

# Memorandum

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**TO:** Board of Governors

**FROM:** Martha Crago, Vice-Principal (Research and Innovation)

**SUBJECT:** Report on Research and Innovation 2017

**DATE:** February 15, 2018

**DOCUMENT #:** GD17-41

**ACTION REQUIRED:**  INFORMATION  APPROVAL/DECISION

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**ISSUE & EXPECTED OUTCOME** The Annual Report on Research and Innovation presents key indicators of McGill's recent research funding performance as well as performance in areas related to innovation and partnership-building between the University and external communities.

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**BACKGROUND & RATIONALE** The Report on Research and Innovation is an annual review of McGill's success in major funding programs, progress in areas related to innovation and partnerships, and the major achievements of University researchers.

The Research Funding Performance section reviews McGill's overall success in garnering research funding from all sources (i.e. federal, provincial, non-profits and individuals, industry, foreign governments, and other miscellaneous revenue), with a focus on Tri-Agency programs and Trois Fonds programs for Fiscal Year 2016. It examines how the University compares to U5 (or U6, when including McMaster University) and U15 peers in terms of total funding, research intensity, and share of total funding on a three-year rolling average. The 2017 report also provides data on McGill's performance in earning funding from the Canada Foundation for Innovation (CFI).

Notably, the 2017 Report on Research and Innovation reflects the unit's renewed emphasis on industry-sponsored research by providing a detailed look at selected NSERC Industry Partnered Programs, including Collaborative Research and Development Grants (CRD) and Industrial Research Chairs (IRC) as well as contracts. The Innovation Performance section reviews McGill's revenue from inventions, licenses, and options while establishing new measurements for the University's efficiency in transferring knowledge and new technologies into the community, such as the ratio of patent applications to inventions. Research output measures are also presented in this report, including publication efficiency, number of PhDs granted versus total sponsored research revenue, and research career excellence as measured by McGill's percentage of Royal Society of Canada Fellows.

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<b>ALIGNMENT WITH MISSION AND STRATEGIC PRIORITIES</b>	<p>The goal of the report is to inform members of the Board of Governors and the wider McGill community of significant issues related to research funding while outlining how the University’s research enterprise is becoming better suited to compete in the future.</p> <p>The report therefore aims to inform Governors of McGill’s progress in its mission to remain one of Canada and the world’s best research-intensive universities as well as toward its strategic priority of enhancing and strengthening its engagement with the full range of community partners.</p>
<b>COMPLIANCE WITH UNIVERSITY POLICY</b>	<p>The Report on Research and Innovation is an important means for the Vice-Principal (Research and Innovation) to update the Board of Governors on McGill’s research successes, opportunities, and challenges. The presentation aligns with best practices to promote transparency and accountability across a major sector of the University’s mandate.</p> <p>Numerous internal stakeholders have reviewed the report, and the report was presented to Senate on January 17, 2018.</p>
<b>COMPLIANCE WITH LEGISLATION/ EXTERNAL REGULATIONS</b>	<p>There are no legislative requirements associated with the report.</p>
<b>RISK FACTORS</b>	<p>The University’s performance in areas related to research and innovation affects its ability to carry out its missions in research, teaching, and learning and has reputational effects.</p>
<b>SUSTAINABILITY CONSIDERATIONS</b>	<p>As outlined in the Strategic Research Plan 2013-18, sustainability is a core commitment of McGill’s research plans and activities.</p>
<b>IMPACT OF DECISION AND NEXT STEPS</b>	<p>N/A</p>
<b>MOTION OR RESOLUTION FOR APPROVAL</b>	<p>N/A</p>
<b>APPENDICES</b>	<p>Appendix A: Highlights from the Report on Research and Innovation 2017</p> <p>Appendix B: Report on Research and Innovation 2017</p>

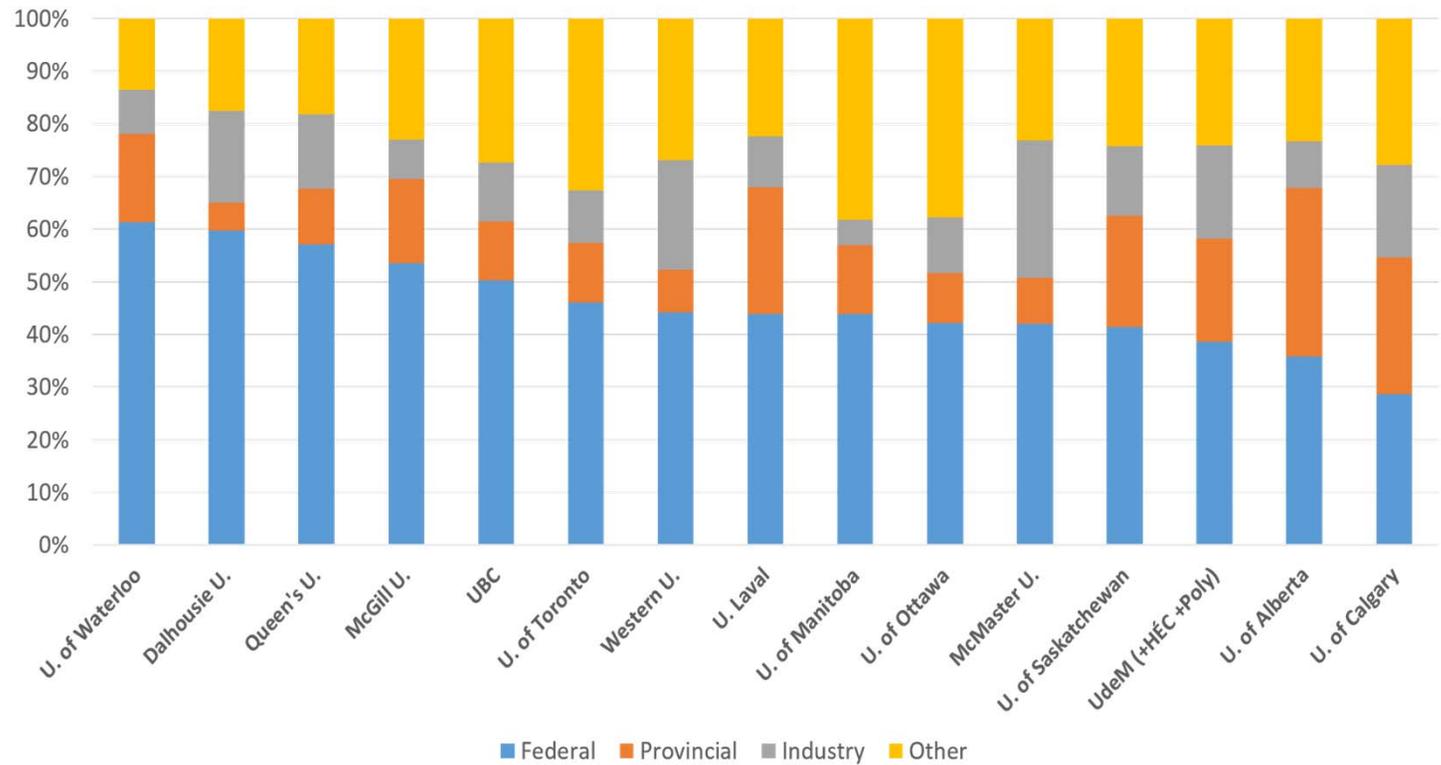


# Highlights from the Report on Research and Innovation 2017

By Martha Crago, PhD  
Vice-Principal (Research and Innovation)

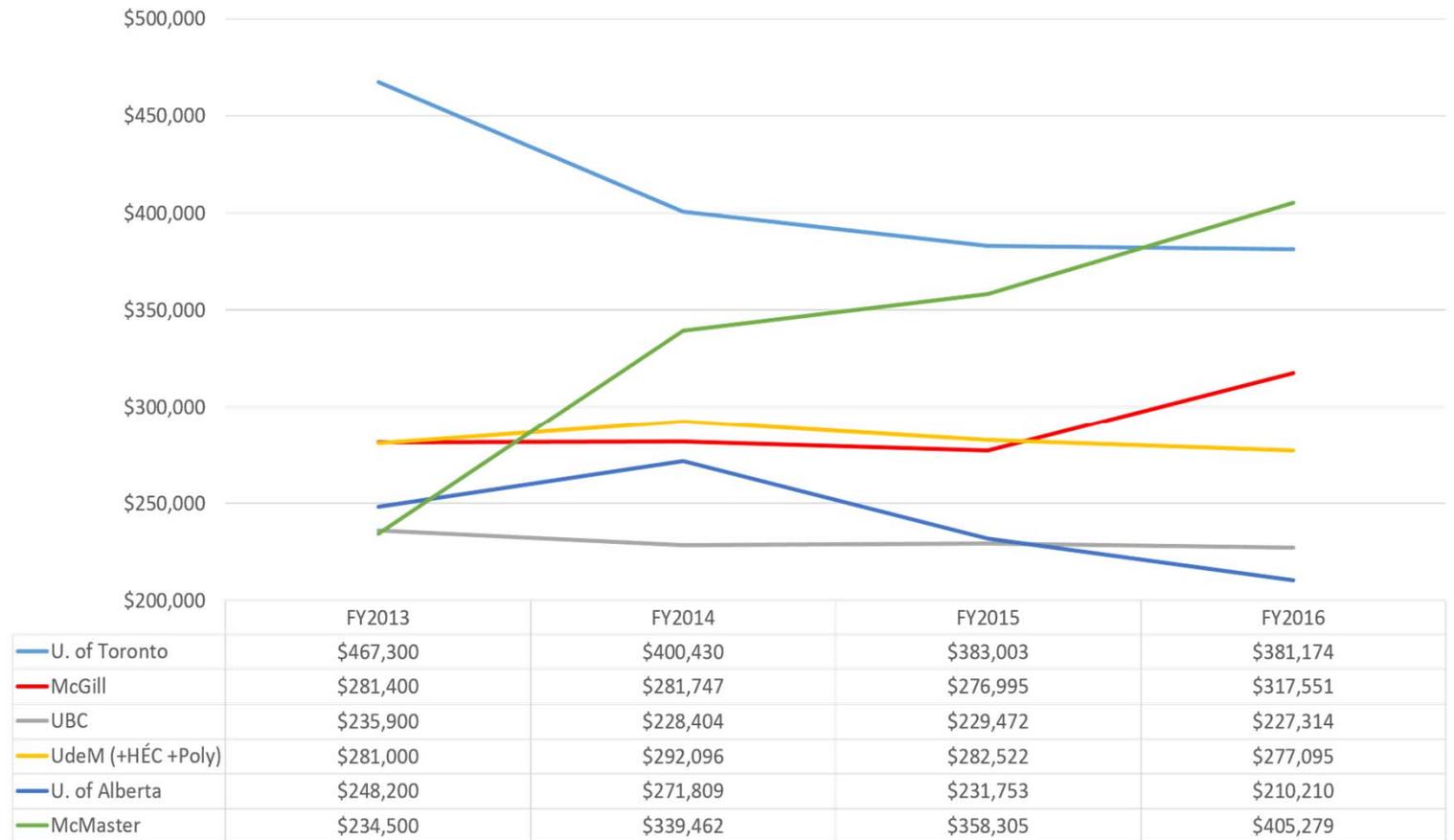


## Funding Source as Share of Total Sponsored Research – U15, 3-year (FY2014-FY2016) Average (Figure 2, Page 6)



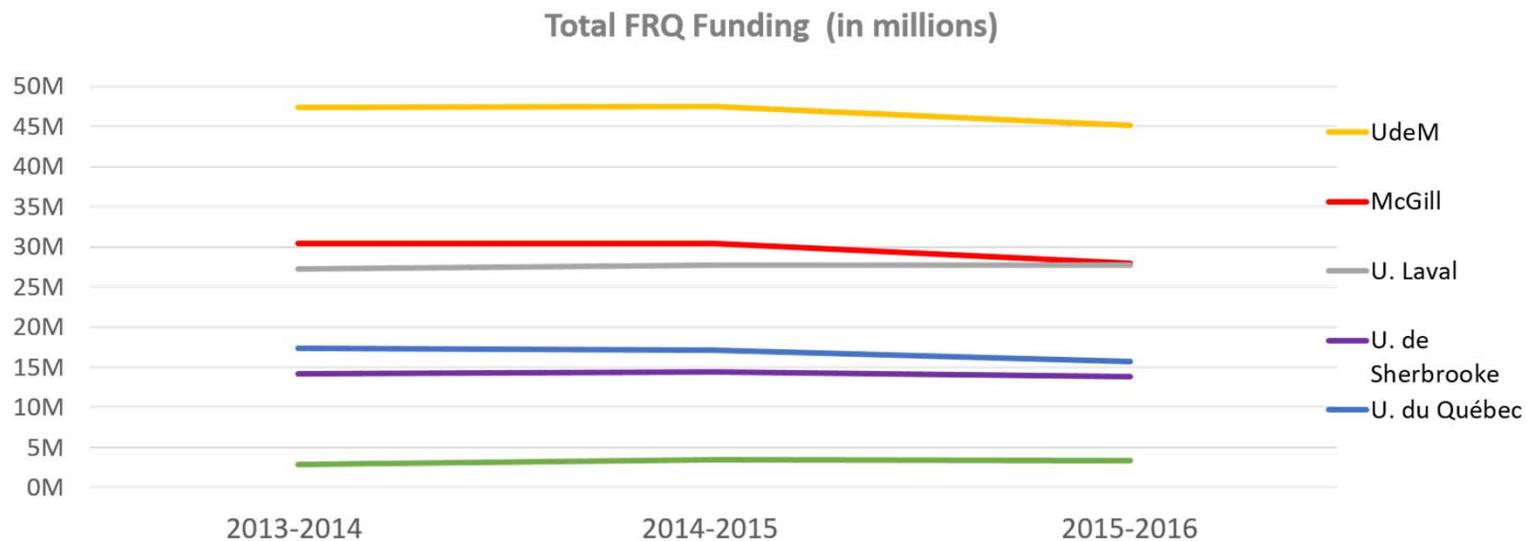


## Research Intensity (Figure 3, Page 7)





## Fonds de Recherche du Québec Overview (Figure 12 and Table 3, Page 15)



**FRQ Funding Intensity –  
Average per Year for 3 Years (2014-2016)**

	FRQ (millions)	# Faculty Members	Funding per Faculty Member (thousands)
UdeM	\$46.7	1,882	\$24.8
U. Laval	\$27.5	1,543	\$17.8
<b>McGill</b>	<b>\$29.6</b>	<b>1,709</b>	<b>\$17.3</b>
U. de Sherbrooke	\$14.1	1,136	\$12.5
Concordia U.	\$3.2	782	\$4.1



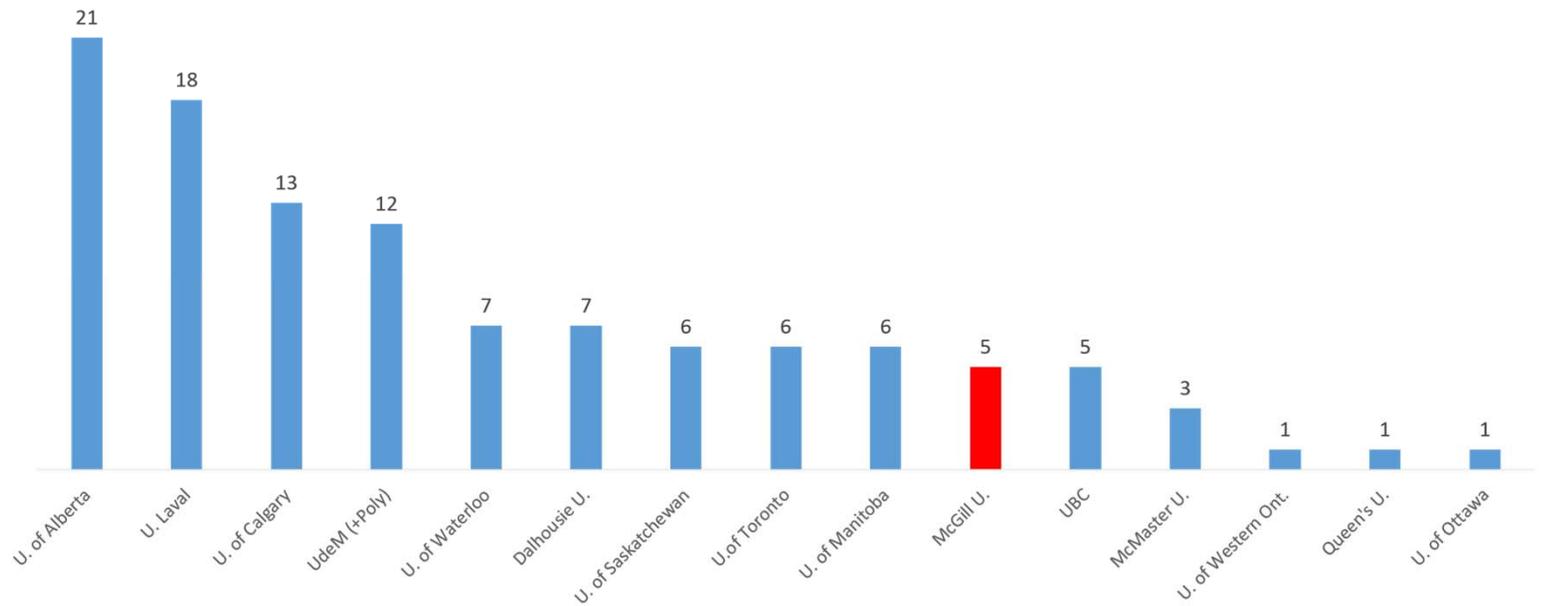
## Industry-Sponsored Research – U6 (Table 5, Page 21)

**Industry Research Funding and Intensity (3-year average, 2014-2016)**

	Average Revenue (millions)	% of Total Research Revenues	# Faculty Members	Funding per Faculty Member (thousands)
U. of Toronto	\$101.1	10.0%	2,617	\$38.6
<b>McGill</b>	<b>\$37.1</b>	<b>7.4%</b>	<b>1,709</b>	<b>\$21.7</b>
UBC	\$60.3	11.2%	2,365	\$25.5
UdeM (+ HEC+Poly)	\$94.3	17.7%	1,882	\$50.1
U. of Alberta	\$40.5	8.9%	1,932	\$21.0
McMaster U.	\$86.1	26.1%	899	\$95.8
U. of Waterloo	\$14.8	8.5%	1,120	\$13.2

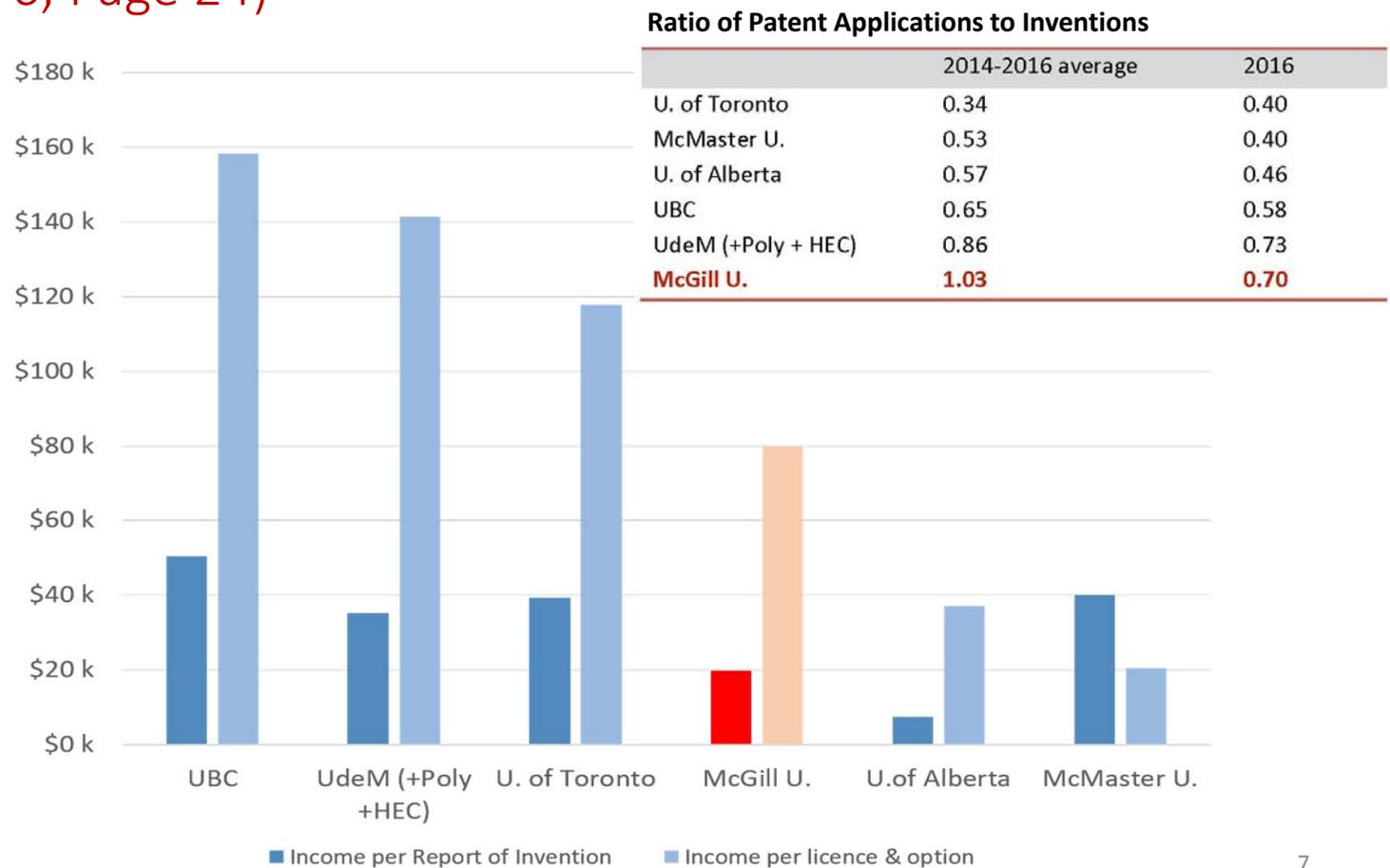


## NSERC Industry-Partnered Research – IRC in U15 (Figure 24, Page 23)





## Innovation and Commercialization (Figure 25 and Table 6, Page 24)



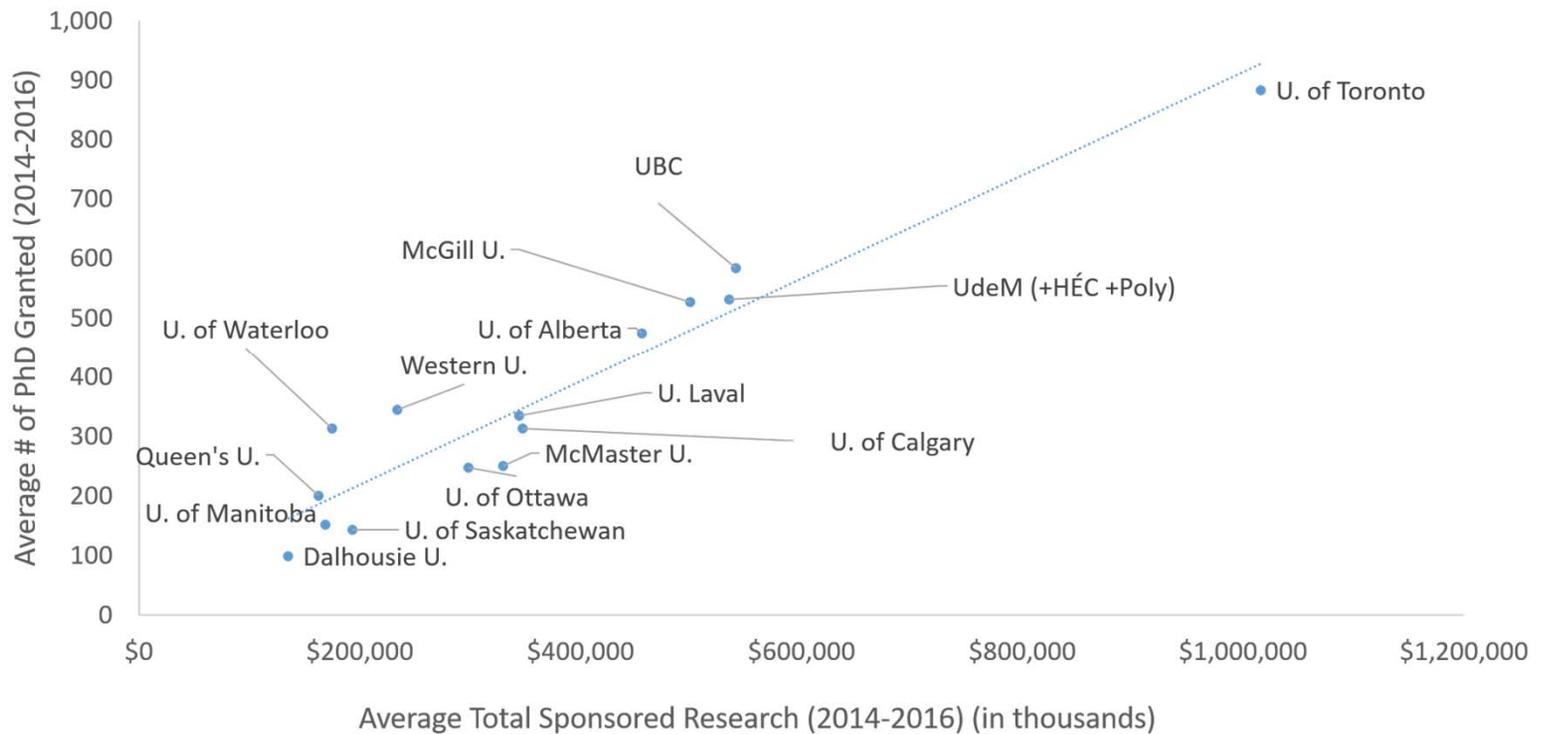


## Commercialization Observations

- Licensing revenue in Canada is at least an order of magnitude lower than in the United States.
- Licensing revenue is not predictable:
  - From 2014 to 2016, the University of Saskatchewan led Canadian schools (\$48.2M). This was based on royalties from **one** license.
  - From 2014 to 2016, the University of Waterloo grossed only \$573,000. Licensing returns to the institution are minimal due to their “creator-owned” IP policy.
  - The University of Toronto made more \$34M from licensing in 2014 and less than \$2M in 2015.
- In Canada, a university’s IP ownership policy is not directly correlated with licensing revenue (i.e. no *one* model guarantees higher revenues).

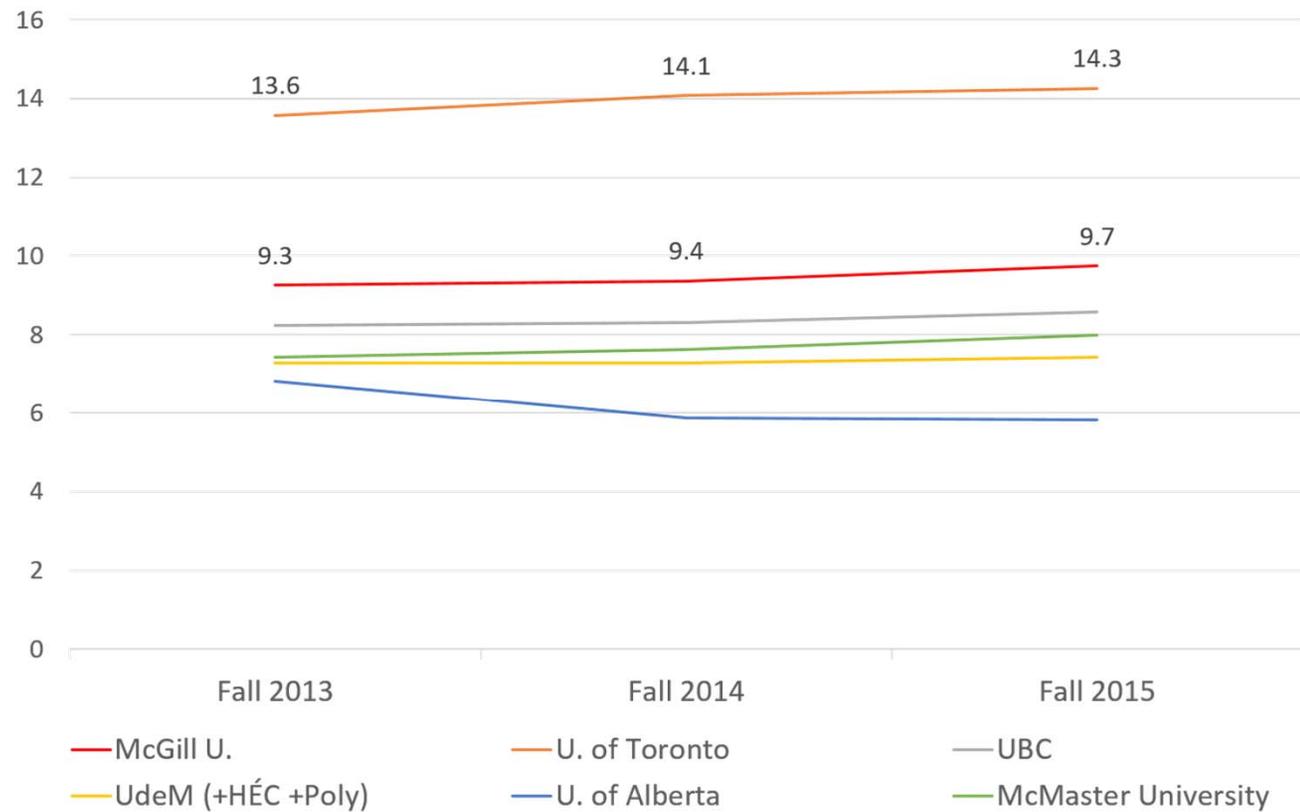


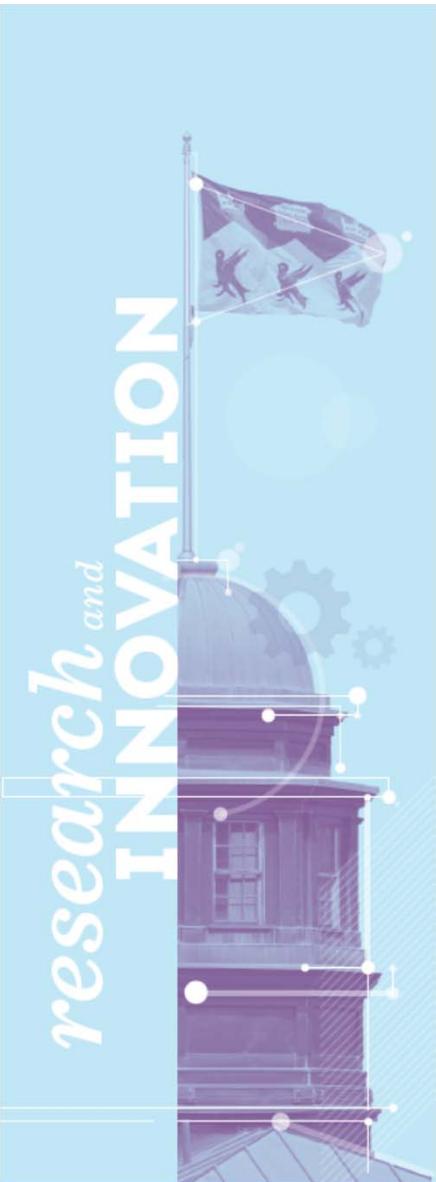
## Output – PhD by Total Sponsored Research (Figure 27, Page 26)





## Research Career Excellence – RSC Fellows (Figure 28, Page 27)





## Conclusions

- McGill is one of the U15 institutions that depends most on public funds.
- We rank well in Tri-Agency funding overall, especially in CIHR
  - Improvements could be made in NSERC.
- In FRQ, we consistently rank below UdeM.
  - We are not leading networks and teams at the level of UdeM.
  - Improvements could be made in FRQ-NT and -SC funding.
- We need to make improvement in key non-government categories:
  - Industry funding
  - Non-Tri-Agency and FRQ government funding
  - Funding from other sponsors, such as not-for-profits and foundations





Report on Research and  
Innovation

2017

Dr. Martha Crago, PhD  
Vice-Principal (Research and Innovation)



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# Introduction

The Report on Research and Innovation is the Vice-Principal (Research and Innovations)'s annual review of McGill's success in major funding programs, our progress in areas related to innovation and commercialization, and the significant achievements of University researchers. The objective of the report is to provide Senate and the Board of Governors with a high-level portrait of McGill's competitiveness in major funding programs as well as the University's effectiveness in moving discoveries and inventions from our campuses to the community and commercial market.

McGill's overall performance in research funding and innovation is extremely important, as it serves as an indicator of the wider social and economic impact of the science and scholarship conducted at the University. Performance in federal Tri-Agency funding programs directly correlates to McGill's access to Canada Research Chairs, Canada Excellence Research Chairs, Canada Foundation for Innovation awards, Banting and Vanier Fellowships (generally the most prestigious graduate awards), and our Research Support Fund grant, which assists the University with the indirect costs of research. University rankings are another area where research and academic reputation are intertwined. For instance, the Times Higher Education World University Rankings has "Research: Volume, Income, Reputation" as a major component, with the category making up 30% of their assessment criteria. Therefore, it is imperative that McGill's research sector provides the best possible support environment for our researchers to thrive and obtain funding revenue – not only to be able to further their discoveries, but also because of the ripple effect it has on other areas of the University's access to funding, the strength of our reputation, and our ability to attract and retain talent.

The Research Funding Performance section reviews McGill's overall success in garnering research funding from all sources (i.e. federal, provincial, non-profits, industry, international, endowment, and miscellaneous programs), with a focus on Tri-Agency programs and Trois Fonds programs for Fiscal Year 2016. It examines how we compare to our U5 (or U6 when including McMaster University) and U15 peers in terms of total funding, research intensity, and share of total funding on a three-year rolling average. For the first time in recent years, this report also provides data on McGill's performance in funding from the Canada Foundation for Innovation (CFI).

In July 2016, the Board of Governors officially expanded my office's mandate, changing our name to Research and Innovation. The 2017 Report on Research and Innovation attempts to reflect the unit's renewed emphasis on industry-sponsored research by providing a detailed look at selected NSERC Industry Partnered Programs, including Collaborative Research and

Development Grants (CRD) and Industrial Research Chairs (IRC) as well as contracts. The Innovation Performance section reviews McGill's revenue from inventions, licenses, and options while establishing new measurements for the University's efficiency in transferring knowledge and new technologies into the community, such as the ratio of patent applications to inventions. Research output measures are also presented in this report, including publication efficiency, number of PhDs granted versus total sponsored research revenue, and research career excellence as measured by McGill's percentage of Royal Society of Canada Fellows.

Finally, the report highlights a small selection of major research funding achievements, significant new or strengthened partnerships, and researchers who received major prizes and awards over the past year.

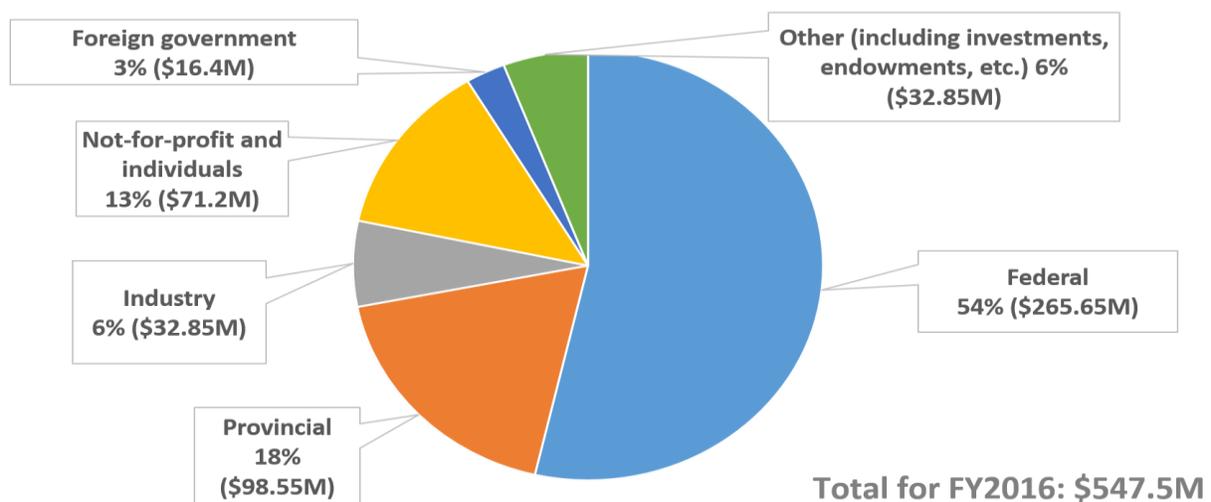
# Research Funding Performance

## BREAKDOWN OF FUNDING SOURCES

McGill, like all Canadian universities, relies on “traditional” sources for the majority of its research funding. Over the past decade, public funding (federal and provincial) has been the most important source of research funding for McGill, with federal funding accounting for 50% to 55% (54% in FY2016) of research revenue and provincial funding ranging between 10% and 20% (18% in FY2016).

Funding from other entities than the federal and provincial governments, or “alternative” sources of research funding – non-profits, industry, individuals, other governments (including foreign governments), and endowment and other investments – have also remained relatively stable over the past decade. Collectively, these non-traditional sources generated approximately \$153.3 million in research funding for McGill in FY2016: \$71.2 million from non-profits, \$33 million from industry, and \$33 million from individuals, endowment and other investments funding sources. Revenues from foreign governments was \$16.4 million in FY2016. Overall, non-traditional sources of revenues increased by more than \$9 million in FY2016 compared to FY2015. Sponsored research funding from businesses decreased from \$39 million in FY2015 to less than \$33 million in FY2016 while funding from non-profits increased from \$55 million in FY2015 to more than \$71 million in FY2016.

**Figure 1: McGill Sources of Research Funding FY2016 (includes affiliated institutions)**



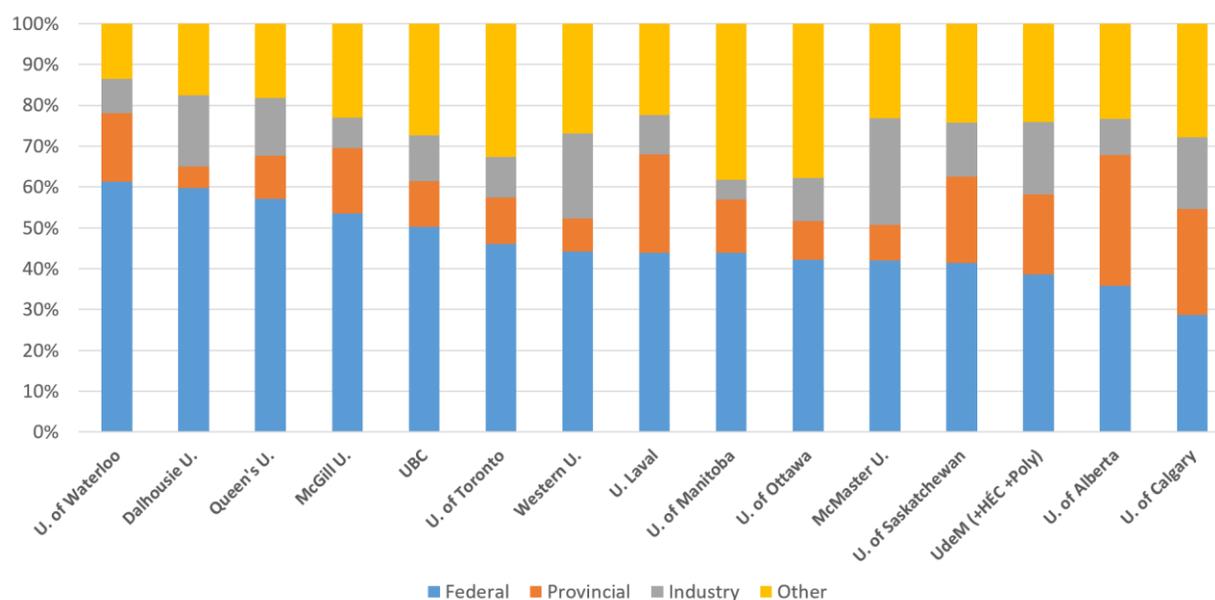
Source: Canadian Association of University Business Officers (CAUBO)

## COMPARISON OF TOTAL SPONSORED RESEARCH

Among Canada’s five largest research-intensive universities (U5), McGill relies the most on federal sources of income for research, with federal funding accounting for 53.5% of its total research funding. McGill is followed by the University of British Columbia (50.2%), the University of Toronto (46%), Université de Montréal (38.6%), and the University of Alberta (35.8%).<sup>1</sup> Figure 2 details the full breakdown of funding sources for each of Canada’s 15 largest research-intensive universities (U15) from FY2014 to FY2016.

Please note that the “Other” category includes funding from the following sources: municipal governments, other provinces, foreign governments, individuals, not-for-profit organizations, endowments, other investments, sales of services and products, and miscellaneous.

**Figure 2: Funding Source as Share of Total Sponsored Research – U15, 3-year (FY2014-FY2016) Average**



Source: Financial Information of Universities and Colleges (CAUBO)

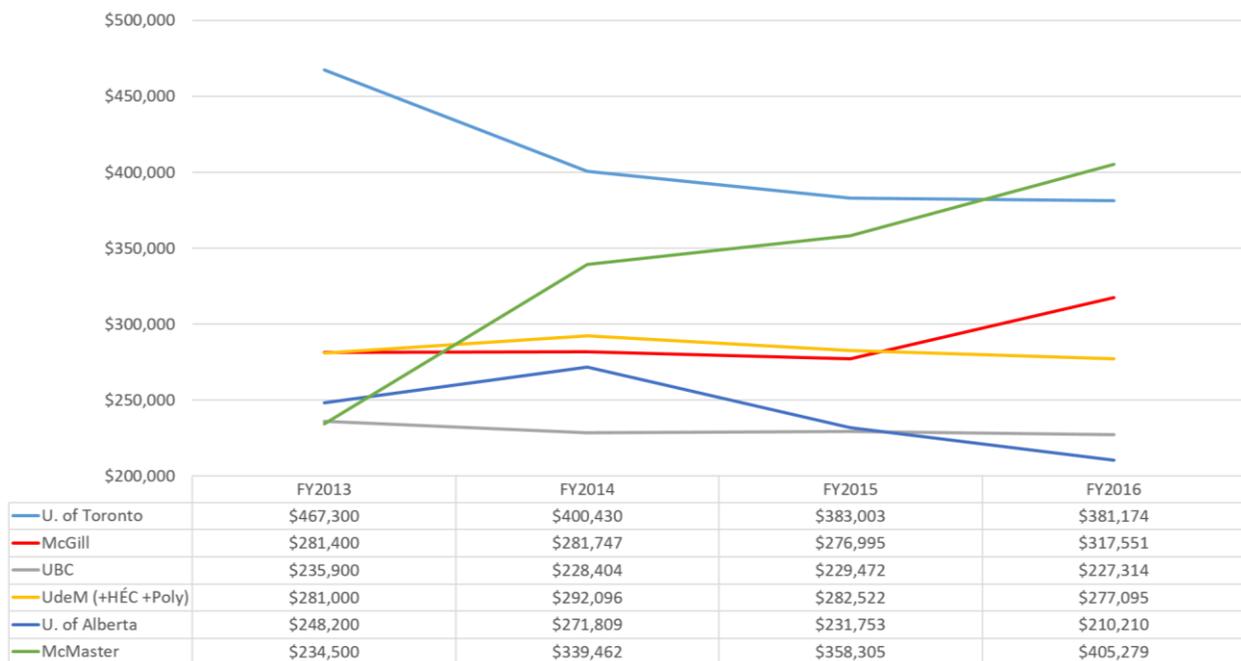
<sup>1</sup> Throughout this report, references to funding at McGill and the University of Toronto include research revenue generated at all campuses and affiliated hospitals, while references to funding at Université de Montréal include research revenue from its affiliated hospitals as well as HEC Montréal and Polytechnique Montréal, which are independent degree-granting institutions.

## RESEARCH INTENSITY

Research intensity is equal to the total research income in a given fiscal year, divided by the number of faculty members in the fall of the reference year. In FY2016, McGill ranked 3rd after the University of Toronto and McMaster University in research intensity. FY2016 represents a peak year of funding for McGill, which is largely attributed to significant revenue from CFI funding.

However, it should be noted that McMaster's increase in research intensity from FY2013 to FY2014 is due to a significant change in how the university reports its number of faculty members, which fell from 1,375 in fall 2012 to 915 in fall 2013. Moreover, McMaster has continued to show a decline in faculty numbers in fall 2014 and fall 2015, reporting 906 and 875 faculty members respectively.

**Figure 3: Research Intensity**



Source: RESEARCH Infosource Ranking, which uses CAUBO data for income and their own RESEARCH Infosource University R&D database for faculty members

## TRI-AGENCY OVERVIEW

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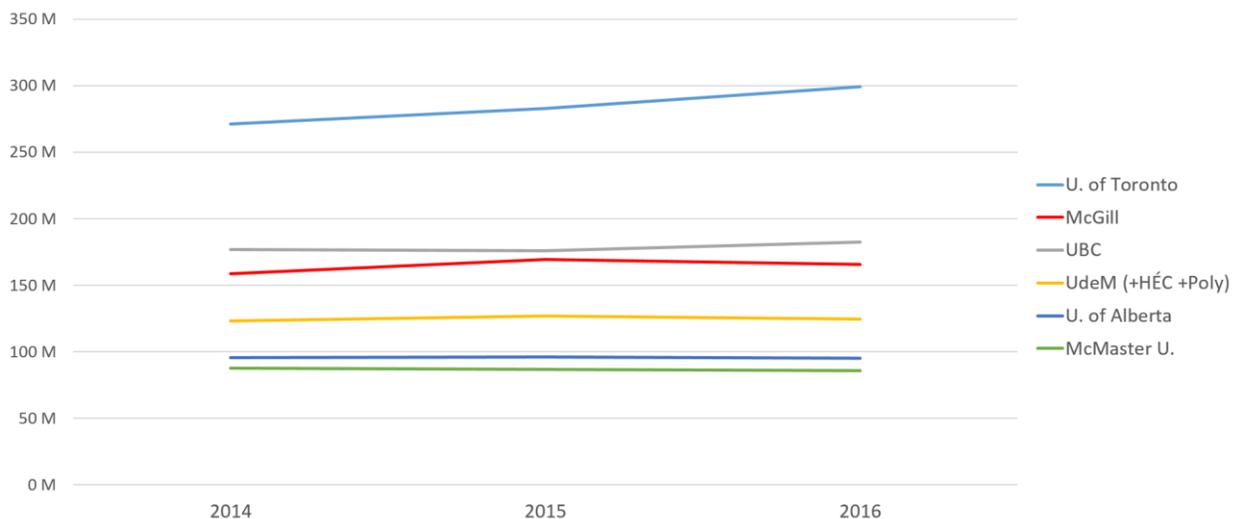
McGill continues to perform well in programs offered by the three major federal granting agencies: Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC), and the Social Sciences and Humanities Research Council (SSHRC), known collectively as the Tri-Agency.

McGill ranks among the top research universities in Canada – both overall (Figure 4 and Table 1) and in each of the individual funding agencies (Figure 5). In particular, this report pays close attention to comparing McGill to the following research-intensive institutions: University of Toronto, University of British Columbia, University of Alberta, Université de Montréal, and McMaster University (known collectively as the “U6”).

McGill ranked 3rd among the U15 for total Tri-Agency funding in FY2016, behind University of Toronto and University of British Columbia. In addition, McGill ranked 2nd in CIHR funding, 4th in NSERC funding, and 3rd in SSHRC funding.

The totals below include grants, career awards, and scholarships, but exclude Canada Research Chairs (CRC), Canada Excellence Research Chairs (CERC), and Networks of Centres of Excellence (NCE).

**Figure 4. Total Tri-Agency Funding per Institution (in millions)**



Source: Tri-Agency statistics compiled by Observatoire des Sciences et Techniques (OST) and McGill’s Office of Analysis, Planning and Budget (APB)

**Table 1. Tri-Agency Funding Intensity (x \$1,000) – Average per Year for 3 Years (2014-2016)**

	<b>Total Tri-Agency Funding</b>	<b># Faculty Members</b>	<b>Funding per Faculty Member</b>
University of Toronto	\$284,518	2617	\$108.7
McGill University	\$164,445	1709	\$96.2
University of British Columbia	\$178,185	2365	\$75.3
Université de Montréal (+HEC and Polytechnique)	\$124,920	1882	\$66.4
University of Alberta	\$95,664	1932	\$49.5
McMaster University	\$86,763	899	\$96.5

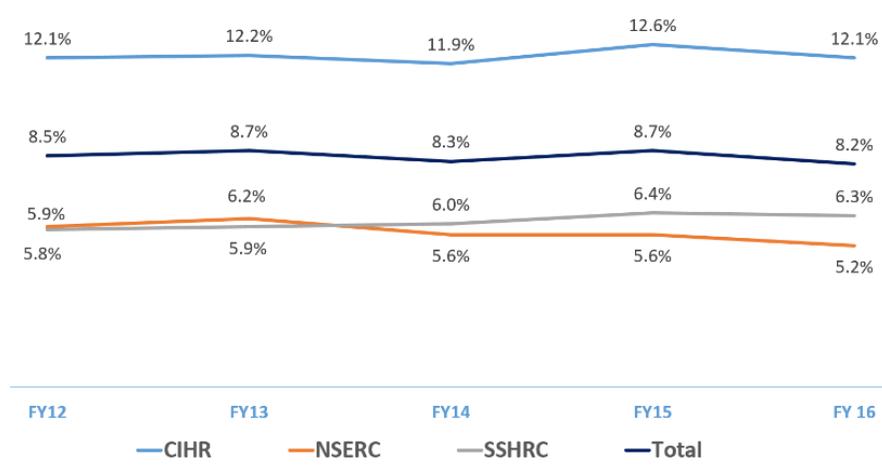
Source: Tri-Agency statistics compiled by OST, RESEARCH Infosource University R&D database for faculty members

#### **Figure 5: McGill Tri-Agency Share by Council**

“Share” is defined as McGill’s percentage of the total Tri-Agency award dollars (grants, career awards and scholarships), based on annual instalments (payments).

McGill’s share of faculty members is approximately 8% of the U15 total, and over the last 15 years, McGill’s total sponsored research represents 9% of the U15 total as reported to CAUBO. (U15 members represent 80% of all research funding by the Canadian institutions that report to CAUBO.)

Within the Tri-Agency, McGill earns 11.3% of the U15 share, although it has only about 8% of the total faculty members in the U15. (U15 institutions receive approximately 73% of the total Tri-Agency funding.)



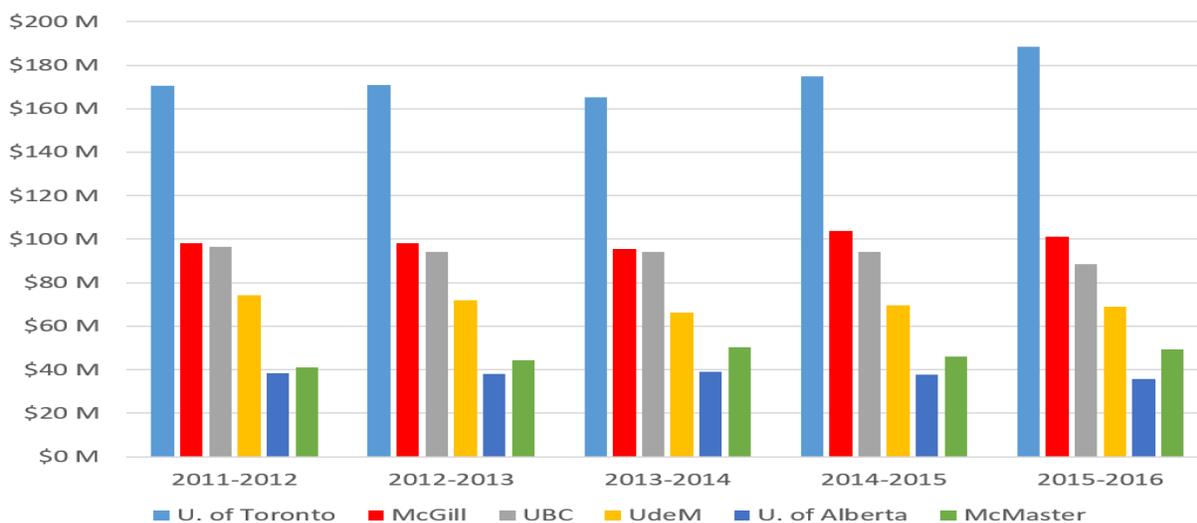
2015-2016 Market shares U6 rank	
1. U. of Toronto	14.9%
2. UBC	9.1%
3. McGill	8.2%
4. UdeM	6.2%
5. U. of Alberta	4.7%
6. McMaster	4.3%
CIHR	
1. U. of Toronto	22.4%
2. McGill	12.1%
3. UBC	10.5%
4. UdeM	8.2%
5. McMaster	5.9%
6. U. of Alberta	4.7%
NSERC	
1. U. of Toronto	9.3%
2. UBC	8.3%
3. U. of Alberta	5.6%
4. McGill	5.2%
5. UdeM	4.5%
6. McMaster	3.2%
SSHRC	
1. U. of Toronto	9.9%
2. UBC	6.9%
3. McGill	6.3%
4. UdeM	5.3%
5. U. of Alberta	3.6%
6. McMaster	2.6%

Source: Tri-Agency statistics compiled by OST

### CANADIAN INSTITUTES OF HEALTH RESEARCH (CIHR)

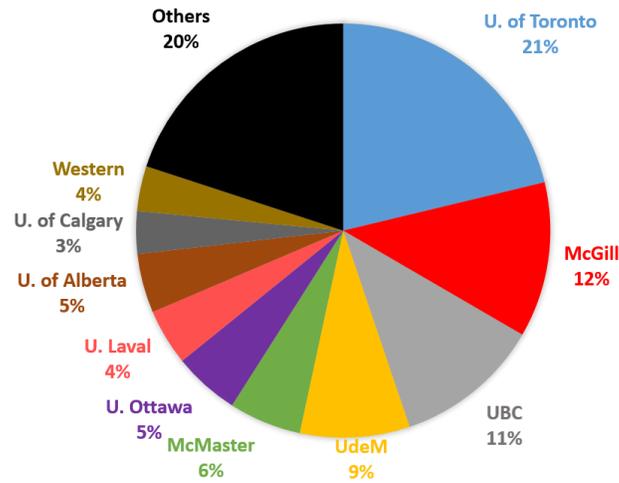
Over the past five years, McGill has ranked 2nd in total CIHR funding in the U15, behind only the University of Toronto.

Figure 6. Total CIHR funding per institution (in million) 2012-2016 (5 years)



Source: Tri-Agency statistics compiled by OST

**Figure 7. Share of CIHR funding – Top 10 Institutions (average 2012-2016)**

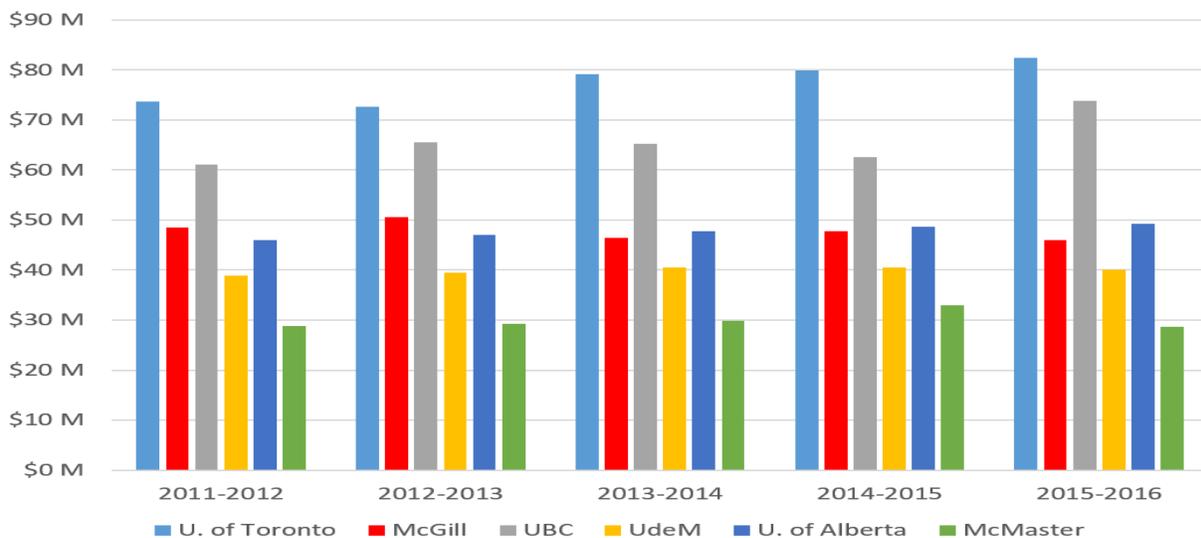


Source: Tri-Agency statistics compiled by OST

**NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA (NSERC)**

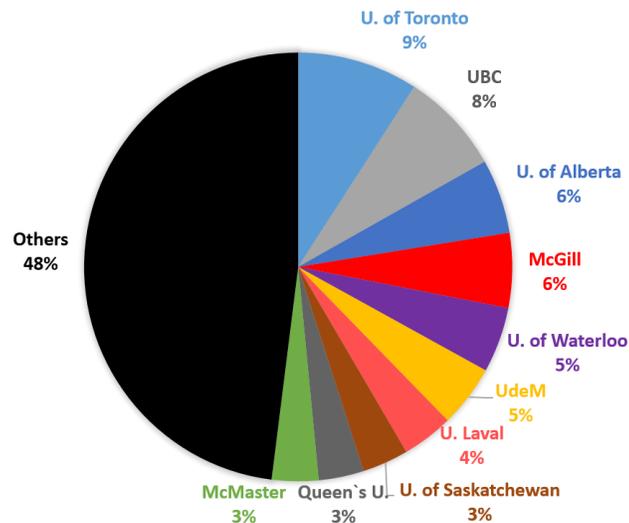
Over the past five years, McGill has ranked 4th in total NSERC funding among the U15, behind University of Toronto, University of British Columbia, and University of Alberta.

**Figure 8. Total NSERC funding per institution (in million) 2012-2016 (5 years)**



Source: Tri-Agency statistics compiled by OST

**Figure 9. Share of NSERC funding – top 10 institutions (average 2012-2016)**

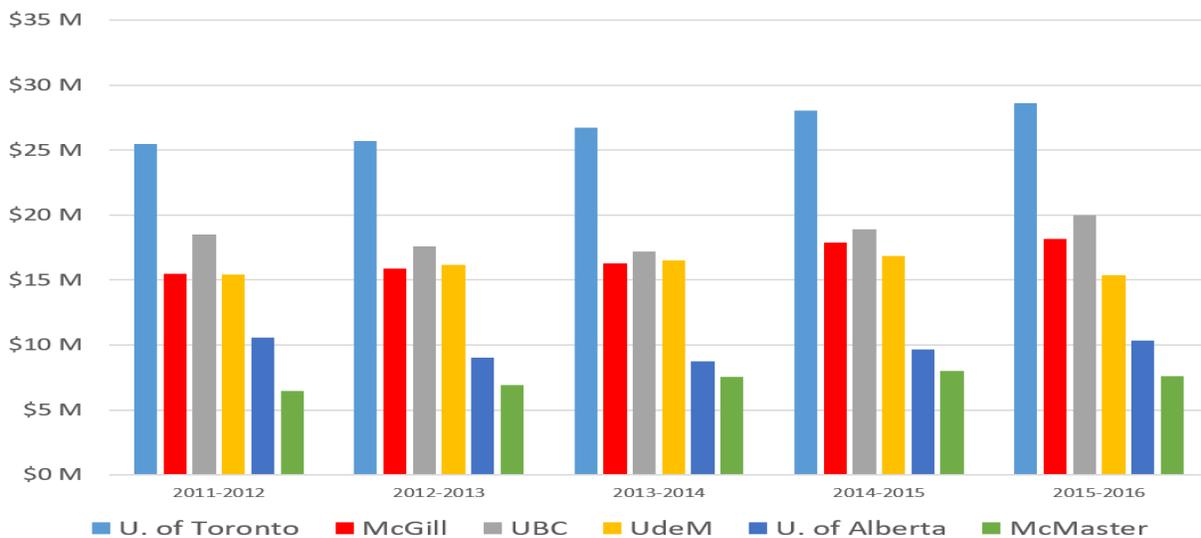


Source: Tri-Agency statistics compiled by OST

**SOCIAL SCIENCES AND HUMANITIES RESEARCH COUNCIL (SSHRC)**

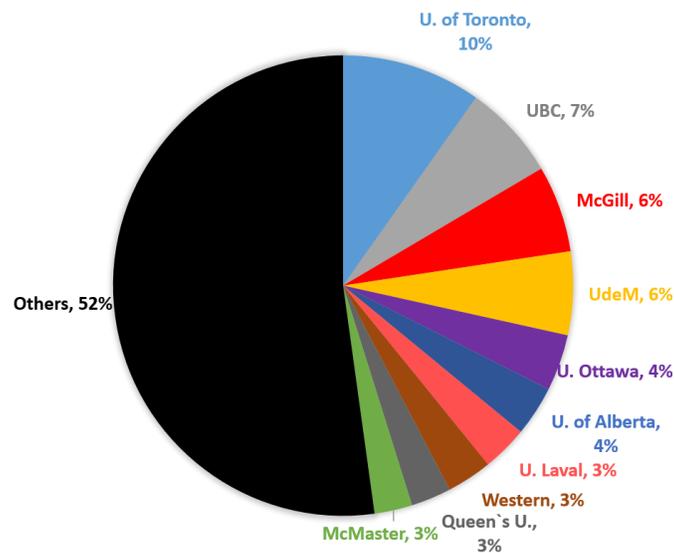
Over the past five years, McGill has ranked 3rd among the U15 in total SSHRC funding, behind University of Toronto and University of British Columbia.

**Figure 10. Total SSHRC funding per institution (in million) 2012-2016 (5 years)**



Source: Tri-Agency statistics compiled by OST

**Figure 11. Share of SSHRC funding – top 10 institutions (average 2012-2016)**



Source: Tri-Agency statistics compiled by OST

### CANADA FOUNDATION FOR INNOVATION

The Canada Foundation for Innovation (CFI) funding rate is each university's share of awarded CFI funding versus its application allocation (i.e. the amount for which the institution could apply in each round) (Table 2). The CFI funding rate measures the ability of each institution to "take" their share of the national pool as per the allocation envelopes calculated by CFI at the application stage. The table includes CFI funding for each university as well as its affiliated hospitals. Statistics for Université de Montréal includes funding to Polytechnique Montréal and HEC Montréal.

**Table 2. U5 Awarded Amounts and Proportion of Institutional Allocation**

<b>ROUND 8 (2015)</b>	<b>AWARDED (\$ MILLION)</b>	<b>PROPORTION OF INSTITUTIONAL ALLOCATION</b>
<b>1. MCGILL</b>	<b>41.7</b>	<b>59.0%</b>
<b>2. U. OF TORONTO</b>	<b>33.3</b>	<b>29.3%</b>
<b>3. UBC</b>	<b>20.5</b>	<b>26.1%</b>
<b>4. U DE M</b>	<b>16.8</b>	<b>30.4%</b>
<b>5. U. OF ALBERTA</b>	<b>2.1</b>	<b>4.6%</b>
<b>ROUND 9 (2017)</b>		
<b>1. U. OF TORONTO</b>	<b>80.1</b>	<b>46.2%</b>
<b>2. UBC</b>	<b>67.5</b>	<b>57.0%</b>
<b>3. MCGILL</b>	<b>31.0</b>	<b>29.3%</b>
<b>4. U DE M</b>	<b>27.6</b>	<b>33.8%</b>
<b>5. U. OF ALBERTA</b>	<b>23.8</b>	<b>35.1%</b>

Source: CFI statistics compiled by the Strategic Initiatives unit in Research and Innovation

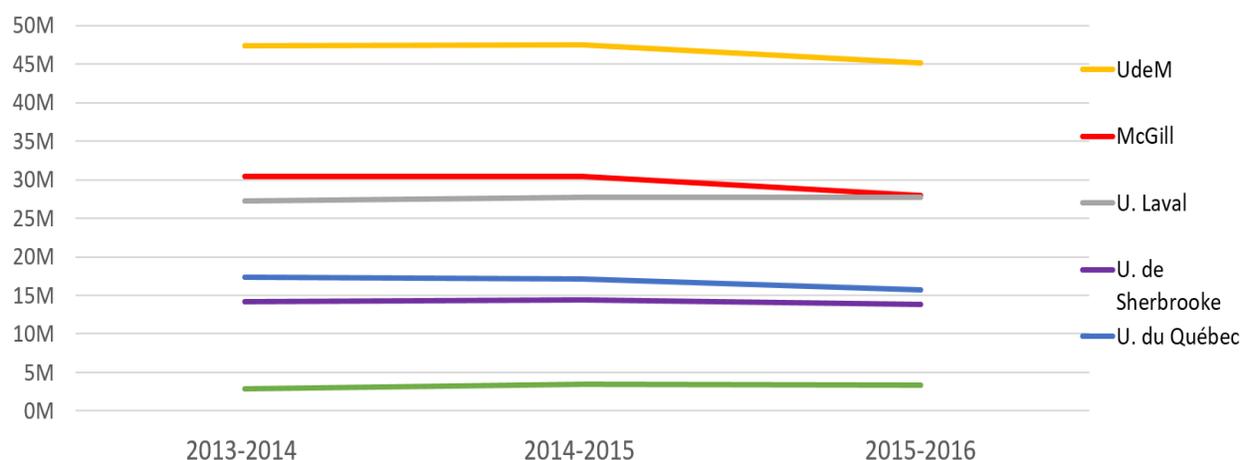
### **FONDS DE RECHERCHE DU QUÉBEC (FRQ) OVERVIEW**

The Fonds de recherche du Québec (FRQ) is the province’s primary research funding organization. Its three agencies, known collectively as the “Trois Fonds,” are the Fonds de recherche du Québec – Santé (FRQ-S), Fonds de recherche du Québec – Nature et technologies (FRQ-NT), and the Fonds de recherche sur la société et la culture (FRQ-SC).

In FY2016, the FRQ awarded McGill just under \$30 million, behind only Université de Montréal at \$47 million. McGill also ranked 3rd, behind Université de Montréal and Université Laval, in FRQ research intensity with \$173,000 per faculty member. Université de Montréal hosts the most Strategic Networks (Regroupement stratégiques) in Quebec, which accounts for a significant amount of its FRQ research funding. Université de Montréal, McGill University, and Université Laval together receive approximately 70% of all FRQ funding.

In the following figures, Université du Québec includes all universities in the provincial network. The FRQ funding amounts below include all awards, but exclude support to students through scholarships.

**Figure 12. Total FRQ Funding (in millions)**



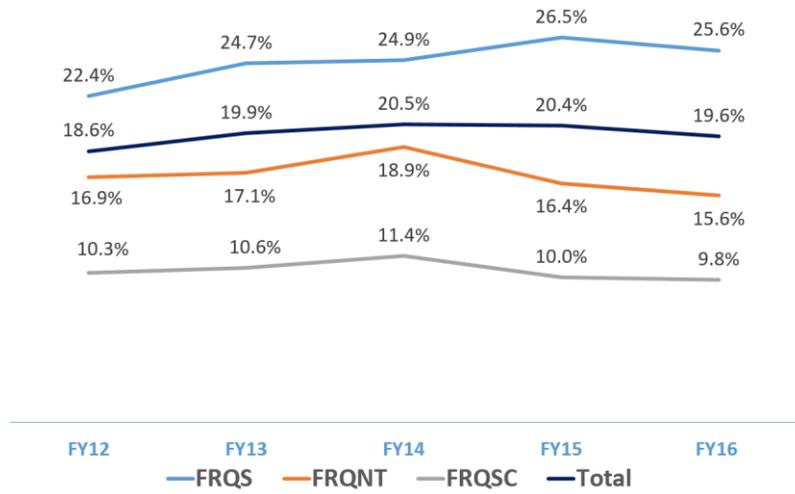
Source: Data obtained from FRQ; analyzed by APB

**Table 3. FRQ Funding Intensity – Average per Year for 3 Years (2014-2016)**

	FRQ (millions)	# Faculty Members	Funding per Faculty Member (thousands)
UdeM	\$46.7	1,882	\$24.8
U. Laval	\$27.5	1,543	\$17.8
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Concordia U.	\$3.2	782	\$4.1

Source: Data obtained from FRQ; analyzed by APB

**Figure 13. FRQ – McGill Share of Annual Funding**



**Table 4. 2015-2016 Shares of Annual Funding QC Universities Rank**

1. U DE M	31.8%
<b>2. MCGILL</b>	<b>19.6%</b>
3. U. LAVAL	18.8%

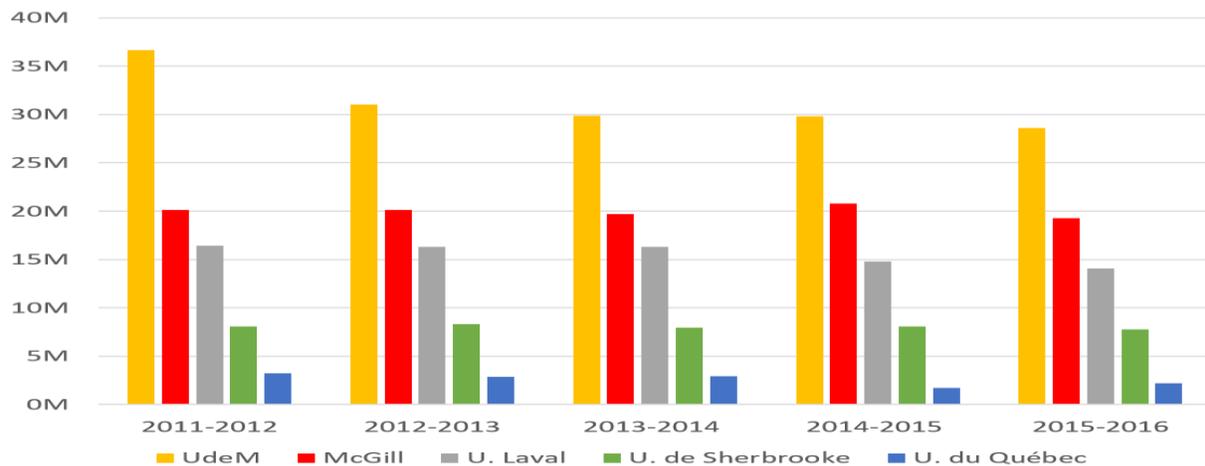
FRQS	
1. U DE M	37.9%
<b>2. MCGILL</b>	<b>25.6%</b>
3. U. LAVAL	18.7%

FRQNT	
1. U DE M	23.4%
2. U. LAVAL	22.8%
<b>3. MCGILL</b>	<b>15.6%</b>

FRQSC	
1. U DE M	26.6%
2. UQAM	15.5%
3. U. LAVAL	14.3%
<b>4. MCGILL</b>	<b>9.8%</b>

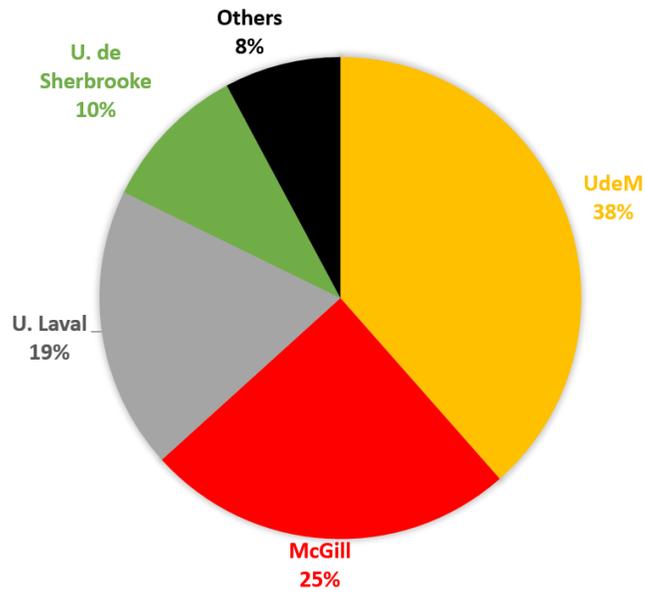
Source: Data obtained from FRQ; analyzed by APB

**Figure 14. Total FRQ-S Funding per Institution (in \$ million) 2012-2016 (5 years)**



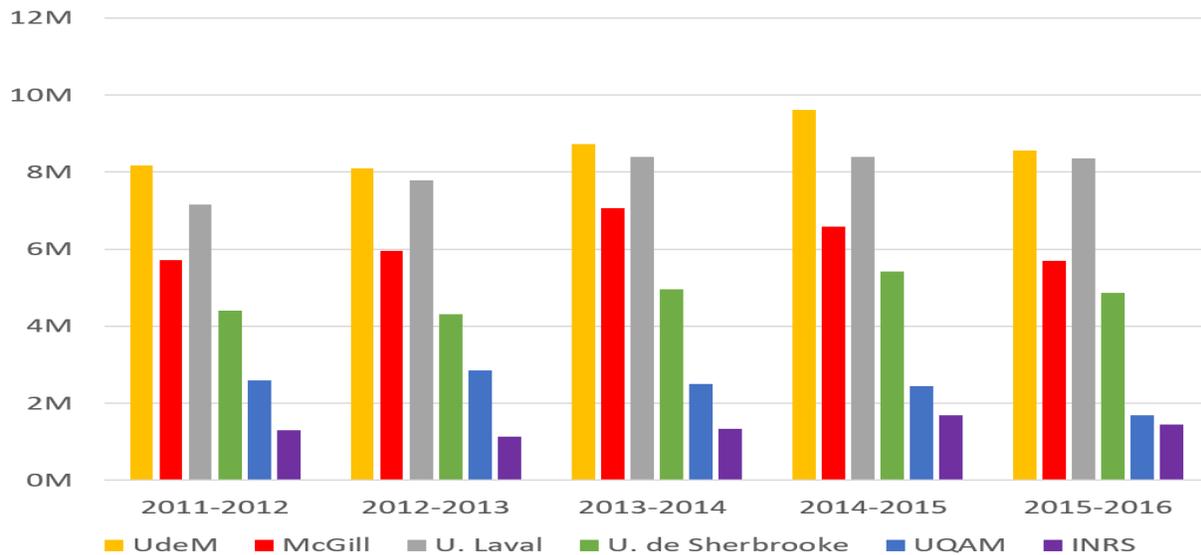
Source: Data obtained from FRQ; analyzed by APB

**Figure 15. Share of FRQ-S Funding (average 2012-2016)**



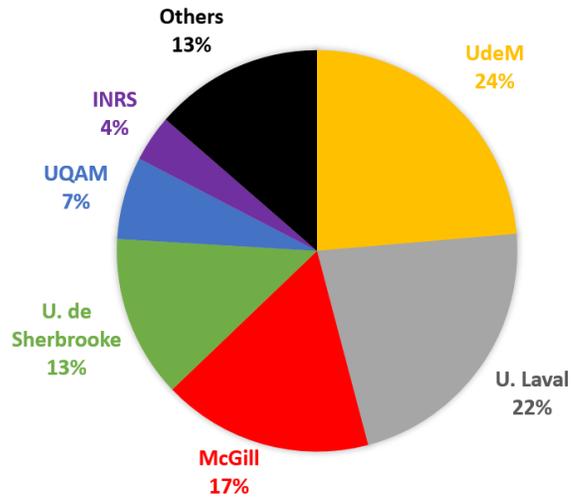
Source: Data obtained from FRQ; analyzed by APB

**Figure 16. Total FRQ-NT Funding per Institution (in \$ million) 2012-2016 (5 years)**



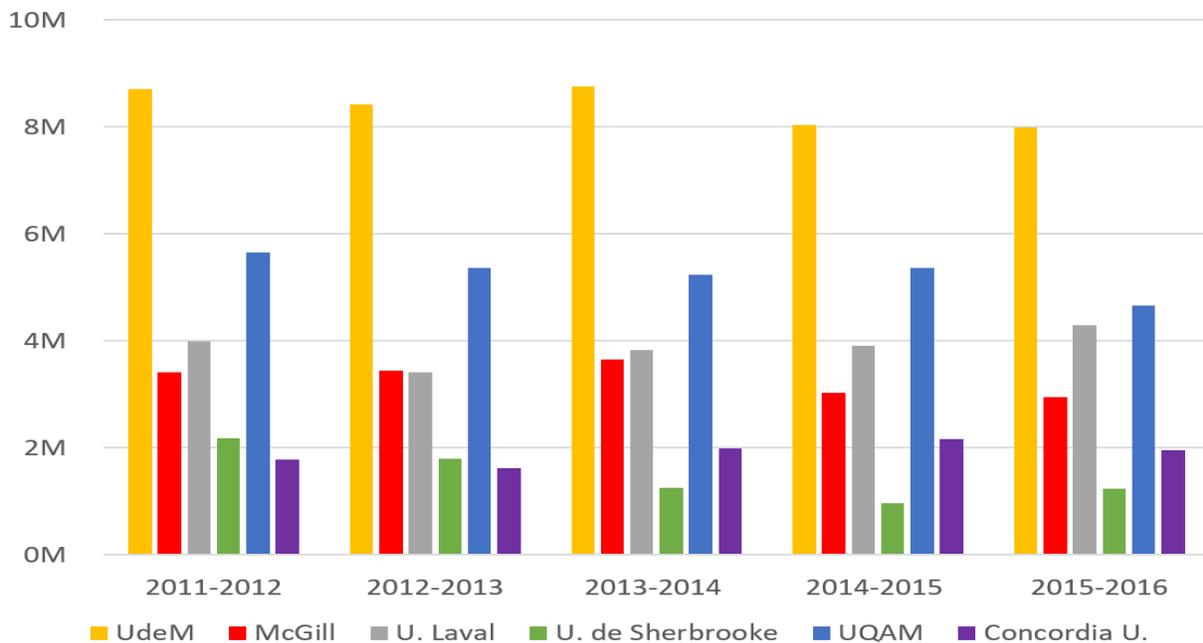
Source: Data obtained from FRQ; analyzed by APB

**Figure 17. Share of FRQ-NT Funding (average 2012-2016)**



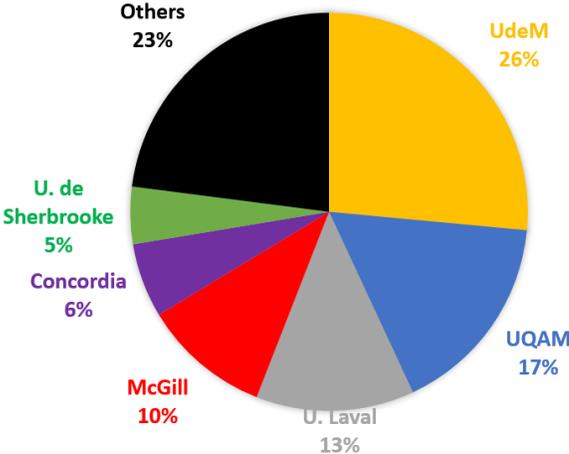
Source: Data obtained from FRQ; analyzed by APB

**Figure 18. Total FRQ-SC Funding per Institution (in \$million) 2012-2016 (5 years)**



Source: Data obtained from FRQ; analyzed by APB

Figure 19. Share of FRQ-SC Funding (average 2012-2016)



Source: Data obtained from FRQ; analyzed by APB

# Innovation Performance

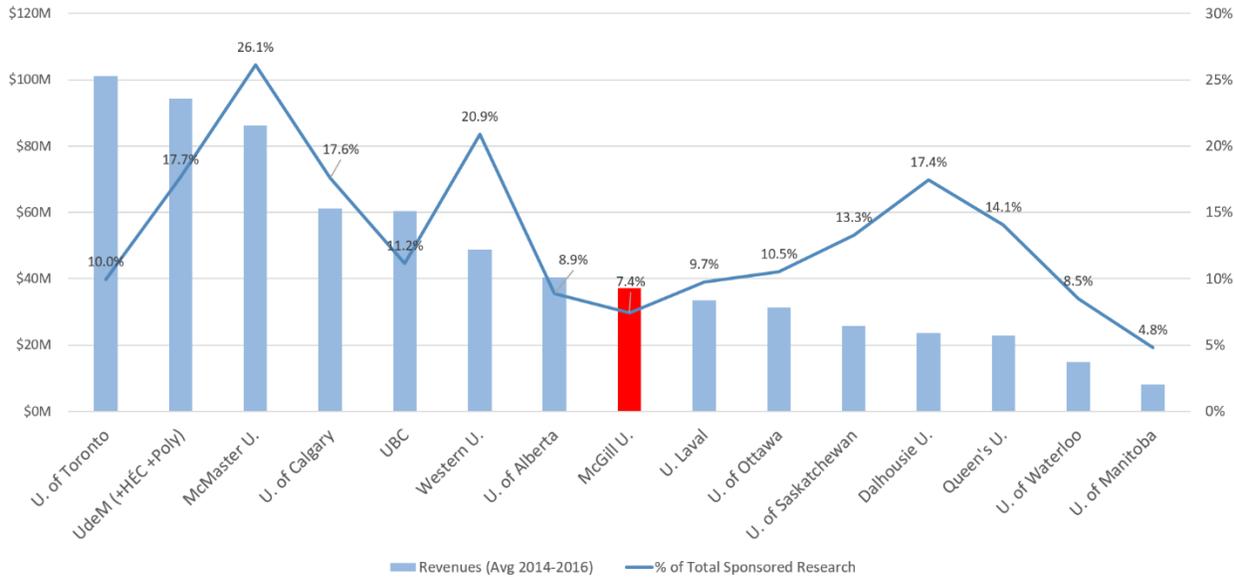
## BACKGROUND

In recent years, the annual Report on Research and Innovation has stressed the need for McGill to work differently with our researchers, our community partners (including investors and alumni), and industry to create new sources of research funding as well as deliver knowledge, ideas, and new technologies that address pressing societal issues. This means more and better collaboration, a more strategic and open approach to our patent portfolio, and a concerted effort to take our research beyond the academy to the market or translate it into new means of engaging and improving our communities. The 2017 Report on Research and Innovation identifies a number of new indicators that will be used to measure the University’s performance in areas related to commercialization and partnership-building in future years.

### BUSINESS ENTREPRISE SPONSORED RESEARCH – U15 AND U6

The following statistics include grants and contracts as well as donations for the purpose of research.

**Figure 20. Industry Sponsored Research Funding and Share of Total Sponsored Research (3-year average, 2014-2016)**



Source: Financial Information of Universities and Colleges, CAUBO

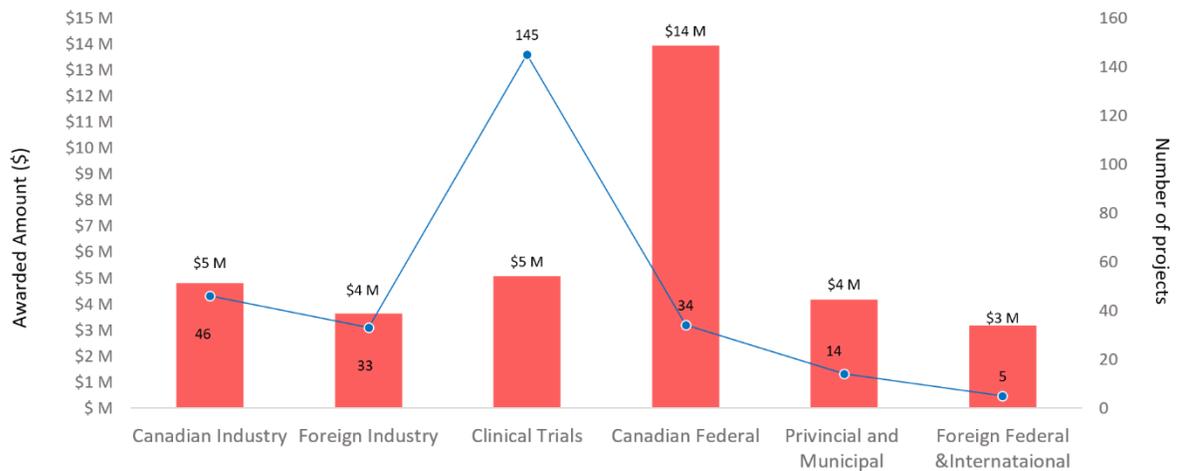
**Table 5. Industry Research Funding and Intensity (3-year average, 2014-2016)**

	Average Revenue (millions)	% of Total Research Revenues	# Faculty Members	Funding per Faculty Member (thousands)
U. of Toronto	\$101.1	10.0%	2,617	\$38.6
<b>McGill</b>	<b>\$37.1</b>	<b>7.4%</b>	<b>1,709</b>	<b>\$21.7</b>
UBC	\$60.3	11.2%	2,365	\$25.5
UdeM (+ HEC+Poly)	\$94.3	17.7%	1,882	\$50.1
U. of Alberta	\$40.5	8.9%	1,932	\$21.0
McMaster U.	\$86.1	26.1%	899	\$95.8
U. of Waterloo	\$14.8	8.5%	1,120	\$13.2

Source: CAUBO and RESEARCH Infosource University R&D database for faculty members

**MCGILL CONTRACT RESEARCH – INDUSTRY AND PUBLIC**

**Figure 21. Research Contracts\* Awarded (total revenues and counts) in 2016-2017 by Sponsor Type**



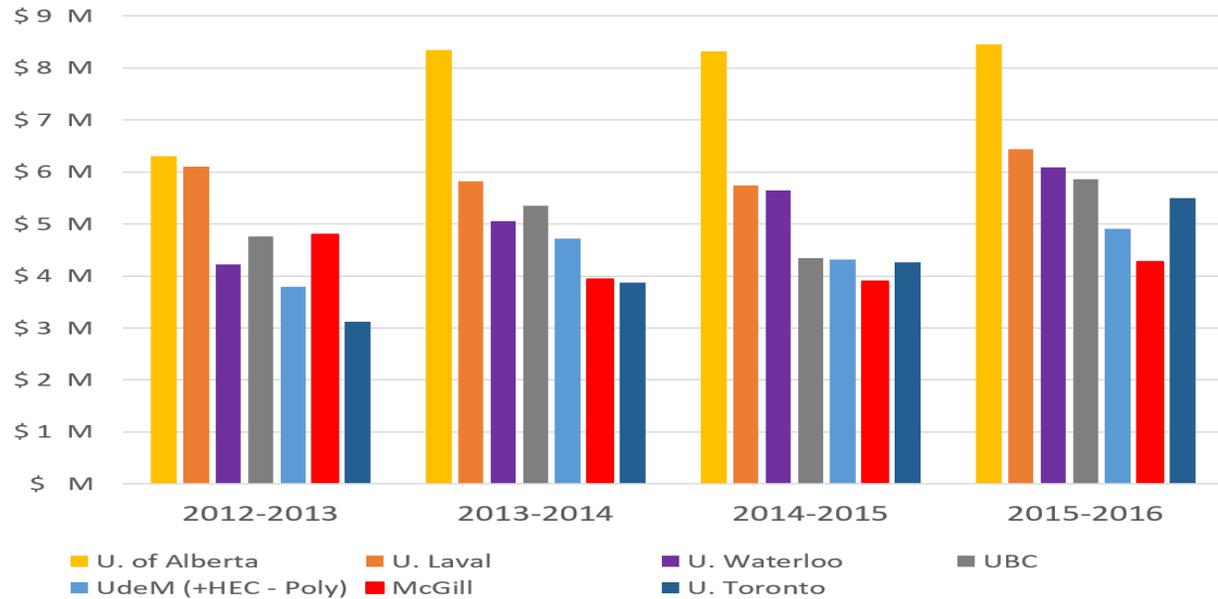
\*Includes clinical trials administered at McGill, but excludes affiliated research institutes

Source: InfoEd (internal data)

## NSERC INDUSTRY PARTNERED RESEARCH

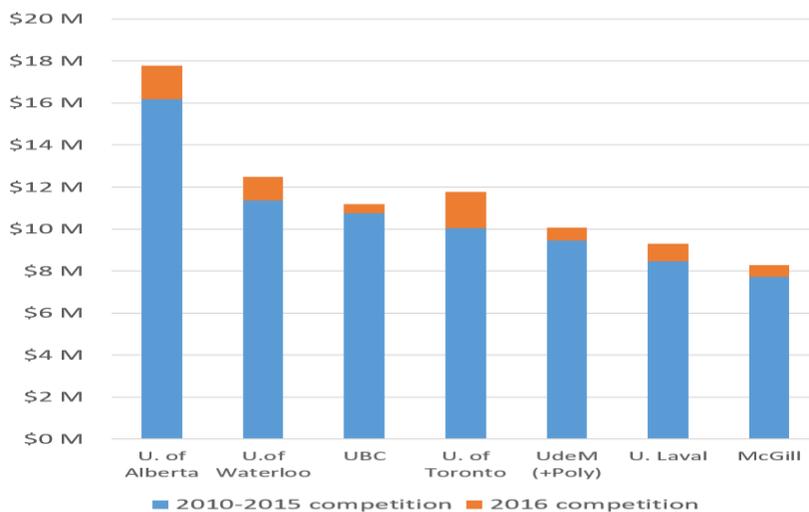
**Figure 22. NSERC Collaboration Research and Development Grants (CRD) – Annual Funding of Top 7 Institutions**

NSERC CRD award dollars are based on the annual instalments (payments).



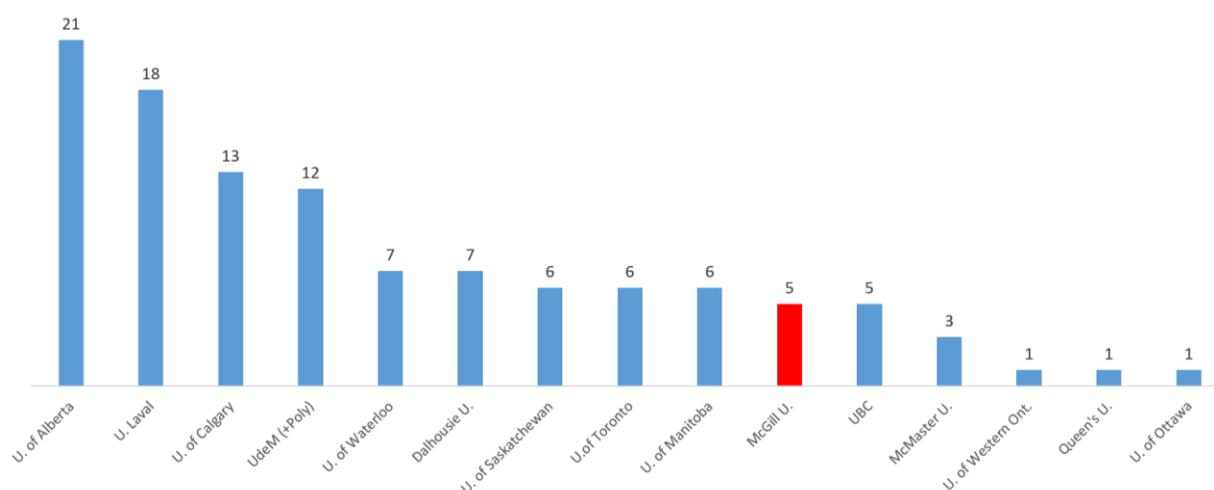
Source: Tri-Agency statistics compiled by OST

**Figure 23. NSERC CRD Funding Awarded 2010-15 and 2016**



Source: [NSERC online portal](#)

**Figure 24. Number of Active NSERC Industrial Research Chairs (2017)**



Source: [NSERC Chairholder Database](#) (extracted on November 21, 2017)

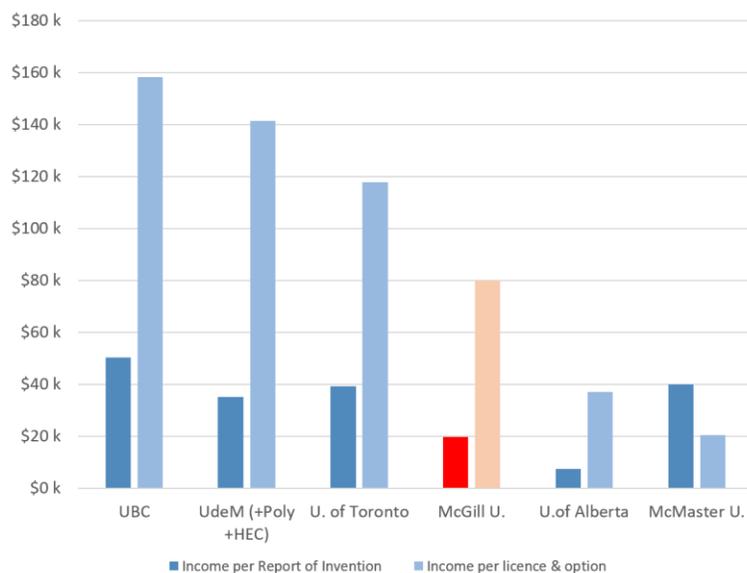
## INNOVATION AND COMMERCIALIZATION

As context for the following section, it is important to bear in mind a few key observations about commercialization among Canadian universities:

- Licensing revenue in Canada is at least an order of magnitude lower than in the United States.
- Licensing revenue is not predictable; for example:
  - From 2014-2016, the University of Saskatchewan led all Canadian universities in licensing revenue (\$48.2 million). This was based on royalties from one license.
  - From 2014 to 2016, the University of Waterloo – widely perceived as strong in innovation-related measures – grossed only \$573,000. Licensing returns to the institution are minimal due to [Waterloo's "creator-owned" IP policy](#).
  - The University of Toronto earned more \$34 million from licensing in 2014 and less than \$2 million in 2015.
- In Canada, a university's IP ownership policy does not directly correlate to its licensing revenue. (There is not one model that guarantees higher revenues.)

**Figure 25. Revenue by Inventions and Licences and Options (2012-2016)**

Figure 25 lists gross adjusted income in Canadian dollars from reports of inventions and licences and options. Commercialization income varies widely from year to year, as revenue is often attributable to a small number of licences or patent sales.



Source: AUTM Licensing survey

**Table 6. Ratio of Patent Applications to Inventions**

A smaller ratio (Figure 31) indicates that an institution is more selective in choosing which inventions to protect with a patent. McGill is moving toward this model. All institutions listed in this table, with the exception of the University of Toronto, had a smaller ratio for 2016 than their three-year average, indicating a similar trend across institutions.

	2014-2016 average	2016
U. of Toronto	0.34	0.40
McMaster U.	0.53	0.40
U. of Alberta	0.57	0.46
UBC	0.65	0.58
UdeM (+Poly + HEC)	0.86	0.73
<b>McGill U.</b>	<b>1.03</b>	<b>0.70</b>

Source: AUTM Licensing survey

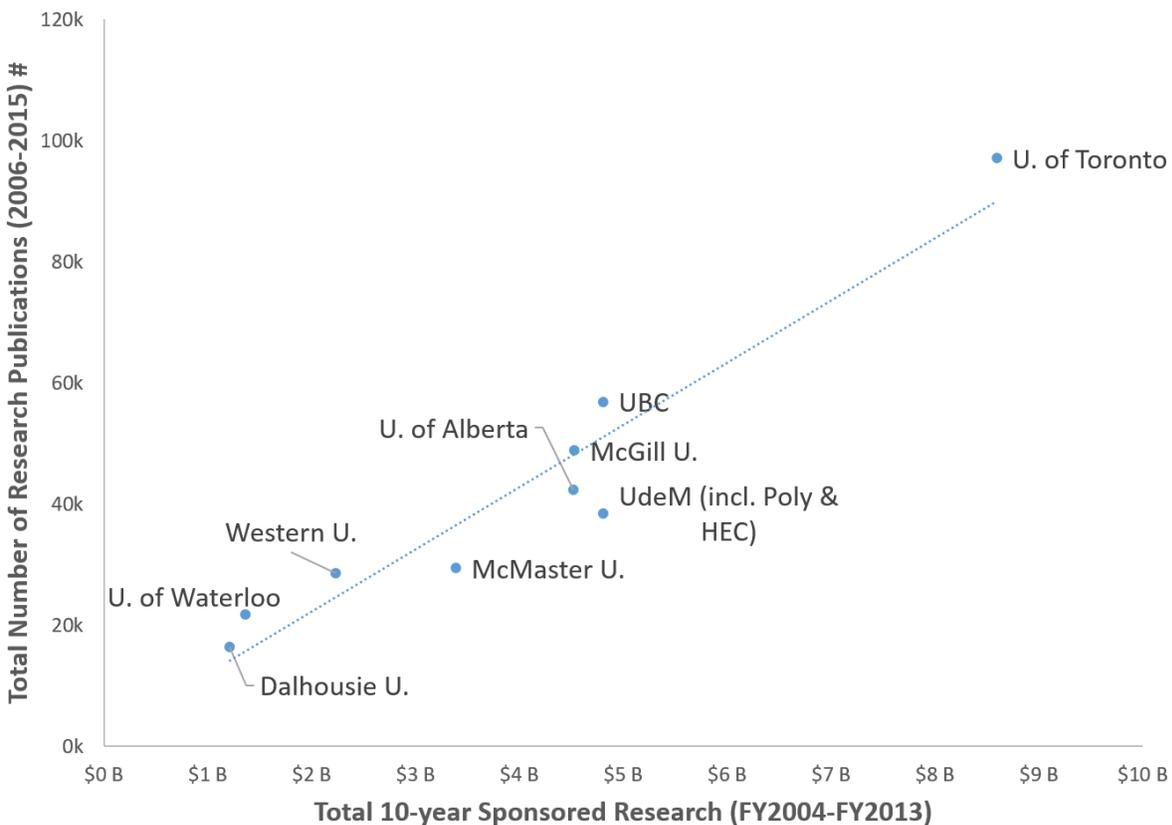
## OTHER RESEARCH OUTPUT MEASUREMENTS

Research analytics are often focused on the inputs of research (typically research funding). In Research and Innovation, we are conscious of the need to look at the outputs of research as well. Two of these outputs are counts of publications and PhD students who earned degrees. (This latter output reflects a significant research achievement.)

Figure 32 shows “Publication Efficiency” or counts of publications versus research funding over a 10-year period. An institution above the line of best-fit produces more publications per research dollar than is typical among the institutions being compared. What is the right level of publication efficiency? This is open to debate, but publication efficiency allows us to see our output in a comparative context.

Figure 33 shows a 2-year average of PhD degrees granted versus research funding over the same period. Institutions above the line of best-fit “produce” more doctoral degrees than might be expected for their funding levels.

**Figure 26. Publication Efficiency**

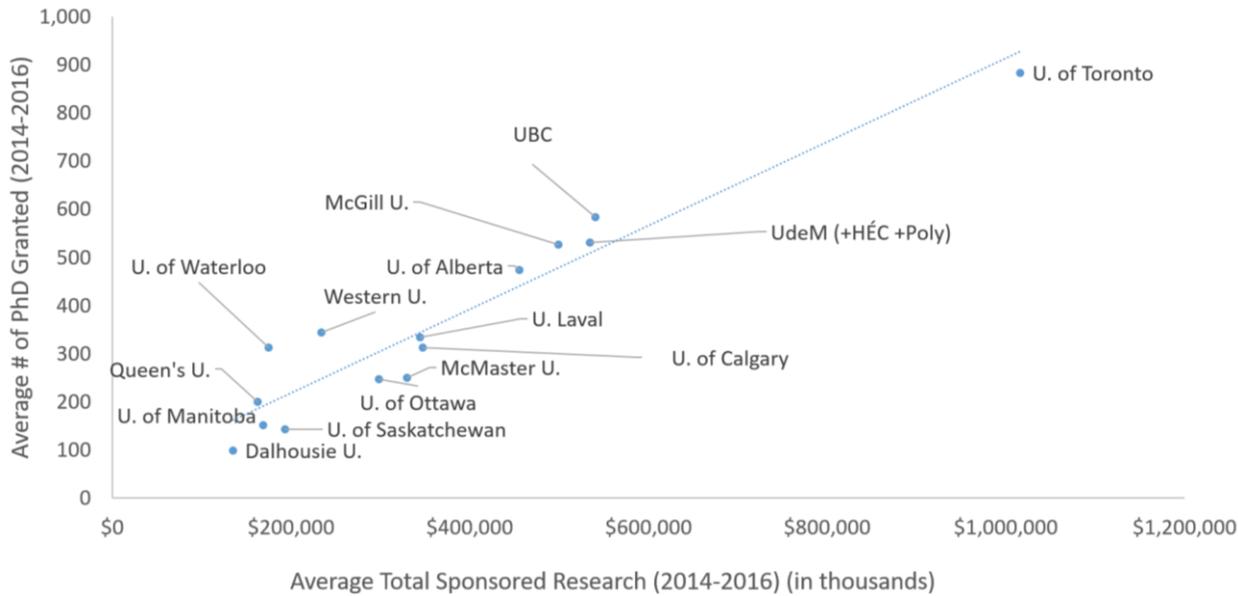


Source: CAUBO and OST Volume of Publication (based on Web of Science)

Table 7. 10-year Publication Efficiency (research revenue per publication), 2006-2015 (in thousands)	
U. OF WATERLOO	\$62.4
DALHOUSIE U.	\$73.6
WESTERN U.	\$78.2
U. OF TORONTO	\$88.5
<b>MCGILL U.</b>	<b>\$92.8</b>
U. OF ALBERTA	\$106.6
U. DE MONTRÉAL	\$125.0

Source: CAUBO and OST Volume of Publication (based on Web of Science)

Figure 27. Graduated PhD Students by Total Sponsored Research (3-year average)



Source: CAUBO for income, U15 Data Exchange for PhDs awarded

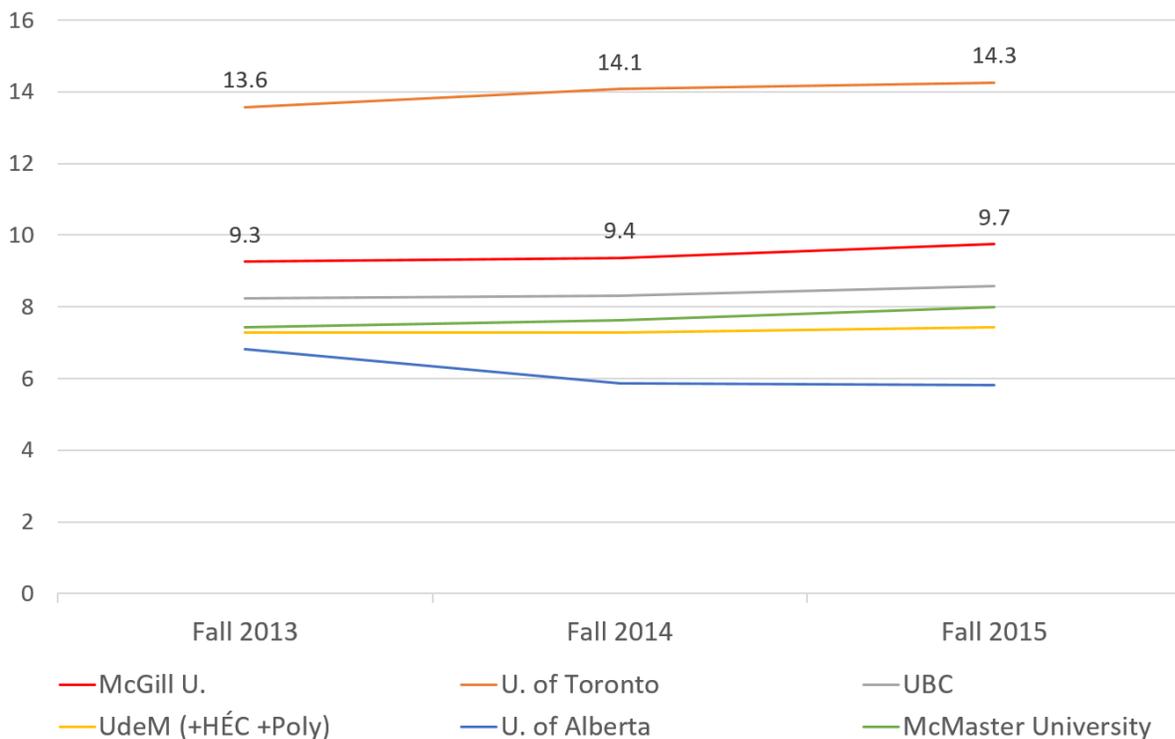
**RESEARCH CAREER EXCELLENCE – ROYAL SOCIETY OF CANADA FELLOWS**

The number of McGill-based Fellows of the Royal Society of Canada (RSC) is a representative indicator to track excellence among established researchers in Canada. McGill ranked 2nd in 2015 with 9.7 RSC Fellows per 100 faculty members, after University of Toronto with 14.3 RSC

Fellows per 100 researchers. McGill ranked 3rd in raw counts in the U15 in 2017 with 184 RSC Fellows, while University of Toronto ranked 1st (387) and University of British Columbia ranked 2nd (211).

In the past two years, McGill has increased its portion of RSC Fellows per 100 faculty members from 10.1 in 2016 to 10.4 in 2017. In addition, between fall 2015 and fall 2017, McGill increased its share of RSC Fellows overall from 7.2% to 7.5%, while the University of Toronto, University of British Columbia, University of Alberta, and McMaster University all experienced slight decreases in their respective shares.

**Figure 28. Number of RSC Fellows for Every 100 Faculty Members, 2013-2015**



Source: Official data from Royal Society of Canada, corrected for deceased individuals by the Office of Sponsored Research; faculty counts from RESEARCH Infosource for fall 2013 to fall 2015 (not available thereafter); McGill faculty count is as reported to University and College Academic Staff System (UCASS) for fall 2016 and estimated for fall 2017 (not included in graph)

# Conclusion

Drawing on the data presented in this report, Research and Innovation would like to underscore a few key observations about the state of McGill's research enterprise and innovation agenda:

- McGill is one of the U15 institutions that depends most on public funds.
- Although McGill performs well in Tri-Agency funding overall and in CIHR programs specifically, improvements can be made in NSERC funding programs.
- In FRQ programs, McGill consistently ranks below Université de Montréal, because we are not leading networks and teams at a comparable level.
- There is room for improvement in McGill's performance in FRQ-NT and FRQ-SC funding programs.
- The need remains for McGill to make improvements in key non-government funding categories, particularly from industry, not-for-profits, and foundations.

# Selected Major Achievements in 2017

## EXAMPLES OF NOTEWORTHY GRANTS AND FUNDING SUCCESSES

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- Barbara Hales, Department of Pharmacology and Therapeutics, is the lead on a successfully awarded CIHR Team Grant, worth \$2 million, for the project, “Endocrine Disrupting Chemicals: Towards Responsible Replacements.” This application was submitted under the CIHR program Environment and Health: Programmatic Grants in Intersectoral Prevention Research as a collaboration among McGill’s Faculties of Medicine, Law, Engineering, Agricultural and Environmental Sciences, and Management as well as with partnering organizations from Canada, France, South Africa, and USA.
- Edward Fon at the Montreal Neurological Institute and Hospital (MNI) received \$1.5 million in funding from CQDM and Brain Canada via their Focus on Brain strategic initiative. His team’s project involves the development of a [novel drug discovery platform](#) for Parkinson’s disease and amyotrophic lateral sclerosis (ALS).
- The Government of Canada awarded McGill and two of its affiliated hospitals \$70.7 million through the \$2-billion Post-Secondary Institutions Strategic Investment Fund (SIF). The SIF funding is earmarked for [upgrades to research facilities and energy-saving renovations](#). The Quebec government will provide an additional \$5.1 million toward the cost of the work at McGill.
- Pedro Rosa-Neto, Departments of Neurology and Neurosurgery and Psychiatry; Marta Kaminska, Department of Medicine; and John Breitner, Department of Psychiatry, each received funding promises of up to \$1.7 million from the Weston Brain Institute to [fight the brain diseases of aging](#) through research.
- The Government of Quebec awarded \$5 million for the [Consortium de recherche précompétitive en transformation alimentaire](#) at the Macdonald Campus. The funds will be awarded in five annual instalments of \$1 million. The Consortium is being created with the goal of reinforcing the competitive capacity of businesses in the food transformation industry by increasing their ability to conduct research and development as well as to launch new technological innovations.
- The Government of Quebec awarded more than \$3.7 million in funding over three years for the [Farm Management and Technology Program \(FMT\)](#), a three-year academic and practical college program offered at the Faculty of Agricultural and Environmental Sciences. The funding will enable access to strategic training for Quebec’s English-

speaking farm-business operators, thereby enhancing the competitiveness and productivity of Quebec's agricultural industry.

- Morgan Sonderegger, Department of Linguistics, received \$897,000 in funding through the Trans-Atlantic Platform (T-AP) Digging into Data Challenge, to [develop and apply user-friendly software for large-scale speech analysis](#), investigating how English speech has changed over time and space, and across dialects.
- Two McGill researchers at The Neuro received substantial grants under the [Canada Brain Research Fund](#), a public-private research fund administered by the Brain Canada Foundation: nearly \$3.9 million to Sylvain Baillet for the McConnell Brain Imaging Centre; and more than \$1.5 million to Alan Evans for his project in neuroinformatics.
- A \$25 million gift from the family foundation of Montreal businessman and philanthropist Aldo Bensadoun, who built the global retail shoe empire that bears his name, will pave the way for a [new school of retail management](#) at McGill.
- The Government of Canada awarded nearly \$3 million to two McGill research projects aimed at [helping farmers mitigate greenhouse gas emissions](#). The McGill-led projects will investigate novel ways in which emissions can be reduced through improved water and biosolids management. The funding comes from the Agricultural Greenhouse Gases Program, which supports projects that will create technologies, practices and processes that can be adopted by farmers to mitigate greenhouse gas emissions.
- The Tenaquip Foundation donated \$1.5 million to help [create the world's first Phase 1 clinical trial unit](#) at The Neuro, dedicated to developing drugs for all forms of ALS.
- McGill led the country by receiving 23 projects, totaling \$4.2 million, through the Canada Foundation for Innovation (CFI) John R. Evans Leaders Fund – designed to help [universities attract and retain the very best researchers](#) by ensuring they have access to state-of-the-art equipment and facilities.
- Thanks to an extraordinary \$16-million donation from the Azrieli Foundation, The Neuro is creating the [Azrieli Centre for Autism Research](#), a new research centre that will help lift the shroud of mystery surrounding autism spectrum disorder and lead to the development of better diagnostic tools and more effective therapies for people with autism.
- The BMO Financial Group and the McConnell Foundation awarded respectively \$2.25 million and \$1 million in new support for the [Centre for Interdisciplinary Research on](#)

[Montreal](#). This money will go toward supporting two positions designed to accelerate innovation and translate knowledge into action in the coming years.

- CFI granted \$6.9-million to McGill for a ground-breaking project in environmental research that will link the Gault Nature Reserve with other University research stations in different parts of the world. John Gyakum, Department of Atmospheric and Oceanic Studies, will lead the project to establish an [Adaptable Earth Observation System](#).
- The ALS Society of Canada awarded \$1.8-million to a research team led by Heather Durham from the Department of Neurology and Neurosurgery, which will seek to find out [whether a promising drug combination can address misfolded proteins](#), one of the defining biological characteristics of ALS.
- Caroline Palmer, Department of Psychology, received a \$1.65 million research grant, to be distributed over six years, from NSERC's Collaborative Research and Training Experience (CREATE) for her research and training program, ["Complex Dynamics: Accelerating discoveries in brain and behavior."](#) Palmer is one of the few researchers to receive two CREATE training grants to date.

## EXAMPLES OF SIGNIFICANT NEW OR STRENGTHENED PARTNERSHIPS

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- Corbin Therapeutics, a Montreal-based start-up, licensed a technology developed by the laboratory of Philippe Gros, Department of Biochemistry. The invention is a [platform to discover new drug development targets for inflammation](#), which could lead to the development of therapies for diseases such as multiple sclerosis.
- Microsoft acquired Maluuba, [the Montreal deep-learning research lab that collaborates with the Reasoning and Learning Lab](#) in the School of Computer Science. Microsoft's plan to grow Maluuba include a gift of \$1 million to McGill over the next five years.
- The Institut Nordique du Québec – made up of Université Laval, McGill, and Quebec's national institute for scientific research (INRS) – [released a seven-session program](#) on the social and political issues facing Nunavik and other regions in northern Quebec.
- Brain@McGill, the University of Oxford, and the University of Zurich and ETH Zurich (ZNZ) [renewed their tripartite partnership agreement](#). First signed in 2013, the three-way agreement has since supported over 60 collaborations, including research projects and research workshops in diverse areas – from work related to bilingualism, to that confronting Parkinson's and Alzheimer's disease.

- An extraordinarily powerful new telescope, the [Canadian Hydrogen Intensity Mapping Experiment](#), known as CHIME, was completed. The unique “half-pipe” telescope design and advanced computing power will help scientists better understand the three frontiers of modern astronomy: the history of the universe, the nature of distant stars and the detection of gravitational waves. CHIME is a collaboration among 50 Canadian scientists from the University of British Columbia, the University of Toronto, McGill, and the National Research Council of Canada.
- Facebook opened a new [Artificial Intelligence Research Lab in Montreal — FAIR Montreal](#). Joelle Pineau, School of Computer Science and co-director of McGill’s Reasoning and Learning Lab, will head the new Montreal AI lab while maintaining her academic position at the University.
- The International Association of Providers of AIDS Care (IAPAC), the Research Institute of the McGill University Health Centre (RI-MUHC), and SYMPACT-X announced a partnership to implement [HIVSmart!™](#) – a software application that facilitates HIV self-testing, linkages to care, and retention in care – in high HIV burden Fast-Track Cities worldwide.
- McGill entered into a formal [partnership with Japan’s National Institutes of Physiological Sciences \(NIPS\)](#) with the signing of a Memorandum of Understanding (MOU). As a leading research institute for understanding human physiology with a strong emphasis on neuroscience research, NIPS is a natural partner for McGill.
- DeepMind, the AI company famous for its Go-playing AlphaGo program, announced that it is opening a new [research lab](#) to be headed by Doina Precup, School of Computer Science. Based in the UK, DeepMind is owned by Google’s parent company, Alphabet.
- McGill researchers are participating in three of the remaining proposals in the [Innovation Superclusters Initiative](#), a federal investment of up to \$950 million to encourage public-private partnerships in innovative industries across the country.

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## EXAMPLES OF MAJOR PRIZES, AWARDS, AND RECOGNITIONS

- Henri Darmon, Department of Mathematics, won the [2017 CRM-Fields-PIMS Prize](#) for his influential contributions to the arithmetic theory of elliptic-curves, including his recent breakthrough on the Birch and Swinnerton-Dyer Conjecture.

- Several professors and alumni from the Schulich School of Music were nominees for the [59th Annual GRAMMY Awards](#), including: Martha De Francisco, Department of Sound Recording, in the category of Best Choral Performance and Richard King, Department of Music Research, in the category Best Classical Instrumental Solo.
- NSERC awarded an [E.W.R Steacie Memorial Fellowship](#) to Tomislav Friščić, Department of Chemistry, to support his work in an innovative branch of chemistry that aims to develop environmentally friendly alternatives to solvent-based chemical processes.
- Maksym Radziwill, Department of Mathematics and Statistics, was awarded the [Sloan Research Fellowship](#). Radziwill is considered one of the emerging research leaders among a new generation of analytic number theorists.
- The John Simon Guggenheim Memorial Foundation awarded a [Guggenheim Fellowship](#) to Ehab Abouheif, Department of Biology, for his work at the intersection of ecology and evolutionary and developmental biology.
- Vicky Kaspi, Department of Physics, received the [2017 Prix d'excellence of the Fonds de recherche du Québec – Nature et technologies](#) for her work unraveling the mysteries of pulsars, magnetars, and fast radio bursts.
- Brigitte Kieffer, Department of Psychiatry and Scientific Director of the Douglas Mental Health University Institute, was appointed an [officer of the French National Order of Merit](#). The National Order of Merit recognizes the distinguished service of French citizens in translating the dynamism of society, being a positive role model, and recognizing diversity.
- McGill researchers were once again well represented during the Royal Society of Canada's annual inductions and awards ceremony, which included:
  - The induction of [nine new Fellows](#) and [seven new members to the College of New Scholars, Artists and Scientists](#) (the most in Canada);
  - The awarding of the [McLaughlin Medal](#) for important research of sustained excellence in medical science to Michel L. Tremblay, Department of Biochemistry;
  - The presentation of the [2017 Alice Wilson Award \(NSERC nomination\)](#) to Mélanie Guigueno, Department of Natural Resource Sciences, for her outstanding academic qualifications in evolutionary biology, neuroscience, and ecology.

- Claudia Mitchell, Department of Integrated Studies in Education, received one of five [fellowships for social science research from the Pierre Elliott Trudeau Foundation](#).
- The Canadian Academy of Health Sciences (CAHS) recognized eight McGill representatives as leaders in the health sciences through their election as [CAHS Fellows](#), one of the highest honours for individuals in the Canadian health sciences community.
- Emeritus professor Balfour Mount was named as part of the latest cohort of inductees to the [Canadian Medical Hall of Fame](#), recognizing him as a pioneer in the field of palliative care.
- Two McGill researchers were chosen as [CIFAR Azrieli Global Scholars](#), a two-year appointment designed to support young investigators in the first five years of their careers. Daryl Haggard, Department of Physics, and Khanh Huy Bui, Department of Anatomy and Cell Biology, will join an international cohort of 15 emerging research leaders from the United States, Canada, India, Ghana, and Italy.
- Isabelle Daunais, Département de langue et littérature françaises, received the 2017 [Acfas André-Laurendeau prize in the humanities](#), for her role in reshaping the way readers think about and use literature.
- Alan Evans of The Neuro, Andrea C. LeBlanc of the Lady Davis Institute, and Bernard J. Lapointe, Director of Palliative Care McGill, were awarded [Senate of Canada 150 medals](#) for their commitment to advancements in Alzheimer's disease and palliative care research.

# Acknowledgements

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If you have questions about this report, please contact me at [martha.crago@mcgill.ca](mailto:martha.crago@mcgill.ca) or my office at 514-398-3991.