including funding, space, infrastructure and personnel — strengthens our world-class research and educational programs and enhances the experience of our faculty, staff and students.

In 2017–2018, we increased our total revenue by 5.0% over the previous year and our net revenue by 4.1%. This increase, combined with prudent budgeting and careful fiscal management, enabled us to invest further in infrastructure and initiatives that advance our goals. We committed \$6.4 million this year to new Dean’s Strategic Fund (DSF) projects for up to three years, which support multidisciplinary research collaborations, improvements to teaching labs, new experiential learning programs and other projects with broad impact on our Faculty.

The Engineering Instructional Innovation Program (EIIP), an extension of the DSF, continues to foster curriculum innovation through strategic investments aimed at enhancing teaching, learning and the overall student experience. Projects funded this year include the development of online safety instruction tools, upgrades to the undergraduate mineral processing laboratory, and redesign of modules for the first-year design course Engineering Strategies & Practice.

In 2016, we created the Dean’s Infrastructure Improvement Fund (DIIF), which has so far supported 13 large-scale infrastructure enhancements within our Faculty. We have also further invested \$19.1 million (matched by \$13.4 million from the federal government’s Strategic Investment Fund) in renovations to 89 laboratory facilities across our Faculty through the Lab Innovation for Toronto (LIFT) project.

The Myhal Centre for Engineering Innovation & Entrepreneurship, which opened this year, is our first entirely new engineering building since the 1960s. Its flexible, innovative educational spaces promote active learning, while its fabrication facilities, design studios and dedicated space for student clubs and teams catalyze rich opportunities for experiential education. It provides a new home to several of our recently launched multidisciplinary research institutes, and serves as a vibrant hub that sparks new connections between the various members of our community — students, faculty, staff, alumni and external partners. The Myhal Centre embodies our commitment to strengthening our research and education, driving innovation, facilitating entrepreneurship and preparing the next generation of global engineering leaders. *For more on the Myhal Centre, see page 7 or visit www.uoft.me/MyhalCentre.*

Total Revenue and Central Costs

The Faculty’s total revenue and associated costs are reflected in Figures 11.1 and 11.2. Revenue in 2017–2018 grew to \$234.0 million, an increase of 5.0% over 2016–2017, with a compound annual growth rate of 6.5% since 2008–2009.

Total central costs rose to \$105.6 million, a 6.5% increase over 2016–2017, with a compound annual growth rate of 5.2% since 2008–2009. Central costs include the student aid levy, University fund contributions and University-wide costs, which experienced year-over-year increases of 6.7%, 3.6% and 7.4%, respectively (Figures 11.2 and 11.3).

The rise in our student aid levy is part of our commitment to provide need-based assistance to all students. U of T’s Student Access Guarantee makes this goal clear: “No student offered admission to a program at the University of Toronto should be unable to enter or complete the program due to lack of financial means.” Student aid ensures we continue to attract the very best students regardless of their financial situation. In 2017–2018, the University of Toronto established the Pearson Scholarships, which provide awards to international students. These are supplemented by our own Faculty’s International Scholar Awards, which have been presented to eight students since inception in 2015–2016. Starting next year, the International Pearson Scholar Awards will be reconfigured to provide support to a larger number of students, with an initial target cohort of 17.

University-wide costs — which include caretaking, utilities, central human resources, student services, information technology, central library, advancement and research services — also increased by 7.4%.

Key spending initiatives included:

- Upgrades and revitalization of classrooms;
- Electronic acquisitions for our libraries;
- Additional support for inventions and commercialization;
- Development of a new student information system;
- Improved on-campus WiFi connectivity; and
- Support to extend the Boundless fundraising campaign to reach the \$2.4 billion goal.

Figure 11.1 Total Revenue, 2008–2009 to 2017–2018

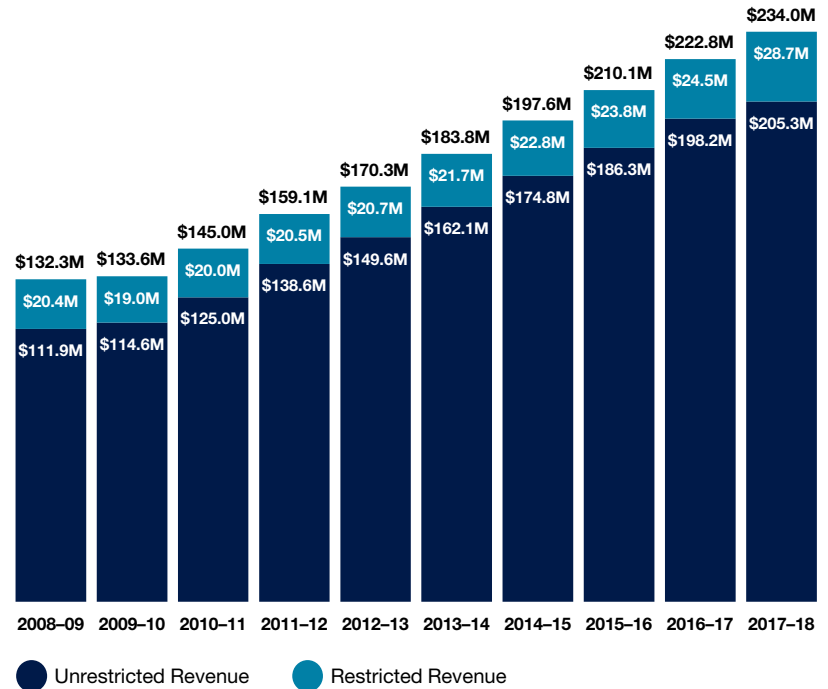
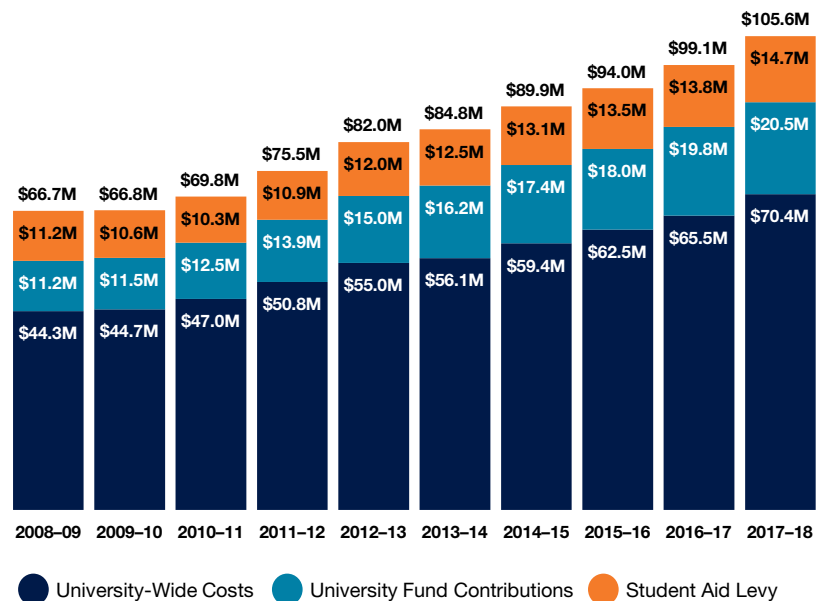


Figure 11.2 Total Central Costs, 2008–2009 to 2017–2018



Data in this chapter are presented by fiscal year (May to April).

Figure 11.3 Budget Data, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
Unrestricted Revenue	\$111,937,605	\$114,602,697	\$124,966,518	\$138,597,605	\$149,615,656	\$162,048,175	\$174,819,446	\$186,298,686	\$198,246,669	\$205,332,615
Restricted Revenue	\$20,395,795	\$18,969,092	\$20,009,763	\$20,483,566	\$20,726,973	\$21,737,177	\$22,751,425	\$23,766,755	\$24,525,299	\$28,686,839
Total Revenue	\$132,333,400	\$133,571,789	\$144,976,282	\$159,081,170	\$170,342,629	\$183,785,352	\$197,570,871	\$210,065,441	\$222,771,967	\$234,019,454
Inter-Divisional Teaching Revenue Transfer								\$6,042,335	\$5,084,764	\$5,028,443
University-Wide Costs	\$44,307,203	\$44,693,620	\$47,027,056	\$50,817,454	\$55,028,273	\$56,089,556	\$59,390,462	\$62,461,112	\$65,553,462	\$70,384,637
University Fund Contributions	\$11,193,761	\$11,460,270	\$12,496,652	\$13,859,760	\$14,961,566	\$16,167,220	\$17,443,377	\$17,985,353	\$19,787,234	\$20,496,107
Student Aid Levy	\$11,166,550	\$10,614,513	\$10,313,864	\$10,859,371	\$11,995,084	\$12,539,417	\$13,093,888	\$13,541,938	\$13,793,571	\$14,716,594
Total Central Costs	\$66,667,514	\$66,768,403	\$69,837,572	\$75,536,585	\$81,984,923	\$84,796,193	\$89,927,727	\$93,988,403	\$99,134,267	\$105,597,337
Net Revenue	\$65,665,886	\$66,803,386	\$75,138,710	\$83,544,584	\$88,357,706	\$98,989,159	\$107,643,144	\$110,034,703	\$118,552,936	\$123,393,674

Budget Overview

Our revenue sources, attributed central costs and budget breakdown for 2017–2018 are shown in Figures 11.4, 11.5 and 11.6, respectively. Net revenues are up 4.1% year-over-year, driven by stronger growth in both international and domestic MASc enrolment as well as growth in international MEng enrolment. Government grant revenues continued to remain flat year-over-year as the grant per domestic student has not changed for a number of years.

The ability to consistently grow net revenue at the Faculty level enables us to pursue major strategic initiatives such as the Myhal Centre for Engineering Innovation & Entrepreneurship construction and the Lab Innovation for Toronto (LIFT) fund-matching requirement. Further prudent budgeting and fiscal management across the

Faculty have allowed us to grow reserves to meet future commitments, upgrade existing classrooms and laboratories and invest in Dean’s Strategic Fund (DSF) and Dean’s Infrastructure Improvement Fund (DIIF) initiatives.

Through a combination of disciplined saving and contributions from donors and the Ontario government, we paid down the remaining \$3.8 million owed on the Bahen Centre for Information Technology mortgage, and avoided having to take out a mortgage on the Myhal Centre. The Faculty also contributed \$4.0 million – in the form of an internal loan – to the University’s recent purchase of the neighbouring Centre for Addiction and Mental Health (CAMH) facility, an investment that will benefit future generations of faculty and students.

Figure 11.4 Revenue Sources, 2017–2018

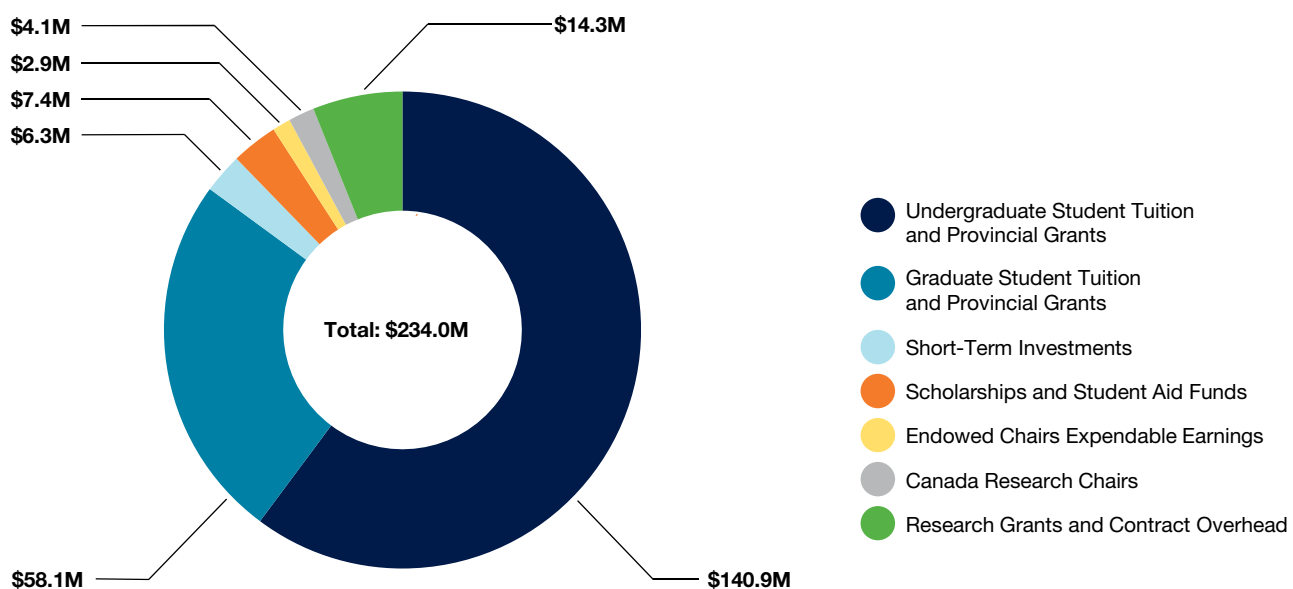


Figure 11.5 Revenue Distribution, 2017–2018

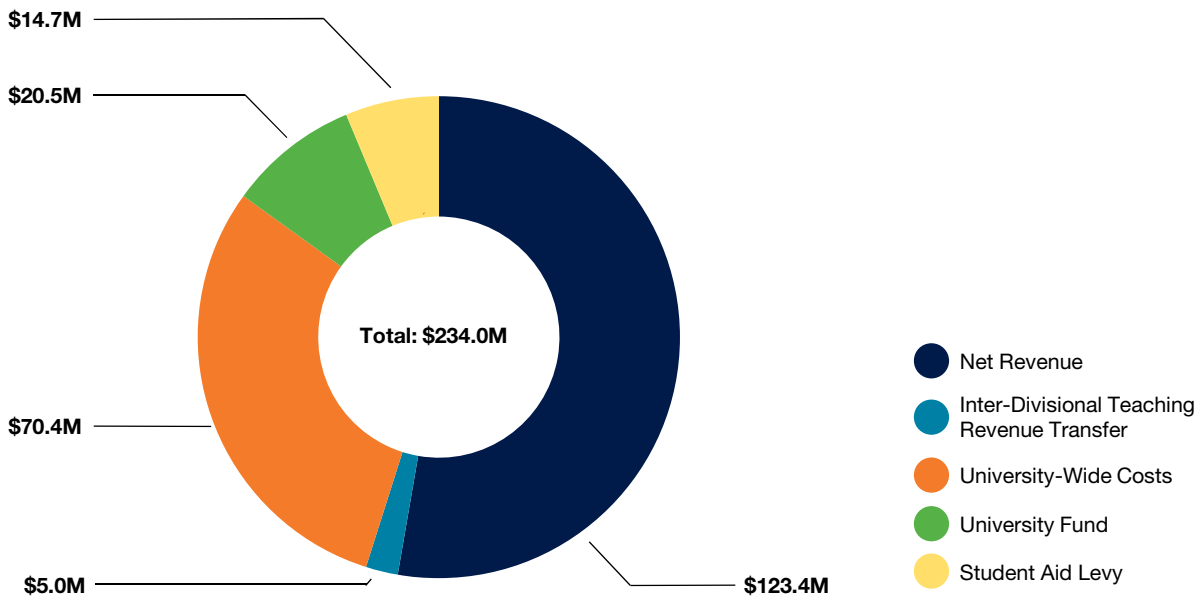
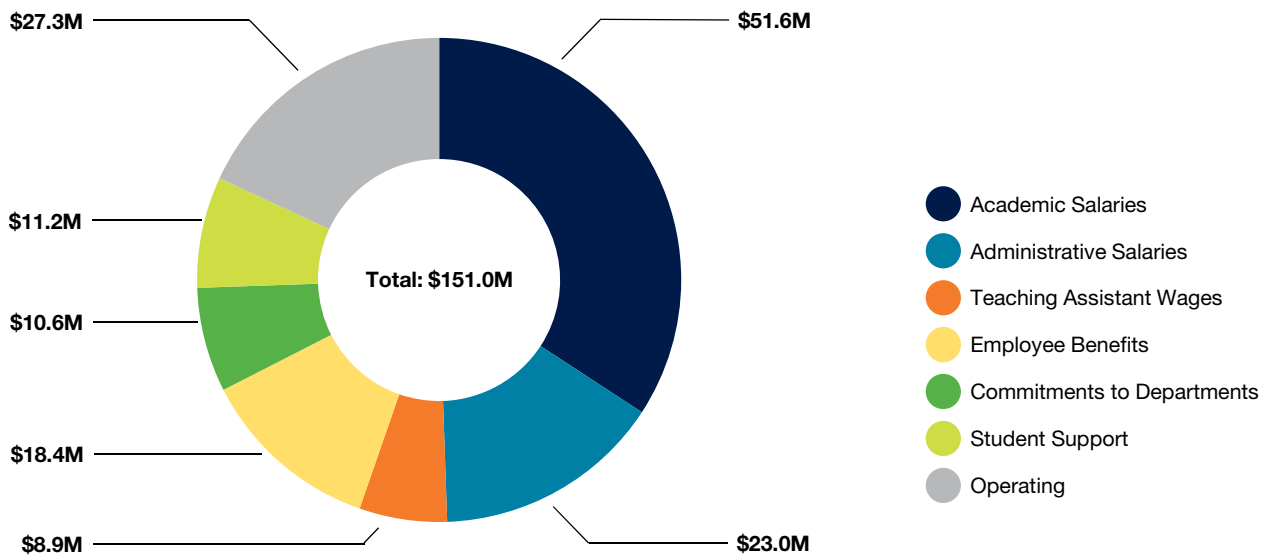


Figure 11.6 Total Operating Budget: Breakdown by Expense, 2017–2018 (net of central University costs)



Early-Career Professorships

Building on the success of the Percy Edward Hart and Erwin Edward Hart Professorships, as well as the Hart Teaching Innovation Professorships, we have further expanded our support for research and teaching among early-career professors with the creation of new professorships in three streams:

- Dean's Spark Professorships for tenure-stream assistant professors within four years of appointment (three-year term; \$75,000 per year)

- Dean's Catalyst Professorships for tenure-stream assistant professors who have served at least four years (three-year term; \$75,000 per year)
- Dean's Emerging Innovation in Teaching Professorships for teaching-stream assistant professors (three-year term; \$35,000 per year)

These professorships were awarded to 27 faculty with demonstrated commitment to Academic Plan priorities. *See Appendix D for a full listing of Chairs and Professorships.*

Dean's Strategic Fund (DSF)

The DSF provides seed funding for projects and initiatives with broad impact within the Faculty. In 2017–2018 we awarded \$6.4 million over three years to support 22 projects designed to further the goals of our Academic Plan 2017–2022. These projects include:

XSeed: Expanding Research Impact through Inter-Faculty Collaboration

XSeed is a seed funding program designed to stimulate and expand opportunities for research collaboration between U of T Engineering, the Faculty of Arts & Science, the University of Toronto Mississauga, University of Toronto Scarborough and the Ontario Institute for Studies in Education. Calls for proposals will be issued three times per year, with the goal to fund eight new collaborative projects per year. XSeed builds on the success of EMHSeed, created in 2016, which brings together co-principal investigators from U of T Engineering, the Faculty of Medicine and the Toronto Academic Health Sciences Network for collaborative projects.

Paint Booth for Student Projects

This project will refurbish a space on the lower level of the Mechanical Engineering Building to allow for installation of a certified and properly ventilated paint booth facility. This facility will be available to students in all engineering departments, institutes and divisions for finishing design projects, such as fourth-year capstone projects or those facilitated through the Institute for Multidisciplinary Design & Innovation (IMDI). It will

also be available for extra-curricular projects such as the Blue Sky Solar Racing vehicle, the Formula SAE vehicle, the Supermileage team vehicle and Skule™ orientation materials.

Indigenous Community Partnerships

The Faculty initiated three innovative projects that partner with Indigenous communities nationwide in support of recommendations made by the Eagles' Longhouse:

- A pilot STEM program for high schools in five Labrador communities. The program will run for one week in each community, where students will work on design projects focused on relevant engineering challenges in consultation with engineers from the region.
- The Reconciliation Through Engineering Initiative (RTEI) is a long-term CGEN initiative that aims to work within geographically disparate Indigenous communities to identify pressing engineering challenges and collaborate with locals on co-designed, sustainable solutions.
- In partnership with Dennis Franklin Cromarty High School in Thunder Bay, a school operated by the Northern Nishnawabe Education Council, this project aims to teach science students to design and build a quadrotor drone. Providing technical education and background context to students will enable a greater understanding of how drone technology can benefit the community.

For details on these projects, see the Chapter 10: Diversity.

Below is a list of 2017–2018 DSF-funded projects with their primary units:

Project	Primary Unit
Battery and Converter to DC Microgrid (Lighting System)	ECE
Better Together: Moving Collaborative Robots Out of the Laboratory and Into the Real World	UTIAS
Centre for Engineering Strategies for Climate Change Adaptation and Mitigation	CivMin
Centre for Healthcare Engineering – Acceleration, Collaboration and Sustainability	MIE
Developing MEng Emphases in Biomanufacturing, Sustainable Processing and Advanced Soft Materials	ChemE
Development of a Knowledge Base for Estimating Greenhouse Gas Emissions in Urban Areas through the Carbon Accounting Partnership, CAP-iCity	CivMin & ChemE
Diversity & Inclusion @ FASE: Learning from Leaders enacting Social Change	Troost ILead
Drone Design/Build at High Schools Serving Indigenous Students	UTIAS
Engineering Hall of Distinction Revitalization Project	Advancement
Global Observatory proposal: A Mechanism to Establish and Grow U of T Engineering Innovation Clusters in Water and Sustainability and Position the Faculty as a Global Hub for Water Research	CivMin
High Precision Scanning Arm	MIE
Institute for Water Innovation: Path Toward Sustainable and Expanded Operations	IWI
Makerspace Website Project	Faculty-wide
Management Support for the Centre for Management of Technology and Entrepreneurship	ChemE
MIE/ChemE Resources Consolidation to Create a Modernized, Interdisciplinary Fluid Mechanics Laboratory	MIE & ChemE
Next Generation CAMP: Enabling Sustainable Water Resources Experiential Learning for Civil and Mineral Engineers	CivMin
Paint Booth for Student Projects	MIE
Reconciliation Through Engineering Initiative (RTEI)	CGEN
Replacement of ROB301 Lab Robots and Design of New Experiments	UTIAS
ROLE: Realigning Objectives and Learning Experience in the Engineering Science Program	EngSci
The Transparent Lab – Centre for the Quantitative Characterization of Natural and Anthropogenic Materials	CivMin
Toronto Institute of Advanced Manufacturing Pathway to Sustainability and Success: Placing U of T as the Top Advanced Manufacturing Portal in Canada	TIAM
Towards the Global Classroom for Engineering Students (TGCES) - A Model for Enhancing International Exposure	CivMin
U of T Engineering Outreach in Labrador	MSE
U of T Studio for Robot Innovation (U of T RoboNation)	IRM
Wallberg and Older Buildings GHG Modernization	ChemE
XSeed: Expanding Research Impact through Inter-Faculty Collaboration	Faculty-wide

Infrastructure and Facilities

Our Engineering Precinct encompasses 18 buildings across U of T's St. George campus and north of the campus at Downsview, from modern structures such as the Myhal Centre for Engineering Innovation & Entrepreneurship, to historical ones such as the Sandford Fleming Building and Lassonde Mining Building, both of which date back more than a century. (Appendix I provides a map of the Engineering Precinct.) Each of these contain unique research and educational spaces that are critical to our position as the top-ranked engineering school in Canada and among the best in the world.

Figure 11.7 Summary of Buildings and Areas Occupied by the Faculty of Applied Science & Engineering, 2017–2018

Code	Building	Office of the Dean	EngSci	UTIAS	ChemE	CivE & MinE	ECE	IBBME	MIE	MSE	Total NASMs
AS	Aerospace (Downsview)			5,293							5,293
BA	Bahen Centre	1,363	561		67		5,745		1,375		9,111
DC	Donnelly CCBR				667			889			1,556
ES	Earth Sciences				164						164
EA	Engineering Annex	328					936				1,264
EL	Electrometal									149	149
FI	Fields Institute	325									325
GB	Galbraith	1,825				4,886	4,143				10,854
HA	Haultain				198	110			639	720	1,667
	MaRS West Tower						136	791	183		1,110
MB	Lassonde Mining					1,205		1,362	1,886	831	5,284
MC	Mechanical Engineering	63							5,397		5,460
MY	Myhal Centre	5,708									5,708
PT	D.L. Pratt						1,327			1,488	2,815
RS	Rosebrugh							818	2,096		2,914
SF	Sandford Fleming	766		692		1,559	3,546				6,563
WB	Wallberg	573			8,138		130			1,327	10,168
RM	256 McCaul	528									528
	Total Area	11,479	561	5,985	9,234	7,760	15,963	3,860	11,575	4,515	70,933
70,933 NASMs (Net Assignable Square Metre)											

Note 11.7: Opened in April 2018, the Myhal Centre adds 5,708 NASMs to the Faculty's footprint, including 4,860 NASMs of teaching and learning space and 848 NASMs dedicated to student clubs and teams.

Selected Major Infrastructure Highlights, 2008 to 2018

Over the past decade, we dedicated significant efforts and resources to renew and strengthen our infrastructure. These initiatives ensure that our professors and students have access to leading-edge facilities for collaborative and multidisciplinary research and educational initiatives, while respecting and venerating the rich history of our campus. In 2016, we created the Dean's Infrastructure Improvement Fund (DIIF), which enables upgrades to large-scale teaching and research laboratories and general facility renovations that further improve the experience of our students. A further \$19.1 million, matched by \$13.4 million from the federal government's Strategic Investment Fund (SIF), is supporting renovations to 89 laboratory facilities across our Faculty through the Lab Innovation for Toronto (LIFT) project.

Some highlights of the major renovations and updates made to our campus over the past decade to enhance the experience of our community include:



Office of the Dean Relocation (2008–2009)

In 2009, the Office of the Dean relocated from the Galbraith Building to the Bahen Centre, with an entrance located at 44 St. George St., the historic Chadwick House. This

move improved efficiency by consolidating all Dean's Office personnel into a contiguous unit.

Sandford Fleming Atrium (2008–2009)

The Sandford Fleming Atrium serves as an undergraduate student activity hub, study space, event space and an informal fabrication and installation space for student projects. The space underwent significant renovation in 2009 with the replacement of the ceilings and lighting on the lower level, new seating and tables, and the installation of a continuous counter around the perimeter of the central, sunken pit area.



MIE Student Services Centre (2010)

The Department of MIE created a new Student Services Centre adjacent to the main entrance lobby of the Mechanical Engineering Building to consolidate

services for undergraduate and graduate students in a more efficient manner, providing a highly visible and accessible location for students and visitors alike.

Canadian Aerosol Research Network (CARN) (2010–2011)

Renovations in several buildings, including the Wallberg, Mechanical Engineering, and Gage buildings (in conjunction with the Faculty of Medicine) provided infrastructure for new research equipment to expand the CARN capabilities for atmospheric sampling and analysis.

Centre for Microfluidic Systems (2010–2011)

This project included renovations to lab space in the Mechanical Engineering, Pratt, and Lash Miller buildings (in conjunction with Arts & Science) to support new research equipment for microfluidic chemical and materials synthesis.

Goldcorp Mining Innovation Suite (2010–2012)



This project transformed a fourth-floor attic space and added a fifth-floor section to the Lassonde Mining Building, while preserving the historic elements of the century-old heritage structure. It created 100 workstations for mineral and civil engineering students to collaborate on design projects, office space for graduate students, a new seminar/conference room with video-conferencing capability and a lounge/event space. The project also included a new atrium and elevator to improve accessibility and was awarded LEED Gold status.



IBBME Undergraduate Teaching Laboratory (2010–2012)

This project combined two separate clusters of rooms on the third floor of the Lassonde Mining Building into a

single 3,000-square-foot, state-of-the-art wet lab with a self-contained microscope room. Ceiling-mounted screens allow instructors to share video feeds from their microscopes and offer visual instructions to students.

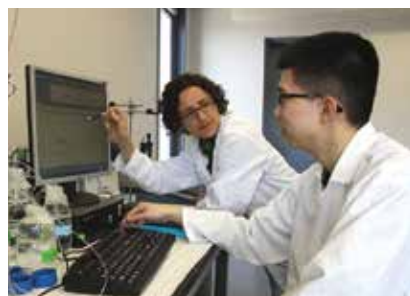
UTIAS Microsatellite Science and Technology Centre (2010–2013)



This facility is housed in an addition to the original UTIAS building at Downsview and has increased the assignable space available by approximately 25%. The Centre accommodates research, fabrication and analysis, enabling graduate students and research associates to work and interact with visiting researchers and industry clients.

BioZone (2010–2014)

This multidisciplinary research centre brings together internationally renowned researchers who use the



most advanced and innovative biotechnology to address urgent societal needs in energy, environment and health. Its facilities are housed on the third (renovated) and fourth (addition

to building) floors of the Wallberg Building, and include specialized equipment for protein production, screening and crystallization, biomanufacturing and fermentation equipment ranging from the microlitre to 100L scale, and mass spectrometry facilities for metabolomics, proteomics and small molecule analysis.

Centre for Industrial Application of Microcellular Plastics (CIAMP) (2012–2013)

Located in Mississauga, CIAMP is a state-of-the-art research and development centre with industry-scale facilities for developing innovative, commercially viable plastic foaming and composite technologies. Officially opened in 2013, the facilities produce lighter, stronger and more cost-effective plastic materials for the automotive and construction industries. It includes industrial-scale extrusion lines and an injection molding machine, complete with an overhead crane, and adds nearly 1,000 square metres of leased space to the Faculty.

Ontario Centre for the Characterization of Advanced Materials (OCCAM) (2013–2016)

An interdisciplinary collaboration between the departments of ChemE and MSE, OCCAM was made possible by strategic investments from the Canada Foundation for



Innovation (CFI), the Ontario Ministry of Research and Innovation, Hitachi High-Technologies Canada and the Faculty. The facility is housed in the Wallberg and Pratt Buildings and includes advanced electron microscopes and leading-edge spectroscopy equipment for imaging, analyzing and manipulating materials with nanometre-scale precision.

Gas Turbine Combustion Research Lab (2014–2018)

Constructed at UTIAS, this facility uses lasers and a pressurized combustion chamber to enable advanced analysis of the gases and fuels used in aircrafts and power generation plants. This research informs the design of next-generation turbines that could improve efficiency or be adapted to run on renewable fuels, all without compromising performance or safety.

Translational Biology & Engineering Program (TBEP) Lab (2015–2016)



TBEP occupies the 14th floor of the MaRS Discovery District West Tower, and includes open-concept research labs, offices and meeting rooms. It serves 130 researchers focused on advanced techniques for studying cardiovascular disease and developing novel

therapies. TBEP is part of the Ted Rogers Centre for Heart Research (TRCHR), which brings together researchers from the Hospital for Sick Children, the University Health Network and the University of Toronto.

Dean's Infrastructure Improvement Fund (DIIF) (2016–present)

The DIIF represents a new strategy to enable upgrades to large-scale teaching and research laboratories and general facility renovations that further improve the experience of our students. These projects are brought forward by the sponsoring departments or institutes, who share the costs 50:50 with the Faculty. Below are selected projects funded under DIIF:

Project	Description
Undergraduate Materials Science Labs	<ul style="list-style-type: none"> Labs in the Wallberg Building are widely used in first-, second- and third-year courses Complete renovation, including new fumehoods, lab benches and moveable furniture
Catapult Innovation Research Space	<ul style="list-style-type: none"> Joint facility for IBBME and the Department of Medical Imaging Upgraded a laboratory facility on the fourth floor of the Rosebrugh Building to Level 2 biosafety standards, including a new fumehood, new lab benches and electrical upgrades
Mechanical Engineering Building Lobby Renovation	<ul style="list-style-type: none"> Enlargement of existing MIE lobby area to reduce congestion and improve access to auditorium Internal divisions within the lobby removed New flooring, new lighting, new seating benches and vestibule and washroom reconfigurations are included
Gull Lake Survey Camp Bunkhouse	<ul style="list-style-type: none"> Located near Minden, Ontario, comprised of multiple structures which support the Civil and Mineral Practicals (CAMP), a field-based experiential learning experience New bunkhouse to accommodate 90 students in an accessible and energy-efficient net zero building
Wallberg Sustainability Lab Addition	<ul style="list-style-type: none"> Located on Wallberg Building's east-end roof Focuses on a broad array of energy challenges, from energy capture to storage, conversion and integration Enriches the graduate student experience through collaboration and innovation of climate change technologies

LIFT projects (2016–present)

In June 2016, the University of Toronto announced the Lab Innovation for Toronto (LIFT) project, which included funding from the federal government through its Post-Secondary Institutions Strategic Investment Fund (SIF).

Combined with contributions from our Faculty, the project contributes more than \$32.5 million to support renovations to 89 laboratory facilities across U of T Engineering, benefitting more than 330 professors, graduate students and undergraduate students. The LIFT project includes:

- Renovations to lab space in the Galbraith, Sandford Fleming and Engineering Annex buildings, including upgraded environmental controls to protect sensitive research equipment.
- New equipment for labs in IBBME, ChemE and MIE, including fumehoods to increase the number of experiments that can be run simultaneously.
- Expansions to the Sustainable Aviation Design Lab at UTIAS to enhance the work of researchers who are reducing emissions and cutting fuel costs in the global aviation industry.



Myhal Centre for Engineering Innovation & Entrepreneurship (2008–2018)

The road to the Myhal Centre began in 2008 with an extensive review of all assigned Faculty space. It was clear that our Faculty

required prototyping facilities, student spaces to foster active and experiential learning, and collaborative research spaces to address complex multidisciplinary challenges. Five potential sites were considered and the parking lot at 55 St. George Street (Site 10) was the final selection.

Our Project Planning Committee included broad participation from the U of T Engineering community, including faculty members, staff and students, and submitted a detailed project-planning report in 2012. Our priorities were to build a functional, flexible and energy-efficient building with leading-edge learning and research spaces that would promote innovation and new partnerships. The official groundbreaking ceremony took place in June 2015, and the project was completed in 2018.

The Faculty's 18th building sets a new standard in engineering education and research. It is designed to foster key engineering qualities such as collaboration across disciplines, experiential learning, leadership and entrepreneurship. Generous donations by supporters, alumni and students have resulted in more than 40 named spaces, including technology enhanced active learning rooms, fabrication facilities, design studios and dedicated space for student clubs and teams. This new building was officially opened on April 27, 2018. On September 13, 2018, we will host an open house to celebrate the Myhal Centre with the entire U of T Engineering community, including alumni, students, staff, faculty and donors. *(For more on the Myhal Centre, see page 7.)*

Faculty of Applied Science & Engineering Academic Area Terms

Academic Area	For the purpose of this annual report, Academic Area refers to the following departments, divisions and institutes: UTIAS, IBBME, ChemE, CivMin, ECE, EngSci, MIE and MSE. While TrackOne is not an academic unit, it is also included as an academic area in specific contexts in Chapter 1: Undergraduate Studies.
ChemE	Department of Chemical Engineering & Applied Chemistry Graduates who studied the discipline of Chemical Engineering are also designated as ChemE.
CivE	Graduates who studied the discipline of Civil Engineering from the Department of Civil & Mineral Engineering (CivMin)
CivMin	Department of Civil & Mineral Engineering
CompE	Graduates of The Edward S. Rogers Sr. Department of Electrical & Computer Engineering (ECE) who studied the discipline of Computer Engineering.
ElecE	Graduates of The Edward S. Rogers Sr. Department of Electrical & Computer Engineering (ECE) who studied the discipline of Electrical Engineering.
ECE	The Edward S. Rogers Sr. Department of Electrical & Computer Engineering Graduates of Electrical Engineering are designated as ElecE; graduates of Computer Engineering are designated as CompE.
EngSci	Division of Engineering Science Graduates of this Division are also designated as EngSci.
IBBME	Institute of Biomaterials & Biomedical Engineering Graduates who studied the discipline of Biomedical Engineering are referred to as BioMedE.
IndE	Graduates of the Department of Mechanical & Industrial Engineering (MIE) who studied the discipline of Industrial Engineering.
MechE	Graduates of the Department of Mechanical & Industrial Engineering (MIE) who studied the discipline of Mechanical Engineering.
MIE	Department of Mechanical & Industrial Engineering Graduates of Mechanical Engineering are designated as MechE; graduates of Industrial Engineering are designated as IndE.
MinE	Graduates from the Department of Civil & Mineral Engineering (CivMin) who studied the discipline of Mineral Engineering.
MSE	Department of Materials Science & Engineering Graduates who studied the discipline of Materials Engineering are also designated as MSE.
TrackOne	Undeclared first-year undergraduate studies in Engineering. Upon successful completion of TrackOne, students choose from one of the Engineering undergraduate programs, excluding Engineering Science.
UTIAS	University of Toronto Institute for Aerospace Studies Graduates who studied the discipline of Aerospace Engineering within this Institute are designated as AeroE.

Additional Terms

AAAS	American Association for the Advancement of Science	ELITE	Entrepreneurship, Leadership, Innovation & Technology in Engineering
AAU	Thomson Reuters Association of American Universities	Endowed Chair	Fixed-term chairs created through donor support
ARWU	Academic Ranking of World Universities	EngEd	Engineering Education, graduate-level programs
ASEE	American Society for Engineering Education	ESIP	Engineering Summer Internship Program
BASc	Bachelor of Applied Science	ESOO	Engineering Student Outreach Office
BizSkule	Alumni speaker series	ESROP	Engineering Science Research Opportunities Program
CCR	Co-Curricular Record	FTE	Full-time equivalent
CFI	Canada Foundation for Innovation	GEARS	Guided Engineering Academic Review Sessions
CGEN	Centre for Global Engineering	GECoS	Graduate Engineering Council of Students
CHE	Centre for Healthcare Engineering	G-IFP	Graduate International Foundation Program
CHRP	Collaborative Health Research Projects	GLEE	Girls' Leadership in Engineering Experience
CIE	Centre for International Experience	Gratitude	Fundraising campaign for students
CIHR	Canadian Institutes of Health Research	GTA	Greater Toronto Area
CONNECT	U of T Engineering's online community for alumni, staff, faculty and students	H-index	A measurement of both the productivity and impact of published work based on citations
CRC	Canada Research Chair; the Canadian government invests \$300M per year in Tier 1 renewable chairs held for seven years and Tier 2 chairs held for five years and renewable once	HC	Headcount, or number of degree-seeking students
CREATE	NSERC Collaborative Research and Training Experience program	IEEE	Institute of Electrical and Electronics Engineers
DEEP Summer Academy	Da Vinci Engineering Enrichment Program Summer Academy	IFP	International Foundation Program
DIIF	Dean's Infrastructure Improvement Fund	IRC	Industrial Research Chair; funded jointly by NSERC and industry to enable universities to build on existing strengths or develop research capacity in areas of interest to industry
DSF	Dean's Strategic Fund	ISE	Institute for Sustainable Energy
Eagles' Longhouse	The name of the Faculty's Engineering Indigenous Initiatives Steering Committee	ISTEP	Institute for Studies in Transdisciplinary Engineering Education and Practice
ECN	Engineering Communications Network	IWI	Institute for Water Innovation
ECP	Engineering Communication Program	LIFT	Lab Innovation for Toronto
EDU	Extra-Departmental Unit		
EEDIAG	Engineering Equity, Diversity and Inclusion Action Group		
EIIP	Engineering Instructional Innovation Program		

MASc	Master of Applied Science	TBEP	Translational Biology and Engineering Program
MCP	Multidisciplinary Capstone Projects	TEAL	Technology Enhanced Active Learning
MEng	Master of Engineering	THE	Times Higher Education–Thomson Reuters World University Ranking
MEngCEM	MEng in Cities Engineering & Management	TIAM	Toronto Institute for Advanced Manufacturing
MHSc	Master of Health Science (Clinical Engineering)	T-Program	Transition Program
MY	Myhal Centre for Engineering Innovation & Entrepreneurship	TRCHR	Ted Rogers Centre for Heart Research
NASM	Net Assignable Square Metre	Tri-Agency	Canadian Institutes of Health Research (CIHR), Natural Sciences and Engineering Research Council of Canada (NSERC) and Social Sciences and Humanities Research Council (SSHRC)
NCE	Networks of Centres of Excellence	Troost ILead	Troost Institute for Leadership Education in Engineering
NSBE	National Society of Black Engineers	U15	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
NSERC	Natural Sciences and Engineering Research Council of Canada	UnERD	Undergraduate Engineering Research Day
NTU	National Taiwan University	University Professor	The highest possible rank at U of T, awarded to a maximum of 2% of tenured faculty
OGS	Ontario Graduate Scholarship	UT-IMDI	University of Toronto Institute for Multidisciplinary Design & Innovation
OISE	Ontario Institute for Studies in Education	UTAPS	University of Toronto Advanced Planning for Students
ONWIE	Ontario Network of Women in Engineering	U of T Distinguished Professor	Designed to advance and recognize faculty with highly distinguished accomplishments. This chair is limited to no more than 3% of tenured faculty
OPTIONS	Opportunities for PhDs: Transitions, Industry Options, Networking and Skills	UTTRI	University of Toronto Transportation Research Institute
ORF	Ontario Research Fund	WISE	Women in Science & Engineering
OSAP	Ontario Student Assistance Program	YWIES	Young Women in Engineering Symposium
PASS	Peer-Assisted Study Sessions		
PEY Co-op	Professional Experience Year Co-op Program		
PhD	Doctor of Philosophy		
PPIT	Prospective Professors in Training Program		
PyschEng	Cross-Faculty Collaborative Master's Specialization in Psychology and Engineering		
QS	QS World University Rankings		
SGS	University of Toronto School of Graduate Studies		
Skule™	Refers to the U of T Engineering community		
SSHRC	Social Sciences and Humanities Research Council		
STEM	Science, Technology, Engineering and Mathematics		
SwB	Science without Borders		

Appendices

Appendix A: Student Clubs and Teams

Below is a list of Engineering student clubs and teams, which is referenced in *Chapter 1: Undergraduate Studies*. Beyond the groups presented here, our students also participate in clubs and teams across U of T.

Arts

- Skule™ Arts Festival
- Skule™ Choir
- Skule™ Orchestra
- Skule™ Stage Band
- The Engineers' Poet Society
- U of T Music Clubs Initiative

Athletics

- Skule™ Badminton Club
- Skule™ Cricket Club
- Skule™ Ski Club
- U of T Engineering Iron Dragons
- U of T Ironsports Club
- U of T Sports Analytics Group

Community

- 180 Degrees Consulting
- Bridges to Prosperity
- Engineers Without Borders: U of T Chapter
- Pakistan Development Foundation
- Power to Change U of T
- Project Include
- Rational Capital Investment Fund
- RoboGals: U of T Chapter
- SettleIn
- Student Research Teams
- Suits U
- ThrillX
- Toronto Students for the Advancement of Aerospace (TSAA)
- TrackOne Mentorship Program
- Volunteer Engineering Experience Program
- We4Others

Cultural

- Association of Chinese Engineers
- Bangladeshi Engineering Students' Association
- Indian Engineering Students' Association
- Korean Engineering Students' Association
- Muslim Students' Association
- Pakistan Development Foundation

Design & Competition

- aUToronto
- Blue Sky Solar Racing
- Destination Imagination
- Human-Powered Vehicle Design Team
- International Genetically Engineered Machine (iGEM)
- Mechatronics Design Association
- Neurotech UofT
- Project Holodeck (UTOPH)
- Robotics for Space Exploration (RSX)
- Seismic Design Team
- Spark Design Club
- Supermileage Team
- Troitsky Bridge Building Club
- University of Toronto Aerospace Team
- University of Toronto Chemical Vehicles (UTCV)
- U of T Baja Team
- U of T Biomod Team
- U of T Concrete Canoe Team
- U of T Concrete Toboggan Team
- U of T Formula SAE Racing Team
- U of T Robotics Association
- U of T Space Design Contest
- U of T Steel Bridge Team

Hobby & Special Interest

- Data Science Toronto
- Mine Rescue Club
- Skule™ Dance Club
- Skule™'s Got Talent
- Skule™ Improv
- U of T Emergency First Responders
- U of T Engineering Toastmasters
- University of Toronto Machine Intelligence Student Team (UTMIST)
- University of Toronto Math and Physics Club
- UTFOLD
- U of T Smash
- Skule™ Juggling Club
- Skule™ Smash Bros.

Professional Development & Industry

- ALChemE
- American Society of Mechanical Engineers
- ASHRAE U of T
- Biomedical Engineering Students Association
- Canadian Association of Food Engineers: U of T Chapter
- Canadian Electrical Contractors Association
- Canadian Society for Chemical Engineering
- Canadian Society for Mechanical Engineering
- Canadian Society for Civil Engineering: U of T Chapter
- CECA/NECA Student Chapter
- Club for Undergraduate Biomedical Engineering
- Digital Trinity Labs
- Earthquake Engineering Research Institute (UT-EERI): U of T Student Chapter
- Engineering Finance Association
- Galbraith Society
- Human Factors Interest Group (HFIG)
- Institute of Electrical and Electronics Engineers (IEEE): U of T Student Branch
- Institute of Industrial Engineers: Chapter 0889
- Institute of Transportation Engineers
- Ontario Water Works Association: U of T Student Chapter
- Materials Industry Club
- Math and Physics Club (UTMPC)
- Mechanical Engineering Club
- MIE Mentorship Program
- MechEngage
- National Society of Black Engineers
- Nsight Mentorship
- Nspire Innovation Network
- Materials Industry Club
- Rational Capital Investment Fund
- Society of Petroleum Engineers: U of T Chapter
- Sustainable Engineers Association
- TechXplore
- U of T Business Association
- U of T Consulting Association
- U of T Engineering Finance Association
- UT Industry Insights
- Water Environment Association of Ontario Student Chapter
- Women In Science and Engineering (WISE)

Appendix B: Outreach Programs

Between July 2017 and June 2018, we offered the following pre-university outreach programs, reaching more than 7,500 students from across Ontario, Canada and the world.

Program	Date	Total # of Participants (2017-2018)	Female (2017-2018)	Male (2017-2018)	Audience
DEEP Summer Academy	July 4 - August 5, 2017	449	117	332	Grades 9-12
DEEP Leadership Camp	July 4 - July 29, 2017	43	17	26	Grades 9-12
Jr. DEEP Robotics	July 4 - 7, 2017 & August 8 - 11, 2017	41	25	16	Grades 7-8
Jr. DEEP Math Camp	July 4 - 7, 2017	67	26	41	Grades 3-8
3-Day Leadership Retreat	July 19 - 21, 2017 & July 30 - August 1, 2017	34	24	10	Grades 7-9
Girls' Jr. DEEP	July 10 - 14, 2017	68	68	0	Grades 3-8
ENGage	July 10 - 14, 2017	40	11	29	Grades 3-8
High School Math Academy	July 10 - 23, 2017, July 29 - 30, 2017, & August 12 -13, 2017	50	18	32	Grades 9-12
Jr. DEEP Coding	July 17 - August 4, 2018 & August 14 - 18, 2017	253	60	193	Grades 3-8
Jr. DEEP	July 17 - August 4, 2018 & August 14 - 18, 2017	637	252	385	Grades 3-8
DEEP Repeat	July 29 - August 1, 2017 & August 8 - 11, 2017	115	28	87	Grades 9-12
Go ENG Girl	October 14, 2017	75	75	0	Grades 7-9
Girls' Jr. DEEP Saturdays (Fall)	October 21 - November 4, 2017	73	73	0	Grades 3-8
Engineering a Future Neighbourhood	October 17, 2017	20	20	0	Grades 5-6
Jr. DEEP Saturdays (Fall)	November 11 - 25, 2017	71	15	56	Grades 3-8
Jr. DEEP Math Saturdays (Fall)	November 11 - 25, 2017	24	9	15	Grades 3-8
High School Saturdays (Fall)	October 21 - November 25, 2017	188	63	125	Grades 9-12
Girls' Jr. DEEP Saturdays (Winter)	January 13 - 27, 2018	64	64	0	Grades 3-8
Jr. DEEP Saturdays (Winter)	February 3 - 24, 2018	68	13	55	Grades 3-8
Jr. DEEP Math Saturdays (Winter)	February 3 - 24, 2018	18	10	8	Grades 4
High School Saturdays Winter	January 13 - 27, 2018, February 3 - 24, 2018	155	63	92	Grades 9-12
Ready. Set. Code!	February 20 - 21, 2018	125	63	62	Grades 3-6
DEEP Leadership March Break	March 13 - 15, 2018	31	8	23	Grades 10-11
Jr. DEEP at March Break	March 12 - 16, 2018	75	25	50	Grades 3-8
High School March Break	March 13 - 16, 2018	75	35	40	Grades 9-11
In-School and On-Campus Workshops	May 30 - June 19, 2018	3,488	1,744	1,744	Grades 3-8
Skule™ Kids	June 2, 2018	30	15	15	Grades 3-8
Go North	June 5, 2018	1,200	600	600	Grades 3-8
Total		7,577	2,941	3,436	

Appendix C: Time to Completion for Graduate Students

The following figures indicate the median time to completion for graduating cohorts in each master's and doctoral degree program by academic area for the past decade. Time to completion represents the number of years between a student's initial enrolment in a graduate program and meeting all the requirements for graduation. The data includes only terms in which a student is registered, excluding leaves, lapses and (in most cases) the term in which convocation occurs. Where a student is fast-tracked from the MASc into a PhD, the total time for both programs is counted. Distinguishing full-time (FT), extended full-time (ExtFT) and part-time (PT) MEng students provides greater clarity.

Figure C.1 **University of Toronto Institute for Aerospace Studies**
Time to Completion for Graduate Students, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
PhD	5.3	6.0	7.0	4.7	5.3	5.3	5.7	6.3	5.3	5.0
MASc	2.0	2.0	2.0	2.0	2.0	2.2	2.0	2.0	2.0	2.0
MEng (FT)	1.3	1.2	1.3	1.3	1.0	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)							1.7	1.7	1.7	1.7
MEng (PT)	1.0	1.8			1.7	1.3	2.0	2.3	3.0	3.0

Figure C.2 **Institute of Biomaterials & Biomedical Engineering**
Time to Completion for Graduate Students, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
PhD	4.3	4.3	6.0	5.7	5.0	5.0	6.0	5.7	5.2	5.3
MASc	2.2	2.0	2.0	2.0	2.0	2.0	2.3	2.0	2.0	2.3
MEng (FT)										1.0
MHSc (FT)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

Figure C.3 **Department of Chemical Engineering & Applied Chemistry**
Time to Completion for Graduate Students, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
PhD	5.0	5.3	6.0	5.3	5.2	5.5	5.7	5.7	5.5	5.8
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.3	2.0	2.0
MEng (FT)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)							1.5	1.7	1.7	1.7
MEng (PT)	3.7	2.2	1.8	1.3	2.0	2.0	1.8	1.5	2.0	1.7

Figure C.4 **Department of Civil & Mineral Engineering**
Time to Completion for Graduate Students, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
PhD	5.0	5.0	5.3	5.3	5.3	5.0	5.3	5.3	5.7	5.0
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
MEng (FT)	1.0	1.0	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)							1.3	1.7	1.3	1.3
MEng (PT)	1.7	2.0	2.3	1.8	2.0	2.0	1.7	2.0	2.2	2.0
MEngCEM (FT)							1.3	1.3	1.3	1.3
MEngCEM (Ext FT)										1.3

Figure C.5 **The Edward S. Rogers Sr. Department of Electrical & Computer Engineering**
Time to Completion for Graduate Students, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
PhD	4.7	4.7	5.0	5.2	5.5	5.3	5.0	5.0	5.3	5.0
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.3	2.0	2.0	2.3
MEng (FT)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)							1.3	1.3	1.3	1.7
MEng (PT)	2.0	3.0	2.7	2.0	2.2	2.0	2.0	2.0	2.3	2.7

Figure C.6 **Department of Mechanical & Industrial Engineering**
Time to Completion for Graduate Students, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
PhD	4.7	4.0	4.7	5.0	5.7	5.0	4.8	5.0	4.7	5.0
MASc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
MEng (FT)	1.0	1.3	1.0	1.3	1.0	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)							1.7	1.7	1.7	1.7
MEng (PT)	2.3	2.3	2.0	2.0	2.0	2.0	2.0	1.7	2.3	2.0
MEngDM (PT)	3.3	2.7	2.3	2.7	2.5	2.7	2.3	3.5	2.8	3.0

Figure C.7 **Department of Materials Science & Engineering**
Time to Completion for Graduate Students, 2008–2009 to 2017–2018

	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
PhD	4.0	5.3	6.0	6.3	5.7	4.7	5.3	5.5	5.8	5.3
MASc	1.7	2.0	2.0	2.0	2.0	2.3	2.0	2.0	2.0	2.0
MEng (FT)	1.5	1.7		0.8	1.0	1.0	1.0	1.0	1.0	1.0
MEng (Ext FT)							1.3	1.7	1.7	1.7
MEng (PT)	1.3	2.0	2.3	2.3	2.0	2.7	2.8			

Note: Based on Ontario Council of Graduate Studies (OCGS) data from ROSI. Data reflects median values based on the total number of terms in which a student is registered.

Appendix D: Chairs and Professorships

Our Faculty is home to 120 chairholders including one Canada Research Chair that is approved but under embargo at the time of publication. The following list reflects several types of chairs and professorships, including: Canada Research Chair; Endowed Chair; Industrial Research Chair; U of T Distinguished Professor; University Professor; Dean's Catalyst Professor; Dean's Emerging Innovation in Teaching Professor; and Dean's Spark Professor.

Figure D.1 Research Chairs, 2017–2018

Title	Chairholder	Sponsor	Tier	Dep't
Alumni Chair in Bioengineering	Cristina Amon	Endowed		MIE
Bahen/Tanenbaum Chair in Civil Engineering	Jeffrey Packer	Endowed		CivMin
Bahen/Tanenbaum Chair in Civil Engineering	Michael Collins	Endowed		CivMin
Bell Canada Chair in Multimedia	Kostas Plataniotis	Endowed		ECE
Bell Canada Chair in Software Engineering	Michael Stumm	Endowed		ECE
Bell University Labs Chair in Computer Engineering	Baochun Li	Endowed		ECE
Canada Research Chair in Advanced Catalysis for Sustainable Chemistry	Cathy Chin	NSERC	Tier 2	ChemE
Canada Research Chair in Anaerobic Biotechnology	Elizabeth Edwards	NSERC	Tier 1	ChemE
Canada Research Chair in Turbulent Reacting Flow	Adam Steinberg	NSERC	Tier 2	UTIAS
Canada Research Chair in Cellular Hybrid Materials	Glenn Hibbard	NSERC	Tier 2	MSE
Canada Research Chair in Computational Modelling and Design Optimization 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 Endogenous Repair	Penney Gilbert	NSERC	Tier 2	IBBME
Canada Research Chair in Environmental Engineering and Stable Isotopes	Elodie Passeport	NSERC	Tier 2	ChemE, CivMin
Canada Research Chair in Freight Transportation and Logistics	Matthew Roorda	NSERC	Tier 2	CivMin
Canada Research Chair in Engineered Soft Materials and Interfaces	Arun Ramchandran	NSERC	Tier 2	MIE
Canada Research Chair in Functional Cardiovascular Tissue Engineering	Milica Radisic	NSERC	Tier 2	IBBME, ChemE
Canada Research Chair in Human Factors and Transportation	Birsen Donmez	NSERC	Tier 2	MIE
Canada Research Chair in Information Processing and Machine Learning	Brendan Frey	NSERC	Tier 1	ECE
Canada Research Chair in Information Theory and Wireless Communications	Wei Yu	NSERC	Tier 1	ECE
Canada Research Chair in Integrated Photonic Devices	Joyce Poon	NSERC	Tier 2	ECE
Canada Research Chair in Micro and Nano Engineering Systems	Yu Sun	NSERC	Tier 2	MIE
Canada Research Chair in Microfluidics and Energy	David Sinton	NSERC	Tier 1	MIE
Canada Research Chair in Modelling of Electrical Interconnects	Piero Triverio	NSERC	Tier 2	ECE
Canada Research Chair in Nano- and Micro-Structured Electromagnetic Materials and Applications	George Eleftheriades	NSERC	Tier 1	ECE
Canada Research Chair in Nanotechnology	Edward Sargent	NSERC	Tier 1	ECE
Canada Research Chair in Network Information Theory	Ashish Khisti	NSERC	Tier 2	ECE
Canada Research Chair in Novel Optimization and Analytics in Health	Timothy Chan	NSERC	Tier 2	MIE
Canada Research Chair in Organic Optoelectronics	Zheng-Hong Lu	NSERC	Tier 1	MSE
Canada Research Chair in Quantitative Cell Biology and Morphogenesis	Rodrigo Fernandez-Gonzalez	NSERC	Tier 2	IBBME
Canada Research Chair in Robots for Society	Goldie Nejat	NSERC	Tier 2	MIE
Canada Research Chair in Secure and Reliable Computer Systems	Olivier Trescases	NSERC	Tier 2	ECE
Canada Research Chair in Seismic Resilience of Infrastructure	Constantin Christopoulos	NSERC	Tier 2	CivMin
Canada Research Chair in Nanobioengineering	Warren Chan	NSERC	Tier 1	IBBME
Canada Research Chair in Thermofluidics for Clean Energy	Aimy Bazylak	NSERC	Tier 2	MIE

Title	Chairholder	Sponsor	Tier	Dep't
Canada Research Chair in Tissue Engineering	Molly Shoichet	NSERC	Tier 1	ChemE, IBBME
Canada Research Chair in Transportation and Air Quality	Marianne Hatzopoulou	NSERC	Tier 2	CivMin
Celestica Chair in Materials for Microelectronics	Doug Perovic	Endowed		MSE
Chair in Information Engineering	Joseph Paradi	Endowed		MIE
Clarice Chalmers Chair of Engineering Design	Greg Jamieson	Endowed		MIE
Claudette MacKay-Lassonde Chair in Mineral Engineering	Lesley Warren	Endowed		CivMin
Dusan and Anne Miklas Chair in Engineering Design	Paul Chow	Endowed		ECE
Dean's Catalyst Professor	Amy Bilton			MIE
Dean's Catalyst Professor	Arthur Chan			ChemE
Dean's Catalyst Professor	Kinnor Chattopadhyay			MSE
Dean's Catalyst Professor	Eric Diller			MIE
Dean's Catalyst Professor	Jennifer Drake			CivMin
Dean's Catalyst Professor	Jonathan Kelly			UTIAS
Dean's Catalyst Professor	Edmond W.K. Young			MIE
Dean's Emerging Innovation in Teaching Professor	Chris Boumeester			IBBME
Dean's Emerging Innovation in Teaching Professor	Ariel Chan			ChemE
Dean's Emerging Innovation in Teaching Professor	Jennifer Farmer			ChemE
Dean's Emerging Innovation in Teaching Professor	Dawn Kilkenny			IBBME
Dean's Emerging Innovation in Teaching Professor	Elham Marzi			ISTEP
Dean's Emerging Innovation in Teaching Professor	Patricia Sheridan			Troost ILead
Dean's Emerging Innovation in Teaching Professor	Hamid Timorabadi			ECE
Dean's Emerging Innovation in Teaching Professor	Chirag Variawa			ISTEP
Dean's Spark Professor	Fae Azhari			CivMin, MIE
Dean's Spark Professor	Giselle Azimi			ChemE
Dean's Spark Professor	Erin Bobicki			MSE, ChemE
Dean's Spark Professor	Merve Bodur			MIE
Dean's Spark Professor	Hai-Ling (Margaret) Cheng			IBBME, ECE
Dean's Spark Professor	Mason Ghafghazi			CivMin, MIE
Dean's Spark Professor	Alison Olechowski			MIE, Troost ILead
Dean's Spark Professor	Daniel Posen			CivMin
Dean's Spark Professor	Scott Sanner			MIE
Dean's Spark Professor	Shoshanna Saxe			CivMin
Dean's Spark Professor	Marianne Touchie			CivMin, MIE
Dean's Spark Professor	Yu Zou			MSE
Edward S. Rogers Sr. Chair in Engineering	Brendan Frey	Endowed		ECE
Erwin Edward Hart Professor in Chemical Engineering and Applied Chemistry	Alison McGuigan	Endowed		ChemE
Erwin Edward Hart Professor in Civil Engineering	Daman Panesar	Endowed		CivMin
Erwin Edward Hart Professor in Materials Science and Engineering	Chandra Veer Singh	Endowed		MSE
Erwin Edward Hart Professor in Mechanical and Industrial Engineering	Tobin Filleter	Endowed		MIE
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	Mansoor Barati	Endowed		MSE
J. Armand Bombardier Foundation Chair in Aerospace Flight	Chris Damaren	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 Chair in Multidisciplinary Engineering Design	Kamran Behdinan	NSERC		MIE

Title	Chairholder	Sponsor	Tier	Dep't
NSERC Industrial Research Chair in Nanomaterials and Nanomedicine (with Johnson & Johnson Medical Products)	Frank Gu	NSERC		ChemE
NSERC Industrial Research Chair in Source Water Quality Monitoring and Advanced/Emerging Technologies for Drinking Water Treatment	Robert Andrews	NSERC		CivMin
NSERC Industrial Research Chair in Technologies for Drinking Water Treatment	Ron Hofmann	NSERC		CivMin
NSERC Industrial Research Chair in the Role and Fate of Inorganics in the Industrial Processing of Woody Biomass	Nikolai DeMartini	NSERC		ChemE
NSERC/Altera Industrial Research Chair in Programmable Silicon	Vaughn Betz	NSERC/Altera		ECE
NSERC/Cement Association of Canada Industrial Research Chair in Concrete Durability and Sustainability	Doug Hooton	NSERC/CAC		CivMin
NSERC-Energi Simulation Industrial Research Chair and Foundation CMG Industrial Research Chair in Fundamental Petroleum Rock Physics and Rock Mechanics	Giovanni Graselli	NSERC/Energi Simulation		CivMin
NSERC/NanoXplore Industrial Research Chair in Multifunctional Graphene-based Nanocomposites and Foams	Chul Park	NSERC/NanoXplore		MIE
NSERC/P&WC Industrial Research Chair in Aviation Gas Turbine Combustion/Emissions Research and Design System Optimization	Sam Sampath	NSERC/P&WC		UTIAS
NSERC/UNENE Industrial Research Chair in Corrosion Control and Materials Performance in Nuclear Power Systems	Roger Newman	NSERC/UNENE		ChemE
Percy Edward Hart Professor in Aerospace Engineering	Philippe Lavoie	Endowed		UTIAS
Percy Edward Hart Professor in Biomaterials and Biomedical Engineering	Jonathan Rocheleau	Endowed		IBBME
Percy Edward Hart Professor in Electrical and Computer Engineering	Natalie Enright Jerger	Endowed		ECE
Pierre Lassonde Chair in Mining Engineering	John Hadjigeorgiou	Endowed		CivMin
Robert M. Smith Chair in Geotechnical Mine Design and Analysis	Murray Grabinsky	Endowed		CivMin
Skoll Chair in Computer Networks and Enterprise Innovation	Elvino Sousa	Endowed		ECE
Skoll Chair in Software Engineering	Jason Anderson	Endowed		ECE
Stanley Ho Professorship in Microelectronics	Sorin Voinigescu	Endowed		ECE
The Stanley L. Meek Chair in Advanced Nanotechnology	Harry Ruda	Endowed		MSE
U of T Distinguished Professor in Global Engineering	Yu-Ling Cheng			ChemE
U of T Distinguished Professor in Plasma Engineering	Javad Mostaghimi			MIE
U of T Distinguished Professor of Digital Communications	Frank Kshischang			ECE
U of T Distinguished Professor of Mechanobiology	Craig Simmons			MIE, IBBME
U of T Distinguished Professor of Microcellular Engineered Plastics	Chul Park			MIE
U of T Distinguished Professor of Nanobioengineering	Warren Chan			IBBME
U of T Distinguished Professor of Urban Systems Engineering	Mark Fox			MIE
U of T Distinguished Professor of Computational Aerodynamics and Sustainable Aviation	David Zingg			UTIAS
U of T Distinguished Professor in Forest Biomaterials Engineering	Ning Yan			ChemE
University Professor	Michael Collins			CivMin
University Professor	Edward Sargent			ECE
University Professor	Michael Sefton			ChemE
University Professor	Molly Shoichet			ChemE, IBBME
University Professor	Peter Zandstra			IBBME
Velma M. Rogers Graham Chair in Engineering	George Eleftheriades	Endowed		ECE
W. M. Keck Chair in Engineering Rock Mechanics	John Harrison	Endowed		CivMin
Wallace G. Chalmers Chair of Engineering Design	Axel Guenther	Endowed		MIE

Appendix E: Research Funding by Academic Area

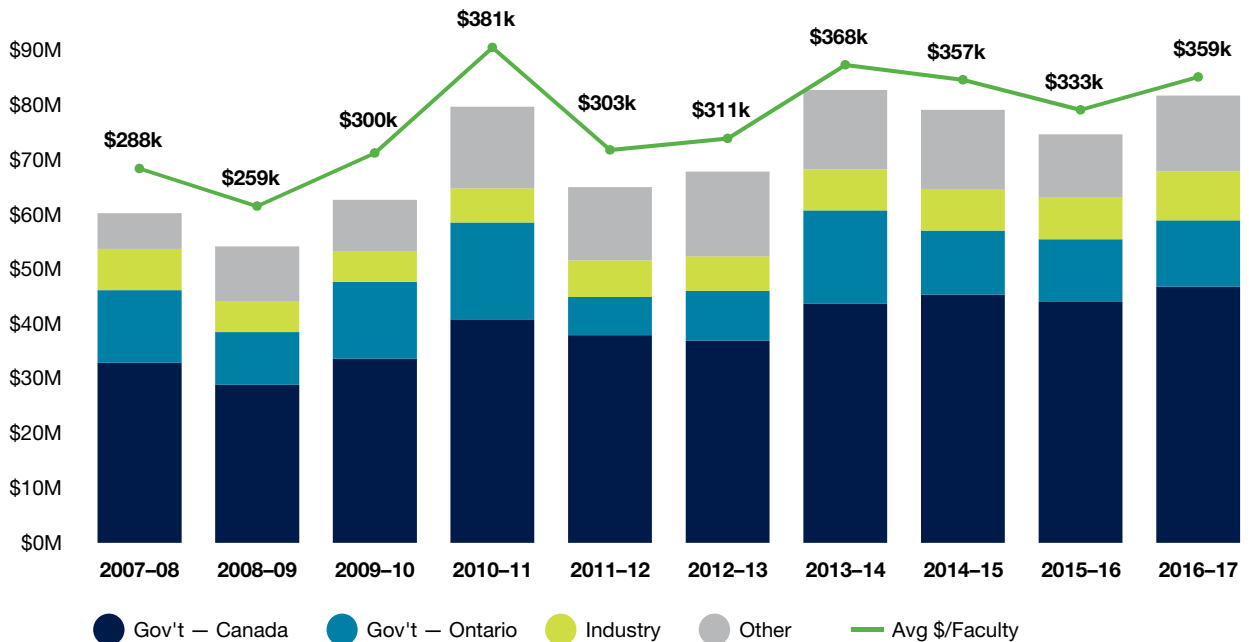
Figure E.1 shows our Faculty's total research funding, including operating and infrastructure.

Figures E.2 to E.8 in this appendix show research operating funding by department and institute over the last decade. This data excludes 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

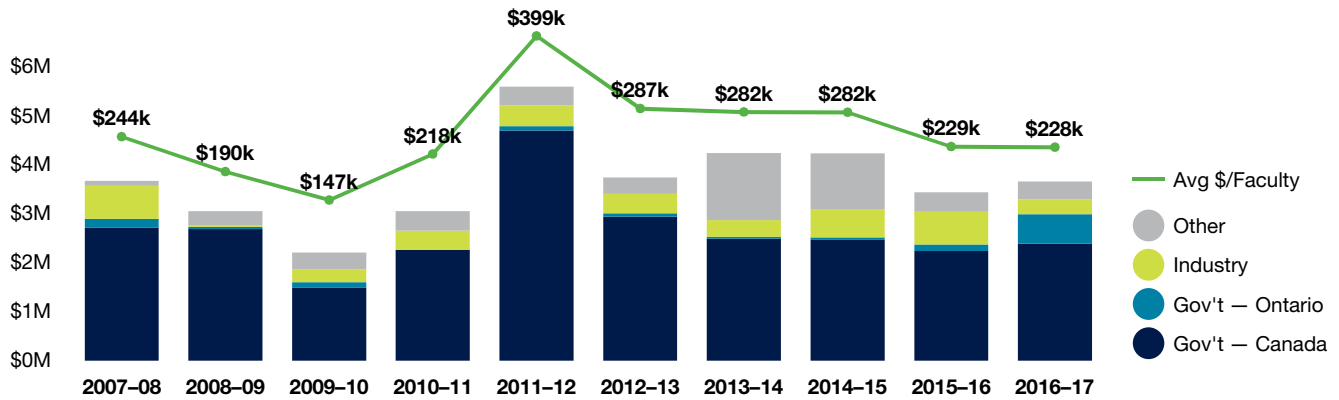
Data is based on grant years (April to March). For example, 2012–13 represents the granting cycle starting in April 2012 and ending in March 2013.

Figure E.1 University of Toronto Faculty of Applied Science & Engineering Total Research Funding by Source and Average Funding per Faculty Member, 2007–2008 to 2016–2017



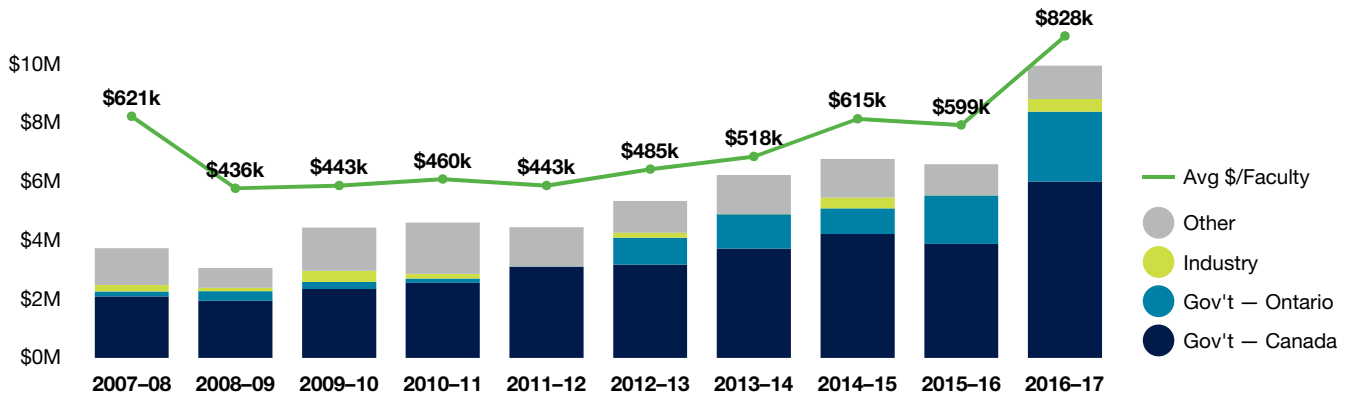
	Gov't - Canada	Gov't - Ontario	Corporate	Other	Total	Avg \$/Faculty
2007-08	\$32,878,393	\$13,319,325	\$7,520,781	\$6,525,854	\$60,244,353	\$288,250
2008-09	\$28,875,913	\$9,661,808	\$5,640,631	\$9,995,737	\$54,174,089	\$259,206
2009-10	\$33,664,583	\$14,040,322	\$5,540,382	\$9,462,900	\$62,708,187	\$300,039
2010-11	\$40,854,389	\$17,729,370	\$6,210,621	\$14,918,995	\$79,713,375	\$381,404
2011-12	\$37,975,721	\$6,973,334	\$6,702,822	\$13,400,263	\$65,052,140	\$302,568
2012-13	\$37,014,570	\$9,035,999	\$6,315,707	\$15,529,396	\$67,895,672	\$311,448
2013-14	\$43,706,453	\$17,068,393	\$7,490,891	\$14,522,410	\$82,788,147	\$367,947
2014-15	\$45,405,255	\$11,653,588	\$7,658,869	\$14,436,376	\$79,154,088	\$356,550
2015-16	\$44,134,372	\$11,368,499	\$7,731,492	\$11,447,261	\$74,681,624	\$333,400
2016-17	\$46,789,940	\$12,183,854	\$8,956,135	\$13,827,596	\$81,757,525	\$358,586

Figure E.2 University of Toronto Institute for Aerospace Studies Research Operating Funding by Source and Average Funding per Faculty Member, 2007–2008 to 2016–2017



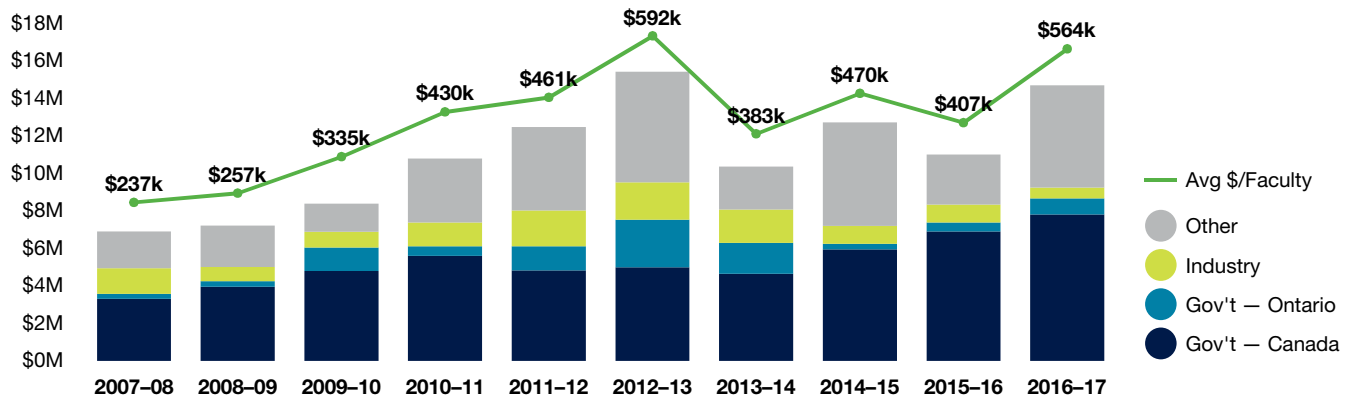
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg \$/Faculty
2007–08	\$2,712,542	\$175,000	\$679,227	\$96,167	\$3,662,936	\$244,196
2008–09	\$2,682,272	\$45,000	\$35,500	\$282,968	\$3,045,740	\$190,359
2009–10	\$1,486,735	\$107,333	\$259,200	\$349,358	\$2,202,626	\$146,842
2010–11	\$2,261,742		\$390,200	\$396,928	\$3,048,870	\$217,776
2011–12	\$4,692,109	\$89,356	\$420,400	\$389,239	\$5,591,104	\$399,365
2012–13	\$2,931,459	\$70,157	\$397,116	\$337,560	\$3,736,292	\$287,407
2013–14	\$2,485,293	\$35,708	\$342,396	\$1,372,126	\$4,235,523	\$282,368
2014–15	\$2,458,871	\$50,000	\$584,609	\$1,130,655	\$4,224,135	\$281,609
2015–16	\$2,232,872	\$130,258	\$674,557	\$396,079	\$3,433,766	\$228,918
2016–17	\$2,382,142	\$603,570	\$303,998	\$362,282	\$3,651,992	\$228,250

Figure E.3 Institute of Biomaterials & Biomedical Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2007–2008 to 2016–2017



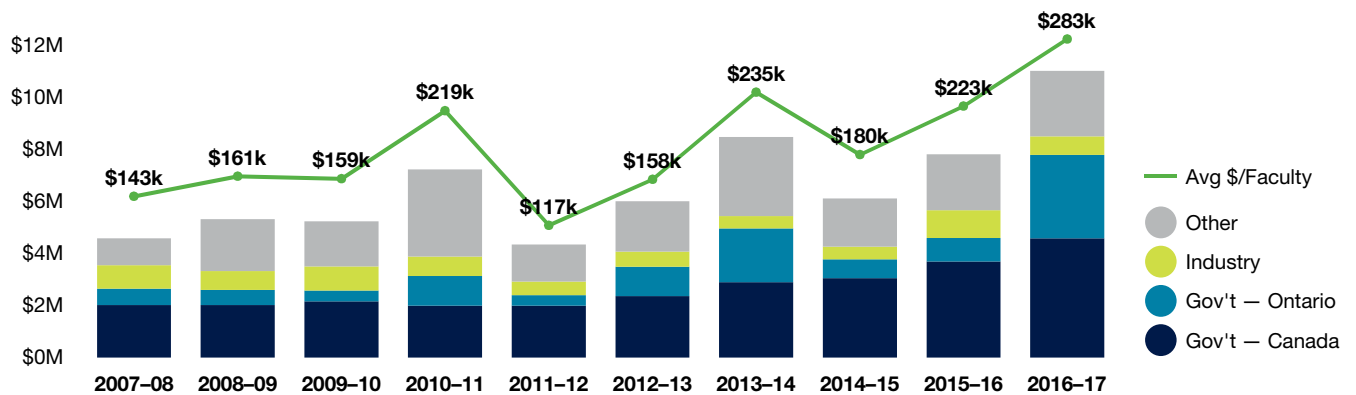
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg \$/Faculty
2007–08	\$2,086,500	\$165,515	\$222,300	\$1,251,056	\$3,725,371	\$620,895
2008–09	\$1,940,671	\$317,147	\$117,411	\$678,498	\$3,053,727	\$436,247
2009–10	\$2,337,302	\$242,228	\$375,037	\$1,476,045	\$4,430,612	\$443,061
2010–11	\$2,548,234	\$142,383	\$160,634	\$1,748,405	\$4,599,656	\$459,966
2011–12	\$3,089,869	\$13,500		\$1,330,768	\$4,434,137	\$443,414
2012–13	\$3,169,604	\$908,280	\$167,789	\$1,088,556	\$5,334,229	\$484,930
2013–14	\$3,711,273	\$1,172,808	\$1,301	\$1,331,778	\$6,217,160	\$518,097
2014–15	\$4,206,908	\$870,159	\$371,689	\$1,311,847	\$6,760,603	\$614,600
2015–16	\$3,865,135	\$1,658,924	\$9,800	\$1,051,699	\$6,585,558	\$598,687
2016–17	\$5,994,976	\$2,375,769	\$427,108	\$1,138,744	\$9,936,597	\$828,050

Figure E.4 Department of Chemical Engineering & Applied Chemistry Research Operating Funding by Source and Average Funding per Faculty Member, 2007–2008 to 2016–2017



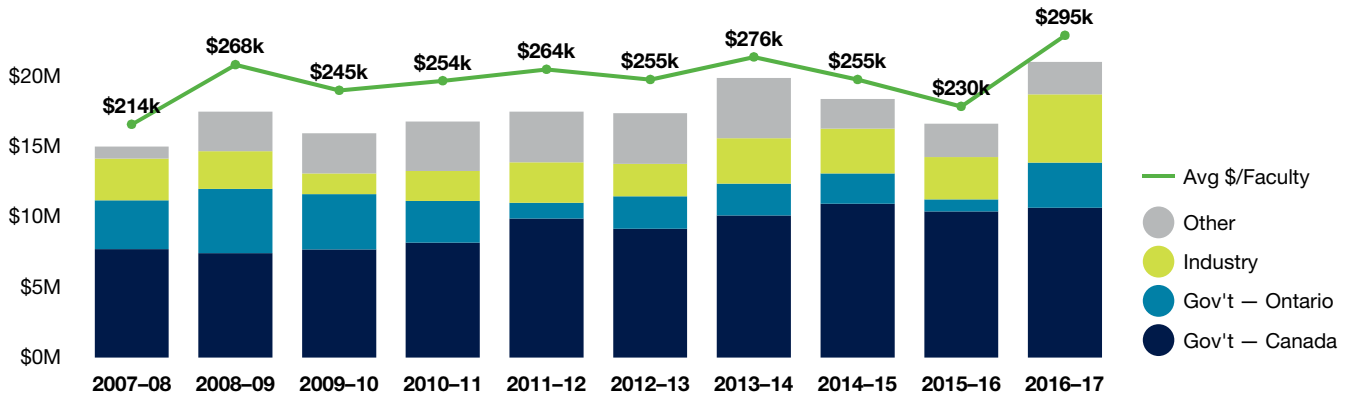
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg \$/Faculty
2007–08	\$3,292,332	\$261,610	\$1,368,550	\$1,961,293	\$6,883,785	\$237,372
2008–09	\$3,934,667	\$299,378	\$757,256	\$2,202,402	\$7,193,703	\$256,918
2009–10	\$4,769,681	\$1,257,813	\$835,642	\$1,500,521	\$8,363,657	\$334,546
2010–11	\$5,578,513	\$514,057	\$1,261,226	\$3,401,819	\$10,755,615	\$430,225
2011–12	\$4,811,759	\$1,283,133	\$1,897,761	\$4,450,643	\$12,443,296	\$460,863
2012–13	\$4,976,349	\$2,527,365	\$1,990,739	\$5,896,678	\$15,391,131	\$591,967
2013–14	\$4,630,511	\$1,644,429	\$1,770,656	\$2,292,755	\$10,338,351	\$382,902
2014–15	\$5,920,118	\$304,274	\$947,271	\$5,509,933	\$12,681,596	\$469,689
2015–16	\$6,884,549	\$470,606	\$957,890	\$2,667,705	\$10,980,750	\$406,694
2016–17	\$7,779,316	\$865,092	\$577,959	\$5,444,469	\$14,666,836	\$564,109

Figure E.5 Department of Civil & Mineral Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2007–2008 to 2016–2017



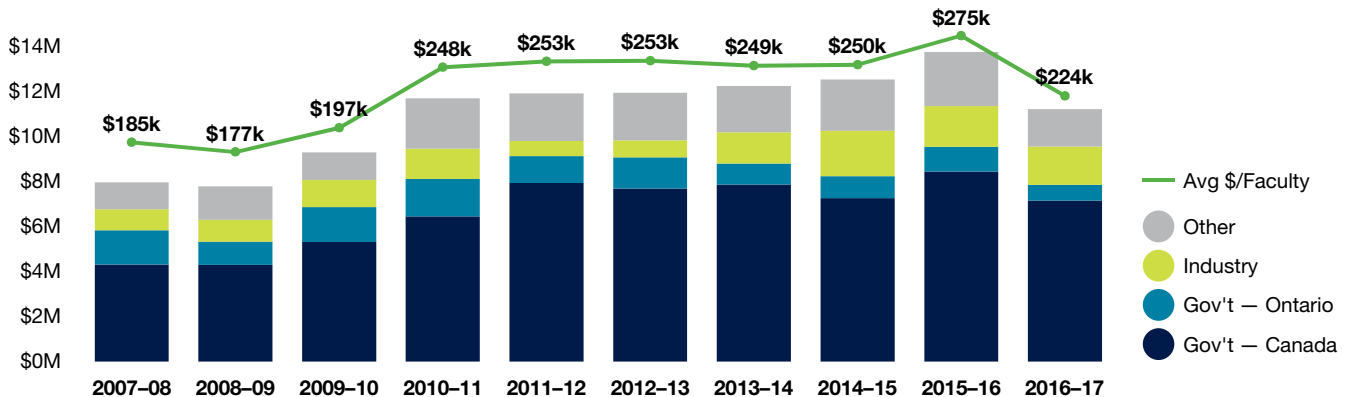
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg \$/Faculty
2007–08	\$2,015,213	\$622,300	\$910,734	\$1,023,094	\$4,571,341	\$142,854
2008–09	\$2,015,779	\$572,670	\$730,460	\$1,988,916	\$5,307,825	\$160,843
2009–10	\$2,154,607	\$412,542	\$931,988	\$1,732,686	\$5,231,823	\$158,540
2010–11	\$1,981,371	\$1,151,073	\$747,127	\$3,345,792	\$7,225,363	\$218,950
2011–12	\$1,991,794	\$402,645	\$515,359	\$1,428,083	\$4,337,881	\$117,240
2012–13	\$2,358,881	\$1,121,005	\$586,088	\$1,941,535	\$6,007,509	\$158,092
2013–14	\$2,892,286	\$2,069,441	\$470,776	\$3,041,895	\$8,474,398	\$235,400
2014–15	\$3,039,003	\$727,716	\$491,188	\$1,857,708	\$6,115,615	\$179,871
2015–16	\$3,680,569	\$906,961	\$1,072,331	\$2,146,656	\$7,806,517	\$223,043
2016–17	\$4,575,199	\$3,207,797	\$715,922	\$2,521,698	\$11,020,616	\$282,580

Figure E.6 The Edward S. Rogers Sr. Department of Electrical & Computer Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2007–2008 to 2016–2017



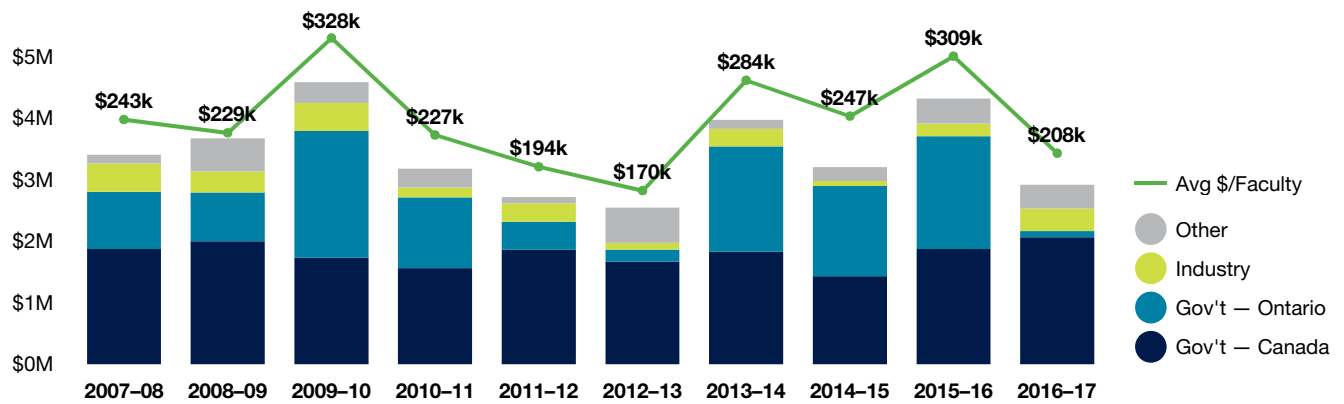
	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg \$/Faculty
2007–08	\$7,687,020	\$3,470,568	\$2,950,516	\$853,280	\$14,961,384	\$213,734
2008–09	\$7,397,769	\$4,551,690	\$2,684,325	\$2,815,615	\$17,449,399	\$268,452
2009–10	\$7,663,706	\$3,923,865	\$1,472,750	\$2,856,764	\$15,917,085	\$244,878
2010–11	\$8,139,058	\$2,962,550	\$2,139,422	\$3,491,863	\$16,732,893	\$253,529
2011–12	\$9,854,328	\$1,107,633	\$2,891,235	\$3,582,326	\$17,435,522	\$264,175
2012–13	\$9,131,379	\$2,300,498	\$2,305,784	\$3,590,130	\$17,327,791	\$254,820
2013–14	\$10,082,197	\$2,250,783	\$3,226,004	\$4,283,350	\$19,842,334	\$275,588
2014–15	\$10,897,608	\$2,160,216	\$3,176,267	\$2,112,100	\$18,346,191	\$254,808
2015–16	\$10,354,379	\$856,013	\$2,998,980	\$2,369,957	\$16,579,329	\$230,268
2016–17	\$10,618,241	\$3,200,489	\$4,860,989	\$2,289,940	\$20,969,659	\$295,347

Figure E.7 Department of Mechanical & Industrial Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2007–2008 to 2016–2017



	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg \$/Faculty
2007–08	\$4,297,951	\$1,519,533	\$924,880	\$1,202,714	\$7,945,078	\$184,769
2008–09	\$4,276,083	\$1,027,566	\$976,457	\$1,488,165	\$7,768,271	\$176,552
2009–10	\$5,289,382	\$1,558,727	\$1,203,710	\$1,212,981	\$9,264,800	\$197,123
2010–11	\$6,432,136	\$1,653,762	\$1,353,512	\$2,225,087	\$11,664,497	\$248,181
2011–12	\$7,912,011	\$1,188,878	\$679,470	\$2,114,704	\$11,895,063	\$253,086
2012–13	\$7,663,486	\$1,387,360	\$757,191	\$2,105,662	\$11,913,699	\$253,483
2013–14	\$7,842,378	\$929,834	\$1,393,542	\$2,050,831	\$12,216,585	\$249,318
2014–15	\$7,239,600	\$979,827	\$2,007,845	\$2,283,777	\$12,511,049	\$250,221
2015–16	\$8,415,718	\$1,097,935	\$1,812,219	\$2,406,525	\$13,732,397	\$274,648
2016–17	\$7,130,480	\$701,996	\$1,704,959	\$1,657,899	\$11,195,334	\$223,907

Figure E.8 Department of Materials Science & Engineering Research Operating Funding by Source and Average Funding per Faculty Member, 2007–2008 to 2016–2017



	Gov't – Canada	Gov't – Ontario	Corporate	Other	Total	Avg \$/Faculty
2007–08	\$1,873,042	\$927,585	\$464,574	\$138,250	\$3,403,451	\$243,104
2008–09	\$1,995,563	\$796,601	\$339,222	\$539,173	\$3,670,559	\$229,410
2009–10	\$1,729,347	\$2,059,894	\$462,055	\$334,545	\$4,585,841	\$327,560
2010–11	\$1,561,829	\$1,150,973	\$158,500	\$309,101	\$3,180,403	\$227,172
2011–12	\$1,860,686	\$453,820	\$298,597	\$104,500	\$2,717,603	\$194,115
2012–13	\$1,666,249	\$196,359	\$111,000	\$569,275	\$2,542,883	\$169,526
2013–14	\$1,826,773	\$1,711,981	\$286,216	\$149,675	\$3,974,645	\$283,903
2014–15	\$1,430,343	\$1,464,291	\$80,000	\$230,356	\$3,204,990	\$246,538
2015–16	\$1,870,628	\$1,835,138	\$205,715	\$408,640	\$4,320,121	\$308,580
2016–17	\$2,063,027	\$99,500	\$365,200	\$387,309	\$2,915,036	\$208,217

Appendix F: Spinoff Companies

Est.	Company Name	Engineering Affiliation	Department
2017	Mesosil	Cameron Stewart	IBBME
2017	Phycus Biotechnologies	Vik Pandit	ChemE
2017	BIM2Network	Tamir El-Diraby	CivMin
2017	Phenomic AI	Oren Kraus	ECE
2016	2488138 Ontario Inc.	Roman Genov	ECE
2016	Ardra Bio Inc.	Radhakrishnan Mahadevan	ChemE
2016	Crowd2Know Inc.	Tamer El-Diraby	CivMin
2016	Hammock Pharmaceuticals Inc.	Molly Soichet & Michael Cooke	ChemE
2016	Knitt Labs, Inc. (formerly FlexCube Technology Inc.)	Shuze Zhao	ECE
2016	LegUp Computing Inc.	Jason Anderson & Stephen Brown	ECE
2016	Polumiros Inc.	Soror Sharifpoor & Kyle Battiston	IBBME
2016	Sheba Microsystems Inc.	Ridha Ben Mrad & Faez BaTis	MIE
2016	Sonare Inc.	David Steinman & Luis Aguilar	MIE
2015	Appulse Inc. (formerly ICE3 Power Technologies Inc.)	Aleksander Prodic	ECE
2015	Deep Genomics Inc.	Brendan Frey	ECE
2015	Enhanced Biomodulation Technologies Inc.	Paul Yoo	IBBME
2015	ExCellThera Inc.	Peter Zandstra	IBBME
2015	Onyx Motion Inc.	Marissa Wu	IBBME
2015	Tara Biosystems, Inc.	Milica Radisic	IBBME, ChemE
2014	Arrowonics Inc.	Hugh Liu	UTIAS
2014	Enceladeus Imaging	Steve Mann	ECE
2014	IQBiomedical	David Sinton	MIE
2014	Pragmatek Transport Innovations, Inc.	Baher Abdulhai	CivMin
2014	QD Solar Inc.	Sjoerd Hoogland and Ted Sargent	ECE
2014	Sonas Systems Inc.	Joyce Poon	ECE
2014	SpineSonics Medical Inc.	Richard Cobbold	IBBME
2014	Toronto Nano Instrumentation Inc. (TNI Inc.)	Yu Sun	MIE
2014	XCellPure Inc.	Milica Radisic	IBBME, ChemE
2014	XTouch Inc.	Parham Aarabi	ECE
2013	CoursePeer	Hadi Aladdin	ECE
2013	eQOL Inc.	Binh Nguyen	ECE
2013	Kydo Engineering	John Ruggieri	ChemE
2013	Whirlscape Inc.	Will Walmsley	MIE
2012	Kinetica Dynamics Inc.	Constantin Christopoulos	CivMin
2012	MyTrak Health Systems	Sean Doherty	CivMin
2012	OTI Lumionics Inc.	Zheng-Hong Lu	MSE
2012	XTT	Parham Aarabi	ECE
2011	Aereus Technologies Inc. (formerly Aereus Wood)	Javad Mostaghimi	MIE
2011	Bionym Inc.	Karl Martin	ECE
2011	Filaser Inc.	Peter Herman	ECE
2011	Luminautics Inc. (formerly Ensi Solutions)	Graham Murdoch	MSE
2011	Nymi (formerly Bionym Inc.)	Karl Martin	ECE
2011	Ojiton Inc.	Tom Chau	IBBME
2011	PRISED Solar Inc.	Wahid Shams-Kolahi	ECE
2011	RenWave	Mohamed Kamh	ECE
2011	Sense Intelligent	Brian Hu	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	Cyodiagnosics	Warren Chan	IBBME
2009	Peraso Technologies Inc.	Sorin Voinescu	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	CivMin
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 Optronics Inc.	Zheng-Hong 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
2002	SiREM	Elizabeth Edwards	ChemE
2001	Fox-Tek	Rod Tennyson	UTIAS
2001	Insception 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 Grynps	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	CivMin
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

Appendix G: Descriptions of Major Awards

Chapter 5: Awards and Honours summarizes the international, national and provincial awards our faculty and alumni received. Below are descriptions of some of those awards and honours.

International

American Association for the Advancement of Science (AAAS) Fellowship – Engineering Section

Recognition of extraordinary achievements across disciplines by a member whose efforts on behalf of the advancement of science or its applications are scientifically or socially distinguished. The AAAS is the world's largest general scientific society.

MIT Top 35 Under 35

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

U.S. National Academies

The National Academies serve (collectively) as the scientific national academy for the United States.

National

Brockhouse Prize

Recognition of outstanding Canadian interdisciplinary research teams for internationally significant achievement in the natural sciences and engineering.

Canadian Academy of Engineering (CAE) Fellowship

Recognition for distinguished achievements and career-long service to the engineering profession.

Engineering Institute of Canada (EIC) Fellowship

Recognition for exceptional contributions to engineering in Canada and for service to the profession and to society.

Engineering Institute of Canada (EIC) Awards

Recognition of outstanding engineers for exemplary contributions to engineering achievement in Canada and the world.

Engineers Canada Awards

Recognition of outstanding Canadian engineers, teams of engineers, engineering projects and engineering students.

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.

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.

Manning Innovation Award

Recognition of Canadian innovators who are improving the lives of Canadians and others around the world through their commercialized innovations.

Royal Society of Canada (RSC) Fellowship

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

Royal Society of Canada (RSC) College of New Scholars, Artists and Scientists

Members are Canadian scholars who, at an early stage in their career, have demonstrated a high level of achievement and excellence.

Steacie Fellowship

Awarded to enhance the career development of outstanding and highly promising scientists and engineers by the Natural Sciences and Engineering Research Council (NSERC).

Steacie Prize

Awarded to a scientist or engineer 40 years of age or less for outstanding scientific research carried out in Canada.

Synergy Award for Innovation

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

Provincial

Ontario Professional Engineers Awards

Awarded to Professional Engineers Ontario members who have contributed substantially to the advancement of the engineering profession in any of its branches.

Ontario Confederation of University Faculty Associations (OCUFA) Teaching Award

Recognition of individuals with exceptional contributions to the higher education community in Ontario, including teaching philosophy, curriculum development and research on university teaching.

Appendix H: Academic Staff by Academic Area

The figures in Appendix H show the composition of our academic staff from 2008–2009 to 2017–2018. Figures H.1a and H.1b provide a Faculty overview and H.2 to H.8 present a detailed analysis by academic area.

Figure H.1a Total Academic Staff by Academic Area, 2008–2009 to 2017–2018

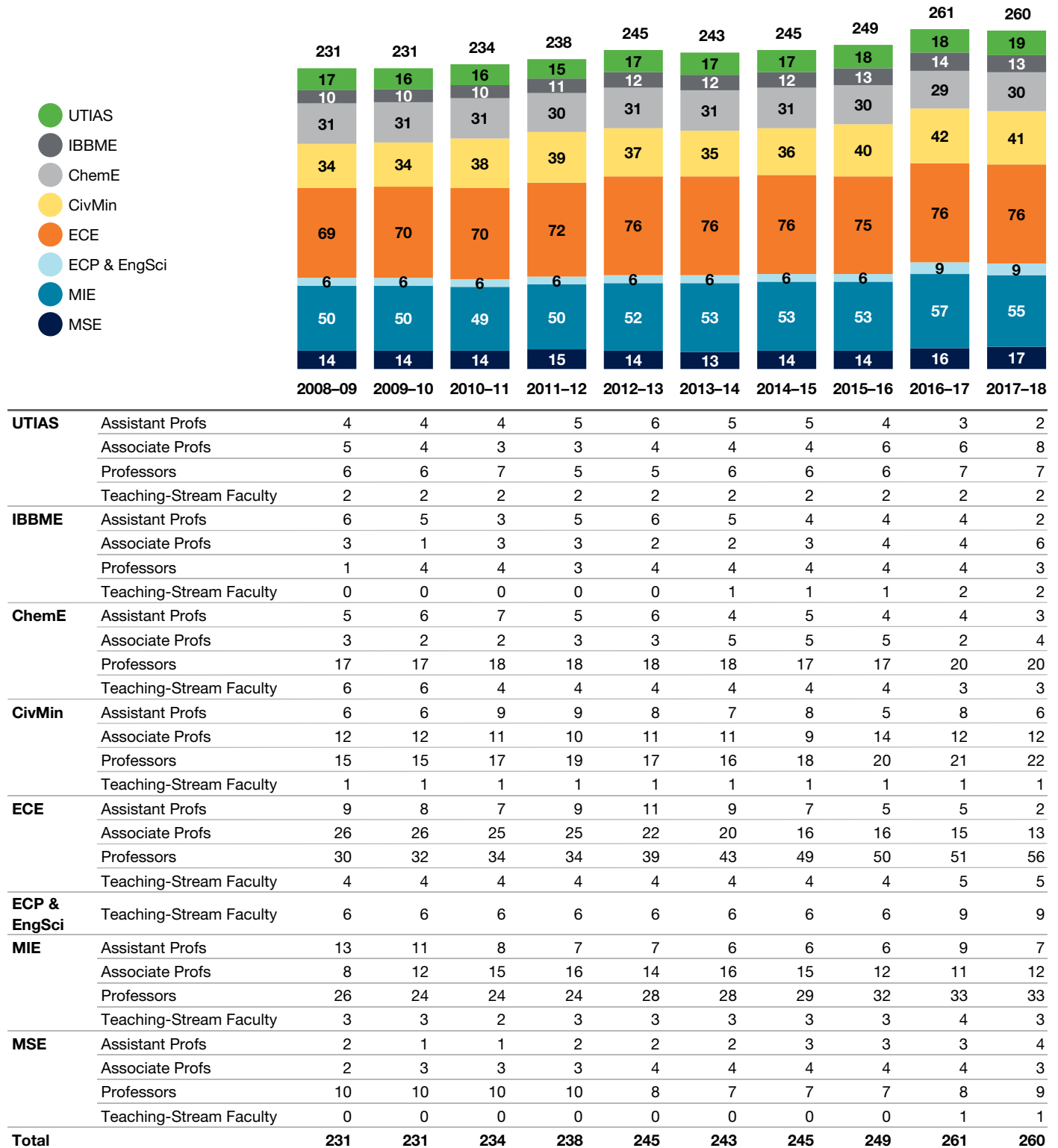


Figure H.1b University of Toronto Faculty of Applied Science & Engineering Total Academic Staff by Position with Percentage of Women, 2008–2009 to 2017–2018

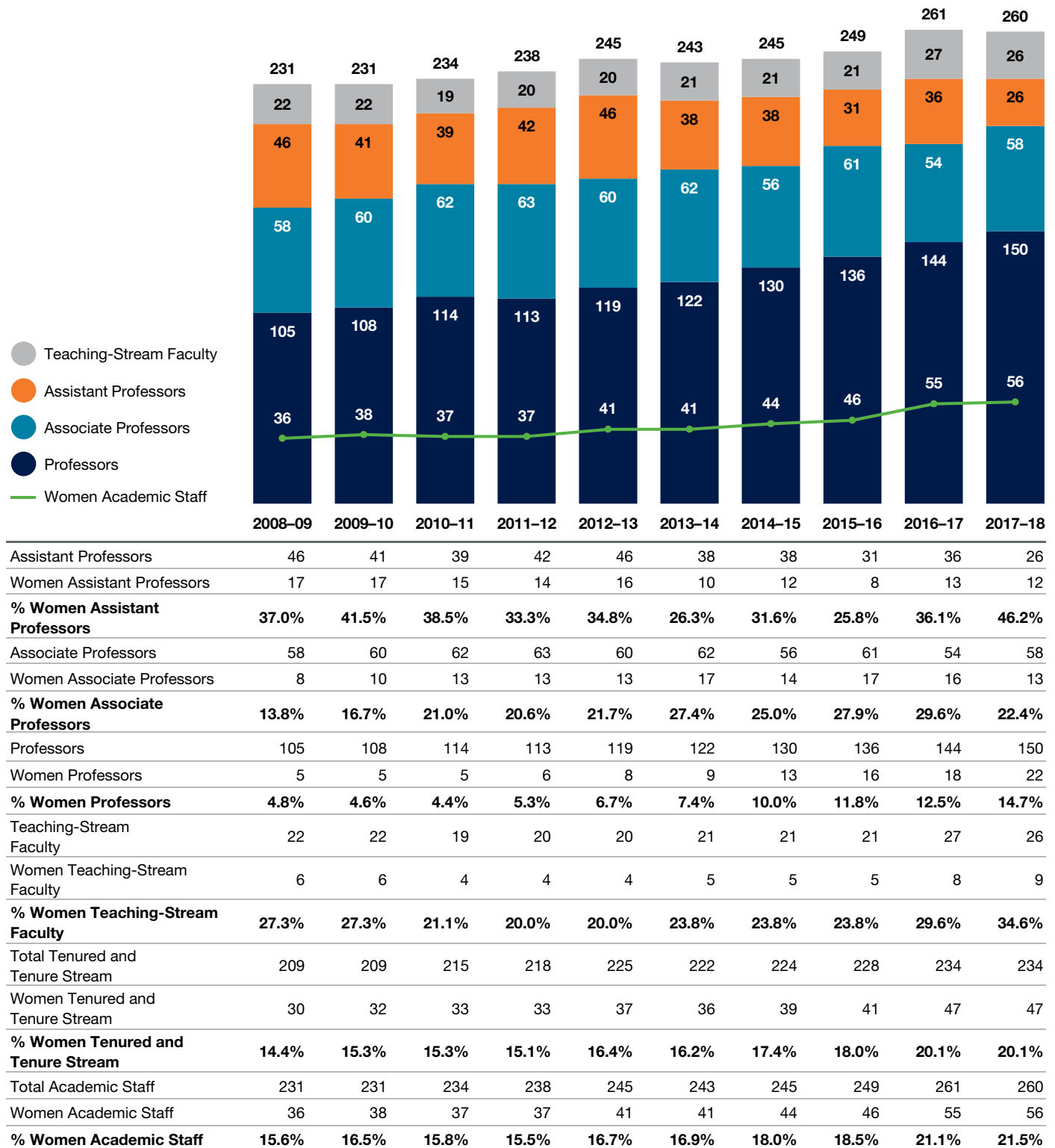
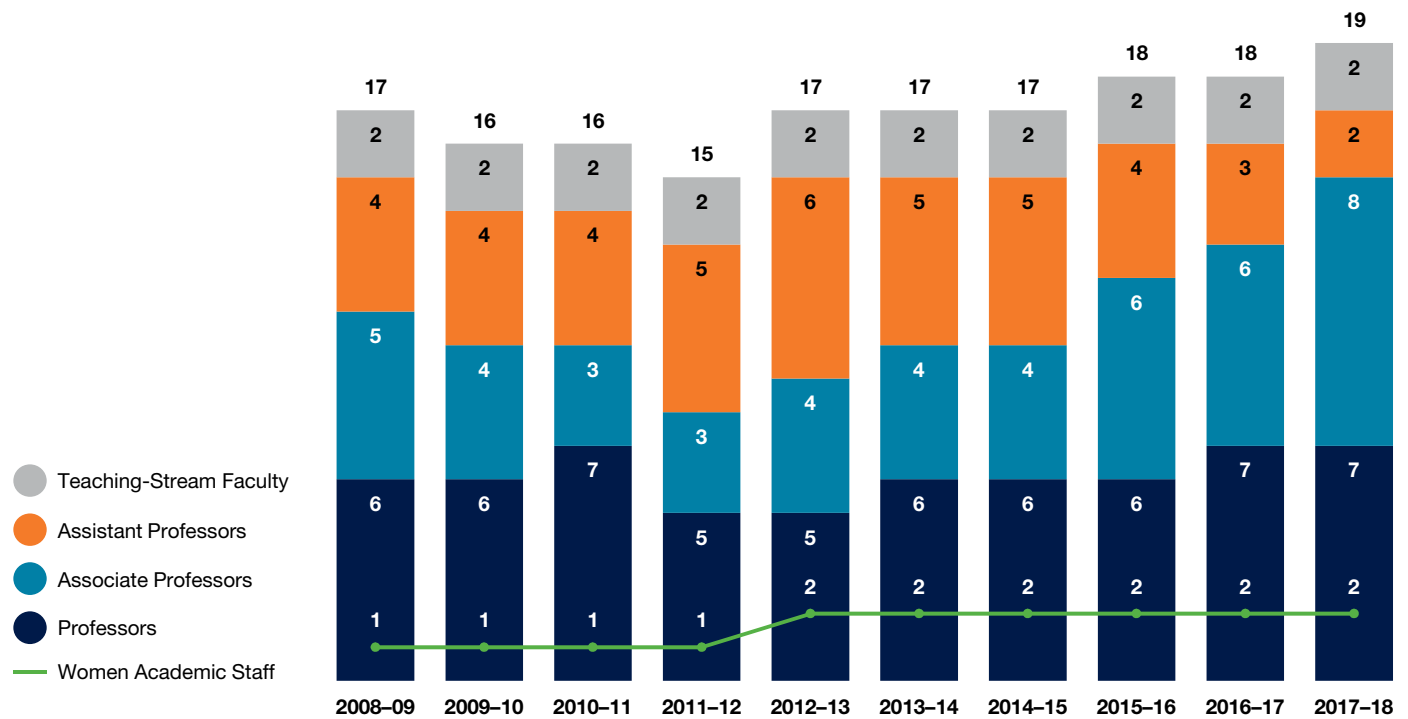


Figure H.2 University of Toronto Institute for Aerospace Studies:
Academic Staff by Position with Percentage of Women, 2008–2009 to 2017–2018



Assistant Professors	4	4	4	5	6	5	5	4	3	2
Women Assistant Professors	1	1	1	1	2	2	2	1	1	1
% Women Assistant Professors	25.0%	25.0%	25.0%	20.0%	33.3%	40.0%	40.0%	25.0%	33.3%	50.0%
Associate Professors	5	4	3	3	4	4	4	6	6	8
Women Associate Professors	0	0	0	0	0	0	0	1	1	1
% Women Associate Professors	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.7%	16.7%	12.5%
Professors	6	6	7	5	5	6	6	6	7	7
Women Professors	0	0	0	0	0	0	0	0	0	0
% Women Professors	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Teaching-Stream Faculty	2	2	2	2	2	2	2	2	2	2
Women Teaching-Stream Faculty	0	0	0	0	0	0	0	0	0	0
% Women Teaching-Stream Faculty	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total Tenured and Tenure Stream	15	14	14	13	15	15	15	16	16	17
Women Tenured and Tenure Stream	1	1	1	1	2	2	2	2	2	2
% Women Tenured and Tenure Stream	6.7%	7.1%	7.1%	7.7%	13.3%	13.3%	13.3%	12.5%	12.5%	11.8%
Total Academic Staff	17	16	16	15	17	17	17	18	18	19
Women Academic Staff	1	1	1	1	2	2	2	2	2	2
% Women Academic Staff	5.9%	6.3%	6.3%	6.7%	11.8%	11.8%	11.8%	11.1%	11.1%	10.5%

Figure H.3 Institute of Biomaterials & Biomedical Engineering:
Academic Staff by Position with Percentage of Women, 2008–2009 to 2017–2018

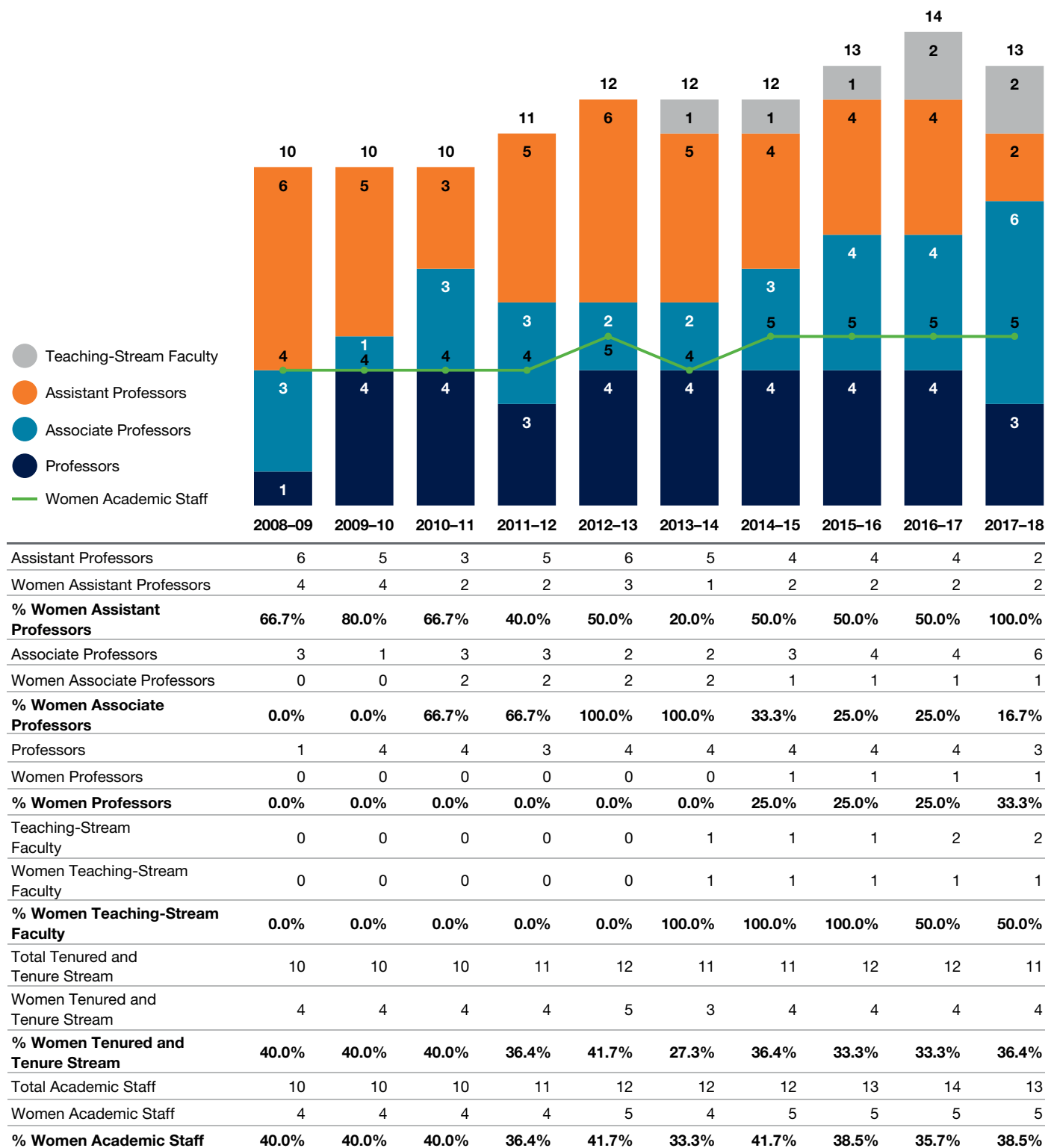


Figure H.4 Department of Chemical Engineering & Applied Chemistry:
Academic Staff by Position with Percentage of Women, 2008–2009 to 2017–2018

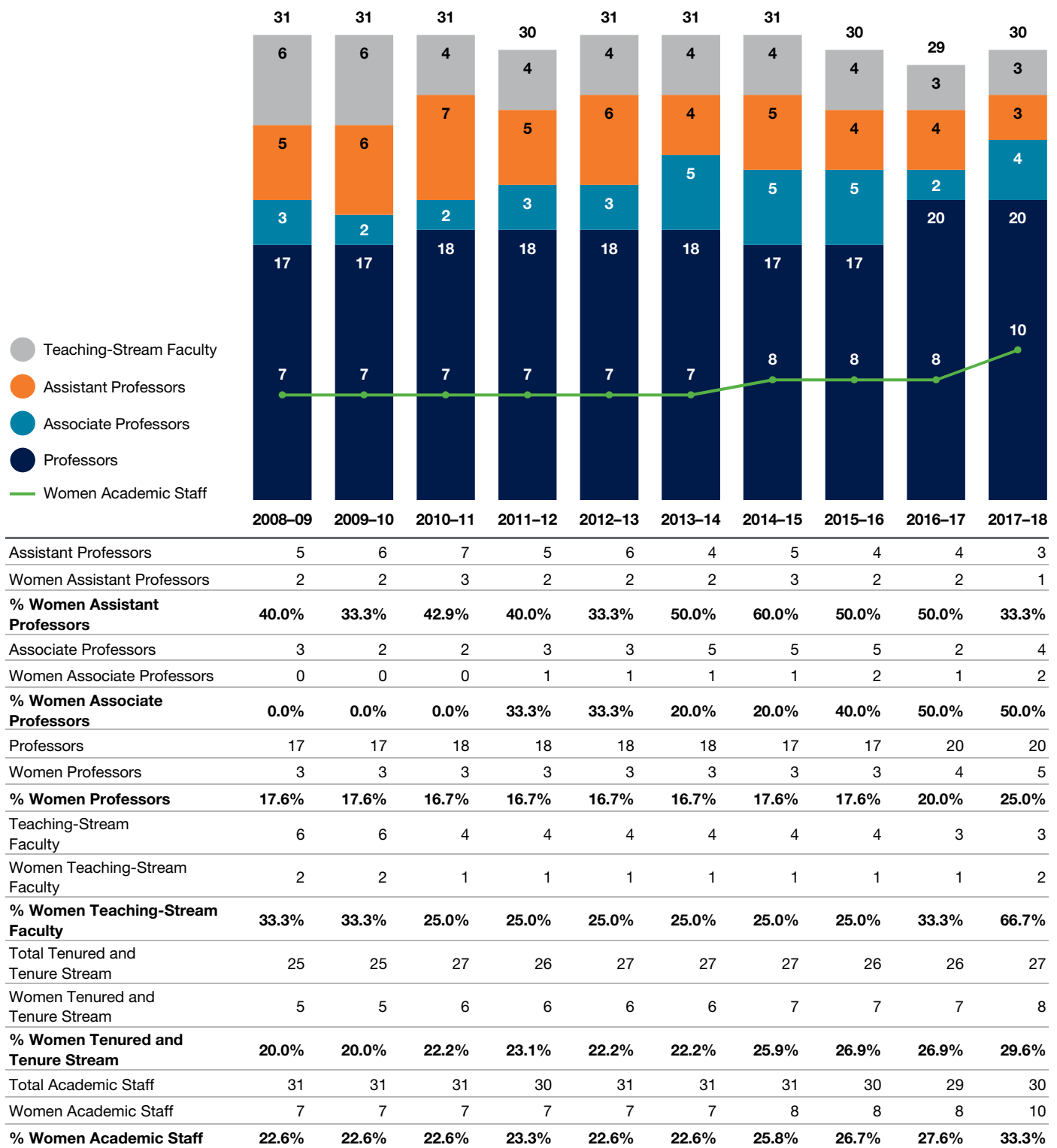
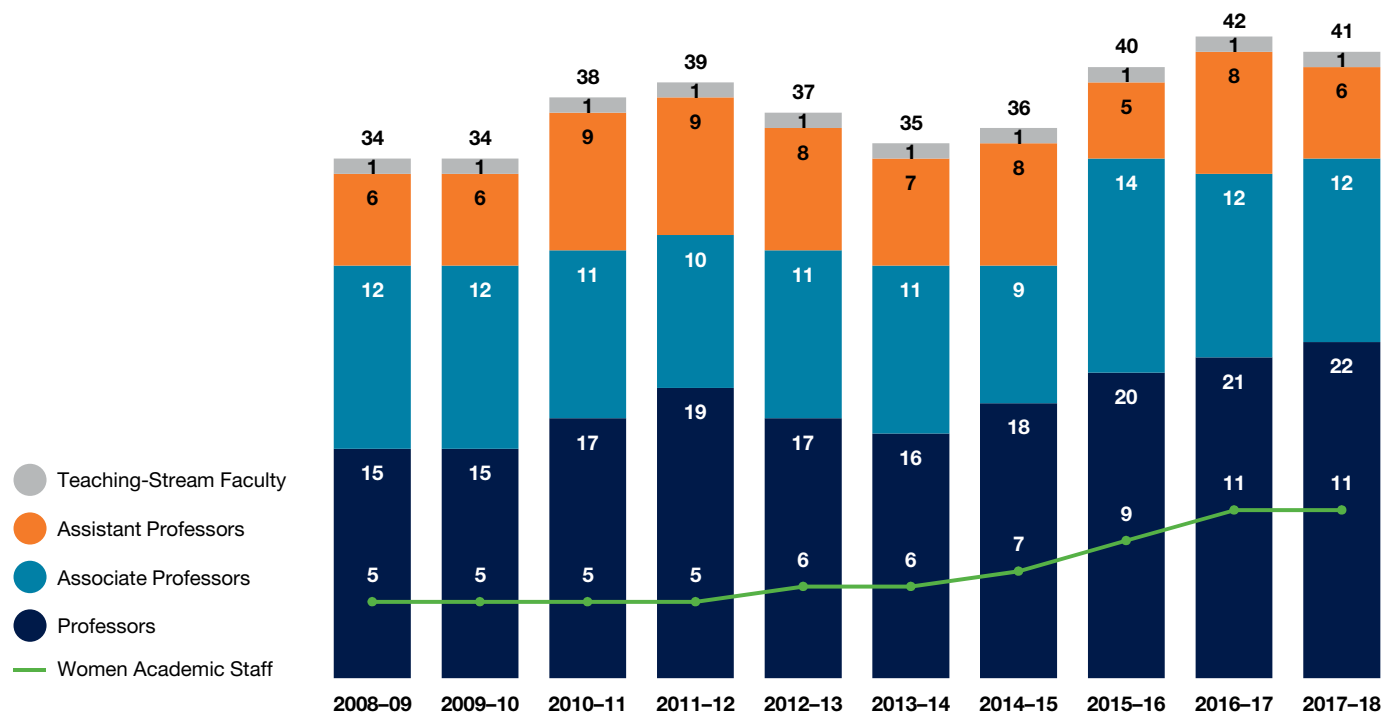
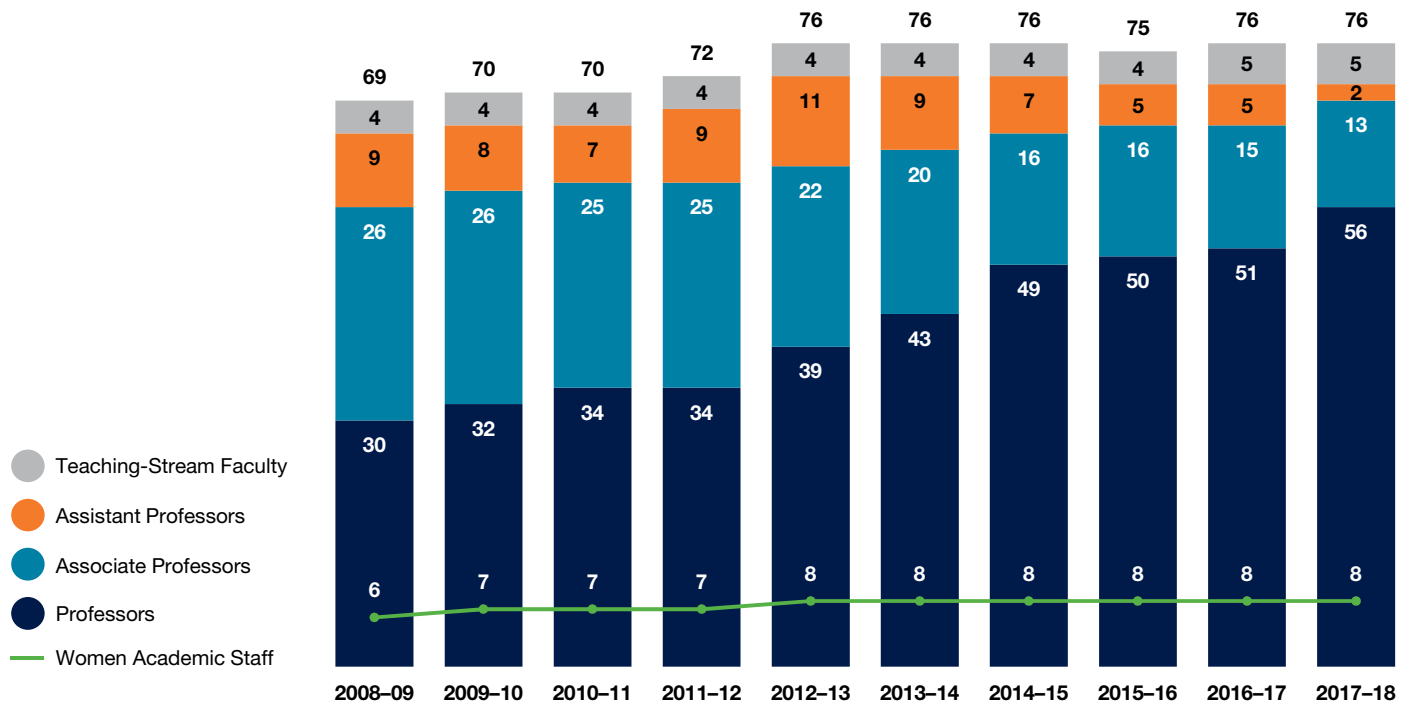


Figure H.5 Department of Civil & Mineral Engineering:
Academic Staff by Position with Percentage of Women, 2008–2009 to 2017–2018



Assistant Professors	6	6	9	9	8	7	8	5	8	6
Women Assistant Professors	2	2	2	2	3	2	3	2	4	4
% Women Assistant Professors	33.3%	33.3%	22.2%	22.2%	37.5%	28.6%	37.5%	40.0%	50.0%	66.7%
Associate Professors	12	12	11	10	11	11	9	14	12	12
Women Associate Professors	3	3	3	2	2	3	2	4	4	3
% Women Associate Professors	25.0%	25.0%	27.3%	20.0%	18.2%	27.3%	22.2%	28.6%	33.3%	25.0%
Professors	15	15	17	19	17	16	18	20	21	22
Women Professors	0	0	0	1	1	1	2	3	3	4
% Women Professors	0.0%	0.0%	0.0%	5.3%	5.9%	6.3%	11.1%	15.0%	14.3%	18.2%
Teaching-Stream Faculty	1	1	1	1	1	1	1	1	1	1
Women Teaching-Stream Faculty	0	0	0	0	0	0	0	0	0	0
% Women Teaching-Stream Faculty	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total Tenured and Tenure Stream	33	33	37	38	36	34	35	39	41	40
Women Tenured and Tenure Stream	5	5	5	5	6	6	7	9	11	11
% Women Tenured and Tenure Stream	15.2%	15.2%	13.5%	13.2%	16.7%	17.6%	20.0%	23.1%	26.8%	27.5%
Total Academic Staff	34	34	38	39	37	35	36	40	42	41
Women Academic Staff	5	5	5	5	6	6	7	9	11	11
% Women Academic Staff	14.7%	14.7%	13.2%	12.8%	16.2%	17.1%	19.4%	22.5%	26.2%	26.8%

Figure H.6 The Edward S. Rogers Sr. Department of Electrical & Computer Engineering: Academic Staff by Position with Percentage of Women, 2008–2009 to 2017–2018



	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18
Assistant Professors	9	8	7	9	11	9	7	5	5	2
Women Assistant Professors	2	2	2	2	2	1	0	0	0	0
% Women Assistant Professors	22.2%	25.0%	28.6%	22.2%	18.2%	11.1%	0.0%	0.0%	0.0%	0.0%
Associate Professors	26	26	25	25	22	20	16	16	15	13
Women Associate Professors	3	4	4	4	4	4	4	3	3	0
% Women Associate Professors	11.5%	15.4%	16.0%	16.0%	18.2%	20.0%	25.0%	18.8%	20.0%	0.0%
Professors	30	32	34	34	39	43	49	50	51	56
Women Professors	0	0	0	0	1	2	3	4	4	7
% Women Professors	0.0%	0.0%	0.0%	0.0%	2.6%	4.7%	6.1%	8.0%	7.8%	12.5%
Teaching-Stream Faculty	4	4	4	4	4	4	4	4	5	5
Women Teaching-Stream Faculty	1	1	1	1	1	1	1	1	1	1
% Women Teaching-Stream Faculty	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	20.0%	20.0%
Total Tenured and Tenure Stream	65	66	66	68	72	72	72	71	71	71
Women Tenured and Tenure Stream	5	6	6	6	7	7	7	7	7	7
% Women Tenured and Tenure Stream	7.7%	9.1%	9.1%	8.8%	9.7%	9.7%	9.7%	9.9%	9.9%	9.9%
Total Academic Staff	69	70	70	72	76	76	76	75	76	76
Women Academic Staff	6	7	7	7	8	8	8	8	8	8
% Women Academic Staff	8.7%	10.0%	10.0%	9.7%	10.5%	10.5%	10.5%	10.7%	10.5%	10.5%

Figure H.7 Department of Mechanical & Industrial Engineering:
Academic Staff by Position with Percentage of Women, 2008–2009 to 2017–2018

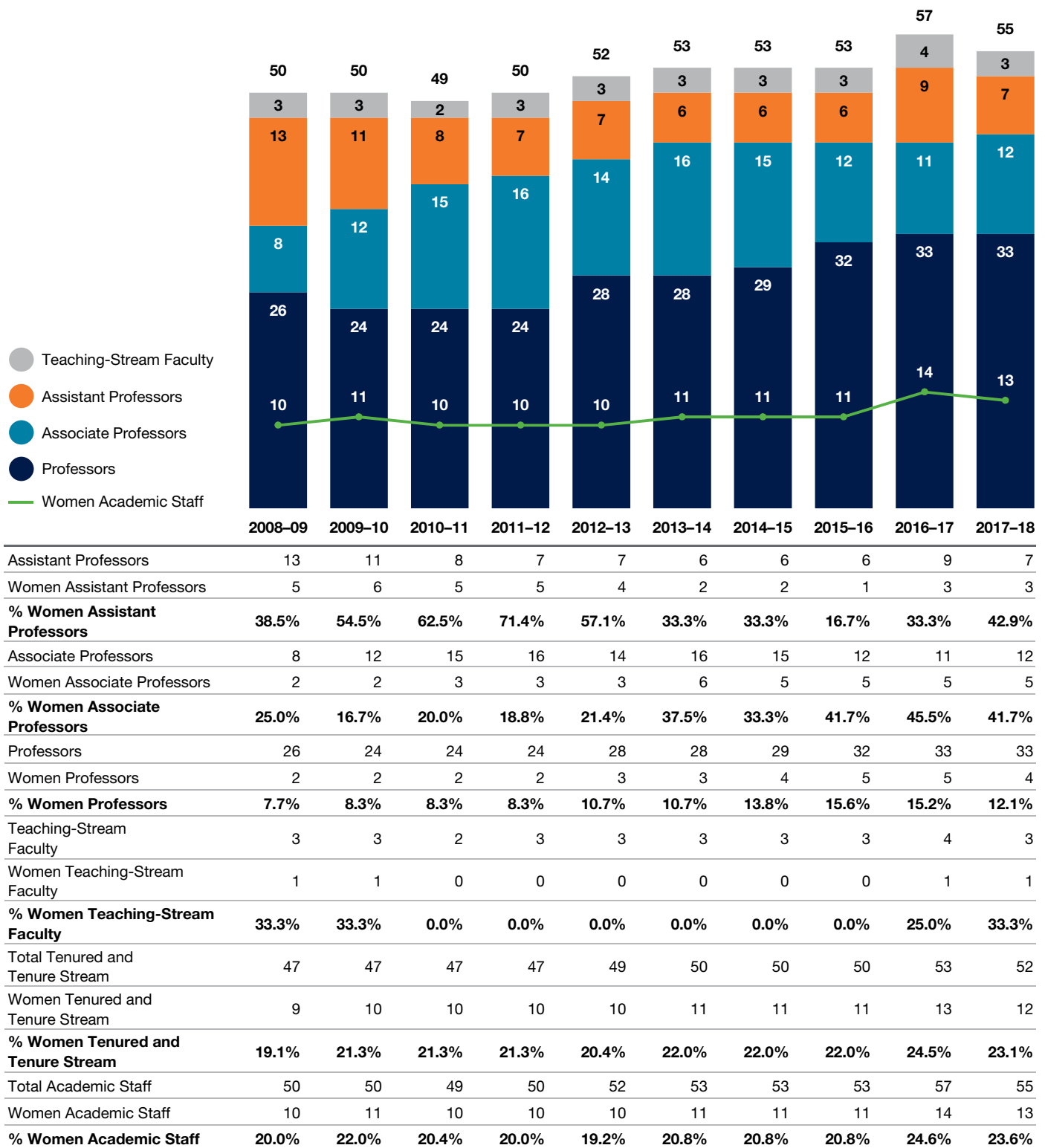
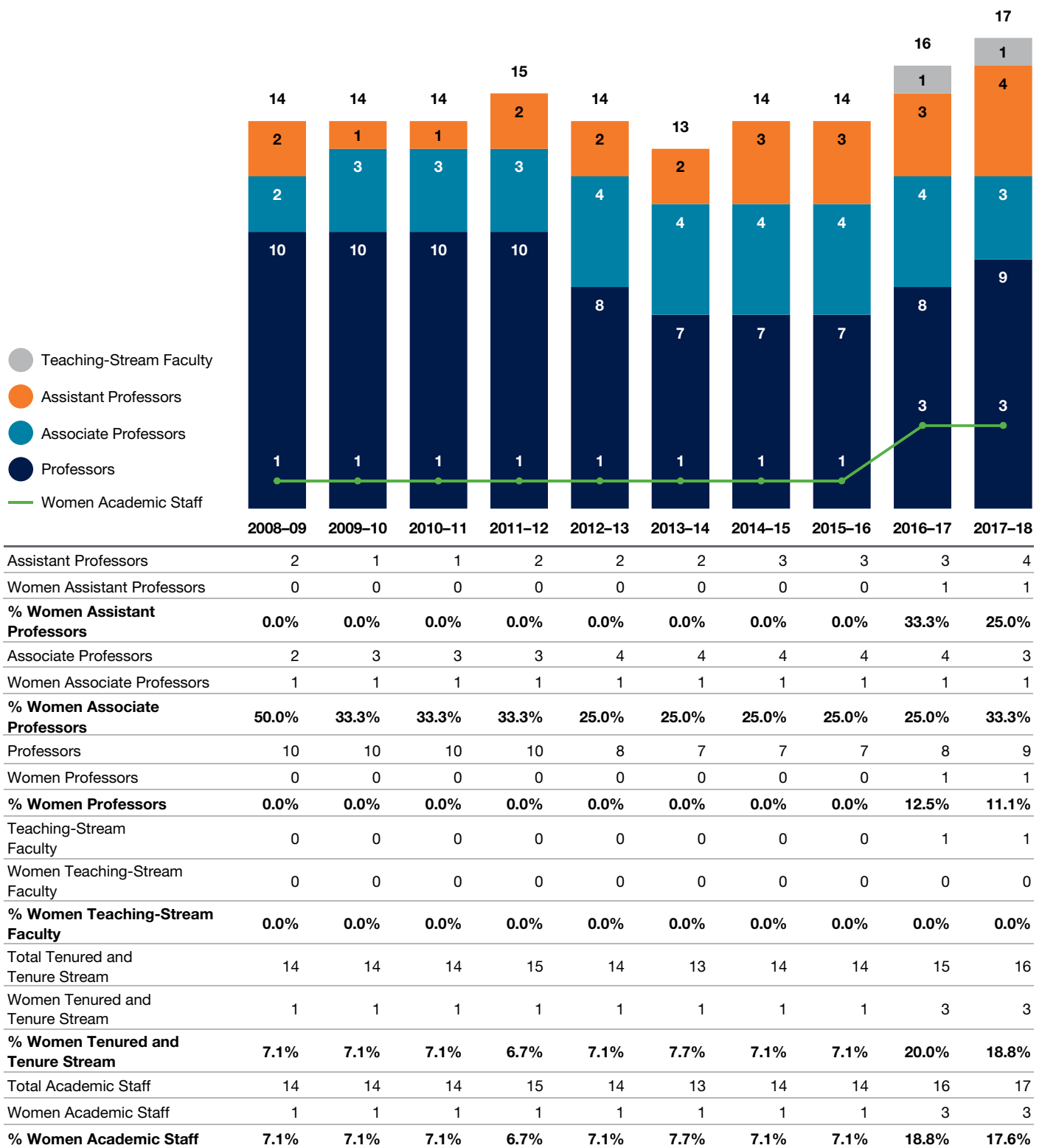
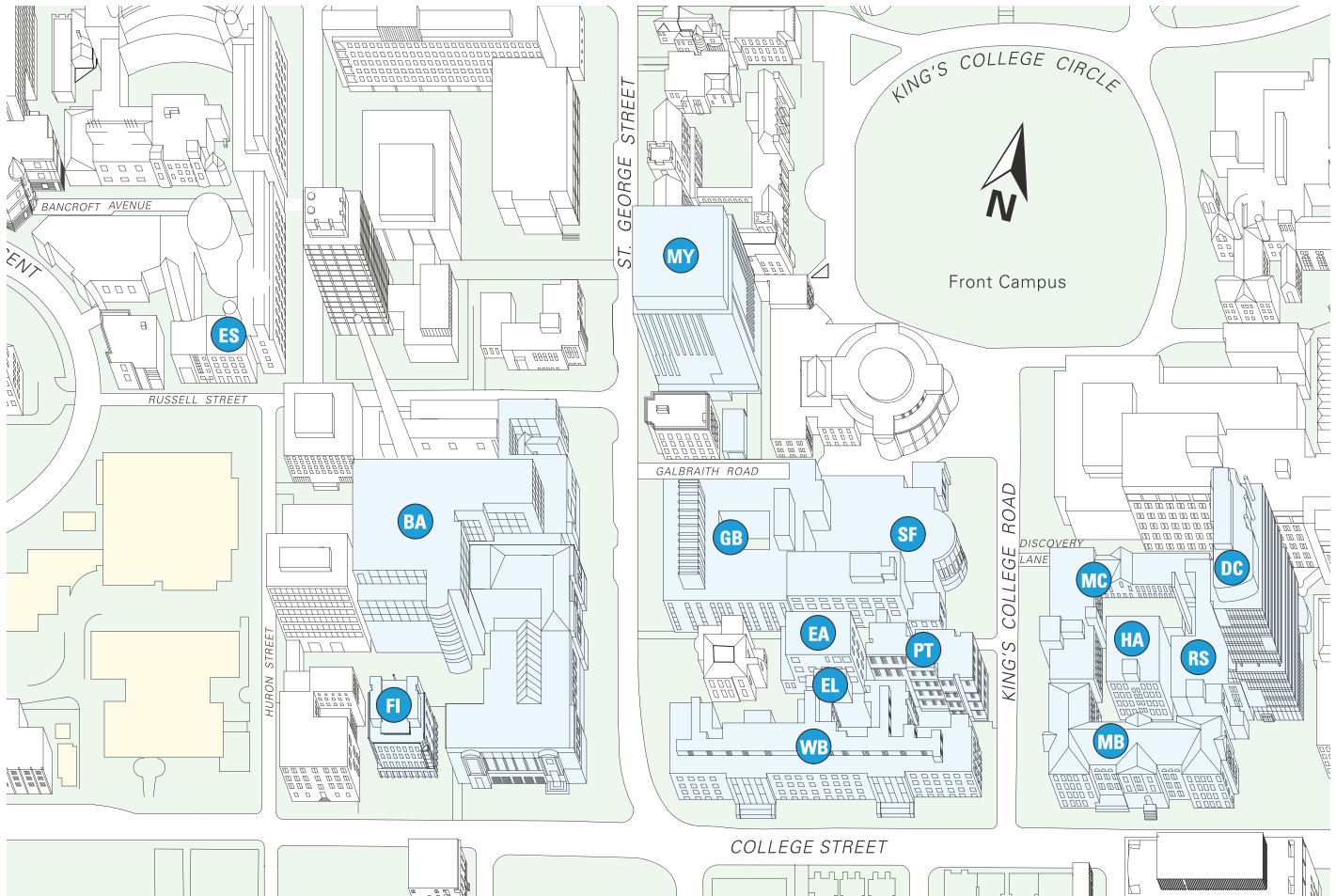


Figure H.8 Department of Materials Science & Engineering:
Academic Staff by Position with Percentage of Women, 2008–2009 to 2017–2018



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, our offices at 256 McCaul Street, 704 Spadina Ave and the West Tower of MaRS Discovery District, these buildings house our students, faculty, staff, research and teaching spaces. For details on the buildings we occupy, please see *Chapter 11: Financial and Physical Resources*.



BA	Bahen Centre for Information Technology	MC	Mechanical Engineering Building
DC	Donnelly Centre for Cellular and Biomolecular Research (CCBR)	MY	Myhal Centre for Engineering Innovation & Entrepreneurship
EA	Engineering Annex / Electro-Metallurgy Lab Building (South Side)	PT	D.L. Pratt Building
EL	Electrometallurgy Lab	RS	Rosebrugh Building
ES	Earth Sciences Centre	SF	Sandford Fleming Building
FI	Fields Institute	WB	Wallberg Building
GB	Galbraith Building	-	256 McCaul Street [not pictured]
HA	Haultain Building	-	MaRS Discover District West Tower [not pictured]
MB	Lassonde Mining Building	-	UTIAS (Downsview) [not pictured]

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

Figure Data Source

Comparison of U of T Engineering with Ontario and Canada, 2017–2018

Enrolment, degrees granted and faculty data are based on the 2017 calendar year and come from the National Council of Deans of Engineering and Applied Science (NCDEAS) 2017 Resources Report, prepared by Engineers Canada and circulated to Canadian engineering deans in July 2018. Undergraduate enrolment figures exclude non-degree students and those working full-time through the Professional Experience Year Co-op Program. 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 (www.nserc-crsng.gc.ca/ase-oro/index_eng.asp) with the following parameters: Selection Committees = Discovery Grants + Research Partnerships (excl CRCs & NCEs); Research Subjects = all engineering-related categories; Universities only; Fiscal Year = 2017–2018 (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 2017–2018 grant year (April to March).

Comparison of U of T Engineering with St. George Campus and University of Toronto, 2017–2018

All student enrolment statistics are based on headcount for Fall 2017 from the U of T Enrolment 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 2017 to June 2018 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 the 2016–2017 grant year and exclude partner hospitals; includes all program types; data current as of May 2018. Engineering academic staff statistics provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering (based on HRIS and published lists of faculty members). Engineering administrative and technical staff statistic from 2017 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 2017. 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, March 2018. U of T and St. George space statistics from U of T Facts and Figures 2017.

Chapter 1: Undergraduate Studies

1.1a Applications, Offers, Registrations, Selectivity and Yield of First-Year Undergraduates, 2008 to 2017

All years' data for applications and offers are based on annual Admissions Committee reports to Engineering 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. Cube Parameters: Faculty = Faculty of Applied Science & Engineering, All Fall Terms for 2008–2017, Degree Type = Undergraduate; Stage of Study (SESLEV) = Year 1, New Intake (NEWINTK) = Yes, Measure = Headcount.

1.1b Applications, Offers, Registrations, Selectivity and Yield of Domestic First-Year Undergraduates, 2008 to 2017

All years' data for applications and offers are based on annual Admissions Committee reports to Engineering 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. Cube Parameters: Faculty = Faculty of Applied Science & Engineering, All Fall Terms for 2008–2017, Degree Type = Undergraduate; Stage of Study (SESLEV) = Year 1, New Intake (NEWINTK) = Yes, Domestic / International (DOM_INTL) = Domestic; Measure = Headcount.

1.1c Applications, Offers, Registrations, Selectivity and Yield of International First-Year Undergraduates, 2008 to 2017

All years data for applications and offers are based on annual Admissions Committee reports to Engineering 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. Cube Parameters: Faculty = Faculty of Applied Science & Engineering, All Fall Terms for 2008–2017, Degree Type = Undergraduate; Stage of Study (SESLEV) = Year 1, New Intake (NEWINTK) = Yes, Domestic / International (DOM_INTL) = International; Measure = Headcount.

1.2 Ontario Secondary School Averages of Incoming First-Year Undergraduates and Retention Rate Between First and Second Year, 2008 to 2017

Averages of incoming first-year students from Admissions Committee Report to Engineering Faculty Council (November). Retention rates based on successful transition of new (incoming) first year students in each entering cohort into second year within two years.

-
- 1.3 Incoming First-Year Undergraduates with Percentage of Women and International Students, 2008 to 2017**
 Headcount from U of T Undergraduate Enrolment Cube. Excludes students with special status. Cube Parameters: All Fall Terms for 2008–2017; Degree Type = Undergraduate; New Intake (NEWINTK) = Yes; Measure = Headcount; [Gender] and [DOM_INTL] parameters used to calculate percentages of women and international students, respectively. See footnote to Fig. 1.3 for more information about changes in the reporting of gender beginning in 2017.
-
- 1.4 Incoming First-Year Domestic and International Undergraduates, 2008 to 2017**
 Headcount from University of Toronto Enrolment Master Files, source of the U of T Enrolment Reporting Cube. Includes new and returning students. Excludes students with special status. Cube Parameters: All Fall Terms for 2008–2017; Stage of Study (SESLEV) = Year 1; New Intake (NEWINTK) = Yes; Degree Type = Undergraduate; Measure = Headcount
-
- 1.5a Undergraduate Enrolment with Percentage of Women and International Students, 2008–2009 to 2017–2018**
 Headcount from U of T Undergraduate Enrolment Reporting Cube. Excludes students with special status. Cube Parameters: All Fall Terms for 2008–2017; Degree Type = Undergraduate; Measure = Headcount; [Gender] and [DOM_INTL] parameters used to calculate percentages of women and international students, respectively. See footnote to Fig. 1.5a for more information about changes in the reporting of gender beginning in 2017.
-
- 1.5b Percentage of Women by Undergraduate Program, 2008–2009 to 2017–2018**
 Headcount from U of T Undergraduate Enrolment Reporting Cube. Excludes students with special status. Cube Parameters: Fall Terms for 2008–2017; Degree Type = Undergraduate; Gender = Female; Departments based on [Programs] field
-
- 1.6 Undergraduates by Program, Year of Study and Professional Experience Year Co-op, 2017–2018**
 Headcount from U of T Undergraduate Enrolment Reporting Cube. Includes full-time students, part-time students and students on PEY Co-op. Excludes students with special status. Cube Parameters: Stage of Study (SESLEV) = Years 1–4; Fall 2017; Departments based on [Programs] field; Degree Type = Undergraduate.
-
- 1.7 Undergraduates by Program, 2008–2009 to 2017–2018**
 Headcount from U of T Undergraduate Enrolment Reporting Cube. Includes full-time students, part-time students and students on PEY Co-op. Excludes students with special status. Cube Parameters: All Fall Terms for 2008–2017; Stage of Study (SESLEV) = Years 1–4; Degree Type = Undergraduate; Measure = Headcount; Departments based on [Programs] field.
-
- 1.8a Number of Awards Received by Cohort with Total Number of Undergraduate Need-Based Award Recipients, 2009–2010 to 2017–2018**
 Award data from U of T Student Accounts Cube. Parameters: Transaction Type = Income / Awards – Undergrad; Need-based; Level of Instruction = Undergrad; Enrolment Status = All (e.g. FINCA, CANG, etc.); Stage of Study (SESLEV) = Years 1–4 (exclude any N/A); Sessions: include most recent (current) academic year (even without Summer; summer = mostly CIE exchange funding); Measure = Dollar amount
-
- 1.8b Total Value of Undergraduate Financial Assistance and Percentage Distributed by Year of Study, 2009–2010 to 2017–2018**
 Award data from U of T Student Accounts Cube. Parameters: Transaction Type = Income / Awards – Undergrad; Need-based; Level of Instruction = Undergrad; Enrolment Status = All (e.g. FINCA, CANG, etc.); Year of Study = 1-4 (exclude any N/A); Sessions: include most recent (current) academic year (even without Summer; summer = mostly CIE exchange funding); Measure = Distinct student count
-
- 1.9a Undergraduate Degrees Awarded by Program, 2008–2009 to 2017–2018**
 All data from ROSI download: 5EA (Graduated Students); Faculty = Faculty of Applied Science & Engineering.
-
- 1.9b Undergraduate Degrees Awarded by Gender, 2008–2009 to 2017–2018**
 All data from ROSI download: 5EA (Graduated Students); Faculty = Faculty of Applied Science & Engineering.
-

1.9c U of T Engineering Degrees Awarded by Academic Area Compared with Canadian, and North American Degree Totals, 2016

U of T and Canadian statistics are based on the 2016 calendar year and come from Engineers Canada Report of Enrolment & Degrees Granted (*Canadian Engineers for Tomorrow, Trends in Engineering Enrolment and Degrees Awarded 2012-2016*), released November 2017, and available online at: <https://engineerscanada.ca/reports/canadian-engineers-for-tomorrow-2016>. American statistics used to calculate North American percentages are based on the 2016–2017 academic year and come from the 2017 American Society of Engineering Educators (ASEE) Report, available online at: www.asee.org/papers-and-publications/publications/college-profiles

1.10a Undergraduate Student-to-Faculty Ratios by Academic Area, 2017–2018

Number of undergraduates from U of T Undergraduate Enrolment Reporting Cube. Excludes students on PEY Co-op and students with special status. Cube Parameters: Fall 2017, Degree Type = Undergraduate; AssocOrg = blank (to exclude PEY Co-op); 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. Faculty counts provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering and used on a slip-year basis: totals from July 2017 are used to compare with 2017-16 student counts. Calculation includes tenured, tenure-stream and teaching-stream faculty.

1.10b Undergraduate Full-Time Equivalent Student-Faculty Ratios, 2008–2009 to 2017–2018

Number of undergraduates from U of T Undergraduate Enrolment Reporting Cube. Excludes students on PEY Co-op and students with special status. Cube Parameters: Fall Terms for 2008–2017, Degree Type = Undergraduate; AssocOrg = blank (to exclude PEY Co-op); 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. Faculty counts provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering and used on a slip-year basis: totals from July 2017 are used to compare with 2017-16 student counts. Calculation includes tenured, tenure-stream and teaching-stream faculty.

1.11a Number of Students and Percentage of Class Graduating with Honours, 2009 to 2018

Data provided by the Office of the Faculty Registrar, Faculty of Applied Science & Engineering.

1.11b Number of Students on the Dean's Honour List by Term and Academic Area, Fall 2013 to Winter 2018

Data provided by the Office of the Faculty Registrar, Faculty of Applied Science & Engineering. Based on ROSI 4FF download; Academic Standing Code = H*

Chapter 2: Graduate Studies

2.1a International and Domestic Graduate Students by Degree Type, with Percentage of International Students, 2008–2009 to 2017–2018

Enrolment counts are from U of T Graduate Enrolment Reporting Cube. Excludes special status students. Cube Parameters: All Fall Terms for 2008–2017, Measure = Headcount. [DOM_INTL] parameter used to calculate percentage of international students.

2.1b Graduate Students by Degree Type and Gender with Percentage of Women, 2008–2009 to 2017–2018

Enrolment counts are from U of T Graduate Enrolment Reporting Cube. Excludes special status students. Cube Parameters: All Fall Terms for 2008–2017; Measure = Headcount. Gender parameter used to calculate percentage of women. See footnote to Fig. 2.1b for more information about changes in the reporting of gender beginning in 2017.

2.1c Graduate Student Enrolment by Full-Time Equivalent (FTE) and Headcount (HC) by Academic Area, 2008–2009 to 2017–2018

Enrolment counts are from U of T Graduate Enrolment Reporting Cube. Excludes special status students. Cube Parameters: Measure = Headcount or Total FTE (UAR). Headcounts are reported for all fall terms from 2008–2017. FTEs are counted by academic year as reported in the cube (May to April).

2.1d Comparison of MAsc and MEng/MHSc Full-Time Equivalent Enrolment Trends, 2008–2009 to 2017–2018

Enrolment counts are from U of T Graduate Enrolment Reporting Cube. Excludes special status students. Cube Parameters: All Fall Terms for 2008–2017; Measure = Total FTE (UAR).

2.2a Undergraduate and Graduate Full-Time Equivalent Students per Faculty Member, 2008–2009 to 2017–2018

Number of FTE undergraduates from U of T Undergraduate Enrolment Reporting Cube. Excludes students on PEY Co-op and students with special status. Cube Parameters: Fall terms 2008–2017; AssocOrg = blank (to exclude PEY Co-op); Degree Type = Undergraduate; Measure = Headcount. To calculate Undergraduate FTEs, part-time students are counted as 0.3 FTE. Number of FTE graduate students from U of T Graduate Enrolment Reporting Cube. Cube Parameters: Fall terms 2008–2017; Measure = Total FTE (UAR); excludes students with special status. Number of faculty included in the calculation provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering and used on a slip-year basis: totals from July 2017 are used to compare with 2017–2018 student counts. Graduate ratios include only tenured and tenure-stream faculty; Undergraduate ratios also include teaching stream faculty.

2.2b Ratio of Undergraduate to Graduate Full-Time Equivalent Students, 2008–2009 to 2017–2018

Number of FTE undergraduates from U of T Undergraduate Enrolment Reporting Cube. Excludes students on PEY Co-op and students with special status. Cube Parameters: Fall terms 2008–2017; AssocOrg = blank (to exclude PEY Co-op); Degree Type = Undergraduate; Measure = Headcount. To calculate Undergraduate FTEs, part-time students are counted as 0.3 FTE. Number of FTE graduate students from U of T Graduate Enrolment Reporting Cube. Cube Parameters: Fall terms 2008–2017; Measure = Total FTE (UAR); Includes all degree types but excludes students with special status.

2.2c FTE Graduate Student-to-Faculty Ratios by Academic Area and Degree Type, 2017–2018

Number of FTE graduate students from U of T Graduate Enrolment Reporting Cube. Cube Parameters: Fall 2017; Measure = Total FTE (UAR). Includes all degree types but 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. Faculty counts are provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering, and are used on a slip-year basis: totals from July 2017 are used to compare with 2017–2018 student counts. Includes tenured and tenure-stream faculty only.

2.3 Domestic and International PhD Students: Applications, Offers, Registrations, Selectivity and Yield, 2008–2009 to 2017–2018

All data from ROSI download: 4BEG (Admissions Statistics). Students who have fast-tracked from MASc programs into PhD programs are calculated separately (see Fig. 2.8a) but have been included in this figure as applications, offers and admissions in order to more accurately reflect total PhD student intake.

2.4 Domestic and International MASc Students: Applications, Offers, Registrations, Selectivity and Yield, 2008–2009 to 2017–2018

All data from ROSI download: 4BEG (Admissions Statistics)

2.5 Domestic and International MEng and MHSc Students: Applications, Offers, Registrations, Selectivity and Yield, 2008–2009 to 2017–2018

All data from ROSI download: 4BEG (Admissions Statistics).

2.6a Graduate Student Funding by Category, 2007–2008 to 2016–2017

Data from 2010–2011 onward were obtained from the Student Accounts Reporting Cube. Parameters: Transaction Type = Awards – Grad, Stipend, UT Employment; exclude Awards – Undergrad, Waiver. Data for years prior 2010–2011 were obtained from the Graduate Student Income Reporting Cube. Includes funding from all sources except work-study employment income. Student funding reported by academic year (September to August).

2.6b Graduate Student Funding by Category and Academic Area, 2016–2017

Data obtained from the Student Accounts Reporting Cube. Parameters: Transaction Type = Awards – Grad, Stipend, UT Employment; exclude Awards – Undergrad, Waiver. Includes funding from all sources except work-study employment income. Student funding reported by academic year (September to August).

2.7a Total Graduate Student Scholarships by Source, 2007–2008 to 2016–2017

Data from 2010–2011 onward were obtained from the Student Accounts Reporting Cube. Parameters: Transaction Type = Income / Awards – Grad; Award Income Source = External. Data for years prior to 2010–2011 were obtained from the Graduate Student Income Reporting Cube. Parameters: Award Income only. Student funding reported by academic year (September to August).

2.7b Number of NSERC Graduate Student Award Recipients by Academic Area, 2007–2008 to 2016–2017

Data from 2010–2011 onward were obtained from the Student Accounts Reporting Cube. Parameters: Transaction Type = Income / Awards – Grad; Award Income Source = Federal – Natural Sciences and Engineering Research Council. Data for years prior to 2010–2011 were obtained from the Graduate Student Income Reporting Cube. Parameters: Award Income only. Source = Federal – Natural Sciences and Engineering Research Council. Measure = Distinct Student Count. Student funding reported by academic year (September to August).

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- 2.8a Number of Students Fast-Tracked from MASc to PhD by Academic Area, 2008–2009 to 2017–2018**
All data from ROSI download: 4FF (Student Registrations). Fast-tracked students are identified by POST codes that end in 'PHD U' and are counted when prior session POST code was a Masters degree (MASc or MEng). To reflect fast-tracking practice, an academic year is considered to be Summer-Fall-Winter (May to April).
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- 2.8b Number of Direct-Entry PhD Students by Academic Area, 2008–2009 to 2017–2018**
All data from ROSI download: 4FF (Student Registrations). Include all PhD students where prior session POST code was blank or AE NDEGP (recently-completed UGrad). Reported by academic year defined as Summer-Fall-Winter (May to April).
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- 2.9 Time to Completion for PhD, MASc, MEng and MSc Students, 2008–2009 to 2017–2018**
All data from ROSI download: 4BEA (Years to Graduate), 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, extended full-time and part-time MEng students are distinguished for greater clarity and accuracy.
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- 2.10 Graduate Degrees Awarded by Degree Type and Gender, 2008–2009 to 2017–2018**
All data from ROSI download: 5EA (Graduated Students); Faculty = Faculty of Applied Science & Engineering.
-
- 2.11 ELITE Emphases Awarded, 2008–2009 to 2017–2018**
ELITE eligibility based on year of graduation and successful completion of a minimum of 4 ELITE-designated courses. Eligibility criteria and course listing provided by the Vice-Dean Graduate Studies, Faculty of Applied Science & Engineering.

Chapter 3: Research

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- 3.1a Research Infrastructure Funding and Research Operating Funding, 2007–2008 to 2016–2017**
Data from the U of T Research Reporting Cube. Current as of May 2018. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Infrastructure Funding includes the following programs: Canada Foundation for Innovation (except the CFI Career Award), the Ontario Innovation Trust, the Ontario Research Fund (ORF) – Research Infrastructure and the NSERC Research Tools and Instruments (RTI) Program.
-
- 3.1b Research Operating Funding by Year, Source and Funding per Faculty Member, 2007–2008 to 2016–2017**
Data is from the U of T Research Reporting Cube, current as of May 2018, and is organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Research Operating Funding excludes the following infrastructure programs: Canada Foundation for Innovation (except the CFI Career Award), the Ontario Innovation Trust, the Ontario Research Fund (ORF) – Research Infrastructure and the NSERC Research Tools and Instruments (RTI) Program. Faculty data is provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering, and here includes tenured and tenure-stream faculty only, as reported each July. Faculty counts are used on a slip-year basis: e.g. those reported in July 2016 (for academic year 2015–2016) are linked to Grant Year 2017 (Apr 2016 to Mar 2017).
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- 3.1c CIHR, NSERC and NCE Funding, 2007–2008 to 2016–2017**
Data from the U of T Research Reporting Cube. Current as of May 2018. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017).
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- 3.2a NSERC Funding, 2016–2017**
Data from the U of T Research Reporting Cube. Current as of May 2018. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Sponsor = Three Councils / Natural Sciences & Engineering. Year = 2017.
-
- 3.2b NSERC Industrial Partnership Funding by Program, 2007–2008 to 2016–2017**
Data from the U of T Research Reporting Cube. Current as of May 2018. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Sponsor = Three Councils / Natural Sciences & Engineering / Research Partnerships Programs
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- 3.2c Industrial Partnerships as a Proportion of Total NSERC Funding, 2007–2008 to 2016–2017**
Data from the U of T Research Reporting Cube. Current as of May 2018. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Sponsor = Three Councils / Natural Sciences & Engineering.
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- 3.2d Industry Partners, 2017–2018**
Data from the U of T Research Reporting Cube. Current as of May 2018. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Sponsor = Corporate. Additional information gathered from selected websites (e.g. those of Industrial Research Chairs and major research consortia) and provided by individual departments within the Faculty of Applied Science & Engineering.
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- 3.2e Industry Research Funding, 2007–2008 to 2016–2017**
Data from the U of T Research Reporting Cube. Current as of May 2018. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Sponsor = Corporate.
-
- 3.2f NSERC Research Grant Funding by Program, 2007–2008 to 2016–2017**
Data from the U of T Research Reporting Cube. Current as of May 2018. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Sponsor = Three Councils / Natural Sciences & Engineering / Research Grants & Scholarships (Faculty).
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- 3.3a Canadian Peer Universities vs. University of Toronto Share of NSERC Funding for Engineering Cumulative Five-Year Share, 2012–2013 to 2016–2017**
All data from NSERC Award Search Engine: www.nserc-crsng.gc.ca/ase-oro/index_eng.asp. Based on Selection Committees for Discovery and Partnership Programs, but not Scholarships and Fellowships. Excludes Canada Research Chairs and Networks of Centres of Excellence and does not include Indirect Costs of Research. Research Subjects = all engineering and technology-related fields. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017).
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- 3.3b U of T Annual Share of NSERC Funding in Engineering, 2007–2008 to 2016–2017**
All data from NSERC Award Search Engine: www.nserc-crsng.gc.ca/ase-oro/index_eng.asp. Based on Selection Committees for Discovery and Partnership Programs, but not Scholarships and Fellowships. Excludes Canada Research Chairs and Networks of Centres of Excellence and does not include Indirect Costs of Research. Research Subjects = all engineering and technology-related fields. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017).
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- 3.4a Engineering Invention Disclosures by Academic Area, 2013–2014 to 2017–2018**
Report of U of T Commercialization Indicators, Annual Supplement for FY2018, provided by the Office of the Vice President, Research. Data current as of May 1, 2018.
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- 3.4b U of T Invention Disclosures by Faculty, 2017–2018**
Report of U of T Commercialization Indicators, Annual Supplement for FY2018, provided by the Office of the Vice President, Research. Data current as of May 1, 2018.
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- 3.4c U of T Patent Applications by Faculty, 2017–2018**
Report of U of T Commercialization Indicators, Annual Supplement for FY2018, provided by the Office of the Vice President, Research. Data current as of May 1, 2018.
-
- 3.5 Distribution of Research Operating Funding by Academic Area, 2007–2008 to 2016–2017**
Data from the U of T Research Reporting Cube. Current as of May 2018. Organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Research Operating Funding excludes the following infrastructure programs: Canada Foundation for Innovation (except the CFI Career Award), the Ontario Innovation Trust, the Ontario Research Fund (ORF) – Research Infrastructure and the NSERC Research Tools and Instruments (RTI) Program.

Chapter 4: Cross-Faculty Education and Experiential Learning

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- 4.1a Number of Engineering Minors Completed with Percentage of Graduating Class Completing an Engineering Minor, 2008–2009 to 2017–2018**
Information provided by the Cross-Disciplinary Programs Office, Faculty of Applied Science & Engineering.
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- 4.1b Students Graduating with an Engineering Business Minor or Certificate, 2011–2012 to 2017–2018**
Information provided by the Cross-Disciplinary Programs Office, Faculty of Applied Science & Engineering.
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- 4.2a Undergraduate Participation in Summer Research Opportunities, 2010 to 2018**
Information regarding Canadian placements provided by the Associate Registrar & Director, Admissions, Faculty of Applied Science & Engineering. International placement statistics provided by the University of Toronto's Centre for International Experience.
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- 4.2b Undergraduate Participation in Summer Research Opportunities by Academic Area, 2018**
Information regarding Canadian placements provided by the Associate Registrar & Director, Admissions, Faculty of Applied Science & Engineering. International placement statistics provided by the University of Toronto's Centre for International Experience.
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- 4.3a Number of Engineering Undergraduate Students Participating in PEY Co-op with Percentage Participation, 2008–2009 to 2017–2018**
Statistics provided by the Assistant Director, Engineering Career Centre, Faculty of Applied Science & Engineering.
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- 4.3b Number of Canadian and International PEY Co-op Positions, 2008–2009 to 2017–2018**
Statistics provided by the Assistant Director, Engineering Career Centre, Faculty of Applied Science & Engineering.
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- 4.3c PEY Co-op Employers, 2008–2009 to 2017–2018**
Statistics provided by the Assistant Director, Engineering Career Centre, Faculty of Applied Science & Engineering.

Chapter 5: Awards and Honours

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- 5.1 Summary of Major International, National and Provincial Awards and Honours, 2008 to 2017**
Information provided by the Director, Awards and Honours, Faculty of Applied Science & Engineering.
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- 5.2a Number of Major National and International Awards Received by U of T Engineering Compared to Other Canadian Engineering Faculties, 2017**
Information provided by the Director, Awards and Honours, Faculty of Applied Science & Engineering.
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- 5.2b Percentage of Total Canadian Engineering Faculty Members and Percentage of Major Awards Received by Canadian Engineering Faculties, 2017**
Information provided by the Director, Awards and Honours, Faculty of Applied Science & Engineering. Faculty FTEs are based on the National Council of Deans of Engineering and Applied Science (NCDEAS) 2016 Resources Report prepared by Engineers Canada and circulated to Canadian engineering deans in July 2017.
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- 5.3 Number of Awards Received by U of T Engineering Faculty Compared to Other Canadian Engineering Faculties, 2013 to 2017**
Information provided by the Director, Awards and Honours, Faculty of Applied Science & Engineering.

Chapter 6: World Recognition by Rankings

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- 6.1a to 6.1d QS World University Rankings for Engineering and Technology, 2018**
Data from QS World University Ranking website: [www.topuniversities.com/university-subject-rankings/2018/engineering-technology](http://www.topuniversities.com/university-rankings/university-subject-rankings/2018/engineering-technology)
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- 6.2a to 6.2c Times Higher Education (THE)–Elsevier World University Ranking for Engineering and Technology, 2017**
Data from THE World University Ranking website: www.timeshighereducation.com/world-university-rankings/2018/subject-ranking/engineering-and-IT
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- 6.3 Top 200 Canadian Universities in the Academic Ranking of World Universities (ARWU) by Subjects, 2017**
Data from ARWU website: www.shanghairanking.com/Shanghairanking-Subject-Rankings
-
- 6.4a to 6.4c National Taiwan University (NTU) Performance Ranking of Engineering Papers, 2017**
Data from National Taiwan University Performance Ranking of Scientific Papers for World Universities website: <http://nturanking.lis.ntu.edu.tw/DataPage/TOP300.aspx?query=Engineering&y=2017>. Data compiled from Thomson Reuters' science citation indexes.
-
- 6.5a Number of Engineering Publications Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2012 to 2016**
Data from Thomson Reuters InCites™ covering 2012 to 2016. Includes public peer institutions in Canada (U15) and U.S. (AAU plus University of California at San Francisco). Schema = Essential Science Indicators (Engineering, Materials Science).

6.5b Summary of U15 Bibliometrics for Publications

Data from Thomson Reuters InCites™ covering 2012 to 2016. Includes public peer institutions in Canada (U15) and U.S. (AAU plus University of California at San Francisco). Schema = Essential Science Indicators (Engineering, Materials Science). Faculty counts for analysis of U15 citations per faculty member are from the Engineers Canada 2016 Resources Report.

6.6a Number of Engineering Citations Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2012 to 2016

Data from Thomson Reuters InCites™ covering 2012 to 2016. Includes public peer institutions in Canada (U15) and U.S. (AAU plus University of California at San Francisco). Schema = Essential Science Indicators (Engineering, Materials Science).

6.6b Summary of U15 Bibliometrics for Citations

Data from Thomson Reuters InCites™ covering 2012 to 2016. Includes public peer institutions in Canada (U15) and U.S. (AAU plus University of California at San Francisco). Schema = Essential Science Indicators (Engineering, Materials Science). Faculty counts for analysis of U15 citations per faculty member are from the Engineers Canada 2016 Resources Report.

6.7 Summary of University of Toronto Engineering Performance in World Rankings

Compiled from other figures in this chapter.

Chapter 7: Advancement

7.1a Philanthropic Support, 2017–2018

Statistics provided by the Office of Advancement and Alumni Relations, Faculty of Applied Science & Engineering.

7.1b Philanthropic Support, 2008–2009 to 2017–2018

Statistics provided by the Office of Advancement and Alumni Relations, Faculty of Applied Science & Engineering.

7.1c Gift Designation, 2017–2018

Statistics provided by the Office of Advancement and Alumni Relations, Faculty of Applied Science & Engineering.

7.1d Graditude Participation, 2009–2010 to 2017–2018

Statistics provided by the Office of Advancement and Alumni Relations, Faculty of Applied Science & Engineering.

Chapter 8: Communications

8.1a Proportion of U of T Engineering Media Stories by Outlet Location, 2017–2018

Information collected via Cormex Research (May 1, 2017 to April 30, 2018)

8.1b Proportion of U of T Engineering Impressions by Strategic Priority Area, 2017–2018

Information collected via Cormex Research (May 1, 2017 to April 30, 2018)

8.1c Proportion of U of T Engineering Impressions by Academic Area, 2017–2018

Information collected via Cormex Research (May 1, 2017 to April 30, 2018)

8.2a Audience Engagement on Twitter from May 1, 2017 to April 30, 2018

Data collected via Sprout Social (May 1, 2017 to April 30, 2018)

8.2b Audience Engagement on Facebook from May 1, 2017 to April 30, 2018

Data collected via Sprout Social (May 1, 2017 to April 30, 2018)

8.2c Audience Engagement on Instagram from May 1, 2017 to April 30, 2018

Data collected via Sprout Social (May 1, 2017 to April 30, 2018)

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- 8.3 Summary of Analytics for U of T Engineering Faculty site and U of T Engineering News site, 2017–2018**
Websites: www.engineering.utoronto.ca and www.news.engineering.utoronto.ca. Information provided by Engineering Strategic Communications, Faculty of Applied Science & Engineering. Website statistics sourced from Google Analytics (May 1, 2017 to April 30, 2018)
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- 8.4 Social Media Referrals for U of T Engineering News, 2017–2018**
Information provided by Engineering Strategic Communications, Faculty of Applied Science & Engineering. Website statistics sourced from Google Analytics (May 1, 2017 to April 30, 2018)
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- 8.5 Top Stories on the Engineering News and U of T News Websites, 2017–2018**
Information provided by Engineering Strategic Communications, Faculty of Applied Science & Engineering and University of Toronto Strategic Communications. Website statistics sourced from Google Analytics (May 1, 2017 to April 30, 2018)
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- 8.6 Summary of Analytics for Discover Engineering and You Belong Here, 2017–2018**
Websites: www.discover.engineering.utoronto.ca and www.admit.engineering.utoronto.ca. Website statistics sourced from Google Analytics (May 1, 2017 to April 30, 2018)
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- 8.7 Top 10 Countries of Origin for Visitors to Discover Engineering, 2017–2018**
Website: www.discover.engineering.utoronto.ca. Website statistics sourced from Google Analytics (May 1, 2017 to April 30, 2018)

Chapter 9: International Initiatives

International Students and Exchanges

Information provided by the Director, Centre for International Experience, University of Toronto and taken from *The Engineering Newsletter*, Faculty of Applied Science & Engineering.

Chapter 10: Diversity

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- 10.1 Continent of Origin: Undergraduate and Graduate Students, Fall 2017**
Student counts from U of T Enrolment Reporting Cube. Excludes students with special status. Cube Parameters: Year = Fall 2017; Degree Type = Undergraduate or one of 3 Graduate programs; Measure = Headcount; Calculations based on Continent/Country of Citizenship (CUNCIT) parameter.
-
- 10.2 Percentage of Women Students, 2008–2009 to 2017–2018**
Student counts from U of T Enrolment Reporting Cube. Excludes students with special status. Cube Parameters: Year = Fall 2017; Degree Type = Undergraduate or one of 3 Graduate programs; Measure = Headcount; Calculations based on Gender category.
-
- 10.3 Total Number of Faculty with Percentage of Women Overall and by Academic Rank, 2005–2006 to 2017–2018**
Information provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering.
-
- 10.4 Percentage of Women Faculty at U of T Engineering compared with Women Faculty in Ontario and Canadian Engineering Faculties, 2017**
Information from 2017 Resources Survey prepared by Engineers Canada for the National Council of Deans of Engineering and Applied Science (NCDEAS) and circulated to Canadian engineering deans in July 2018. Data represents faculty counts as of November 15, 2017.
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- 10.5 Canada Research Chairs with Number and Percentage of Women Chairholders, 2005 to 2018**
Information provided by the Divisional Reporting and Information Analyst, Faculty of Applied Science & Engineering. Includes data sourced from the Office of the Vice-President, Research & Innovation and from the Canada Research Chairs Program website: www.chairs-chaieres.gc.ca/home-accueil-eng.aspx
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Chapter 11: Financial and Physical Resources

11.1 Total Revenue, 2008–2009 to 2017–2018

Information provided by Chief Financial Officer, Faculty of Applied Science & Engineering.

11.2 Total Central Costs, 2008–2009 to 2017–2018

Information provided by Chief Financial Officer, Faculty of Applied Science & Engineering.

11.3 Budget Data, 2008–2009 to 2017–2018

Information provided by Chief Financial Officer, Faculty of Applied Science & Engineering.

11.4 Revenue Sources, 2017–2018

Information provided by Chief Financial Officer, Faculty of Applied Science & Engineering.

11.5 Revenue Distribution, 2017–2018

Information provided by Chief Financial Officer, Faculty of Applied Science & Engineering.

11.6 Total Operating Budget: Breakdown by Expense, 2017–2018 (net of central university costs)

Information provided by Chief Financial Officer, Faculty of Applied Science & Engineering.

11.7 Summary of Buildings and Areas Occupied by the Faculty of Applied Science & Engineering, 2017–2018

Data provided by Director, Facilities & Infrastructure Planning, Faculty of Applied Science & Engineering.

Appendices

A Engineering Student Clubs and Teams

Information from the Engineering Society: www.skule.ca.

B Outreach Programs

Information provided by Engineering Student Outreach Office, Faculty of Applied Science & Engineering.

C Time to Completion for Graduate Students

All data from ROSI 4BEA downloads (Years to Graduate), 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, extended full-time and part-time MEng students are distinguished for greater clarity and accuracy.

D Chairs and Professorships

Chairholders are reported as of the HR turnover date at the end of the reporting cycle, in this case, July 1, 2018, except in cases where new allocations (e.g. CRCs) have not yet been made public. List compiled from the following sources:

- Canada Research Chairs website: www.chairs-chaires.gc.ca/home-accueil-eng.aspx
- Industrial Research Chairs website: www.nserc-crsng.gc.ca/Professors-Professeurs/CFS-PCP/IRC-PCI_eng.asp
- Office of Advancement, Faculty of Applied Science & Engineering
- Office of the Dean, Faculty of Applied Science & Engineering
- Office of the Vice-President & Provost: www.provost.utoronto.ca/awards/Distinguished_Professors.htm and www.provost.utoronto.ca/Awards/uprofessors.htm

E Research Funding by Academic Area

Data is from the U of T Research Reporting Cube, current as of May 2018, and is organized by grant year (e.g., 2016–2017 = April 2016 to March 2017 = Grant Year 2017). Research Operating Funding excludes the following infrastructure programs: Canada Foundation for Innovation (except the CFI Career Award), the Ontario Innovation Trust, the Ontario Research Fund (ORF) – Research Infrastructure and the NSERC Research Tools and Instruments (RTI) Program. Faculty data is provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering, and here includes tenured and tenure-stream faculty only, as reported each July. Faculty counts are used on a slip-year basis: e.g. those reported in July 2016 (for academic year 2014-15) are linked to Grant Year 2017 (Apr 2016 - Mar 2017).

F Spinoff Companies

Information provided by the Office of the Vice President, Research & Innovation (OVPR).

G Descriptions of Major Awards

Information from the Director, Awards and Honours, Faculty of Applied Science & Engineering.

H Academic Staff by Academic Area

Information provided by the Assistant Dean, Administration, Faculty of Applied Science & Engineering. Women academic staff include all ranks of professors in both the tenure and teaching streams.

I The Engineering Precinct

Information from Office of Space Management. Visit www.map.utoronto.ca for a full campus map.

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

Pictured on the front cover (top to bottom):

U of T Engineering is home to more than 100 student clubs and design teams, including the University of Toronto Aerospace Team (UTAT), which builds and flies aircrafts, satellites and rockets. UTAT is among the many student clubs to be permanently housed on level 0 of the new Myhal Centre for Engineering Innovation & Entrepreneurship.

(Left) In October 2017, Prime Minister Justin Trudeau met with elementary school students who spent the day designing future neighbourhoods during a U of T Engineering Outreach workshop. The project was part of an announcement by Waterfront Toronto and Sidewalk Labs to design a new mixed-use community on Toronto's Eastern Waterfront.

(Right) On April 27, 2018, U of T Engineering launched a new era in engineering education and research with the official opening of the Myhal Centre for Engineering Innovation & Entrepreneurship. U of T leadership and more than 200 donors, alumni and friends joined the celebration.

In fall 2017, it was announced that U of T Engineering was one of just eight schools from across North America selected to participate in the AutoDrive Challenge™, a new intercollegiate autonomous vehicle competition. More than 50 undergraduate and graduate students from a range of disciplines have joined the U of T Engineering team, named aUToronto.



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