11

Financial and Physical Resources

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**

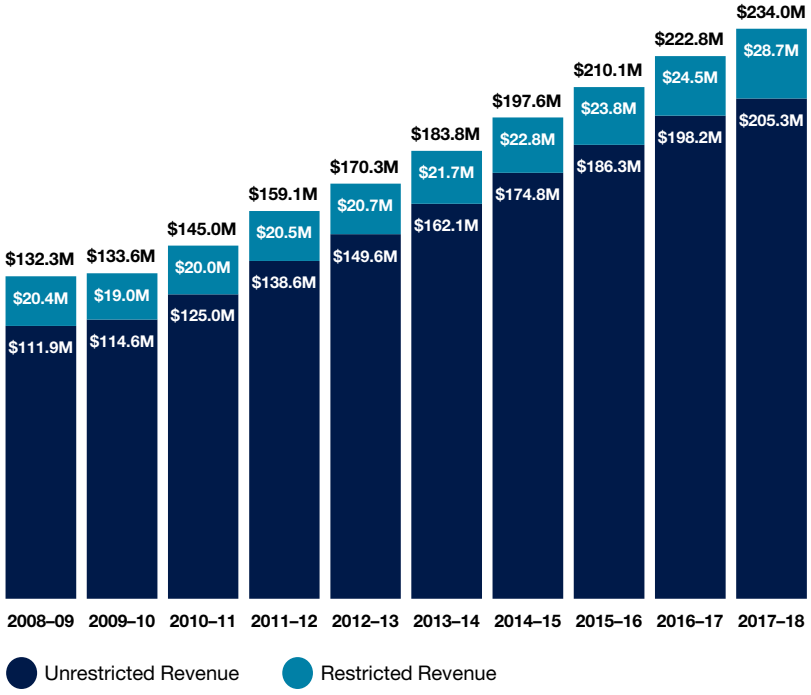
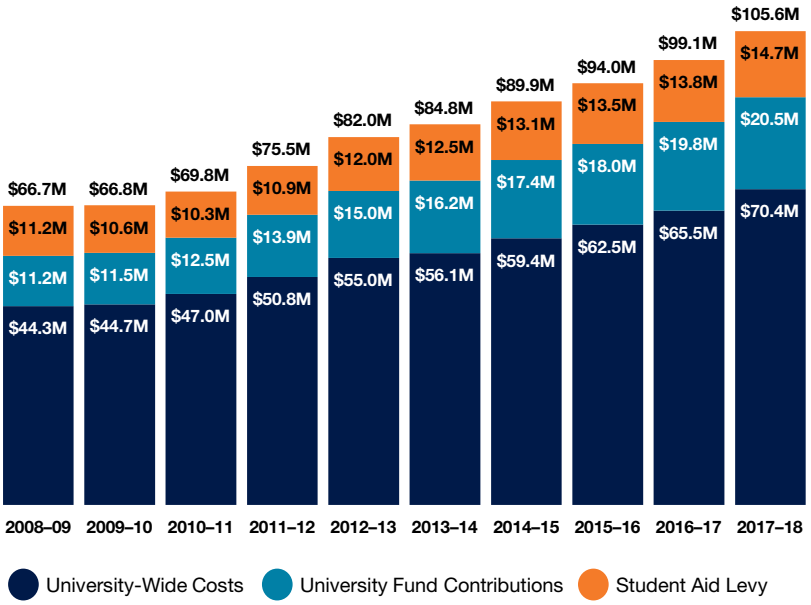


Figure 11.2 **Total Central Costs, 2008–2009 to 2017–2018**



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**

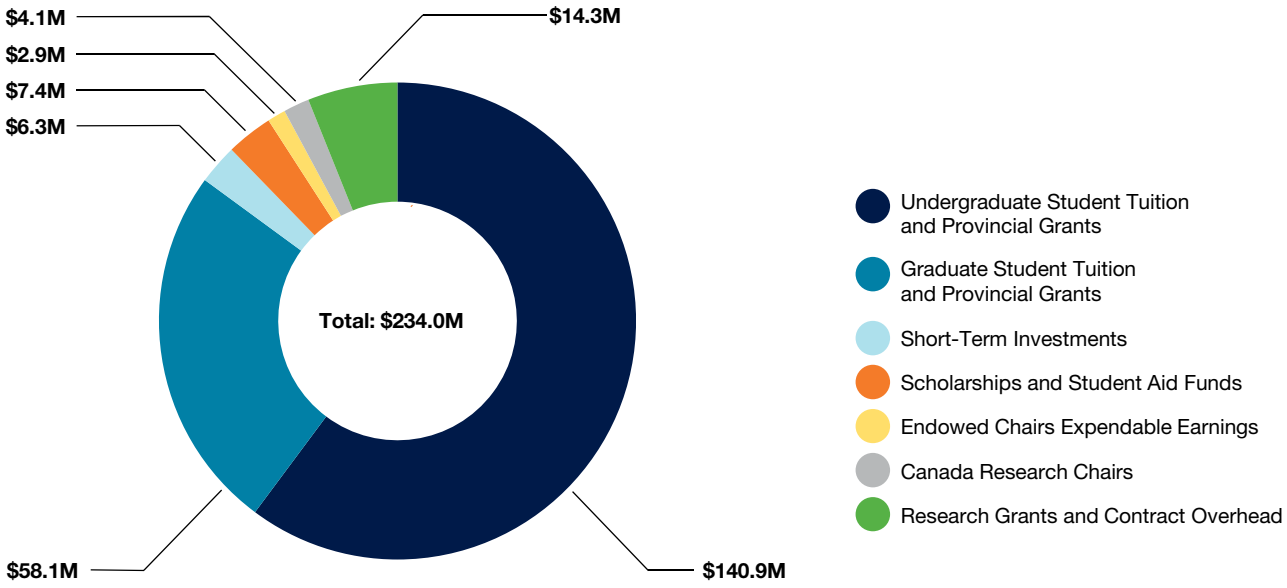


Figure 11.5 **Revenue Distribution, 2017–2018**

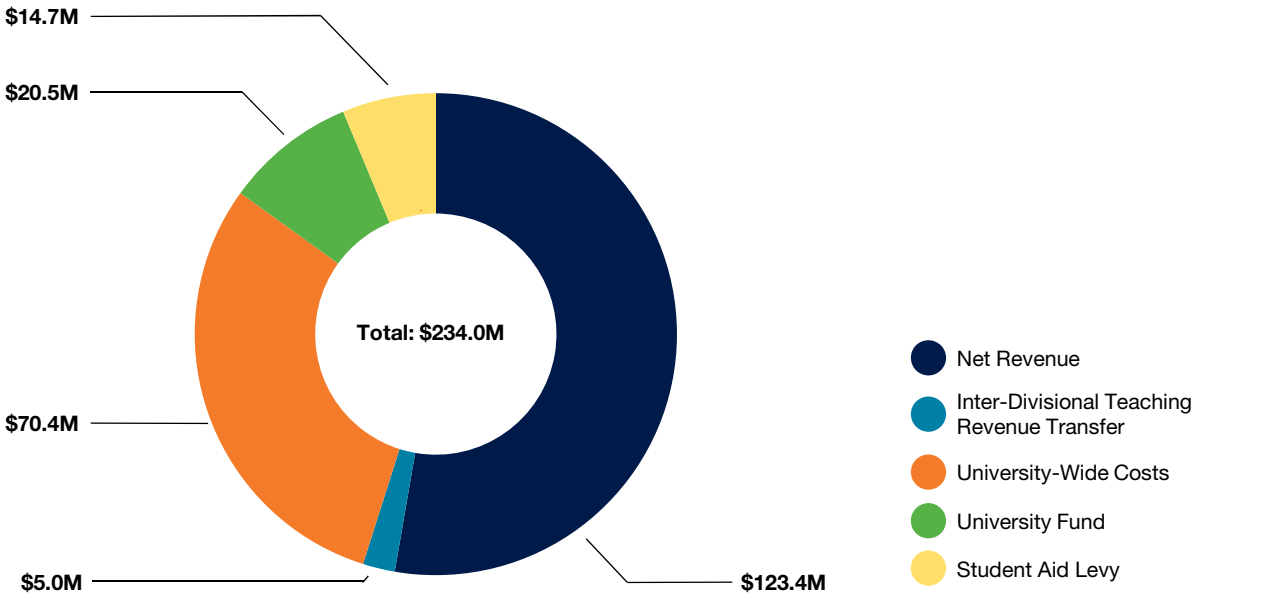
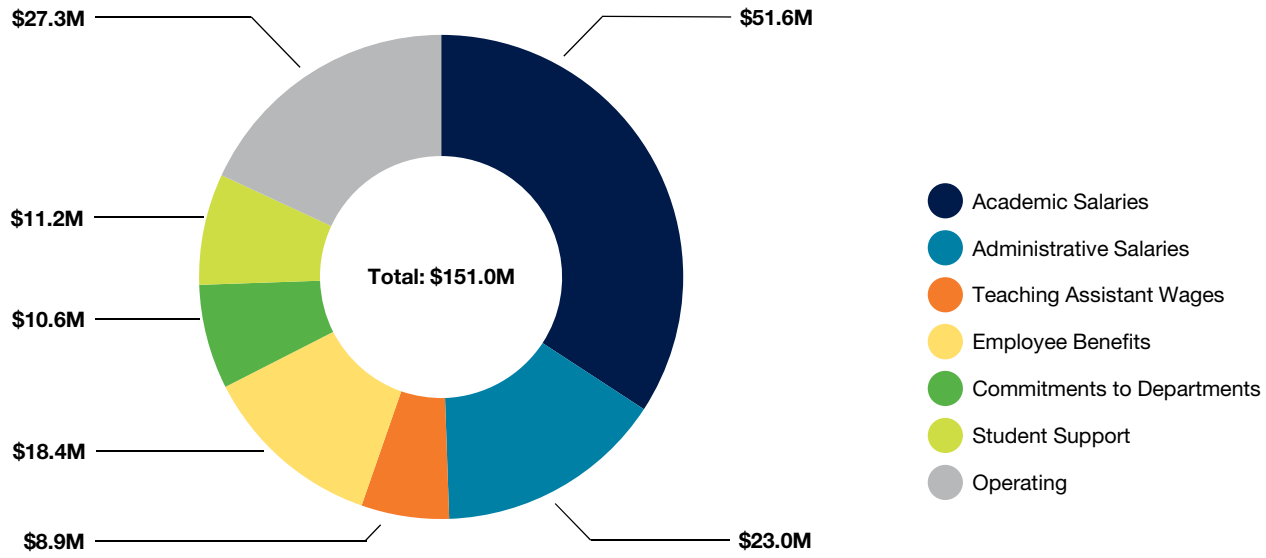


Figure 11.6 **Total Operating Budget: Breakdown by Expense, 2017–2018 (net of central University costs)**



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)

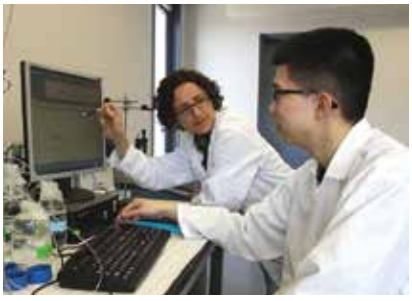
This project combined two separate clusters of rooms on the third floor of the Lassonde Mining Building into a single 3,000-square-foot, state-of-the-art wet lab with a self-contained microscope room. Ceiling-mounted screens allow instructors to share video feeds from their microscopes and offer visual 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	• 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	• 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	• 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	• 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	• 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.)*