

CIL

CANADA'S
INNOVATION
LEADERS2013



Canadian Innovators Share their
Secrets to Success

Canadians are getting impatient and that’s turning out to be a good thing. In a world where discoveries of a new gene, molecule or sub-atomic particle are lauded almost daily in the media, it’s only natural that people begin asking, “When will these discoveries begin helping me, my community, my country, my planet?”

While basic research continues to serve as the bedrock to provide the foundation for Canada’s long-term success in science and technology, the past decade has witnessed a seismic shift in what we do with that knowledge.

Rather than inventing a technology in search of a solution, more and more research is being directed by the needs of companies, consumers, patients, communities and other end users of technology.

In Canada’s automotive sector, for example, consumer demands and pending new emission standards are upping the competitive pressure to make vehicles that are safer, greener and better performing.

“We’re doing a lot of work on light-weighting and energy efficiency ... to try to optimize the vehicle across the different systems.”

Brian LaTouf
Director of Canadian Regional Engineering Centre, General Motors of Canada Limited

General Motors of Canada Limited stepped up its game last year with a commitment to invest an unprecedented \$150 million annually on R&D between now and 2016. Its main focus is on light-weighting materials, mechatronics, software and communications.

“We’re doing a lot of work on light-weighting and energy efficiency ... We have electrical engineers working with software engineers and mechanical engineers to try to optimize the vehicle across the different systems,” says Brian LaTouf, Director of GM

Canada’s Canadian Regional Engineering Centre (CREC) in Oshawa.

GM Canada increasingly relies on computer-aided design to test new ideas instead of more expensive and time consuming trial and error approaches. Canadian universities help GM Canada understand the material and mechanical properties of a light-weight material like aluminium so that manufacturing processes can be optimized – well before the first car is ever manufactured.

“That allows us to use computer-aided engineering simulations to engineer our future products without having to create a physical vehicle,” says LaTouf.

Environmental sustainability has become a priority in many industry sectors. In Canada’s oil sands, companies are working on several fronts to reduce their environmental footprint, something Joy Romero, V.P. Technology Development at **Canadian Natural Resources Limited** (CNRL), describes as “good business sense.”

At its Horizons Oil Sands facility north of Fort McMurray, Alberta, the company is adding CO2 to the tailings, a process that allows the solids to settle more quickly so that the water can be recycled and re-used in the extraction process. The technology will help reduce the size of tailings ponds and reduce CNRL’s costs.

“If we built a dyke to contain tailings, that’s \$50 million a metre, so if we reduce that tailings pond by half that’s good business,” says Romero. “So every time we reduce our footprint, we improve on our bottom line.”

A growing share of CNRL’s research and technology development is now being done in partnership with its competitors as part of Canada’s Oil Sands Innovation Alliance. Launched in 2012, COSIA’s 14 members account for 90% of the oil sands production.

“Some 450 technologies have already been shared amongst the companies,” says Romero, “and we’re working on 185 active projects right now to accelerate our performance in tailings, water, land and greenhouse gases. And that’s just within COSIA.”

HELPING CANADIAN FIRMS DO BETTER
In 1990, **Rogers Communications Inc.** was the first company to bring wireless

data to the Canadian market. Today, Rogers’ national networks, from its slower 2G to its super-fast LTE, provide more than one million machine-to-machine (M2M) connections for a range of applications, including traffic lights, parking meters, automatic teller machines, glucometers, blood pressure cuffs and, coming soon, even your car or dishwasher. “If you look at Ted Rogers’ legacy, it was really about bringing innovative new things to Canadians and being the first with things like high-speed Internet, GSM network and digital video,” says Mansell Nelson, V.P. of Advanced Business Solutions, Rogers Communications Inc.

With the Canadian M2M market forecast to reach \$1 billion in revenue over the next three years, the competitive stakes are high. That’s why Rogers is investing millions of dollars to develop the technology platforms, software and systems integration that meet each user’s specific needs. Much of this innovation happens at its research centres in Toronto, Vancouver and Montreal, where customers can see first-hand how these technologies can help boost their productivity and better connect with customers.

“It’s not so much a technology issue now,” says Nelson. “It’s back to translating how this technology will help companies be better at what they do.”

IMPROVING PATIENT CARE
If ever there was a problem in search of solution, no doubt health care would top the lists of every province and territory in Canada. Ontario and Quebec are already spending half of their total revenues on health, and another six provinces will hit the 50 per cent mark by 2028.

It’s not a problem the research community can solve on its own. That’s why several universities and research hospitals are working hand-in-hand with provincial funders, policy makers, health care professionals and even patients to identify and implement solutions.

For example, on August 1 the Ontario government cut funding for test strips that diabetics use to monitor their blood sugar levels – saving the province up to \$25 million annually. That decision was based on a 2009 study co-authored by Dr. Muhammad Mamdani at **St. Michael’s**

“Since health transcends borders and races, we deliberately take an approach that our research here is applicable globally.”

Dr. Salim Yusuf, V.P. Research, Hamilton Health Sciences

Hospital in Toronto that found the tests unnecessary for people with type 2 diabetes who are not insulin-dependent.

“These are real out-of-pocket savings for the government that do not adversely affect health care or inconvenience patients,” says Dr. Arthur Slutsky, V.P. of Research at St. Michael’s Hospital.

One of the hospital’s strengths is its 182 research scientists, 110 of whom also hold medical degrees. With one foot firmly in the lab and the other in the clinic, these clinician scientists are trained to translate basic science into better policies and patient care.

Among them is Dr. Kamran Khan, an infectious disease clinician and scientist who developed a web technology – and a spin-off company, Bio.Diaspora – that uses global air traffic patterns to predict the international spread of infectious disease. His research has helped anticipate the risk of epidemics during mass gatherings at the London Olympic Games, FIFA World Cup and annual hajj pilgrimage in Saudi Arabia.

Dr. Slutsky says St. Michael’s will be able to accomplish even more, and faster, with the work being done at the Keenan Research Centre and Li Ka Shing Knowledge Institute – new buildings that are connected to each other and to the hospital via a pedestrian tunnel.

“That tunnel is a metaphor for what we want to do, which is to speed up the adoption of discoveries by bridging the knowledge gap between research, education and patient care.”

It’s a familiar story at **Vancouver Coastal Health Research Institute** (VCHRI), where the opening of the Blusson Spinal Cord Centre in 2008 made it possible to connect patients with the Rick Hansen Institute along with researchers from more than 20 different locations in Vancouver and Vancouver

Island. Similarly, the soon-to-be-opened Djavad Mowafaghian Centre for Brain Health will bring together, for the first time under one roof, all the multidisciplinary areas of brain health, including multiple sclerosis, Alzheimer’s, mood disorders and clinical trials.

“It allows the patient to move seamlessly when they transition from surgery to treatment, and then integrating research with that,” says Dr. Robert McMaster, Executive Director at VCHRI.

That multidisciplinary lens is already producing results in ovarian cancer treatment, where VCHRI’s research is closely linked with the BC Cancer Agency next door.

“They’ve shown, for example, that a lot of cancer originates in the fallopian tubes so now they remove them if it’s an appropriate time during surgery,” says Dr. McMaster. “That change in practice reduces the incidence of subsequent ovarian cancer by 25 percent.”

MAKING OUR MARK GLOBALLY
Similar transformations are taking place at research hospitals across Canada. At **Hamilton Health Sciences** (HHS), research priorities are driven by what will make a difference in people’s health over the next five, 10 or 20 years, both domestically and internationally.

“Since health transcends borders and races, we deliberately take an approach that our research here is applicable globally,” says Dr. Salim Yusuf, V.P. Research at HHS. “As such, we work with 85 countries on every continent looking at things like chronic diseases and health systems. We need these international comparisons if we want to improve how we do things in Canada.”

Continued on page 12

THIS CHANGES INDUSTRY.

Our commitment to research, innovation and technology set in motion 10 years ago has made SAIT Canada’s number one research college today.

SAIT is setting new standards in applied research and innovation. Take, for example, the laser induced breakdown spectrometer, LIBS. One of the first in Canada, this technology precisely blasts a tiny piece of solid material to provide instant composition analysis.

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SAIT is proud to be named Canada’s Top Research College for 2013.

THIS CHANGES EVERYTHING.
SAIT.ca

CANADA'S
research
UNIVERSITY
»
20
OF THE YEAR
13

comprehensive category

innovation



curiosity drives innovation

Curiosity drove the first quantum revolution enabling us to understand the quantum world. Today, the researchers at the **Institute for Quantum Computing** collaborate to harness the quantum world to revolutionize technology and drive future economies. Ultra-powerful computers, unbreakable cryptography, quantum devices and nanotechnologies of unprecedented precision — these are just some of the discoveries being pioneered at IQC, many of which are hitting the market today.

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November 8, 2013

Canada's TOP 50 RESEARCH UNIVERSITIES 2013

Rank		University	Sponsored Research Income			Full-time Faculty**	Research Intensity	Province
2012	2011		FY2012 \$000	FY2011 \$000	% Change 2011-2012	2011-2012 #	\$ per Full-time Faculty \$000	
1	1	University of Toronto* **	\$1,038,390	\$915,661	13.4	2,459	\$422.3	Ontario
2	2	University of British Columbia*	\$585,154	\$575,155	1.7	2,374	\$246.5	British Columbia
3	4	Université de Montréal* (a)	\$526,213	\$525,705	0.1	1,879	\$280.0	Quebec
4	5	McGill University* (a)	\$483,527	\$522,913	-7.5	1,633	\$296.1	Quebec
5	3	University of Alberta*	\$452,436	\$536,063	-15.6	1,655	\$273.4	Alberta
6	6	McMaster University*	\$325,156	\$325,946	-0.2	1,358	\$239.4	Ontario
7	7	Université Laval* (a)	\$302,783	\$311,666	-2.9	1,319	\$229.6	Quebec
8	9	University of Ottawa*	\$302,341	\$276,220	9.5	1,277	\$236.8	Ontario
9	8	University of Calgary*	\$282,771	\$286,420	-1.3	1,515	\$186.6	Alberta
10	10	Western University*	\$241,095	\$218,729	10.2	1,475	\$163.5	Ontario
11	16	Université de Sherbrooke* (a)	\$185,222	\$145,493	27.3	1,072	\$172.8	Quebec
12	13	Queen's University*	\$168,025	\$163,280	2.9	815	\$206.2	Ontario
13	11	University of Saskatchewan*	\$166,677	\$203,179	-18.0	1,166	\$142.9	Saskatchewan
14	14	University of Guelph	\$161,172	\$153,068	5.3	753	\$214.0	Ontario
15	12	University of Manitoba*	\$159,763	\$166,303	-3.9	1,205	\$132.6	Manitoba
16	17	Dalhousie University*	\$140,099	\$132,461	5.8	1,008	\$139.0	Nova Scotia
17	15	University of Waterloo	\$137,006	\$146,779	-6.7	1,041	\$131.6	Ontario
18	20	Memorial University of Newfoundland*	\$107,078	\$70,181	52.6	1,013	\$105.7	Newfoundland
19	18	University of Victoria	\$103,007	\$103,249	-0.2	694	\$148.4	British Columbia
20	19	Simon Fraser University	\$95,614	\$89,894	6.4	824	\$116.0	British Columbia
21	21	Université du Québec à Montréal (a)	\$73,901	\$66,084	11.8	1,108	\$66.7	Quebec
22	22	York University	\$67,280	\$65,427	2.8	1,321	\$50.9	Ontario
23	24	Institut national de la recherche scientifique+ (a)	\$62,226	\$59,132	5.2	153	\$406.7	Quebec
24	25	University of New Brunswick	\$52,287	\$48,244	8.4	470	\$111.2	New Brunswick
25	23	Carleton University	\$50,372	\$59,343	-15.1	745	\$67.6	Ontario
26	26	Concordia University (a)	\$44,816	\$43,929	2.0	932	\$48.1	Quebec
27	29	Ryerson University	\$28,695	\$29,518	-2.8	759	\$37.8	Ontario
28	28	University of Windsor	\$28,074	\$32,129	-12.6	491	\$57.2	Ontario
29	27	Université du Québec à Chicoutimi (a)	\$25,687	\$33,966	-24.4	230	\$111.7	Quebec
30	30	Université du Québec à Rimouski (a)	\$24,768	\$25,486	-2.8	189	\$131.0	Quebec
31	35	Lakehead University*	\$23,895	\$22,263	7.3	316	\$75.6	Ontario
32	36	University of Regina	\$23,264	\$22,038	5.6	376	\$61.9	Saskatchewan
33	33	Université du Québec à Trois-Rivières (a)	\$21,049	\$22,552	-6.7	392	\$53.7	Quebec
34	37	École de technologie supérieure+ (a)	\$20,048	\$19,090	5.0	143	\$140.2	Quebec
35	34	Royal Military College of Canada+++	\$19,856	\$22,461	-11.6	209	\$95.0	Ontario
36	32	University of Lethbridge	\$19,135	\$24,101	-20.6	335	\$57.1	Alberta
37	39	Université du Québec en Abitibi-Témiscamingue (a)	\$17,235	\$16,052	7.4	95	\$181.4	Quebec
38	38	University of Prince Edward Island	\$15,893	\$18,216	-12.8	237	\$67.1	Prince Edward Island
39	31	Laurentian University*	\$14,509	\$15,660	-7.3	412	\$35.2	Ontario
40	41	Trent University	\$13,842	\$14,263	-3.0	262	\$52.8	Ontario
41	40	Brock University	\$12,641	\$14,831	-14.8	552	\$22.9	Ontario
42	43	University of Northern British Columbia	\$11,854	\$13,583	-12.7	180	\$65.9	British Columbia
43	44	Wilfrid Laurier University	\$11,819	\$12,613	-6.3	507	\$23.3	Ontario
44	42	Nova Scotia Agricultural College+	\$11,625	\$13,923	-16.5	61	\$190.6	Nova Scotia
45	45	University of Ontario Institute of Technology	\$9,665	\$10,037	-3.7	163	\$59.3	Ontario
46	49	St. Francis Xavier University	\$8,989	\$7,271	23.6	241	\$37.3	Nova Scotia
47	47	Université de Moncton	\$8,019	\$8,483	-5.5	347	\$23.1	New Brunswick
48	46	Université du Québec en Outaouais (a) (b)	\$7,803	\$8,788	-11.2	193	\$40.4	Quebec
49	50	University of Winnipeg	\$7,537	\$6,774	11.3	260	\$29.0	Manitoba
50	48	Saint Mary's University	\$7,528	\$7,703	-2.3	231	\$32.6	Nova Scotia

Notes:
1. Sponsored research income includes all funds to support research received in the form of a grant, contribution or contract from all sources external to the institution.
2. Financial data were obtained from Statistics Canada, except where noted.
3. Fiscal 2011 research income figures may have been adjusted as more accurate information became available.
4. Faculty data were obtained from RESEARCH Infosource Canadian University R&D Database.
5. All data are provided for the main university/college including its affiliated institutions, where applicable.
6. All institutions are members of the Canadian Association of University Business Officers (CAUBO).

*Has a medical school **Includes full, associate and assistant faculty only
+ Not a full-service university
**Sponsored research income administered by affiliated hospitals was reported one fiscal year in arrears
+++ Sponsored research income figures were obtained directly from the university

(a) Fiscal 2011 sponsored research income figure was obtained directly from the university.
(b) Fiscal 2012 sponsored research income figure was obtained directly from the university.

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Research Universities of the Year 2013

Three universities gain RESEARCH Infosource's designation of *Research University of the Year* in their category for their performance on a balanced set of input, output and impact measures for FY2012. These full-service universities demonstrated superior achievement both in earning research income and in publishing research in leading scientific journals

Rank	Medical/Doctoral	Score*	Rank	Comprehensive	Score*	Rank	Undergraduate	Score*
1	University of Toronto	100.0	1	University of Waterloo	87.9	1	Université du Québec à Rimouski	89.9
2	McGill University	66.8	2	University of Guelph	87.4	2	Lakehead University	87.4
3	University of British Columbia	66.6	3	University of Victoria	72.4	3	University of Lethbridge	79.5

*The Score in each category is out of a possible 100 points based on the following indicators and weighting: 2 input measures: total sponsored research income (20%), and research intensity (20%); 2 output measures: total number of publications in leading journals (20%) and publication intensity (20%), and 1 impact measure: publication impact (20%). For each measure, the top ranking institution is assigned a score of 100 and the other institutions' scores are calculated as a percentage of the first ranked institution. To be eligible to be included in the Research Universities of the Year Tier Group rankings, universities must first have ranked in the top 50% in their respective tier group for publication impact and then ranked in the top 50% in their respective tier group for at least 1 out of the 2 input measures, and 1 out of the 2 output measures. See www.researchinfosource.com for details.

Canada's Top 50 Research Universities

RESEARCH INCOME GROWTH MIRED

Research income at Canada's Top 50 Research Universities expanded by only 1.1% in Fiscal 2012, reaching \$6.7 billion, the highest figure on record. The 2012 increase was only half that of 2011 (2.2%) and the smallest increase since RESEARCH Infosource began tracking the Top 50 Research Universities in 2001. Substantial declines in Alberta, Saskatchewan and Prince Edward Island weighed heavily on the results. On a positive note, University of Toronto is the first Canadian institution to post research income in excess of \$1 billion.

THE \$100 MILLION CLUB

Nineteen universities – up from 18 last year – gained membership in RESEARCH Infosource's \$100 Million Club, the elite group of universities that attracted at least \$100 million of research income in Fiscal 2012. In total, the Club members accounted for nearly \$5.9 billion of research income, an increase of 2.8% from Fiscal 2011. Memorial University of Newfoundland joined the Club this year, posting research income of \$107 million with a substantial increase of 52.6% over Fiscal 2011. Club members also increased their total share of research income to 87% of the total in Fiscal 2012 from 86% in 2011. Nine of the 19 universities posted negative growth in research income in Fiscal 2012, compared to with 4 decliners last year. All but 3 universities (Guelph,

Waterloo and Victoria) are Medical/Doctoral institutions – universities with medical schools.

PROVINCIAL PERFORMANCE

Research income totals decreased over the period and weighed heavily against the national results in Alberta (-10.9%), Saskatchewan (-15.7%), Prince Edward Island (-12.8%) and Manitoba (-3.3%). Provinces where overall research income growth out-paced the national trend included Newfoundland (52.6%), New Brunswick (6.3%), Ontario (6.2%) and Nova Scotia (4.3%). Universities in British Columbia recorded a 1.8% funding increase.

Top 50 – Leading Provinces	
Province	% of Total
Ontario (18)	40
Quebec (13)	27
British Columbia (4)	12
Alberta (3)	11

In Fiscal 2012, 18 Ontario universities increased their share of total research income to 40% from 38% over Fiscal 2011. Quebec's 13 institutions maintained their share of the total (27%), as did universities in British Columbia (12%). Alberta universities' share declined to 11% of total research income in Fiscal 2012 from 13% the prior year.

The \$100 Million Club		
2012 Rank	University	Research Income \$000
1	University of Toronto*	\$1,038,390
2	University of British Columbia*	\$585,154
3	Université de Montréal*	\$526,213
4	McGill University*	\$483,527
5	University of Alberta*	\$452,436
6	McMaster University*	\$325,156
7	Université Laval*	\$302,783
8	University of Ottawa*	\$302,341
9	University of Calgary*	\$282,771
10	Western University*	\$241,095
11	Université de Sherbrooke*	\$185,222
12	Queen's University*	\$168,025
13	University of Saskatchewan*	\$166,677
14	University of Guelph	\$161,172
15	University of Manitoba*	\$159,763
16	Dalhousie University*	\$140,099
17	University of Waterloo	\$137,006
18	Memorial University of Newfoundland*	\$107,078
19	University of Victoria	\$103,007

*Has a medical school

RESEARCH INCOME GROWTH

In a disappointing result, 28 universities recorded declines in research income in Fiscal 2012 compared with 16 decliners last year. Only 22 institutions posted increases in research income in Fiscal 2012, compared with last year's total of 34 gainers. The top gainers were led by Memorial University of Newfoundland (52.6%), followed by Université de Sherbrooke (27.3%), St. Francis Xavier University (23.6%), University of Toronto (13.4%) and Université du Québec à Montréal (11.8%).

RESEARCH INTENSITY

Research intensity – research income per full-time faculty position – posted 0% growth in Fiscal 2012. A 1.1% increase in total research income combined with an identical increase in faculty numbers to yield the static result. On average the Top 50 Research Universities each attracted \$174,500 per full-time faculty position, compared with \$174,400 in Fiscal 2011.

A total of 14 universities – the same number as last year – posted research intensity that was higher than the national average. University of Toronto (\$422,300 per full-time faculty position) enjoyed a considerable lead over McGill University (\$296,100), Université de Montréal (\$280,000), University of Alberta (\$273,400) and University of British Columbia (\$246,500).

TIER GROUPS

Sixteen Medical/Doctoral universities accounted for 81% of total research income in Fiscal 2012, the same share as in Fiscal 2011. Twelve Comprehensive institutions maintained their share of research income (13%). However, the 22 Undergraduate universities' share fell to 5% of total research income from 6% in Fiscal 2011 due to their overall decline in research income of -6.9% during the period.

Top 10 Research Intensive Universities**			
2012 Rank Research Intensity Overall		University	Research Intensity (\$ per full-time faculty) \$000
1	1	University of Toronto*	\$422.3
2	4	McGill University*	\$296.1
3	3	Université de Montréal*	\$280.0
4	5	University of Alberta*	\$273.4
5	2	University of British Columbia*	\$246.5
6	6	McMaster University*	\$239.4
7	8	University of Ottawa*	\$236.8
8	7	Université Laval*	\$229.6
9	14	University of Guelph	\$214.0
10	12	Queen's University*	\$206.2

*Has a medical school **Includes full-service institutions only

Top 10 Universities by Growth**			
2012 Rank Income Growth	Overall	University	% Change 2011-2012
1	18	Memorial University of Newfoundland*	52.6
2	11	Université de Sherbrooke*	27.3
3	46	St. Francis Xavier University	23.6
4	1	University of Toronto*	13.4
5	21	Université du Québec à Montréal	11.8
6	49	University of Winnipeg	11.3
7	10	Western University*	10.2
8	8	University of Ottawa*	9.5
9	24	University of New Brunswick	8.4
10	37	Université du Québec en Abitibi-Témiscamingue	7.4

*Has a medical school **Includes full-service institutions only

RESEARCH UNIVERSITIES OF THE YEAR
RESEARCH Infosource highlights the achievements of 3 *Research Universities of the Year* – the leading institutions that excel on a balanced scorecard of research input and output/impact indicators (see our website for details http://www.researchinfosource.com/top50_univ.php).
This year's winners are: University of Toronto in the Medical/Doctoral category, University of Waterloo in the Comprehensive category and Université du Québec à Rimouski in the Undergraduate category.

THIS YEAR AND NEXT

Fiscal 2012 was a study in contrasts so far as the performance of the university research system was concerned. On the plus side, it saw the first Canadian university ever – University of Toronto – reach \$1 billion of research income. And, the \$100 Million Club – the group of leading institutions that recorded over \$100 million of research income – expanded to 19, with the addition this year of Memorial University of Newfoundland.
But these achievements took place in the context of a slim 1.1% overall increase in research income for all of Canada's Top 50 Research Universities. When increased salaries, expenses and overheads are considered a 1.1% increase signifies a decline in real dollar spending. In addition, on a provincial basis, Fiscal 2012 saw double-digit drops in research income in 3 provinces. However with universities continually increasing their cross-sector collaboration and partnerships we look with expectation to next year's results.

STILL NUMBER ONE!

Again this year, INRS University ranks first in Canada in its category in terms of research intensity thanks to the excellence of its professors.

Taking a multidisciplinary approach to fundamental and applied research, INRS research teams play a critical role in the advancement of science both in Canada and around the world as well as in the training of highly qualified researchers.

Congratulations to all our researchers!





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Newest member of the \$100 Million Club.

According to RESEARCH Infosource, Memorial is the No. 1 university by growth and the only new member of the \$100 Million Club. Sure, that's one way to measure our research excellence. But it's not our only badge of honour. Memorial's researchers are making waves in the fields of oceans and marine, genetic research, energy, environment and natural resources. Together with industry, government and community groups, our researchers are facilitating the safe and sustainable development of Arctic and offshore resources. Research at Memorial is innovative, engaged and serves the greater good of the province while playing a critical role in the future of Canada's sovereignty in the North.

Get a deeper perspective at www.mun.ca/100club.



UQAR

RESEARCH
UNIVERSITY
OF THE YEAR
IN CANADA

Undergraduate Category,
According to RE\$EARCH Infosource
October 2013

Once again
Research University of the Year

For a second time in the last three years, the Université du Québec à Rimouski has been designated “Research University of the Year” in the Undergraduate category by RE\$EARCH Infosource. This honor is a testament to the excellence of its researchers and demonstrates the great value of their research.

SEDIMENTARY PALEOMAGNETISM AND MARINE GEOLOGY LABORATORY. PHOTO : GILSON GAGNON

RESEARCH AND INNOVATION: Are We Going for the Summit or Slip-sliding Away?



David Naylor
President (2005-2013)
University of Toronto

As 2013 ends, is Canada ready to compete in a world where new ideas and technologies are the key to national prosperity and social success? My answer, with apologies for the contradiction, is an optimistic ‘No’. Let me explain.

I’ve just spent eight exciting years

as president of the University of Toronto. Thanks to countless faculty, staff, students, volunteers, benefactors, partner institutions and enterprises, it’s been a great run on the R&D front. Research income is up 40%. Our total publication output is 2nd worldwide. A sharp rise in spin-off company generation has moved U of T to 3rd place in North America. Our gifted faculty and students have won hundreds of research awards. As well, entrepreneurship is flourishing, with 2/3rds of all invention disclosures now carrying a student or trainee as a co-inventor.

None of this would have happened without meaningful support from our friends in Ottawa. The lift to Canadian universities and research hospitals began when the federal government made visionary new investments after the recession of the 1990s. When

another recession hit fifteen years later, a new government bravely sustained those investments in the federal granting councils, the Canada Foundation for Innovation, and the Canada Research Chairs program. It also initiated its own suite of smaller but high-impact programs.

All these investments over 20 years have enabled many Canadian universities to stem a longstanding brain drain and attract or retain outstanding talent. Thus, from the standpoint of R&D excellence, it seems we might finally have the summit surrounded. Unfortunately, many worrisome trends suggest we are actually at risk of sliding down the mountain, rather than claiming the peak.

Canadian researchers are still winning big international awards, but we haven’t seen a research-related Nobel prize since 1994.

Canada still has the world’s most perverse formula for offsetting the costs of federal research grants. Small institutions get 80 cents of indirect cost reimbursement for each operating dollar won in granting council competitions. But our most research-intensive institutions receive under 20 cents on the dollar. This is a major disincentive to excellence.

Meanwhile, the proportion of blue-sky research funding by NSERC and CIHR has been dropping as earmarking of priorities gains favour in a misguided effort to drive short-term wins for domestic industry.

The 2011 Jenkins panel, on which I served, recommended a very different set of strategies. First, determine where the NRC’s basic research strengths really lie, and protect its best programs and scientists. Otherwise, reinforce the NRC’s mandate in

industry-facing and contract-funded research. Then, simplify the framework for SRED credits, and invest the resultant savings to do two things: Rebuild the role of the granting councils as globally-competitive engines for investigator-initiated basic and applied research. And make targeted direct investments in industry-friendly R&D.

In fairness, Ottawa has taken some of these steps, but stakeholders remain unsettled by the lack of an overall game-plan.

Other countries, however, are driving forward with clarity and conviction to boost international R&D competitiveness. Germany’s Excellence Initiative has focused billions of Euros on 39 universities out of 390. China has invested massively to raise the research standards of 100 universities, 40 of which will receive

special funding to reach world-class levels. Again, note the math: that’s 100 universities out of nearly 2500.

Among many other examples, there’s France’s plan to spend an additional €19 billion on higher education and advanced research, and excellence-boosting R&D investments in jurisdictions ranging from Brazil to Singapore.

These new initiatives strengthen research universities as a side-effect. They are driven primarily by broader policy objectives, i.e.:

- Ensuring international competitiveness in talent attraction, retention and development
- Supporting breakthrough discoveries that inspire the next generation
- Fostering disruptive as well as incremental innovations that create

Continued on page 18

By 2035, the world will require energy at a level 1.5 times greater than in 2010. Meeting this demand calls for innovative research if future generations are to enjoy sustained prosperity with minimal environmental impact.

Canada’s leader in high-impact energy research

The University of Calgary is strategically located at the core of Canada’s multi-billion-dollar energy industry, giving us a unique opportunity and responsibility to take the lead in addressing the challenges associated with ensuring safe, clean and secure energy supplies for society. **In September 2013, we released our Energy Research Strategy, a blueprint for building a global hub for the discovery, creativity and innovation in energy research the world so urgently needs.**

Energy research at the University of Calgary will help ensure a future that balances supply and demand, in a context of responsible resource development that addresses social, human, environmental and economic constraints. We have already created focused energy research centres, developed infrastructure to support energy research, and attracted some of the best minds in the energy field. An interdisciplinary ‘confederation of scholars’ on campus is actively advancing high-impact energy research on both local and global scales.

Learn more about how the University of Calgary is investing in and delivering world-leading research results and technological innovation to achieve lasting economic and environmental benefits for Canada. View the complete Energy Research Strategy document online at ucalgary.ca/vpr/publications

Catalyzing Innovation

Université de Sherbrooke is catalyzing innovation by creating strategic alliances with institutional, private and public research centres seeking to fast-track their R&D activities by working together with its leading research teams.

Université de Sherbrooke is focused on open innovation:

- State-of-the-art facilities
- On-campus research park
- Exceptional work environment
- Entrepreneurship accelerator
- Successful technology transfer strategies

 UNIVERSITÉ DE
SHERBROOKE

| Voir au futur



RESEARCH: Investing in the People and Ideas of the Future



Janet Walden
Chief Operating Officer,
Natural Sciences and Engineering
Research Council of Canada

Companies repeatedly tell us that finding the right people with the right skill set is their main innovation-related challenge; a challenge that is increasing as the competition for highly educated and skilled talent becomes fiercer

and this talent pool becomes more mobile and responsive to the best opportunities.

Looking forward, how do we continue to attract and retain the talent we need to prosper? The Natural Sciences and Engineering Research Council of Canada (NSERC) is in the business of helping to build a research environment in Canada that promotes excellence and high levels of productivity in research and training.

Top researchers attract and train top students, and a strong research environment attracts and supports these top researchers and their students. NSERC is the leading provider of federal funding for discovery research in Canada: and discovery research and training

are the foundation for innovation. Through our flagship Discovery Grants program, the Government of Canada provides multi-year funding to approximately 9,700 science and engineering researchers annually. This is the Council's single-largest area of investment because it plays such a critical role in ensuring Canada has the talent and creativity to feed our innovation requirements into the future.

NSERC has an active Strategy for Partnerships and Innovation to build on our foundation of excellent discovery research, and increase the value of our discovery investments by better linking the knowledge and expertise in our post-secondary institutions

with private sector know-how and needs. NSERC's partnership initiatives enable relationship-building across sectors that accelerates the flow of ideas into commercial opportunities. These relationships extend the resources of both business and academia, but most importantly, they provide students, our next generation of science and engineering professionals, with the technical and entrepreneurial skills they need to realize their full potential and rapidly enter the workforce.

We are seeing real results. In just over three years, NSERC has grown from working with 1,500 companies to more than 2,700. This is in keeping with the Top 100 Corporate R&D Spenders list,

which shows a strong increase in corporate R&D across Canada this year. And, 80% of companies who worked with a researcher on a collaborative project told us they developed new products and services, improved their process or even increased their competitiveness as a result of the work.

To meet the diverse innovation needs of businesses of all sizes, NSERC also enables applied R&D projects with Canada's colleges. Through more than 400 grants, NSERC has helped more than 60 colleges and cégeps from across the country partner with businesses from industrial sectors across the Canadian economy, many of whom are small and medium sized enter-

prises. These grants translate into hundreds of students gaining new skills and new insights into career opportunities.

Innovation is not a straight line. The roles played by discovery research through to development form an integrated continuum, building on and reinforcing one another. Within this continuum, training our top talent is a priority. By continuing to invest in the full spectrum of research, the Government of Canada is laying the foundation for future growth. Ensuring we have a vibrant research community by focussing on generating top research talent with the best skills, today and in the future, will position Canada for success.



Great research builds strong communities. And great researchers, like **Kathleen Martin Ginis**, are the foundation. Her research is helping to build stronger, healthier and more active communities. From her work involving people with spinal cord injuries to those who are battling Alzheimer's Disease, she's not just spinning her wheels, she's making a remarkable difference.

research.mcmaster.ca



CHALLENGING THE
CONVENTIONAL.

UNCOVERING THE
EXCEPTIONAL.

At Lakehead, we don't look for the easy answers. We dig deep and conduct groundbreaking research. We look for unconventional answers to regional and global challenges. We lead the field in areas like environmental studies, natural resource management, northern health and wellness, and Aboriginal research by engaging our community partners in meaningful ways.

And it's worked.

Lakehead is now ranked 2nd in Canada and 1st in Ontario as Research University of the Year 2013 in the undergraduate category. We're changing the way research is done and that's changing Lakehead.

lakeheadu.ca/research-and-innovation



EXCEPTIONAL
UNCONVENTIONAL.

Leaders' Corner



*Dr. Kent MacDonald
President and CEO
Algonquin College of
Applied Arts and Technology*

Investment in research and development is crucial to discover, and bring to patients, the best possible medicines and treatments. As a leader in innovation, Amgen Canada is committed to continued investment in research and clinical trials to benefit the health of our country and its people, today, and for future patients.

*Dr. Clive Ward-Able
Executive Director, R&D
Amgen Canada Inc.*



Applied Research is many things ... at Algonquin it is all about the students – helping them develop technical, relational and entrepreneurial skills while working on client-driven projects. And it is all about faculty – helping them stay current in their field through research. And it is all about our industry and community clients – helping them develop the products, processes and

services they seek to implement or commercialize.

*Dr. Kent MacDonald
President and CEO
Algonquin College of
Applied Arts and Technology*



Research at the Université Rdu Québec à Rimouski is increasingly recognized as a driving force in the advancement of high-end knowledge. Being designated as Research University of the Year in the Undergraduate category for the second time in three years, is a testament to the excellence of our researchers and demonstrates the great value and potential of our research environment.

*Jean-Pierre Ouellet
Rector
Université du Québec à Rimouski*



*Chris Power
Chair of ACAHO and
President and CEO
Capital Health Halifax*

funding for college and polytechnic applied research – not simply the R&D funding raised. Student involvement in industry-driven R&D projects builds crucial innovation skills that employers need. Over 11,600 students from our members participated in applied research projects last year alone. Students will display these R&D success stories at our Annual Student Applied Research Showcase at SAIT Polytechnic on November 14.

*Nobina Robinson
CEO
Polytechnics Canada*



With the right policy and funding conditions, Canada's academic healthcare organizations – research hospitals, academic regional health authorities, and their research institutes, can generate research and innovation that revolutionize how we address disease, disability, and quality of life issues; bend our healthcare cost curve; and generate wealth for decades to come.

*Chris Power
Chair of ACAHO and
President and CEO
Capital Health Halifax*



Ontario Centres of Excellence is proud to work in partnership with industry and academia to commercialize innovation originating in the province's colleges, universities and research hospitals. As a key partner in delivering Ontario's Innovation Agenda, we focus on areas that will lead to job creation and innovative new products and services while strengthening Ontario's global market competitiveness.

*Dr. Tom Corr
President and CEO
Ontario Centres of Excellence,
Ontario's leader in innovation
and entrepreneurship*



*Daniel Coderre, Ph.D.
Director General
INRS University*

Ryerson is Canada's comprehensive innovation university and an important hub in the country's innovation ecosystem driving Canada's

prosperity and quality of life. In the last 10 years, we have tripled research funding. Our global leadership in innovation was recently recognized when we became Canada's first Ashoka Changemaker campus.

*Wendy Cukier
Vice President, Research
and Innovation
Ryerson University*



INRS University addresses global issues and challenges confronting society within a framework of cross-disciplinary academic research and teaching carried out through strategic national and international partnerships. This approach, put forward by INRS and embraced by its professors for over 40 years, has contributed to sustain remarkable research intensity in solving problems facing not only our society but also humankind.

*Daniel Coderre, Ph.D.
Director General
INRS University*



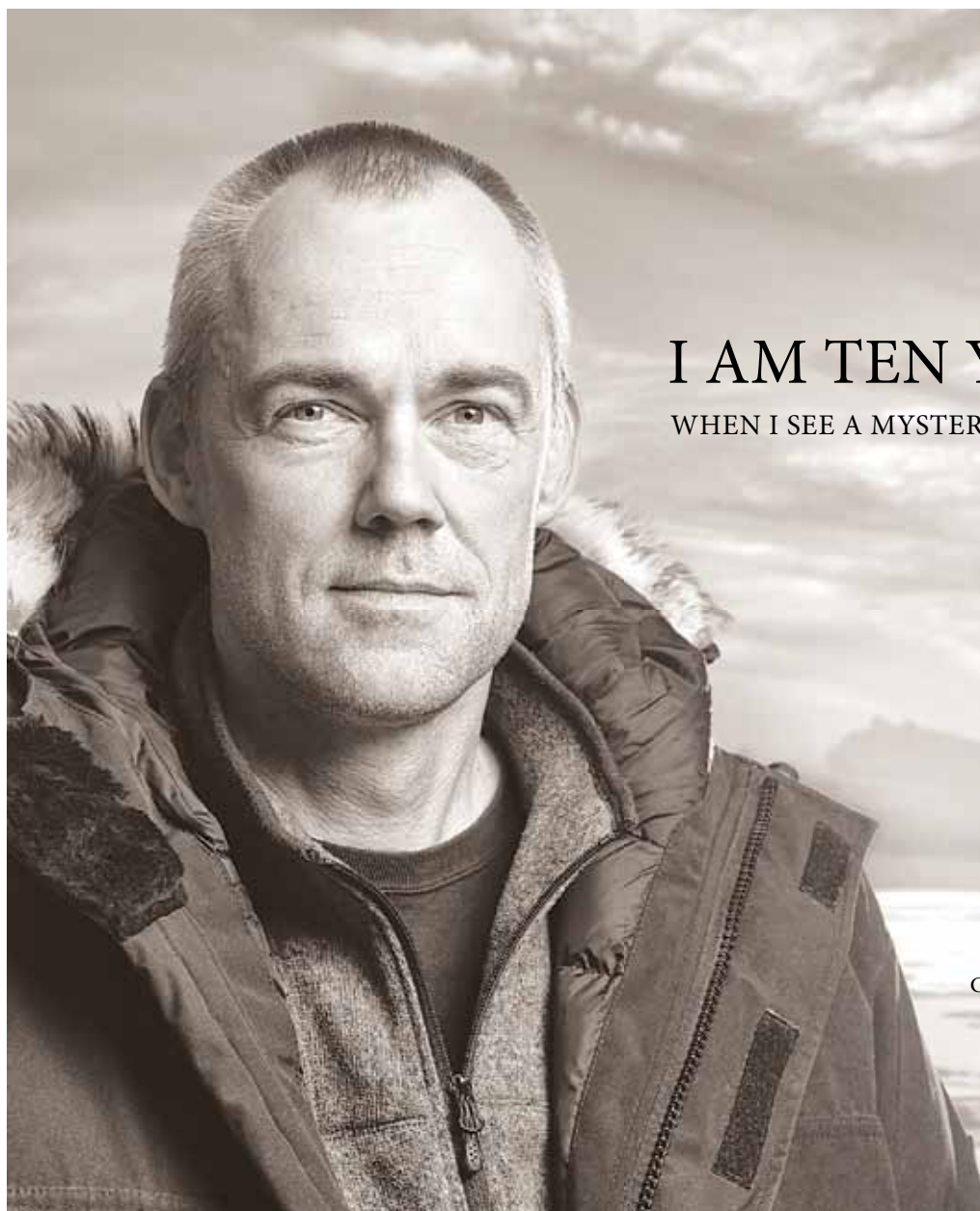
At York, we believe that an active, engaged and collaborative research culture is integral to the fabric of our world-class University. Through fundamental inquiry and external partnerships, research at York is research with an impact and research that makes a difference.

*Robert Haché, Ph.D.
Vice-President Research
and Innovation
York University*



At George Brown College, we support industry applied research, helping industry transform ideas to invoice through access to skills, state of the art facilities and markets. Our centres of excellence in green building, food science and health technology support industry problem solving, prototyping, and product development, from concept to commercialization.

*Dr. Robert Luke
Vice President, Research
and Innovation
George Brown College*



I AM TEN YEARS OLD.

WHEN I SEE A MYSTERY I WANT TO SOLVE IT.

The leaves are turning. The wind is rising. The weather is changing. And I am fascinated by it. I don't feel the cold as I look north in search of answers with the eagerness only a child can muster.


The desire to learn about our world and our climate was something I have always felt, and it has taken me all the way to the High Arctic. When I came to the U of M, I knew I had found people who share my commitment to understanding the forces behind climate change. Now, I stand side by side with them as we work to unravel the mysteries of the arctic ice and how it affects our world. And I am in the North, teaching the next generation how to find their answers.

The University of Manitoba has shown that like me, they are willing to follow a problem and find a solution wherever it happens to be.

I AM A PIONEER.

Søren Rysgaard is the Canada Excellence Research Chair in Arctic Geomicrobiology and Climate Change, and a professor at the Centre for Earth Observation Science at the University of Manitoba.

umanitoba.ca/trailblazer



UNIVERSITY OF MANITOBA

CIFAR: Positioning Canada at the Centre of Global Research Networks



Alan Bernstein
President & CEO
Canadian Institute for Advanced Research

We live in a world transformed by science and research. Vaccines, the Green Revolution, computers, the Internet, nuclear energy, biotechnology and more are direct results of research, most of it publicly funded and conducted at universities. These advances have resulted in new companies but also entirely new multi-billion-dollar industries that employ

tens of thousands of people in Canada and globally.

Canadians should contemplate our future within this dynamic context of research and innovation. We have always been a trading nation. We shipped our forests and furs overseas to provide shelter and warmth to most of Europe even before we officially gained nationhood. The world's concerns and challenges have always been our concerns and challenges. Today, we face global challenges along with other nations around the world. Human health and disease, building a diverse and fair society, finding sustainable forms of energy, global security, a sustainable health system, a rapidly aging society, the melting polar ice cap, global climate change, drug-resistant microbes – these issues are neither unique to Canada nor can Canada address them alone.

We cannot afford to be left out of important discussions at the cutting edge of knowledge creation. To generate innovation and find solutions that

improve life in Canada we must link our best researchers with the world's best, share people, ideas and data.

The report Paradox Lost, released by the Council of Canadian Academies in October 2013, noted Canada's strong record of academic research: seventh in the world in expenditures on higher education R&D as a percentage of GDP. However, the report warns us not to let this position erode. "Canada must sustain its hard-won status as a global research leader," and "ensure that Canadians have 'insider access' to the latest global knowledge pools since inclusion in the best international networks depends on the quality of one's contributions."

Canada's federal research agencies, such as the CIHR, NSERC, SSHRC and CFI, are creating the infrastructure, funding the research and developing the talent essential for research excellence in Canada. CIFAR builds on this by positioning Canada at the

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INNOVATION

Learn more about the Expert Panel Reports on:

- **The State of Industrial Research and Development in Canada**
- **Paradox Lost: Explaining Canada's Research Strength and Innovation Weakness**
- **The State of Science and Technology in Canada**

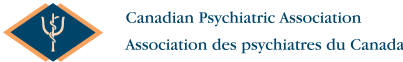
The Council of Canadian Academies offers insight and evidence to enrich Canadian policy development and decision-making.



Council of Canadian Academies
Conseil des académies canadiennes

www.scienceadvice.ca
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FOCUS ON Mental Health RESEARCH



Canada Raises the Bar for Mental Health Research

What if a simple saliva test could tell a doctor precisely the right meds your body needed to fight depression? What if science could prove how dogs are able make breakthroughs in mental health treatment where other approaches have failed? And, what if we, as Canadians, stopped blaming and shaming people with mental illness?

These questions are not hypothetical. They represent some of the leading-edge research happening at institutions across Canada – research that, in many cases, signals a major shift in how mental health is both studied and put into practice.

THE RIGHT DRUG FOR THE RIGHT PERSON

The Centre for Addiction and Mental Health (CAMH) is bringing the promise of personalized medicine closer to reality with a major study involving nearly 20,000 patients that could replace the long and frustrating trial-and-error approach to prescribing drugs with a scientifically proven diagnostic test.

At one test site north of Toronto, doctors at the Thornhill Medical Centre are using a saliva-based test with 150 patients to predict which

of 19 commonly prescribed psychiatric medications work best, based on each person's unique genetic make-up. Medications that work well get a green light to prescribe as directed. Those with a red light are flagged for their poor efficacy or side effects, while meds that fall in the yellow zone may indicate that a dosage is too low or too high.

"There are no biological markers to tell us how sick a person with depression or schizophrenia is, unlike there is for diseases like cancer, heart disease and diabetes," says CAMH's Dr. James Kennedy, who is leading the IMPACT (Individualized Medicine: Pharmacogenetic Assessment and Clinical Treatment) study. "These tests will enable doctors – for the first time – to choose a medication based on biochemical evidence specific to that patient."

Since 80% of psychiatric meds are prescribed in primary care by family doctors, and not psychiatrists, Kennedy says it's essential to have a test that is easy to use.

"The real breakthrough part of this project is being able to deliver all this genetic information widely to doctors in family practice. In a couple of years we hope to have it available to hundreds of doctors.

This has never been done before," says Kennedy.

In addition to improving patient satisfaction and safety, the IMPACT study could also help reduce health-care costs. One of the drawbacks to trial and error prescribing is that patients may have to try several different drugs and dosages to find one that works, and that can take several weeks or months.

"That first medication won't work well in thirty-five to fifty percent of cases," says Kennedy. "That leaves patients frustrated and at increased risk of suicide. It also drives up health care costs."

REDUCING THE STIGMA OF MENTAL ILLNESS

Coming up with more effective treatments for mental illness is only half the solution. The bigger challenge, contends Dr. Heather Stuart at Queen's University, is reducing the stigma that deters two-thirds of Canadians with a mental illness from seeking help.

The consequences of such stigmatization are well known: trouble staying in school, finding and keeping a job and maintaining or establishing relationships. While there are awareness programs to address this issue, Stuart says most are based on

“Mental illness is a serious, pervasive, underfunded, highly stigmatized and common health issue. What has changed is that the conversation is no longer taking place in the shadows. It is now talked about at the dinner table, classroom and boardroom.”

Mary Deacon, Chair
Bell Let's Talk

strongly held beliefs as opposed to hard evidence. To fill this gap, she is collecting scientific data on how often such discrimination occurs, its psycho-social effects and the best ways to reduce discrimination in homes, schools, workplaces and even the health care system.

Her efforts received a major boost last year when Bell Canada donated \$1 million to create the Bell Mental Health and Anti-Stigma Research Chair – the first academic position of its kind in the world. Stuart is the inaugural chair holder.

"My research looks at the prevalence and frequency of stigma from the perspective of people who have a mental illness and how that results in prejudice, discrimination and unequal life chances," she says.

The end goal is to come up with best practices and toolkits that parents, schools and other organizations can use to fight the stigma surrounding mental health.

"We now know that for these programs to work the people who have the illness and their family members have to be front and centre in both planning and delivering these programs," says Stuart.

Canada Brain Bank, and \$1 million to Queen's University to establish the Bell Mental Health and Anti-Stigma Research Chair.

Mary Deacon, Chair of the Bell Let's Talk mental health initiative, says mental health was not high on the list of priorities for corporate Canada a decade ago. The big change, she believes, has been in Canadians' perceptions of mental health. The result has been less stigma and a better understanding that mental illness is a brain disease where investments and treatments can have a profound effect.

"Mental illness is a serious, pervasive, underfunded, highly stigmatized and common health issue.

psychological trauma on the children and grandchildren of the person initially victimized.

A team of neuroscientists at Carleton University examined this issue in the context of First Nations adults forced to attend Canada's residential schools. For second generation Aboriginals, they found these traumatic events had lasting neurochemical and hormonal effects that inhibited their ability to cope with stress later in life, increasing their vulnerability to depression, post-traumatic stress disorder and substance abuse, as well as chronic conditions such as heart disease, high blood pressure, stroke and diabetes.

“These tests will enable doctors – for the first time – to choose a medication based on biochemical evidence specific to that patient.”

Dr. James Kennedy
Centre for Addiction and Mental Health

CORPORATE DONATIONS INCREASING

One of the biggest changes in Canadian mental health research over the past decade has been the unprecedented level of support from corporate donors. Bell Let's Talk is a \$50 million, multi-year program that promotes mental health across Canada based on four action pillars: anti-stigma, care and access, research and workplace best practices.

Bell's investments on the research side have included a \$10 million donation to the Centre for Addiction and Mental Health (CAMH), \$2 million to the Douglas Mental Health University Institute for the Douglas-Bell

What has changed is that the conversation is no longer taking place in the shadows. It is now talked about at the dinner table, classroom and boardroom," says Deacon, who worked as a fundraiser for 10 years at the CAMH Foundation.

HOW KIDS SUFFER FROM A PARENT'S TRAUMA

Reducing the stigma and discrimination too often associated with mental illness begins with understanding its underlying causes. Several studies have shown how personal trauma can contribute to depression, substance abuse and other mental and physical illnesses. Yet, until recently, there were few studies that examined the effects of

"Too often we end up blaming the victim because these events happened so long ago," says Dr. Kimberly Matheson who collaborated on the study with Dr. Hymie Anisman and Dr. Amy Bombay. "But what this research demonstrates is that early life experiences can sensitize the brain so that when you encounter stressors later in life, you are much more reactive."


WORKING WITH ABORIGINAL COMMUNITIES

There is no one-size-fits-all intervention when it comes to treating mental illnesses. Yet, in too many

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Changing the way people think about mental health

Dr. Heather Stuart
Faculty of Health Sciences
Bell Canada Mental Health and Anti-Stigma Research Chair



Queen's
UNIVERSITY

queensu.ca/initiative

RESEARCH COMMITTED TO BUILDING HEALTHY MINDS

Painting by Jane Stewart

Fresh thinking, new approaches and collaboration are hallmarks of the Carleton experience.

The research advances in Neuroscience and Mental Health at Carleton are changing lives – one person, one family and one community at a time.

Learn more at neuroscience.carleton.ca



Carleton
UNIVERSITY

FOCUS ON
Mental Health
RESEARCH

CAMH’s Research Already Helping Patients Today



Bruce G. Pollock, MD, PhD, FRPCP
Vice-President, Research, Centre for Addiction and Mental Health (CAMH), Toronto
Director, Campbell Family Mental Health Research Institute, CAMH

At CAMH, we’re enormously proud of our Campbell Family Mental Health Research Institute, Canada’s largest group of researchers dedicated solely to mental health.

As we celebrate its first anniversary, we have good reason to be proud. With its focus on understanding the brain – from the genetic and molecular levels to the circuits and systems that shape our moods and behaviour – the institute is moving mental health research into the forefront of global science. Where will the next breakthroughs come in unraveling the complexities of the brain? How quickly can we translate those discoveries into better treatments? Can we prevent mental illness before it starts? These are the urgent questions that preoccupy us at CAMH.

We know that the earlier we can intervene, the better the outcome – and research is taking us there.

But what does research really do for those living with mental illness today? Isn’t a research institute just white lab coats, glass beakers

and distant dreams of treatments that might someday exist? What we need is real care today, some might suggest, not a focus on 50 years down the road.

In fact, actual care is embedded into so much of our work at the Campbell Institute. It is an essential part of what we do. As Canada’s leading hospital for mental health, CAMH knows this approach is the best way to ensure patients benefit from research, and that research benefits from patients.

The Temerty Centre for Therapeutic Brain Intervention – a thriving clinical research lab under the umbrella of the Campbell Institute – is pioneering the use of several non-invasive brain stimulation techniques to treat a range of mental illnesses.

lutionizing care for many patients – patients like Jane. As part of our ongoing research, Jane underwent rTMS treatments for the depression she’s lived with for more than 20 years. The treatment helped her replace feelings of shame and loneliness with an overwhelming sense of hope. Jane is a real patient with a real story of a life transformed today – a story only written because of the Campbell Institute.

Finding the right medication for the right patient is a common challenge when treating mental illness. At the Tanenbaum Centre for Pharmacogenetics, scientists are actively working to lessen the chances that treatment won’t work or that unpleasant side-effects will lead to a patient quitting his or her psychiatric medications. Dr. James

test. Early results suggest patients are reporting better outcomes from their medications with fewer side-effects.

This project was initiated by seed funding by visionary business leader Lawrence Tanenbaum, which then led to substantial funding from Ontario’s Ministry of Research and Innovation.

Recently, the study was expanded into the broader community; the test is now being offered to patients at the Thornhill Medical Centre, the Village Family Health team, and other centres. Through these partnerships, Dr. Kennedy and his team will see how this system works when used by frontline

family physicians, the ones who prescribe 80 per cent of psychiatric medications. In all, nearly 1,000 patients have taken the test.

Reaching patients is always our goal – and we continue to build upon our past successes. For example, CAMH’s Dr. Jeff Meyer’s advanced brain imaging research provides a clearer understanding of brain chemistry in major depression, which is needed to create more targeted and effective treatments. Dr. Meyer is now focused on developing a preventive approach to postpartum depression and other serious major depressive disorders, with few if any side-effects. His team

is examining whether a dietary supplement can provide the nutrients removed by high levels of an enzyme that breaks down important brain chemicals like serotonin, norepinephrine and dopamine.

The Campbell Family Mental Health Research Institute is truly advancing research into uncharted territories, but it is also building on a track record that is well-established at CAMH.

Yes, there are white lab coats and beakers to be found within this Institute, as well as treatments in very early stages of development. But there are also real patients receiving real care, and that is something to be truly proud of.

“ We know that the earlier we can intervene, the better the outcome – and research is taking us there. ”

Our experts are the first in Canada to test magnetic seizure therapy, which uses magnetic pulses to stimulate targeted areas of the brain. As well, the Temerty Centre is perfecting the use of repetitive transcranial magnetic stimulation (rTMS), providing better outcomes and fewer side-effects than traditional brain stimulation methods. This technique shows promise in up to 50 per cent of patients, particularly those with treatment-resistant illnesses.

The technique is already revo-

Kennedy is using genetic testing to identify the optimal medications for a particular patient without the frustrating trial and error. The test looks at a person’s specific genetic profile for breaking down particular medications and indicates – in a simple red-yellow-green-light format – which ones are most suitable.

This is a mental health game-changer. So, when will this research begin reaching actual patients? It already is. Almost 400 CAMH patients have taken the

CAMH inspires hope through discovery at the Campbell Family Mental Health Research Institute. We proudly present the first annual Campbell Family Mental Health Research Symposium, *Personalized medicine: Revolutionizing care in mental illness and addiction.*

November 19, 2013
8:30 a.m. – 4:30 p.m.

Royal Conservatory of Music
273 Bloor St. West
Toronto, ON

Special Symposium Guests:

Dr. Anthony Phillips | Symposium Chair
Scientific Director, CIHR Institute of Neurosciences, Mental Health and Addiction

Dr. Thomas Insel
Director, U.S. National Institute of Mental Health, Bethesda, MD

Dr. Daniel Weinberger
Director and CEO, Lieber Institute for Brain Development, Baltimore, MD

For more details and to register (space is limited) please visit: camh.ca/campbell-symposium

HEALTH AND WELL-BEING FOR ALL

By Kathleen Powderley

Providing equal access is one of the fundamental challenges facing health-care planners and providers. Socioeconomic status, gender, race, language and sexuality all too often – even in Canada – affect people’s health outcomes and access to health care. These factors have a profound impact on diagnosis and treatment of mental illness, which is stigmatized in so many cultures.

A new research project at Ryerson University explores ways to reduce the stigma of mental illness among men and boys in Asian communities across Canada, thanks to a \$3-million



A new research project, led by Sepali Guruge, a professor in Ryerson’s Daphne Cockwell School of Nursing, explores ways to reduce the stigma of mental illness among men and boys in Asian communities across Canada.

research grant from the Movember Foundation.

Solving this problem is essential in major cities like Toronto where almost 50 per cent residents were born outside of Canada.

Led by principal investigator Sepali Guruge, a professor in Ryerson’s Daphne Cockwell School of Nursing, this project examines the effectiveness of two pilot anti-stigma interventions with 2,160 men living in Toronto, Vancouver and Calgary. Using innovative approaches to reduce internalized stigma and to support knowledge and skills building, it will have enormous impact. Community leaders from faith-based, media, arts and advo-

cacy sectors will help to build mental health supports within their communities.

This project builds on two strengths of Ryerson research – diversity and health. Other related Ryerson projects include the work of Morton Beiser, professor of distinction in psychology, which examines equality of mental health care for refugees and Donna Kollar, professor in the School of Early Childhood Studies, who helps health-care professionals decrease children’s stress levels and allows them to take an active role in their care.

Ryerson also leads the Ontario Multicultural Health Applied Research Network initiative in

partnership with York University and Markham Stouffville Hospital, which examines and affects change of health inequities among ethno-cultural and racialized groups. Another project led by Judy Finlay, professor in Ryerson’s School of Child and Youth Care, examines the social determinants of health including youth suicide prevention in Northern Ontario First Nations communities.

These research projects are just a few examples of how Ryerson is making a real difference through research and innovation. More information about these and other research is available at www.ryerson.ca/research.

Canada Raises the Bar for Mental Health Research

Continued from page 8

cases, programs developed for mainstream communities in urban centres are simply transplanted into First Nations communities – with limited or no success.

For example, research by Dr. Christopher Mushquash, an Assistant Professor at **Lakehead University** and the **Northern Ontario School of Medicine**, has shown that community programs are more effective when both cultural and contextual differences are taken into account.

“There are big differences between large urban centres and remote communities and northern rural communities,” he says. “You’re also dealing with young people with very different experiences.”

Mushquash, who is also a member of Pays Plat First Nation in Northern Ontario, says he’s not trying to come up with a blanket approach that works for every community. Rather, he is identifying best practices from community-developed approaches, and western-based

science and adapting them in a way that respects the unique cultures and contexts of each community.

The research results have been encouraging. In one project, youth from two Mi’kmaq communities in Nova Scotia who participated in a collaboratively-designed intervention program drank less frequently, engaged in less binge drinking, had lower levels of alcohol-related problems and were more likely to abstain from alcohol use.

THE HEALING TOUCH OF ANIMALS

Any scientist will tell you that knowing something works isn’t the same as proving it works. A case in point is animal-assisted therapy – a growing field that uses dogs or other animals to help people recover from or better cope with health problems, such as heart disease, cancer and mental health disorders.

Saskatoon Health Region (SHR) has no shortage of anecdotal

evidence that its dog and horse therapy programs are having a therapeutic impact with troubled children and youth. What it needs is hard evidence to support the case for expanding these programs. That’s where Dr. Colleen Dell is helping.

The Research Chair in Substance Abuse at the **University of**

“ Developing a science-based evaluation will enable Saskatoon Health Research to implement more of these animal therapy programs. ”

Dr. Colleen Dell
University of Saskatchewan

Saskatchewan works with teams of veterinarians, animal handlers, social workers and human health practitioners to evaluate the results on children and youth of animal-assisted therapy.

“In one project we had many kids who had experienced high rates of sexual abuse. Our research found that handling a horse helped

them learn what healthy touch was,” says Dell.

Others learned how to trust by developing a bond with their favorite horse. “For some, it is much easier to learn to trust with a non-judgemental animal than a human”.

SHR and Dell have since applied for a Canadian Institutes of Health Research grant to further evaluate the therapeutic effects of the region’s horse and dog therapy programs.

“Developing a science-based evaluation will enable Saskatoon Health Research to implement more of these animal therapy programs,” says Dell.

PUTTING RESEARCH INTO PRACTICE

One of the toughest jobs in mental health research is ensuring the results are used by those who need them most. That’s where **Healthy Minds Canada** helps. The national charitable organization funds research, hosts workshops and sym-

posia, and translates the outcomes of mental health and addiction research into practical resources and tools that help families, teachers, workplaces and communities.

Its handbooks are used by companies and organizations across Canada, including Canada Post, Ontario Power Generation, government departments and school boards.

Healthy Minds Canada is posting more of this material online so that even more Canadians can access it. It is also funding research that incorporates this knowledge into a game app for smartphones where players are rewarded each time they make the right choice to help someone with a mental illness or themselves.

“It helps with behavioural choices and improves their empathy to better deal with these kinds of situations,” says Katie Robinette, Executive Director, Healthy Minds Canada.

Canada's TOP 40 RESEARCH HOSPITALS 2013

Rank		Hospital	Research Income			Researchers*	Research Intensity	Province	Main Affiliated Research Institute(s)/Centre(s)
2012	2011		FY2012 \$000	FY2011 \$000	% Change 2011-2012	2011-2012 #	\$ per Researcher \$000		
1	1	University Health Network	\$302,304	\$253,245	19.4	688	\$439.4	Ontario	Ontario Cancer Institute, Toronto General Research Institute, Toronto Western Research Institute
2	3	McGill University Health Centre (MUHC)	\$175,666	\$153,008	14.8	624	\$281.5	Quebec	Research Institute of the MUHC
3	2	Hospital for Sick Children	\$171,163	\$167,815	2.0	552	\$310.1	Ontario	Peter Gilgan Centre for Research and Learning
4	6	Ottawa Hospital	\$152,717	\$129,929	17.5	301	\$507.4	Ontario	Ottawa Hospital Research Institute, Ottawa Heart Institute Research Corporation
5	8	Vancouver Coastal Health Authority	\$134,266	\$120,261	11.6	411	\$326.7	British Columbia	Vancouver Coastal Health Research Institute, Providence Health Care Research Institute
6	5	Provincial Health Services Authority	\$127,412	\$138,722	-8.2	677	\$188.2	British Columbia	BC Cancer Research Centre, Child & Family Research Institute, BC Mental Health & Addictions Res.Inst.
7	4	Hamilton Health Sciences	\$123,811	\$152,545	-18.8	419	\$295.5	Ontario	Population Health Research Institute, Thrombosis/Atherosclerosis Res. Institute, Escarpment Cancer Research Institute
8	7	Sunnybrook Health Sciences Centre	\$116,700	\$122,100	-4.4	236	\$494.5	Ontario	Sunnybrook Research Institute
9	9	London Health Sciences Centre/St. Joseph's Health Care London ^(a)	\$103,100	\$102,000	1.1	287	\$359.2	Ontario	Lawson Health Research Institute
10	10	Mount Sinai Hospital, Joseph and Wolf Lebovic Health Complex	\$95,142	\$84,000	13.3	114	\$834.6	Ontario	Lunenfeld-Tanenbaum Research Institute
11	11	Centre hospitalier universitaire de Québec (CHUQ) ^(b)	\$70,099	\$75,573	-7.2	258	\$271.7	Quebec	Centre de recherche du CHUQ
12	12	Centre hospitalier de l'Université de Montréal (CHUM)	\$66,900	\$67,800	-1.3	339	\$197.3	Quebec	Centre de recherche du CHUM
13	15	St. Michael's Hospital	\$61,385	\$53,643	14.4	182	\$337.3	Ontario	Keenan Research Centre, Li Ka Shing Knowledge Institute
14	13	Centre for Addiction and Mental Health	\$58,465	\$54,393	7.5	124	\$471.5	Ontario	Research Imaging Centre, Campbell Family Mental Health Research Institute, Temerty Centre for Therapeutic Brain Intervention
15	14	Sir Mortimer B. Davis Jewish General Hospital	\$58,420	\$54,038	8.1	225	\$259.6	Quebec	Lady Davis Institute for Medical Research
16	17	CHU Sainte-Justine - Le centre hospitalier universitaire mère-enfant	\$47,700	\$49,004	-2.7	214	\$222.9	Quebec	Centre de recherche du CHU Sainte-Justine
17	16	Institut de Cardiologie de Montréal	\$43,396	\$51,519	-15.8	81	\$535.8	Quebec	Centre de recherche de l'Institut de Cardiologie de Montréal
18	18	Centre hospitalier universitaire de Sherbrooke (CHUS)	\$32,884	\$34,462	-4.6	211	\$155.8	Quebec	Centre de recherche clinique Étienne-Le Bel du CHUS
19	20	Institut universitaire de cardiologie et de pneumologie de Québec	\$32,283	\$27,140	18.9	127	\$254.2	Quebec	Centre de recherche de l'Institut universitaire de cardiologie et de pneumologie de Québec
20	19	St. Joseph's Healthcare Hamilton	\$29,700	\$30,600	-2.9	105	\$282.9	Ontario	Firestone Inst. for Respiratory Health, Hamilton Centre for Kidney Research, Programs for Assessment of Technology in Health (PATH) Research Institute
21	22	Winnipeg Regional Health Authority ^(c)	\$24,702	\$22,647	9.1	221	\$111.8	Manitoba	Manitoba Institute of Child Health
22	23	Kingston General Hospital	\$22,930	\$22,230	3.1	175	\$131.0	Ontario	Kingston General Hospital Research Institute
23	27	Children's Hospital of Eastern Ontario	\$21,867	\$17,239	26.8	146	\$149.8	Ontario	Children's Hospital of Eastern Ontario Research Institute
24	25	Douglas Mental Health University Institute	\$20,690	\$19,173	7.9	54	\$383.1	Quebec	Douglas Hospital Research Centre
25	28	Capital District Health Authority	\$18,618	\$17,218	8.1	250	\$74.5	Nova Scotia	
26	26	Baycrest	\$18,111	\$17,556	3.2	31	\$584.2	Ontario	Rotman Research Institute
27	29	Institut universitaire en santé mentale de Québec	\$17,553	\$16,877	4.0	66	\$266.0	Quebec	Centre de recherche de l'Institut universitaire en santé mentale de Québec
28	31	Hôpital Maisonneuve-Rosemont	\$16,228	\$12,638	28.4	135	\$120.2	Quebec	Centre de recherche de l'Hôpital Maisonneuve-Rosemont
29	21	IWK Health Centre	\$15,041	\$24,635	-38.9	280	\$53.7	Nova Scotia	Centre for Pediatric Pain Research, Canadian Center for Vaccinology, Centre for Research in Family Health
30	30	Centre hospitalier affilié universitaire de Québec (CHA) ^(b)	\$13,611	\$13,509	0.8	139	\$97.9	Quebec	Centre de recherche du CHA
31	32	St. Boniface Hospital	\$11,954	\$12,200	-2.0	32	\$373.6	Manitoba	St. Boniface Hospital Research Centre
32	33	Women's College Hospital	\$10,896	\$8,758	24.4	34	\$320.5	Ontario	Women's College Research Institute
33	35	Hôpital du Sacré-Coeur de Montréal	\$9,359	\$7,799	20.0	132	\$70.9	Quebec	Centre de recherche de l'Hôpital du Sacré-Coeur de Montréal
34	38	Bruyère Continuing Care	\$8,663	\$5,833	48.5	48	\$180.5	Ontario	Bruyère Research Institute
35		Saskatoon Regional Health Authority	\$8,000	\$4,402	81.7	233	\$34.3	Saskatchewan	Saskatoon Centre for Patient-Oriented Research, Cameco MS Neuroscience Research Center
36	36	The Royal	\$7,900	\$7,400	6.8	75	\$105.3	Ontario	University of Ottawa Institute of Mental Health Research
37		Centre de santé et des services sociaux - Institut universitaire de gériatrie de Sherbrooke (CSSS-IUGS)	\$7,700	\$4,375	76.0	100	\$77.0	Quebec	Centre de recherche sur le vieillissement
38	37	Thunder Bay Regional Health Sciences Centre	\$7,621	\$6,191	23.1	41	\$185.9	Ontario	Thunder Bay Regional Research Institute
39	34	Holland Bloorview Kids Rehabilitation Hospital	\$7,350	\$8,167	-10.0	18	\$408.3	Ontario	Bloorview Research Institute
40		Eastern Health Regional Health Authority	\$6,307	\$3,662	72.2	98	\$64.4	Newfoundland	

Notes:

- Research income includes all funds to support research (for direct or indirect costs) received from all sources to the organization (internal and external).
- Data were obtained through a survey of research hospitals or from financial statements. Information for Alberta was not available.
- FY2011 research income figures may have been adjusted as more accurate information became available.
- Data are provided for the main hospital(s) including their affiliated hospitals and research institutes/centres, where applicable.

*Head count of researchers/scientists/investigators/clinician-researchers conducting research. (Does not include research fellows/post docs, technicians, students or support staff.)

- (a) Research income amounts were combined as these hospitals have one research institute.
 (b) For FY2013, the CHUQ AND CHA will be included as the CHU de Québec.
 (c) Data for St. Boniface Hospital are not included with WRHA.

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Canada's Top 40 Research Hospitals

HEALTHY GAIN IN HOSPITAL RESEARCH INCOME

Canada's Top 40 Research Hospitals reported a healthy 4.8% gain in research income in Fiscal 2012. Combined income for research expanded to \$2.3 billion from \$2.2 billion in Fiscal 2011. The 2012 result is especially comforting in light of last year's meagre research income increase of only 0.7%.

University Health Network ranked in first position again in Fiscal 2012 with \$302.3 million of research income. McGill University Health Centre moved into 2nd place (\$175.7 million), Hospital for Sick Children dropped to 3rd (\$171.2 million), Ottawa Hospital moved up 2 spots to 4th place (\$152.7 million) and Vancouver Coastal Health Authority (\$134.3 million) climbed 3 spots to 5th position – rounded out the top 5. Overall, 28 hospitals posted increases in research income in Fiscal 2012, compared with 12 hospitals where research income declined.

THE \$100 MILLION CLUB

In Fiscal 2012, 9 hospitals reported research income of \$100 million or more, gaining admission to RESEARCH Infosource's \$100 Million Club. Combined research income of these leading institutions increased by 5.0% and accounted for 62% of Top 40 research income.

PROVINCIAL PERFORMANCE

In Fiscal 2012, 18 research hospitals in Ontario posted combined research income of \$1.3 billion, accounting for 58% of the national total. Quebec's 14 institutions, with combined research income of \$612.5 million, accounted for 27% and British Columbia's 2 institutions

Top 40 – Three Leading Provinces ¹		
Province		% of Total
Ontario (18)		58
Quebec (14)		27
British Columbia (2)		11

(\$261.7 million) accounted for an additional 11% of the total.

Research income gains were strongest in Saskatchewan (81.7%) and Newfoundland (72.2%). Ontario (6.1%), Manitoba (5.2%), Quebec (4.4%) and British Columbia (1.0%) also posted gains. Research income fell in Nova Scotia, by -19.6%.

RESEARCH INCOME GROWTH

In Fiscal 2012, the strongest gains in research income were made by Saskatoon Regional Health Authority (81.7%), Centre de santé et des services sociaux – Institut universitaire de gériatrie de Sherbrooke (76.0%) and Eastern Health Regional Health Authority (72.2%).

RESEARCH INTENSITY

Research intensity – research income per researcher² – rose by 4.2% to a national average of \$268,600. Nineteen hospitals posted research intensity levels in excess of the average. The leading institution in research intensity was Mount Sinai Hospital, Joseph and Wolf Lebovic Health Complex with \$834,600 per researcher. Baycrest (\$584,200), Institut de Cardiologie de Montréal (\$535,800), Ottawa Hospital (\$507,400) and Sunnybrook Health Sciences Centre (\$494,500) rounded out the top 5.

Top 10 Research Hospitals by Growth			
2012 Rank	Income Growth	Overall Research Hospital	% Change 2011-2012
1	35	Saskatoon Regional Health Authority	81.7
2	37	Centre de santé et des services sociaux – Institut universitaire de gériatrie de Sherbrooke (CSSS-IUGS)	76.0
3	40	Eastern Health Regional Health Authority	72.2
4	34	Bruyère Continuing Care	48.5
5	28	Hôpital Maisonneuve-Rosemont	28.4
6	23	Children's Hospital of Eastern Ontario	26.8
7	32	Women's College Hospital	24.4
8	38	Thunder Bay Regional Health Sciences Centre	23.1
9	33	Hôpital du Sacré-Coeur de Montréal	20.0
10	1	University Health Network	19.4

THIS YEAR AND NEXT

Fiscal 2012 saw a healthy 4.8% jump in hospital research income, compared with a rise of only 0.7% in Fiscal 2011. Research hospitals are key performers in Canada's system of innovation and maintaining a strong research base in our research hospitals is vital if scientific discoveries are to be translated into better health outcomes for patients.

One impressive thing about this year's increase in hospital research income is that it was achieved in the context of a sharp fall in research expenditures by some major pharmaceutical companies. The pharma sector is retrenching in Canada and elsewhere. This will inevitably put more pressure on governments and private donors to fill the funding gap.

Top 10 Research Intensive Hospitals			
2012 Rank	Research Intensity	Research Hospital	Research Intensity (\$ per researcher) \$000
1	10	Mount Sinai Hospital, Joseph and Wolf Lebovic Health Complex	\$834.6
2	26	Baycrest	\$584.2
3	17	Institut de Cardiologie de Montréal	\$535.8
4	4	Ottawa Hospital	\$507.4
5	8	Sunnybrook Health Sciences Centre	\$494.5
6	14	Centre for Addiction and Mental Health	\$471.5
7	1	University Health Network	\$439.4
8	39	Holland Bloorview Kids Rehabilitation Hospital	\$408.3
9	24	Douglas Mental Health University Institute	\$383.1
10	31	St. Boniface Hospital	\$373.6

The \$100 Million Club		
2012 Rank	Research Hospital	Research Income \$000
1	University Health Network	\$302,304
2	McGill University Health Centre (MUHC)	\$175,666
3	Hospital for Sick Children	\$171,163
4	Ottawa Hospital	\$152,717
5	Vancouver Coastal Health Authority	\$134,266
6	Provincial Health Services Authority	\$127,412
7	Hamilton Health Sciences	\$123,811
8	Sunnybrook Health Sciences Centre	\$116,700
9	London Health Sciences Centre/ St. Joseph's Health Care London	\$103,100

¹ Information for Alberta was not available.
² Head count of researchers/scientists/investigators/clinician-researchers conducting research. (Does not include fellows/post docs, technicians, students or support staff.)



Putting patients first

Health research with results

The birthplace of medicare continues to be a health innovator. Saskatoon is the only city in Canada where administration of health research is led by a senior joint position and office with dual accountability to both the health region and the university.

This pioneering model is providing more benefits to patients and their families. It has enabled growth in medical and patient-oriented research within the Saskatoon Health Region, making the region number one in Canada for growth in health research income.

By integrating research and innovation into core health services, we are putting patients first—with new and more effective services, treatments, drugs and technologies that improve care.

The Saskatoon Health Region and the University of Saskatchewan are together leading the way in patient-oriented research and care.

For more information, please visit usask.ca/research



HEALTH INNOVATION: Stepping up to Leadership



Dr. David Hill
Scientific Director,
Lawson Health Research Institute
Integrated VP Research, London
Health Sciences Centre and
St. Joseph's Health Care London

During a recent presentation to the Canadian Medical Association the Honourable Rona Ambrose, Federal Minister of Health, highlighted the importance of innovation and research as a key forward strategy to improve efficiencies and cost-effectiveness, and sustain the Canadian health system. As the Minister noted, with the public investment in health at a federal level now over \$30 billion a year, it is “worthy of federal leadership”. The human talent is already there in abundance: the collective skills of an entire publically-funded industry that includes hundreds of thousands of highly educated and expertly skilled professionals who can define and deliver best value to patients from the health dollar, develop and test innovative health solutions from ‘first-in-human’ research studies and randomized clinical trials, and translate the best of the new knowledge into the latest and best standards of health care. It is not the raw talent that is missing, it is an organizational structure.

Frameworks are emerging, such as the Strategy for Patient-Oriented Research being championed by the Canadian Institutes of Health Research. However, many health innovations in Canada are failing to mature and be translated into the health system because there is no effective receptor mechanism. Provinces such as Ontario do have functioning post-market assessment offices that screen new innovations, particularly in medical devices, to generate evidence-based assessments of their readiness and cost-effectiveness for translation into care. However, this ability to pull forward innovations should ideally extend much earlier into the discovery pipeline. An excellent vehicle through which Federal leadership of health innovation could be established would be the creation of a Federal Health Innovation Fund. Such a fund would select discoveries that had been validated for positive patient and health system impact through standard clinical research designs in our academic hospitals and universities, and rigorously evaluate their performance in a real life setting at the point of health care. The concept is not exactly new. The National Health Service in the UK has for many years operated regional Innovation Centres whose role is to identify and develop future innovations for implementation across the public health system. While the federal government has stressed the important role of the private sector as an R&D partner, it is equally important that our health system has the ability to ‘lift’ innovations over the finishing line.

Championing our system of health and health research as a cradle of innovation can be a role for municipal government also, not

just federal and provincial legislations. After all, the sector is a major local employer of highly skilled labour in all Canadian cities that host academic hospitals and university faculties with a health mandate. Innovation in health creates high quality jobs and attracts individuals who give back to their communities in municipal taxes, support for entertainment and the arts, and local philanthropy. Communities take pride in hosting top-class hospitals directly benefiting them as individuals. This has long been recognized in my own community of London, Ontario, which hosts Western University, the Lawson Health Research Institute, Robarts Research Institute and two major hospitals, London Health Sciences Centre and St Joseph's Health Care. Recently, the City of London showed leadership by directly investing in health innovation through the creation of a \$10 million Innovation and Commercialization Fund. The intent of this fund is to kick-start health innovation, particularly in the fields of orthopaedics, medical devices and diagnostic imaging; areas where London already has a track record of excellence. The challenge from the City to the health research community is to leverage the fund up to \$80 million through partnerships with industry and other levels of government, and to deliver at least 350 new jobs over 10 years. Health innovation has been designated as an engine of municipal growth, and a key strategy to create local wealth and build a ‘creative community’. Success in London will be success for Canada. While the rediscovery of a leadership role in health innovation by the Federal government is to be applauded, this quest can truly be a partnership amongst all stakeholders.

Building on Success: The Hospital for Sick Children

Success is what happens when you make excellence a priority, engage your workforce and allow innovation to flourish. These are not end goals, they are qualities of a top-performing organization; they take years to nurture and vigilance to maintain.



The Hospital for Sick Children has always set its sights high. Today our organization is in a stronger position than ever to lead innovative and collaborative initiatives that will improve the health of children and youth.

With the opening in September of the Peter Gilgan Centre for Research and Learning, SickKids raised the profile of paediatric research and celebrated the progress we've made since 1954 when our Research Institute was established with income from the invention of Pabulum.

It was at SickKids that surgery to correct transposition of the great arteries of the heart (the birth defect of “blue babies”) was pioneered in 1963. It was at SickKids, in 1972, that Canada's first bone marrow transplant program began, and it was at SickKids that Dr. Lap-Chee Tsui led a team that published its discovery in 1989 of the gene which, when defective, is responsible for cystic fibrosis.

Each successful innovation puts us in a better position to recruit world-leading scientists and their teams who, in turn, are able to attract significant grants that foster new and exciting discoveries.

The Gilgan Centre may be the largest child health research tower in the world. Guided by the SickKids vision for healthier children and a better world, it was built on innovative architectural principles to nurture innovation and discovery. It is a physical manifestation of SickKids' vision for extensive and intensive collaboration among disciplines.

The centre has 16 floors dedicated exclusively to scientists and their staff, and more floors for education, conferences and support services. With the help of shared spaces, connective staircases and unique meeting rooms, we have developed six neighbourhoods that provide unique opportunities for multi-disciplinary collaboration:

- Brain & Mental Health • Organ Systems & Disease • Patients, Populations & Policy • Genetic & Genomic Medicine • Cancer & Stem Cell Biology • Molecules, Cells & Therapies

LEADERS IN MENTAL HEALTH

Take the neighbourhood for Brain & Mental Health. SickKids is well positioned to lead initiatives in this field. Here basic scientists, clinician-scientists and health professionals will examine such issues as pain management, brain injury and repair, vision and auditory perception, epilepsy, and cognitive and neuropsychiatric disorders such as ADHD, autism, obsessive compulsive disorder and schizophrenia.



Indeed, SickKids is home to every discipline that can be brought to bear on mental health, ranging from computer scientists to psychopharmacologists. Our leadership team in Brain & Mental Health represents psychology, social work, neurology, neurosurgery,

psychiatry, and our research program in neurosciences and mental health.

Mental health is an evolving field. Not long ago it was generally understood that “bad families” were the cause of mental illness.

Many myths have led to the stigma for children and youth suffering from mental disorder, including the belief that all (or at least most) children are happy, but if they are not, “it's their fault”, or “their parent's fault”. Other unhelpful myths include the assertion that “any dream can be realized if you just work hard enough” and that “bad” behaviour is the result of “wanting attention” or “being spoiled”.

Today, researchers have helped us understand that physical and mental health are inseparable. For example, we know now that:

- Children with mental disorders are at increased risk of injuries, communicable diseases, diabetes, obesity, CVD and asthma.
- Child and adolescent nicotine use leads to increased risk of all adult substance abuse (especially alcohol abuse).
- Children who present with medically unexplained physical symptoms (MUPS) are at risk of growing up to be adults with MUPS.

This understanding is key in our new collaboration with the Centre for Addiction and Mental Health (CAMH) and University of Toronto. Together we recruited Dr. Peter Szatmari, a renowned autism researcher and psychiatrist, who was named the inaugural Patsy and Jamie Anderson Chair in Child and Youth Mental Health in September.

Dr. Szatmari and his team plan to develop an integrated child and youth mental health program which we hope will benefit children across Ontario, throughout Canada and the world.

A common goal: SickKids is driven by the energy of innovation and collaboration. People at SickKids, from scholars to support staff, are engaged, and international researchers are lining up to come and work for us, attracted by our vision for healthier children and a better world. See www.sickkids.ca

Patient-Focused Research Growing in Saskatchewan

A recent Canadian study that found no evidence linking blocked veins to multiple sclerosis – the basis of the controversial “liberation therapy” – grabbed media headlines and the attention of multiple sclerosis patients worldwide.

Co-authored by University of Saskatchewan medical researcher Dr. Katherine Knox, the study published in The Lancet found that that a narrowing of veins leading from the brain to the heart is relatively common and is unlikely to be the cause of multiple sclerosis.

“This was an important study to do because many of my patients were going out of country to get their veins opened,” said Knox.

The project reflects the growing importance of patient-focused research that fosters evidence-informed health care decisions. Several health studies have shown that 50 per cent of patients do not get treatments that are proven effective, and up to 25 per cent get care that’s not needed or potentially harmful.

Saskatoon’s health research community is among the leaders in research that puts patients first. It’s one reason the Saskatoon Health Region (SHR) leads the country in growth in health research income, with an 82 per cent increase over the past year.

Advancing this new approach is the fact the SHR and the U of S have formed a joint office to catalyze health research and innovation. It is led by Beth Horsburgh who is both SHR Vice-President of Research & Innovation and U of S Associate Vice-President Health Research.

The office supports initiatives that foster new services, drugs and technologies, generating evidence to improve health outcomes – ranging from evaluating the need for endoscopy procedures, to developing best practices for reducing MRSA bacterial infection in hospitals and long-term care facilities.

“Building research partnerships among health service providers, aca-

demics, government, and industry is key to our success,” says Horsburgh.

“We have more than 360 ongoing clinical research studies in the health region and 80 per cent involve U of S researchers – so it just makes good sense to work together on integrating research with effective health care delivery to benefit patients, families and communities.”



U of S brain surgeon Dr. Michael Kelly does clinical research to improve stroke treatment.

One such joint initiative – the eight-bed Saskatchewan Centre for Patient-Oriented Research based at Saskatoon City Hospital – is funded by the U of S College of Medicine, U of S, SHR, and the Saskatchewan Cancer Agency.

With 15 highly trained staff, the centre supports trials for cutting-edge treatments and technologies. More than 200 clinical studies have been conducted through SCPOR since its inception three years ago, and the number of new studies has increased by almost 30 per cent.

One SCPOR-supported study involves the first human trial of a stent-like device that promises to improve treatment for complicated brain aneurysms. The industry-sponsored study is led by Dr. Michael Kelly, a neurosurgeon who returned to Saskatoon after doing fellowships

in the U.S. and now holds a chair in clinical stroke research funded by Saskatchewan Health Research Foundation, the Heart and Stroke Foundation, and U of S. The project is expected to have Health Canada approval by the end of December, and will start this winter.

“This model has enabled significant growth in clinical trials research because support is provided for handling contractual issues, logistical challenges, and ethics correspondence. This is allowing researchers to focus on actually conducting the research, which is often very complicated,” said Kelly, who has a dozen SCPOR studies under way.

“When approached by companies to do these studies, it used to take weeks and months to get started. Now disclosure agreements are executed in a few business days and companies can see our efficiency.”

The joint research approach, combined with the presence of Canada’s only synchrotron and a new multi-disciplinary health sciences facility, is attracting stellar researchers. Among them is Dr. Bogdan Popescu who came to U of S from the Mayo Clinic to become Canada Research Chair in Biomedical MS Research.

Popescu, at the Cameco MS Neuroscience Research Centre at Saskatoon City Hospital, is advancing understanding of MS in a province that has one of the highest rates of MS in the world. He uses tissues from MS patients to understand how the disease develops and synchrotron technology to investigate naturally occurring metals, research he hopes will translate into targeted and better treatments for some MS patients.

“By bringing together the engagement of our patients, families and communities, the knowledge needs of our health care system, and the skills and passion of our research community, we are improving patient safety, our culture of evidence-based practice, and Canada’s health care system,” said Maura Davies, SHR President and CEO.

Secrets to Success

Continued from page 1

Here at home, the study of health systems, social factors, government strategies and other structural components is changing how communities deliver health care. In one HHS-led study of 39 Ontario communities, Dr. Lisa Dolovich and her colleagues demonstrated that a community-based health promotion program delivered by volunteers, in partnership with family physicians, pharmacists and community organizations, reduced hospitalization rates for stroke, heart attack and congestive heart failure by nine percent. The Cardiovascular Health Awareness Program is now being evaluated in larger urban centres in Ontario and Quebec.

“This isn’t your conventional view of innovation, where I’ve discovered a new molecule or a new gene,” says Yusuf. “They were able to show a reduction in mortality, and costs, by moving away from a physician-based delivery system.”

It’s not only companies and hospitals that benefit from new technologies. **Simon Fraser University** is home to two of the world’s pioneers in using Geographical Information Systems (GIS) to pinpoint crime hotspots and the conditions that might lead to those crimes. The husband and wife team of Drs. Patricia and Paul Brantingham, both RCMP-funded research chairs, have worked with justice officials in Canada, Australia, the U.K. and Chile to set up computerized systems for tracking crime.

“This technology is able to model criminal behaviour as a function of other factors, such as health disparities and social inequities. All these data can then be used to inform policy,” explains Dr. Mario Pinto, V.P. of Research at Simon Fraser University.

Universities also look for opportunities to spin-off promising technologies into start-up companies. But not all get the green light. For the past decade, SFU has taken a Dragon’s Den-style approach to deciding which projects receive angel funding and other commercialization support.

“You do your due diligence at

the front end and you do the critical go/no-go experiments at the front end,” says Dr. Pinto. “And if you don’t think it will fly, kill it quickly.”

BUILDING REGIONAL CLUSTERS

Leveraging regional strengths is one of the things academic institutions do best. Efforts are underway to solidify Quebec’s participation

in part, to USherbrooke’s 50-year-old co-op program. “When you need to find 4,000 internships every year it forces you to think about the needs of your partners.”

Similarly in Nova Scotia, having five federal labs, several small and mid-sized companies, and a university all involved in ocean science created a perfect storm for assembling something bigger and more coordinated.

“ When you need to find 4,000 internships every year it forces you to think about the needs of your partners.”

Dr. Jacques Beauvais, V.P. Research, Université de Sherbrooke

in a north-eastern North American cluster in microelectronics. Bromont and Montreal are already home to Canada’s largest semiconductor wafer manufacturing facility and one of the world’s most advanced packaging plants.

To support these companies, **Université de Sherbrooke**, IBM and Teledyne DALSA last year opened the MiQro Innovation Collaborative Centre (C2MI), a state-of-the-art microelectronics packaging and testing facility in Bromont. C2MI collaborates with university researchers and 14 industry partners to move innovations from the prototype stage to high-volume commercial production for use in a variety of fields, from medical and automotive to aerospace and telecommunications.

“You have the university doing the fundamental research and proof-of-concept at our new Institute for Interdisciplinary Innovations and Technologies, and then we can go to C2MI to develop and test the actual prototypes used in the manufacturing process. C2MI can also emulate the home, office, hospital or wherever you need to test the technology,” says Dr. Jacques Beauvais, V.P. Research at Université de Sherbrooke.

Beauvais attributes this success,

In just two years that has become a reality with **Dalhousie University’s** opening of the Halifax Marine Research Institute. To top it off, in June Dalhousie launched the Dalhousie Ocean Sciences Building which consolidates many research programs under the same roof.


Dr. Martha Crago, V.P. of Research at Dalhousie University, describes the new building as an “ecosystem of excellence in marine science”.

A NEW ERA FOR COLLEGES

Translating promising research into real-world applications has become a priority for Canada’s colleges as well.

“If you want to win applied research grants, and you want your students to get jobs, you have to engage with industry and ask, ‘where’s your pain’,” says Dr. James Watzke, the Dean of Applied Research and Innovation at **Seneca College**. “Then we drill back into Seneca and figure out if we have the right expertise to solve these problems. I call it a problem-pull model.”

For the continuation go to: researchinfosource.com/cil/2013



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Hands-on research opportunities for students

Our faculty and students are using research to make a difference. Together they worked with Bykart Software on its Chemotherapy Appointment Reservation Manager (CHARM) to simplify the task of booking treatment appointments while developing CHARM’s website and mobile application interface. This project resulted in a 25 per cent increase in patients treated at Sunnybrook Hospital in Toronto in addition to new commercialization opportunities for Bykart with other hospitals.



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CANADA'S TOP

50
RESEARCH
COLLEGES



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RESEARCH
MONEY

November 8, 2013

Canada's TOP 50 RESEARCH COLLEGES 2013

Rank		College	Research Income			Faculty*	Research Intensity	Prov	Main Research Institute(s)/ Centre(s)/Facilities
2012	2011		FY2012 \$000	FY2011 \$000	% Change 2011-2012	2011-2012 #	\$ per Faculty \$000		
1	12	SAIT Polytechnic	\$9,752	\$2,611	273.5	53	\$184.0	AB	Enerplus Centre for Innovation
2	4	NAIT - Northern Alberta Institute of Technology	\$6,334	\$4,958	27.8	60	\$105.6	AB	NAIT Boreal Research Centre
3	7	College of the North Atlantic	\$6,026	\$3,358	79.5	25	\$241.0	NL	Centre for Agrifood Development
4	3	Yukon College	\$5,385	\$5,097	5.7	12	\$448.8	YT	Yukon Research Centre
5	1	British Columbia Institute of Technology	\$5,201	\$6,080	-14.5	180	\$28.9	BC	Building Science Centre of Excellence
6	6	Sheridan College	\$4,554	\$3,520	29.4	121	\$37.6	ON	Screen Industries Research & Training Centre
7	2	Red River College	\$4,372	\$6,038	-27.6	17	\$257.2	MB	Centre for Applied Research in Sustainable Infrastructure
8	11	Seneca College	\$4,356	\$2,632	65.5	82	\$53.1	ON	Centre for Development of Open Technology
9	9	Collège Édouard-Montpetit	\$3,842	\$2,805	37.0	32	\$120.1	QC	Centre technologique en aérospatiale
10	5	Cégep de la Gaspésie et des Îles	\$3,474	\$4,014	-13.5	34	\$102.2	QC	Centre d'initiation à la recherche et d'aide au développement durable
11	8	Cégep de Trois-Rivières	\$3,306	\$2,891	14.4	46	\$71.9	QC	Centre de métallurgie du Québec
12	24	Centennial College	\$3,277	\$1,351	142.6	75	\$43.7	ON	Applied Research & Innovation Centre
13	10	Niagara College	\$3,246	\$2,644	22.8	89	\$36.5	ON	Canadian Food & Wine Institute Research Centre
14	31	La Cité collégiale	\$2,948	\$1,139	158.8	24	\$122.8	ON	Centre de recherche appliquée en biovalorisation
15	46	Grande Prairie Regional College	\$2,556	\$535	377.8	10	\$255.6	AB	National Bee Diagnostic Centre
16	30	Lambton College	\$2,405	\$1,145	110.0	14	\$171.8	ON	Centre of Excellence in Energy & Bio-Industrial Technologies
17	14	Cégep André-Laurendeau	\$2,390	\$2,265	5.5	17	\$140.6	QC	Optech
18	13	Justice Institute of British Columbia	\$2,310	\$2,270	1.8	25	\$92.4	BC	Centre for Resilient Communities
19	33	Mohawk College	\$2,245	\$1,088	106.3	18	\$124.7	ON	iDeaWORKS
20	19	Cégep de l'Abitibi-Témiscamingue	\$2,240	\$1,760	27.3	26	\$86.2	QC	Centre technologique des résidus industriels
21	17	Nova Scotia Community College	\$2,117	\$1,816	16.6	57	\$37.1	NS	Applied Geomatics Research Centre
22	29	George Brown College	\$2,036	\$1,182	72.3	75	\$27.1	ON	Food & Innovation Research Studio
23	21	Olds College	\$1,956	\$1,647	18.8	15	\$130.4	AB	Olds College Centre for Innovation
24	16	Cégep de Saint-Jérôme	\$1,852	\$1,890	-2.0	22	\$84.2	QC	Centre de développement des composites du Québec
25	42	Durham College	\$1,691	\$636	165.9	21	\$80.5	ON	
26	18	Cégep de Lévis-Lauzon	\$1,593	\$1,763	-9.6	29	\$54.9	QC	Centre de robotique et de vision industrielles
27	28	Collège Shawinigan	\$1,561	\$1,191	31.1	20	\$78.1	QC	Centre National en Électrochimie et en Technologies Environnementales
28	22	Cégep de Jonquière	\$1,554	\$1,590	-2.3	49	\$31.7	QC	Centre d'Étude des Conditions de vie et des besoins de la population
29	41	Conestoga College	\$1,530	\$644	137.6	51	\$30.0	ON	Centre for Entrepreneurship
30	39	NorQuest College	\$1,478	\$740	99.7	21	\$70.4	AB	Centre for Intercultural Education
31	15	Algonquin College	\$1,471	\$2,225	-33.9	40	\$36.8	ON	Design Centre
32	27	Cégep de Sainte-Foy	\$1,410	\$1,193	18.2	32	\$44.1	QC	Centre d'enseignement et de recherché en foresterie de Sainte-Foy
33	20	Cégep de Thetford	\$1,400	\$1,700	-17.6	21	\$66.7	QC	Centre de Technologie Minérale et de Plasturgie
34	26	Collège de Maisonneuve	\$1,352	\$1,252	8.0	20	\$67.6	QC	Centre d'études des procédés chimiques du Québec
35	40	Cégep de Sherbrooke	\$1,301	\$734	77.2	26	\$50.0	QC	Centre de productique intégrée du Québec
36	37	Fleming College	\$1,224	\$979	25.0	20	\$61.2	ON	Centre for Alternative Wastewater Treatment
37	34	Cambrian College	\$1,117	\$1,076	3.8	22	\$50.8	ON	Northern Ontario Assessment Resource Centre
38	32	Red Deer College	\$1,103	\$1,129	-2.3	14	\$78.8	AB	Center for Innovation in Manufacturing
39	38	Lethbridge College	\$1,076	\$754	42.7	26	\$41.4	AB	Aquaculture Centre of Excellence
40	35	St. Lawrence College	\$1,062	\$1,032	2.9	20	\$53.1	ON	Sustainable Energy Applied Research Centre
41	23	Collège communautaire du Nouveau-Brunswick	\$1,037	\$1,361	-23.8	13	\$79.8	NB	Centre pré-commercial de technologies en bioprocédés
42	44	Humber College	\$982	\$584	68.2	13	\$75.5	ON	
43		Cégep de l'Outaouais	\$908	na		23	\$39.5	QC	Laboratoire en Énergie Durable
44	36	Dawson College	\$824	\$990	-16.8	13	\$63.4	QC	Ctr. de recherche pour l'inclusion scolaire et professionnelle des étudiants en situation de handicap
45	25	Cégep de Sept-Îles	\$675	\$1,350	-50.0	13	\$51.9	QC	Inst. technologique de maintenance industrielle
46		Lakeland College	\$640	\$179	257.5	25	\$25.6	AB	Centre for Sustainable Innovation
47	49	Holland College	\$622	\$375	65.9	30	\$20.7	PE	Canada's Smartest Kitchen
48	47	Cégep de Saint-Laurent	\$600	\$500	20.0	10	\$60.0	QC	Centre des technologies de l'eau
49	48	SIAST - Saskatchewan Institute of Applied Science and Technology	\$503	\$479	5.0	27	\$18.6	SK	SIAST BioScience Applied Research Centre
50	43	Cégep de Rimouski	\$450	\$608	-26.0	3	\$150.0	QC	Innovation maritime

Notes:

1. Research income includes all funds to support scholarly and applied research (direct and indirect costs) received from all sources to the organization (internal and external).
2. Data were obtained through a survey of public-funded colleges.
3. Data are provided for the main college including their affiliated research institutes/ centres, where applicable.

*Head count of faculty/teaching staff and/or dedicated researchers conducting research. (Does not include support staff or student researchers.)

na = not available

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Canada's Top 50 Research Colleges

COLLEGES POSITIONED FOR GROWTH

RESEARCH Infosource is pleased to present its inaugural *Canada's Top 50 Research Colleges 2013*. Canada's research colleges are important and growing research performers in the country's national system of innovation.

The combined research income of the 50 leading research colleges was \$117.3 million in Fiscal 2012, which marked a substantial 30.7% increase over Fiscal 2011. The number of faculty¹ involved in research increased to 1,731 during this period, which represents an increase of 15.2%. Growth in research income and faculty numbers combined to yield an expansion of 13.4% in research intensity – research income per faculty.

SAIT Polytechnic emerged as the leading research college with research income of \$9.8 million in Fiscal 2012, followed by NAIT - Northern Alberta Institute of Technology (\$6.3 million), Newfoundland's College of the North Atlantic (\$6.0 million), Yukon College (\$5.4 million), British Columbia Institute of Technology (\$5.2 million), Sheridan College (\$4.6 million), Red River College (\$4.4 million), Seneca College (\$4.4 million), Collège Édouard-Montpetit (\$3.8 million) and Cégep de la Gaspésie et des Îles (\$3.5 million) rounding out the Top 10.

PROVINCIAL PERFORMANCE

When research income was rolled up on a provincial basis, Ontario's 15 research colleges accounted for 29% of the total research income in Fiscal 2012, followed by Quebec's 18 colleges (26%) and Alberta's 8 research colleges (21%).

Top 40 – Leading Provinces		
Province		% of Total
Ontario (15)		29
Quebec (18)		26
Alberta (8)		21

RESEARCH INCOME GROWTH LEADERS

Canada's research colleges are on the move in research. The ten leading "gainers" all at least doubled their research income between Fiscal 2011 and Fiscal 2012. Grande Prairie Regional College posted the largest research income growth in Fiscal 2012 (377.8%), followed by SAIT Polytechnic (273.5%), Lakeland College (257.5%) and Durham College (165.9%).

RESEARCH INTENSITY

Research intensity – research income per faculty¹ – increased by 13.4% in Fiscal 2012. Twenty-four research colleges posted research intensity higher than the national

Top 10 Research Colleges by Growth			
2012 Rank	Income Growth	Overall Research College	% Change 2011-2012
1	15	Grande Prairie Regional College	377.8
2	1	SAIT Polytechnic	273.5
3	46	Lakeland College	257.5
4	25	Durham College	165.9
5	14	La Cité collégiale	158.8
6	12	Centennial College	142.6
7	29	Conestoga College	137.6
8	16	Lambton College	110.0
9	19	Mohawk College	106.3
10	30	NorQuest College	99.7

average (\$67,800). Yukon College (\$448,800 per faculty conducting research) topped the leaders in research intensity, followed by Red River College (\$257,200), Grande Prairie Regional College (\$255,600), College of the North Atlantic (\$241,000) and SAIT Polytechnic (\$184,000).

THIS YEAR AND NEXT

This is the first year that RESEARCH Infosource has tracked the research income of Canada's research colleges. Thank you to all the colleges that participated and provided information. Congratulations to those that made our Canada's Top 50 Research Colleges List 2013. We have assembled the most up-to-date information

Top 10 Research Intensive Colleges			
2012 Rank	Research Intensity		
Research Intensity Overall	Research College		Research Intensity (\$ per faculty) \$000
1	4	Yukon College	\$448.8
2	7	Red River College	\$257.2
3	15	Grande Prairie Regional College	\$255.6
4	3	College of the North Atlantic	\$241.0
5	1	SAIT Polytechnic	\$184.0
6	16	Lambton College	\$171.8
7	50	Cégep de Rimouski	\$150.0
8	17	Cégep André-Laurendeau	\$140.6
9	23	Olds College	\$130.4
10	19	Mohawk College	\$124.7

available to salute the achievements of these Top 50 Research Colleges.

These are exciting times for research colleges. Due to the growing awareness of the unique role colleges play in research, which focuses largely (but not exclusively) on the "applied" end of the research spectrum, governments are backing college research with funding that was previously not available. As well, industry and universities are increasing their collaboration with research colleges which will contribute to strengthening Canada's innovation ecosystem. We are looking forward to following the research colleges and their research achievements and contributions.

¹ Head count of faculty/teaching staff and/or dedicated researchers conducting research. (Does not include support staff or student researchers.)



BATTERIES NOT INCLUDED

Red River College's research leaders, together with our industry partners, collaborated to develop a zero-emission, 55-passenger bus with power equivalent to 25,000 AA batteries. Our research partners have access to the College's technology, expertise and business support services while testing and commercializing their inventions and innovations – allowing them to solve real-world problems such as the reduction of greenhouse gas emissions.

To get involved, contact Ray Hoemsen, P. Eng., at 1.204.632.2523

rrc.ca/appliedresearch



What's the Value of Partnership?



Christine Szustaczek
Director of Corporate Communications & External Relations
Sheridan College

Ask Dr. Darren Lawless, Dean of Undergraduate Research at Sheridan College, and he'll tell you "partnership enhances learning for students and often spurs innovation for industry." Part facilitator, matchmaker and R&D project manager, Lawless spends his days bringing varied groups of people together to achieve a common goal.

"There are countless small and medium-sized enterprises in the communities we serve that are faced with very real and sometimes very expensive challenges, such as the need for a prototype, feasibility study, commercialization strategy, training or skills upgrading for employees," observes Lawless. "We also have hundreds of students who are eager to apply the latest knowledge, theories and techniques that they've learned in the classroom to a real-life setting."

That's where Lawless steps in. "Ultimately, we are here to help," he says. "And if we can't help, we won't take on the job." Step one for Lawless is to clarify the problem or identify the needs of the client. From there, he draws on a deep understanding of the academic programs available at Sheridan to see if there's a fit and an opportunity to advance the curriculum or enhance the student experience as a result of the effort.

Partnerships can come from many

sources. Sheridan has built a strong working relationship with organizations such as HalTech, a Regional Innovation Centre (RIC) in Ontario that exists to help entrepreneurs and technology companies develop and grow their ideas, products and businesses. "Haltech was instrumental in bringing an opportunity that a local company, Javelin Reality, needed help with to the attention of faculty and students at Sheridan," says Lawless.

For Javelin Reality, an Oakville-based digital media company, partnership with Sheridan has resulted in a prototype for a 3D, pre-visualization software program. The programs helps video game developers and filmmakers to construct their scenes, arrange characters and sets, and select their camera angles before the time consuming and costly work of development begins.

"Sheridan College was a great fit," says Javelin Reality producer Ben Sainsbury. "We didn't have this

expertise in house but Sheridan has an international reputation as one of the world's best animation schools. And the FedDev program definitely helped offset some of the risk of pursuing this new business venture."

FedDev is short for the Federal Economic Development Agency for Southern Ontario, which runs a number of programs including one that makes matching funds available for companies that involve students in projects that promote innovation or commercialization.

Sheridan assigned three programmers and a project manager from its Faculty of Applied Science and Technology (FAST) to work with Javelin Reality on the project. One developed a motion capture tool that records body movements which can be applied to animating characters within the program. The second worked on creating realistic virtual cameras within the program, so designers could get a preview of a

scene from a camera on the ground, or perhaps from a crane. And the third ensured the cameras behaved properly inside the program and developed editing options to tie all of these tools together.

"This was really an opportunity for the students to get involved in what they would do if they worked for a game company," said Kevin Forest, a Sheridan professor with FAST. Wanting to work side-by-side with the students, staff from Javelin Reality even moved into Sheridan's Applied Research and Collaboration Centre so that they could offer immediate feedback and maximize this partnership. That partnership included a bonus – going beyond the project scope, the students also created a mobile application that turns an iPad into a virtual camera.

Javelin Reality has since demonstrated their prototype to a large online software distributor that intends to carry the company's software tools. With a distribution channel in place, the company has hired a Masters level programmer to help take the project from the prototype stage to a finished sellable

product called CinemaSuite that's expected to be on the market later this year. Late last year, Javelin Reality was informed that the prototype Sheridan students helped to build contributed to an investment by the Canada Media Fund (CMF) to commercialize the platform.

This successful collaboration between Javelin Reality and Sheridan also led to a second phase to the project, involving the development of stereoscopic 3D tools that could be integrated into the existing prototype. The tools include a user-friendly interface appropriate for both creative and technical professionals, and a set of real-world camera tools that accurately reflect the distinct choices that are present in stereoscopic 3D capture and post production work.

"By starting with one small problem, we were able to create a great learning opportunity for our students, assemble a variety of partners and resources, and create a robust product that serves an unmet need and has the potential to generate new jobs" Lawless says.

At the end of the day, that is the true value of partnership.



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Sheridan

Niagara College research team’s innovation greatly increases bio-tech company’s output

With an international customer base and a world-renowned reputation for quality, Norgen Biotek Corp. needs to keep up with the pressing demands of the world of biotechnology.

The Niagara-based company is dedicated to providing its customers with first-class sample preparation kits for RNA, microRNA, DNA and protein purification, clean-up and concentration, while also providing dedicated and expert support services to customers and partners worldwide.

The company has become so successful, in fact, that it recently faced the potential problem of not meeting demand. To overcome that challenge, Norgen Biotek turned to Niagara Research, the Research and Innovation Division of Niagara College, which works with small- and medium-sized businesses to meet their innovation goals, and to keep them competitive.

With funding from various provincial and federal agencies, current students and recent graduates are hired to work alongside faculty to help industry partners leap forward in the marketplace.

Norgen Biotek has been manufacturing its products for a number of years in automated and semi-automated fashion; however as demand for products increases, there was a need to introduce new processes and improve

on existing ones to continue to meet the increased demand while ensuring consistent product quality. Norgen Biotek manufacturing and engineering staff required additional machine shop facilities and expertise to complement the internal effort to tackle increased demand on manufacturing.

Niagara Research’s team of faculty and students, in partnership with Norgen’s engineering and manufacturing staff, worked on two projects. They focused on adding capabilities to the automated liquid handling system, first, by automating the bottle-labelling process, providing more consistency and essentially eliminating labelling time from the manufacturing process. Then, by producing tooling for an automated column machine, the team helped increase production volume from 500 to 12,000 columns per day, or from 10 kits to 240 kits per day.

With this initial success, Norgen and Niagara Research partnered again, this time to develop and improve the liquid-filling process used in the production of the kits, by developing tools to uniformly distribute their patented silicon carbide resin on a silica sheet. The Niagara Research team used fluid dynamic principles in the design of a mechanism that accomplished uniform spray distribution and silica carbide dispersion. This was not an easy task,



Ben Laurence, research assistant, Bob Dunlop, research associate and faculty member, and David Findlay, research engineer, Norgen Biotek Corp., work on equipment modifications at the Norgen facility.

as silicon carbide has a density of more than three times that of water, making it difficult to keep in uniform suspension in water for spraying on the silica sheet.

The technology will increase the range of nucleic acids that can be purified by Norgen kits, in turn increasing the quality and consistency of the kits. The projects also helped Norgen Biotek decrease the overall cost per unit, in turn increasing profit margins per unit sold. The enhanced quality and consistency

of the kits will also be well-received by its large, international customer base.

“Access to Niagara College’s excellent facilities, machining, and engineering expertise is very valuable and helped in Norgen’s continual process improvement towards lean manufacturing, to allow the company to be competitive and remain a global player in the sample preparation market,” according to David Findlay, Research Engineer, Norgen Biotek Corp, adding that the company was also able to create the equivalent of one and a half full-time jobs as a result of these innovations.

These projects were made possible with funding from the Applied Research and Commercialization Initiative through the Federal Economic Development Agency of Southern Ontario and the Colleges Ontario Network for Industry Innovation.

To learn more about partnership opportunities with Niagara Research, visit www.NiagaraCollege.ca/Research

“Access to Niagara College's excellent facilities, machining, and engineering expertise helped in Norgen’s continual process improvement towards lean manufacturing, to allow the company to be competitive and remain a global player in the sample preparation market.”

~David Findlay, Research Engineer, Norgen Biotek Corp.

Innovation happens here.

NIAGARA RESEARCH, the Research & Innovation Division of Niagara College, provides real-world solutions for business, industry and the community through applied research and knowledge transfer activities with college faculty and students. We are increasing the productivity of our region’s small- and medium-sized enterprises and strengthening the economy of Niagara and beyond.

In recent months,
NIAGARA RESEARCH HAS BEEN ABLE TO:



DEVELOP A
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NON-ALCOHOLIC
craft lager for **MADD VIRGIN DRINKS**

Expand the software capabilities for **ULTIMATE KIOSK'S** hearing assessment tools to **INCREASE REVENUE POTENTIAL** and **global opportunities**. The company can now plan for



3,500
LOCATIONS in the next
3 YEARS

DESIGN a new **E-COMMERCE MODEL** to decrease **CALHOUN SPORTSWEAR'S** production time by nearly

50%

INCREASE THE OUTPUT of **NORGEN BIOTEK'S** RNA and DNA test kits by

24X


CREATE A PROTOTYPE POT-HOLE PATCHING MACHINE THAT USES HOT ASPHALT THAT LASTS

3X
LONGER

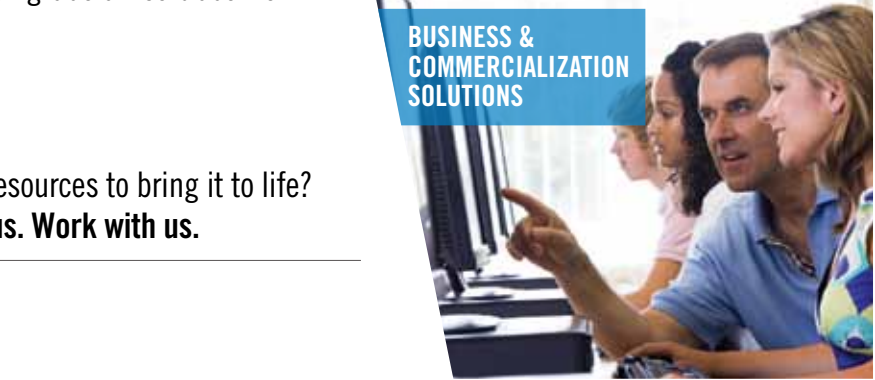
Create a calculation engine for **E3 SOLUTIONS INC** that more accurately tracks hourly greenhouse gas emissions – with better than **ACCURACY 95%**

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Going the Distance in Applied Research and Innovation



Dr. David Ross
President and CEO
SAIT Polytechnic

Today, SAIT Polytechnic is proud to be recognized as Canada's number-one applied research college. We take this leadership role seriously.

SAIT Polytechnic was the first publicly-funded technical institute of its kind in Canada, and 97 years later, it is one of the nation's leading polytechnics. At SAIT, we provide relevant, skill-oriented education to more than 75,000 registrants each year and through our applied research activities, we support industry with

product development and productivity improvement.

While SAIT has “gone the distance” for close to a century, in many ways we are still in the early stages of applied research; there are always more opportunities to support students and industry in the pursuit of innovation.

What does “going the distance” mean to SAIT? Answering this question requires some context around the concepts of applied research and innovation and the enterprise SAIT created to support both.

In recent years, the term innovation has become an over-used description for solving just about everything – a panacea for the world's challenges. However, its basic definition simply means looking at things differently. Similarly, applied research is in fashion in some form or another at almost every academic institution. In its truest form, however, applied research means conducting research that has a practical application.

The starting line for SAIT was in 2003, when we created the Applied

Research and Innovation Services (ARIS) department as a gateway for industry, students and faculty to collaborate on projects. At the time, it was a bold strategy. In the continuum of “idea-to-successful-commercial-venture,” there was a gap where ideas died because there was high risk and low investment.

In creating ARIS, SAIT developed a plan to give our students – Canada's future workforce – a competitive advantage and to help industry accelerate development of innovative products and increase productivity.

The plan bridged the gap and helped turn ideas into commercial success by offering services such as: technology assessments; securing leveraged funding; designing, fabricating and testing prototypes; intellectual property and commercialization strategies; and transferring knowledge gained from the projects into the classroom.

In the process, we helped shape government funding policy and opened the door to collaborative industry-college-university applied-research projects.

The successful translation of innovative ideas and research into practical applications is not the sole domain of the academic sector, nor any one element of the academic sector. Rather, it is a collective and collaborative activity with seven main elements:

1. Ideas
2. An application or market
3. Expertise, equally scientific and applied/skilled
4. Capacity
5. Capital
6. The ability to close the deal
7. Supportive, enabling government policy.

With ARIS, SAIT has created a successful, collaborative model that incorporates all seven elements. Industry, government and academia all play an active role.

The cornerstone of our model is an efficient, rigorous and transparent decision-making process which responsibly stewards public and private investment while supporting student success.

Working with SAIT to develop and test their ideas, small- to medium-

sized enterprises are able to explore business opportunities unencumbered by intellectual property issues, and with full access to funding, facilities and expertise.

What differentiates SAIT from other organizations is the integration of project activity with SAIT's core activity of education and training. Through direct links to SAIT's academic programs, apprenticeships, and diploma and baccalaureate degrees, applied research projects are also aligned with the economic objectives of both federal and provincial governments.

The areas of applied research at SAIT are market driven and cut across our industry-sector based schools. This business-matrix approach has resulted in project activity in RFID applications development, environmental technologies, green building technologies, alternative energy, sustainable culinary operations, and sports and wellness technologies.

The ARIS model will continue to evolve as we respond to the needs and ideas of students and industry.

Compared to other organizations that have been involved in other aspects of research for decades, SAIT's success is remarkable.

In the past five years alone, close to 200 industry-driven, applied-research projects carried out at SAIT have resulted in the development of more than 250 prototypes.

Since 2007, SAIT's Innovative Student Project Fund has invested more than \$450,000 in support of 730 students.

SAIT has “gone the distance” for its students by creating a successful enterprise. As a founding member of Polytechnics Canada, SAIT also has advocated for industry-driven projects in collaboration with other post-secondary institutions.

With ARIS, SAIT has demonstrated it is possible to hurdle barriers, simplify complexities and promote collaboration with industry, universities and colleges, and government partners. We are honoured to be recognized for this effort and to be named as Canada's Top Research College for 2013.

THE SANOFI BIOGENEUS CHALLENGE ASKS STUDENTS “HOW WILL YOU CHANGE THE WORLD?”

In 1993, the Sanofi Group in Canada founded the Sanofi BioGENEius Challenge Canada (SBCC), a national biotechnology research competition that encourages students to pursue careers in science. Since then, the competition has created opportunities for over 4,500 budding young scientists, including Calgary's Arjun Nair (2013 winner), Waterloo's Janelle Tam (2012 winner), and Toronto's Marshall Zhang (2011 winner), to perform cutting-edge research that could lead them to careers in biotechnology.



The 2013 Sanofi BioGENEius Challenge Canada regional winners pose with Governor General David Johnston at Rideau Hall during the national awards ceremony in Ottawa.

The SBCC is an important part of our investment in the people who will shape Canada's future in research and development. As the founding sponsor of the SBCC, Sanofi is excited to see what new ideas spring forth from the curious young minds participating in the SBCC's 21st year, and ultimately, to celebrate those ideas that evolve into commercial uses for some of our toughest challenges.

Recently, we announced Partners In Research (PIR) as the new national coordinator for the SBCC to help emphasize the importance of biomedical research in advancing health and medicine, and Science, Technology, Engineering and Mathematics (STEM) as fields of discovery and study for Canadian students.

The SBCC would not be possible without close cooperation between Canadian businesses, federal, provincial and local government, and support of our life sciences, research and academic communities. Let's work together to accelerate science and build a global talent pool in the biotechnology sector.

To learn more visit www.sanofibiogeneiuschallenge.ca

To become a sponsor, please contact
Brent Peltola, Director, Special Projects, Partners in Research at
1-519-433-7866 ext. 30 or bpeltola@pirweb.org.



The Race is on to Achieve Transformation Through Innovation



Nitin Kawale
President
Cisco Canada

Innovation is like a never-ending track and field race.

Over the years, the pace of innovation has been dazzling and today it's moving at a speed that often feels like an all-out sprint in a non-stop marathon. American astrophysicist Neil deGrasse Tyson observes that, “For most of human civilization, the

pace of innovation has been so slow that a generation might pass before a discovery would influence your life, culture or the conduct of nations.”

Times have definitely changed.

In today's modern world, innovation evolves so rapidly that the impact is felt almost immediately and incessantly. Think, for example, of all the innovation that's happened in the field of information technology (IT). The pace began somewhat slowly. Business mainframe computing dominated for almost 30 years until personal computing exploded in the 1980s. Suddenly innovation in IT accelerated like never before. The advent of simple local area networking that linked personal computing, paved the way for much more powerful wide-area networks and the Internet. Countless applications and processes driven by network communications proliferated. Computing became dependent upon connectivity.

The Internet Age and World Wide Web that evolved in less than 10 years changed everything.

Mobility and computing portability that emerged since the late 1990s has revolutionized our lives in ways most of us could never have imagined. It raised the status of Internet connection to that of “must have.” Cisco's global research in 2012 shows that, among those 30 years old and younger, Internet connectivity as essential – as vital as water, food and air. Most of us, and especially Canadians, would probably agree, since we are among the most avid online users, particularly in our personal lives.

What's perhaps most astounding about the breakneck pace of IT innovation during the past 20 years is that what we're witnessing today barely scratches the surface of the possibilities to come. The monumental innovations that have occurred in 20 or

so years happened as a result of less than 1% of things that could be “connected” to the Internet actually being connected. What might the world look like if we connected 2% of things...or 10%...or the remaining 99% of things? It's almost unimaginable.

Cisco describes that future world as the Internet of Everything and much of Cisco innovation today is focused on creating that reality. The Internet of Everything is happening today, albeit at an early stage. More than 10 billion “things” connected in our world will, in 10 years or less, grow to 50 billion things. Can we even imagine the innovation that will be spurred by this magnitude of connectivity?

Let's try.

We'll build a smart electrical grid that uses network connections and sensors for electricity production and to better understand user behavior. It will improve the reliability, economics, production and distribution of electricity.

We'll construct smart buildings through intelligent and converged networks of electronic devices that monitor and control a building's facilities and services, includ-

ing mechanical, electronics, HVAC, and lighting systems. It will achieve energy efficiencies, cost savings, and improved experiences for occupants.

We'll revolutionize healthcare – by finally eliminating the siloed-information sources plaguing the system with inefficiency today. In the future, all patient knowledge and information will be connected and brought to the point of care – where it's needed.

What an amazing world it will be. But from where will all of that innovation come?

Cisco believes Canada can and should have a significant, if not leading, role. That confidence stems from the Canadian innovation that's already made a significant contribution to Cisco – an estimated value that exceeds \$10 billion and includes products for enterprise networking, optical routing, networking operating systems, and service provider video technologies.

In 2012, Cisco made the commitment to hire during the next five years an additional 300 engineers in Ontario to support our R&D efforts in Canada. Our company believes

Canada is a great place for future investment.

Cisco's commitment to innovation in Canada is a five-point plan that, among other things, includes the establishment of research chairs and innovation centres right across the country. So far more than 10 research chairs have been announced and a commitment of \$15 million has been made. We're also set to make direct investments and to work with venture-capital organizations supporting Canadian startup companies that come to market with innovative products, services and ideas. We seek to lend our business acumen and experience to help them create business cases to sell this great Canadian innovation. We want to be a catalyst.

The future of Canada will depend on our ability to be an innovative nation. We face current challenges around relatively poor labour productivity and weak investment in information technology to support business and innovation. That's a situation which needs to change. Cisco, like governments and other companies, is doing its part in Canada to make that happen.



RESEARCH Infosource Inc. is Canada's source of R&D intelligence. Data used for this table were extracted from our Canadian Corporate R&D Database, a proprietary database. Companies wishing to be included in future editions of the Top 100 List, or who wish to adjust their figures should contact us directly.

For further information visit
www.researchinfosource.com or
call (416) 481-7070.

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Canada's TOP 100 CORPORATE R&D SPENDERS 2013

Rank		Company	R&D Spending			Revenue	Research Intensity	Industry
2012	2011		FY2012 \$000	FY2011 \$000	% Change 2011-2012	FY2012 \$000	R&D as % of Revenue***	
1	2	Bombardier Inc.*	\$1,900,240	\$1,336,274	42.2	\$16,761,293	11.3	Aerospace
2	1	BlackBerry Limited* ++	\$1,508,396	\$1,542,007	-2.2	\$11,068,571	13.6	Comm/Telecom Equipment
3	3	BCE Inc.	\$576,100	\$569,100	1.2	\$19,975,000	2.9	Telecommunications Services
4	5	IBM Canada Ltd. (fs)	\$540,000	\$500,000	8.0	nd		Software & Computer Services
5	6	Pratt & Whitney Canada Corp. (fs)	\$526,984	\$473,000	11.4	nd		Aerospace
6	4	Magna International Inc.*	\$514,794	\$519,278	-0.9	\$30,824,665	1.7	Automotive
7	7	Atomic Energy of Canada Limited	\$384,100	\$441,900	-13.1	\$354,000	108.5	Engineering Services
8	21	Rogers Communications Inc.	\$346,000	\$109,000	217.4	\$12,486,000	2.8	Telecommunications Services
9	8	Ericsson Canada Inc. (fs)	\$325,000	\$323,000	0.6	nd		Comm/Telecom Equipment
10		Canadian Natural Resources Limited	\$270,000	\$220,000	22.7	\$14,589,000	1.9	Energy/Oil & Gas
11	9	AMD Canada (fs)	\$265,702	\$283,255	-6.2	nd		Electronic Systems & Parts
12	11	Cenovus Energy Inc.	\$264,000	\$200,000	32.0	\$16,842,000	1.6	Energy/Oil & Gas
13	13	Apotex Inc.	\$207,745	\$174,003	19.4	\$1,265,624	16.4	Pharmaceuticals/Biotechnology
14	14	Imperial Oil Limited	\$201,000	\$163,000	23.3	\$31,053,000	0.6	Energy/Oil & Gas
15	25	General Motors of Canada Limited* (fs)	\$186,425	\$96,932	92.3	nd		Automotive
16	12	TELUS Corporation	\$170,000	\$183,000	-7.1	\$10,921,000	1.6	Telecommunications Services
17	16	Open Text Corporation*	\$168,975	\$144,401	17.0	\$1,206,990	14.0	Software & Computer Services
18	26	Syncrude Canada Ltd.	\$157,200	\$92,030	70.8	nd		Energy/Oil & Gas
19	19	CAE Inc.	\$144,389	\$117,042	23.4	\$1,821,200	7.9	Aerospace
20	21	Vale Canada Limited (fs)	\$132,000	\$109,000	21.1	\$5,886,000	2.2	Mining & Metals
21	23	Constellation Software Inc.*	\$128,769	\$107,645	19.6	\$890,870	14.5	Software & Computer Services
22		BRP Inc.**	\$128,200	\$129,400	-0.9	\$2,896,200	4.4	Transportation
23	50	Encana Corporation**	\$126,758	\$41,270	207.1	\$5,157,936	2.5	Energy/Oil & Gas
24	15	Sanofi (fs) (a)	\$122,408	\$151,695	-19.3	\$596,116	20.5	Pharmaceuticals/Biotechnology
25	17	Ontario Power Generation Inc.	\$113,000	\$125,000	-9.6	\$4,732,000	2.4	Electrical Power & Utilities
26	18	GlaxoSmithKline Canada (fs)	\$112,266	\$118,433	-5.2	\$947,818	11.8	Pharmaceuticals/Biotechnology
27	24	Hydro-Québec	\$100,000	\$100,000	0.0	\$12,228,000	0.8	Electrical Power & Utilities
28	28	Novartis Pharmaceuticals Canada Inc. (fs)	\$98,808	\$90,008	9.8	nd		Pharmaceuticals/Biotechnology
29	29	CGI Group Inc.	\$95,449	\$86,000	11.0	\$4,772,454	2.0	Software & Computer Services
30	30	PMC-Sierra Ltd.* (fs)	\$90,345	\$84,997	6.3	\$137,946	65.5	Electronic Systems & Parts
31	20	Pfizer Canada Inc. (fs)	\$89,920	\$113,544	-20.8	\$1,517,214	5.9	Pharmaceuticals/Biotechnology
32		Cisco Canada (fs)	\$87,600	\$98,700	-11.2	nd		Comm/Telecom Equipment
33	37	Valeant Pharmaceuticals International, Inc.*	\$79,020	\$64,971	21.6	\$3,545,207	2.2	Pharmaceuticals/Biotechnology
34	36	Amgen Canada Inc. (fs)	\$74,215	\$65,186	13.9	nd		Pharmaceuticals/Biotechnology
35	56	Westport Innovations Inc.*	\$74,010	\$34,285	115.9	\$155,564	47.6	Transportation
36	34	MacDonald, Dettwiler and Associates Ltd.	\$71,340	\$68,563	4.1	\$879,929	8.1	Software & Computer Services
37	33	Honeywell Canada (fs)	\$71,152	\$70,132	1.5	\$1,125,297	6.3	Aerospace
38	32	Boehringer Ingelheim (Canada) Ltd./Ltée. (fs)	\$66,658	\$75,258	-11.4	\$449,053	14.8	Pharmaceuticals/Biotechnology
39	27	Sierra Wireless, Inc.*	\$64,320	\$90,523	-28.9	\$397,162	16.2	Comm/Telecom Equipment
40	41	Janssen Inc. (fs)	\$64,053	\$55,204	16.0	\$1,267,934	5.1	Pharmaceuticals/Biotechnology
41	35	Aastra Technologies Limited	\$59,497	\$65,760	-9.5	\$606,615	9.8	Comm/Telecom Equipment
42	39	EXFO Inc.*	\$59,258	\$56,602	4.7	\$249,866	23.7	Medical Devices & Instrumentation
43	43	Mitel Networks Corporation*	\$58,577	\$53,510	9.5	\$611,555	9.6	Comm/Telecom Equipment
44	42	Linamar Corporation	\$53,526	\$54,771	-2.3	\$3,221,936	1.7	Automotive
45	46	Teledyne DALSA, Inc. (fs)	\$52,700	\$42,924	22.8	\$232,900	22.6	Electronic Systems & Parts
46	44	SMART Technologies Inc.*	\$51,794	\$52,451	-1.3	\$745,502	6.9	Computer Equipment
47	65	SNC-Lavalin Group Inc.	\$47,168	\$26,700	76.7	\$8,091,000	0.6	Engineering Services
48	51	NOVA Chemicals Corporation* (fs)	\$44,982	\$40,553	10.9	\$5,052,978	0.9	Chemicals & Materials
49	55	Evertz Technologies Limited	\$44,200	\$35,719	23.7	\$293,400	15.1	Comm/Telecom Equipment
50	52	Novelis Inc.* (fs)	\$43,982	\$39,564	11.2	\$11,058,575	0.4	Mining & Metals
51	54	Trican Well Service Ltd.	\$43,522	\$35,918	21.2	\$2,213,400	2.0	Energy/Oil & Gas
52	61	Thales Canada Inc. (fs)	\$43,300	\$30,000	44.3	\$447,000	9.7	Electronic Systems & Parts
53	49	Cascades Inc.	\$42,290	\$41,568	1.7	\$3,645,000	1.2	Forest & Paper Products
54	53	Cangene Corporation*	\$41,873	\$36,706	14.1	\$110,985	37.7	Pharmaceuticals/Biotechnology
55	60	Pharmascience Inc.	\$35,994	\$30,917	16.4	\$673,378	5.3	Pharmaceuticals/Biotechnology
56	68	Martinrea International Inc.	\$35,827	\$25,053	43.0	\$2,901,004	1.2	Automotive
57	70	DragonWave Inc.* ++	\$34,006	\$23,761	43.1	\$123,827	27.5	Comm/Telecom Equipment
58	74	Huawei Canada (fs)	\$32,470	\$21,620	50.2	\$266,000	12.2	Comm/Telecom Equipment
59	59	Total E&P Canada Ltd. (fs)	\$32,000	\$31,000	3.2	nd		Energy/Oil & Gas
60	58	Sandvine Corporation*	\$31,577	\$31,202	1.2	\$87,898	35.9	Comm/Telecom Equipment
61	71	Oncolytics Biotech Inc.	\$31,403	\$23,387	34.3	\$0		Pharmaceuticals/Biotechnology
62	57	Dorel Industries Inc.*	\$28,713	\$31,876	-9.9	\$2,489,714	1.2	Other Manufacturing
63	63	Miranda Technologies, a Belden Brand (fs)	\$25,700	\$27,607	-6.9	\$175,500	14.6	Comm/Telecom Equipment
64	45	QLT Inc.*	\$24,568	\$43,058	-42.9	\$25,465	96.5	Pharmaceuticals/Biotechnology
65		Medicago Inc.	\$24,232	\$11,965	102.5	\$5,540	437.4	Pharmaceuticals/Biotechnology
66	72	Monsanto Canada Inc. (fs)	\$24,085	\$23,000	4.7	\$700,000	3.4	Agriculture & Food
67		Bayer Inc. (fs)	\$23,743	\$10,193	132.9	\$858,877	2.8	Pharmaceuticals/Biotechnology
68	85	Enghouse Systems Limited	\$23,266	\$15,867	46.6	\$136,368	17.1	Software & Computer Services
69	64	Molycorp Canada* (fs)	\$22,991	\$27,035	-15.0	nd		Mining & Metals
70	82	Pason Systems Inc.	\$22,467	\$17,366	29.4	\$386,514	5.8	Software & Computer Services
71	69	AEterna Zentaris Inc.*	\$21,463	\$24,629	-12.9	\$33,652	63.8	Pharmaceuticals/Biotechnology
72	81	Descartes Systems Group Inc.* ++	\$21,260	\$18,836	12.9	\$126,832	16.8	Software & Computer Services
73	79	Bioniche Life Sciences Inc.	\$20,549	\$19,782	3.9	\$31,797	64.6	Pharmaceuticals/Biotechnology
74	73	ViXS Systems Inc.* ++	\$20,492	\$22,600	-9.3	\$35,686	57.4	Electronic Systems & Parts
75	40	AstraZeneca Canada Inc. (fs)	\$19,773	\$55,258	-64.2	\$1,074,324	1.8	Pharmaceuticals/Biotechnology
76	93	Resverlogix Corp.*	\$19,730	\$13,979	41.1	\$0		Pharmaceuticals/Biotechnology
77	67	Ballard Power Systems Inc.*	\$19,265	\$25,202	-23.6	\$43,673	44.1	Machinery
78	83	Teck Resources Limited	\$19,000	\$17,000	11.8	\$10,343,000	0.2	Mining & Metals
79	75	Xerox Canada Inc. (fs)	\$18,100	\$20,845	-13.2	\$1,150,000	1.6	Machinery
80	90	Héroux-Devtek Inc.	\$18,066	\$14,303	26.3	\$380,336	4.8	Aerospace
81	78	Tekmira Pharmaceuticals Corporation	\$18,032	\$19,920	-9.5	\$14,107	127.8	Pharmaceuticals/Biotechnology
82		Trimel Pharmaceuticals Corporation*	\$17,060	\$13,086	30.4	\$0		Pharmaceuticals/Biotechnology
83	100	Rio Tinto Iron & Titanium Inc. (fs)	\$17,057	\$13,200	29.2	\$1,431,196	1.2	Mining & Metals
84	86	Tembec Inc.	\$17,010	\$15,638	8.8	\$1,666,000	1.0	Forest & Paper Products
85	83	ArcelorMittal Dofasco Inc. (fs)	\$16,900	\$17,000	-0.6	\$3,800,000	0.4	Mining & Metals
86		MethylGene Inc.*	\$16,759	\$9,715	72.5	\$2		Pharmaceuticals/Biotechnology
87	77	Resolute Forest Products Inc. (fs)	\$16,500	\$20,000	-17.5	\$2,758,000	0.6	Forest & Paper Products
88	91	MEGA Brands Inc.*	\$16,212	\$14,298	13.4	\$420,103	3.9	Other Manufacturing
89	95	Celestica Inc.*	\$15,194	\$13,650	11.3	\$6,504,597	0.2	Electronic Systems & Parts
90	89	NexJ Systems Inc.	\$15,156	\$14,336	5.7	\$26,189	57.9	Software & Computer Services
91		IMRIS Inc.*	\$14,550	\$8,915	63.2	\$52,371	27.8	Medical Devices & Instrumentation
92		Winpak Ltd.*	\$13,927	\$12,469	11.7	\$669,810	2.1	Rubber & Plastics
93		Bauer Performance Sports Ltd.*	\$13,909	\$11,353	22.5	\$374,620	3.7	Other Manufacturing
94	80	Canadian Solar Inc.*	\$12,993	\$19,623	-33.8	\$1,294,311	1.0	Other Manufacturing
95	94	Hydro One Inc.	\$12,950	\$13,900	-6.8	\$5,728,000	0.2	Electrical Power & Utilities
96	98	COM DEV International Ltd.	\$12,839	\$13,318	-3.6	\$208,553	6.2	Comm/Telecom Equipment
97	76	Bell Aliant Inc.	\$12,372	\$29,766	-58.4	\$2,800,000	0.4	Telecommunications Services
98	88	Vecima Networks Inc.	\$12,351	\$14,721	-16.1	\$95,741	12.9	Comm/Telecom Equipment
99		ShawCor Ltd.	\$12,242	\$13,119	-6.7	\$1,482,849	0.8	Other Manufacturing
100		Computer Modelling Group Ltd.	\$12,100	\$10,416	16.2	\$61,034	19.8	Software & Computer Services

Notes:

1. Data were obtained through annual reports, financial statements, securities commission filings, or through a survey.
2. We have attempted, wherever possible, to provide gross R&D spending before deduction of investment tax credits or government grants.
3. We have attempted, wherever possible, to provide revenue net of interest and investment income.
4. FY2011 R&D spending figures may have been adjusted, as more accurate information became available.
5. Canadian-owned company results include worldwide revenue and R&D spending; foreign subsidiaries (fs) include revenue and R&D spending for their Canadian operations only.

*Converted to CDN\$ at annual average 2012 = .9996, 2011 = 0.9891 (Bank of Canada)

**Revenue reported in US\$ and R&D spending was reported in CDN\$

***\$1 million or more of revenue

*Not current name/acquired/merged

**Fiscal 2012 results were used for year-ended January or February

fs = Foreign subsidiary (includes revenue and R&D spending for Canadian operations only)

nd = Not disclosed

(a) Sanofi Pasteur Limited and sanofi-aventis Canada Inc. (including Genzyme Canada).

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Canada's Top 100 Corporate R&D Spenders

CORPORATE R&D SPENDING CONTINUES TO INCREASE

For a second year running Canada's Top 100 Corporate R&D Spenders increased their total R&D spending. R&D spending grew by 12.6% in Fiscal 2012, doubling last year's spending growth of 6.1% and climbing to \$12.3 billion – a record total by Top 100 R&D Spenders. R&D spending expanded despite an overall -3.0% decline in combined company revenue, as reported by 89 of the 100 leading R&D companies.

Bombardier Inc. moved into 1st spot in Fiscal 2012, with R&D spending of \$1.9 billion, increasing spending by 42.2% from Fiscal 2011. BlackBerry Limited fell to 2nd place (\$1.5 billion), BCE Inc. maintained 3rd spot (\$576.1 million), IBM Canada Ltd moved up a spot to rank #4 (\$540.0 million) and Pratt & Whitney Canada Corp. (\$527.0 million) rounded the top 5.

Fiscal 2012 research intensity – R&D spending divided by revenue – was 3.3%, compared with 2.8% in Fiscal 2011. Higher combined research spending together with lower revenue produced the increase.

In Fiscal 2012, 65 companies posted increases in their R&D spending compared with 34 firms where spending dropped and 1 company which was flat, similar results to last year.

THE \$100 MILLION CLUB

RESEARCH Infosource is proud to announce that 27 companies have gained membership in the \$100 Million Club – an elite group of firms that spent \$100 million or more annually on R&D in Fiscal 2012. This compares with 24 companies last year. The Club includes 19 Canadian companies and 8 foreign subsidiaries. Joining the Club this year were Canadian Natural Resources Limited, General Motors of Canada Limited, Syncrude Canada Ltd., BRP Inc. and Encana Corporation.

Total \$100 Million Club R&D spending on research was \$9.6 billion, up 18.2% from Fiscal 2011 and accounted for 78% of total Top 100 R&D spending, an increase from a 75% share in Fiscal 2011.

Top 100 – Leading Industries		
Industry	R&D Spending (% of Total)	
Aerospace (5)	22	
Communications/Telecom equipment (13)	19	
Pharmaceuticals/Biotechnology (22)	10	
Telecommunications Services (4)	9	
Software & Computer Services (10)	9	
Energy/Oil & Gas (7)	9	
Automotive (4)	6	

INDUSTRY PERFORMANCE

In a landmark development in Fiscal 2012, the Aerospace industry captured the largest share of R&D spending. Five aerospace firms spent a total of \$2.7 billion on R&D and accounted for 22% of total Top 100 R&D spending. This eclipsed the \$2.3 billion of spending and 19% share by 13 companies in the Communications/Telecom Equipment industry, which has been the perennial leader. The ICT industry sector in total however, represented 41% of total R&D spending (\$5.0 billion). Twenty-two Pharmaceuticals/Biotechnology firms spent a total of \$1.2 billion on research and captured 10% of the Top 100 total.

R&D SPENDING GROWTH

A number of firms substantially increased their R&D spending in Fiscal 2012. Leading the pack was Rogers Communications Inc. (217.4%), followed by Encana Corporation (207.1%), Bayer Inc. (132.9%) and Westport Innovations Inc. (115.9%).

TOP 10 R&D INTENSIVE FIRMS

As is typically the case, companies in the Pharmaceuticals/Biotechnology industry tended to be the most research-intensive. These companies tend to have high rates of R&D spending compared with their revenues.

LOOKING AHEAD

Many Top Corporate R&D Spenders picked up their research spending in Fiscal 2012 – despite minimal increases or declines in their revenue - helping to propel the combined growth to 12.6% and posting \$12.3 bil-

Top 10 Research Intensive Companies*			
2012 Rank		Company	R&D as % of Revenue
Research Intensity	Overall		
1	65	Medicago	437.4
2	81	Tekmira Pharmaceuticals	127.8
3	7	Atomic Energy of Canada	108.5
4	64	QLT	96.5
5	30	PMC-Sierra (fs)	65.5
6	73	Bioniche Life Sciences	64.6
7	71	AEterna Zentaris	63.8
8	90	Nexj Systems	57.9
9	74	ViXS Systems	57.4
10	35	Westport Innovations	47.6

*Based on companies with \$1 million or more of revenue only
fs = Foreign subsidiary (includes R&D spending for Canadian operations only)

Top 10 Companies by Growth			
2012 Rank		Company	% Change 2011-2012
R&D Growth	Overall		
1	8	Rogers Communications	217.4
2	23	Encana	207.1
3	67	Bayer (fs)	132.9
4	35	Westport Innovations	115.9
5	65	Medicago	102.5
6	15	General Motors of Canada (fs)	92.3
7	47	SNC-Lavalin Group	76.7
8	86	MethylGene +	72.5
9	18	Syncrude Canada	70.8
10	91	IMRIS	63.2

fs = Foreign subsidiary (includes R&D spending for Canadian operations only) *Not current name

lion – the largest R&D spending amount on record for the Top 100 Corporate R&D Spenders. Bombardier's performance was especially notable. The aerospace and transportation company spent \$1.9 billion on R&D, in large part to support the rollout of their new C-Series jet. Although troubled BlackBerry fell to second place on the Top 100 list, their Fiscal 2012 R&D spending was on a par with their result in Fiscal 2011. Rogers Communications led on growth, posting a substantial 217.4% increase in R&D spending.

The \$100 Million Club		
2012 Rank	Company	R&D Spending \$000
1	Bombardier	\$1,900,240
2	BlackBerry	\$1,508,396
3	BCE	\$576,100
4	IBM Canada (fs)	\$540,000
5	Pratt & Whitney Canada (fs)	\$526,984
6	Magna International	\$514,794
7	Atomic Energy of Canada	\$384,100
8	Rogers Communications	\$346,000
9	Ericsson Canada (fs)	\$325,000
10	Canadian Natural Resources	\$270,000
11	AMD Canada (fs)	\$265,702
12	Cenovus Energy	\$264,000
13	Apotex	\$207,745
14	Imperial Oil	\$201,000
15	General Motors of Canada (fs)	\$186,425
16	TELUS	\$170,000
17	Open Text	\$168,975
18	Syncrude Canada	\$157,200
19	CAE	\$144,389
20	Vale Canada (fs)	\$132,000
21	Constellation Software	\$128,769
22	BRP	\$128,200
23	Encana	\$126,758
24	Sanofi (fs) (a)	\$122,408
25	Ontario Power Generation	\$113,000
26	GlaxoSmithKline Canada (fs)	\$112,266
27	Hydro-Québec	\$100,000

fs = Foreign subsidiary (includes R&D spending for Canadian operations only)

(a) Sanofi Pasteur Limited and sanofi-aventis Canada Inc. (including Genzyme Canada)

As the economic future is still in limbo, questions that come to mind that can affect the R&D scene: Will global economic growth recover in the coming year? Will this boost our manufacturing and natural resource sectors? Will R&D spending tail off when it is no longer required for large-scale product development? Will a rising tide encourage companies to invest more in research? We will continue to monitor as the year progresses.



Dr. Clive Ward-Able
Executive Director,
Research and Development
Amgen Canada

CLINICAL TRIALS: More than Just Research, They're for the Public Good

Health care is a thing of national pride in Canada, and Canadians are often looking to play an active role in both their health and the treatments they receive. They demand partnership with their healthcare providers, input into which drugs they will take, and improved naviga-

tion of the system. But what many may not realize is that to uphold our high standards and to continue innovating the best possible medicines for our patients, we need continued investment in clinical research – not only from a financial, but also from a participation standpoint.

Canada has excelled in clinical research – we have state-of-the-art public sector research facilities and are often recognized for our high standards in research and development. This has led many companies to invest heavily in the Canadian research and development sector by operating research facilities and conducting clinical trials here. And while we've done well at attracting investment in clinical research in the past, the country is seeing a dramatic reduction in the number of sites and patients enrolled into trials.

Furthermore, there is low public interest in participation in clinical trials. While we demand involvement in our health care, many of us do not consider participation in clinical trials to fall within this role. We tend to consider this a call above and beyond our duty. In Canada, we're finding ourselves falling behind the curve in terms of recruiting and retaining patients for clinical trials, whereas other countries are actively promoting and stimulating investment into clinical research.

In 2011, Canada's Research-

Based Pharmaceutical Companies (Rx&D) hosted a National Clinical Trial Summit in which they looked at the trends in participation levels in clinical trials. Data presented there showed that between 2006 and 2010, clinical trial applications for non-generic drugs decreased from 777 to 596.18 – a decrease that is seen for both overall and for each of Phase I, II, and most especially, for Phase III trials.^[1] Clinical trial success is based on three factors: speed, quality, and cost. While Canada is one of the most expensive countries for hosting trials, we have always ranked very high on quality. Now, as other countries catch up and offer high quality trial programs that tend to be faster and more cost efficient than the Canadian trials, we can no longer differentiate ourselves on this point.

A significant issue, and one that connects the three success factors, is patient recruitment. Challenges include the predictable recruitment of patients and the retention of those patients throughout the duration of the clinical trial. The biggest issue with patient recruitment and retention is a lack of awareness and commitment to actually enter a study, not only from the patient's perspective, but also from some healthcare professionals to advocate for participation and to present the benefits of being in a study. Encouraging patients to get involved with clinical research and trials might be the answer to increasing the level

of commitment and ultimately retention of participants. We know that enrollment and participation in clinical trials improves our healthcare system, our treatments, and our medications, but as Canadians, generally we just don't feel the need to contribute to the research processes.

We could compare the responsibility to participate in clinical trials and healthcare research to the responsibility of voting in elections. Although Canadians do not have to vote on their next government leader, most feel an obligation to participate as these decisions help shape communities, provinces and countries – overall, benefiting the public good. This is in fact the same circumstance as with clinical trials. By committing to research participation – whether it is enrollment in a trial, or consenting to allow data and specimen collection to assess the real world benefit of innovations – we can all play a role in developing and improving health care.

As we reflect on the public attitude of activism, we need to take control and play a role in contributing to and directing the progress of our healthcare system. We invite all Canadians to step-up and participate – it will only serve to benefit the health of our country and its people, today, and for future patients.

[1] Laberge, N. 2011. Globalization of Clinical Research: Trends and Implications. Presentation Slides for Conference given in Argentina. Rx&D

CIFAR

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centre of global research networks to lead the global research agenda.

CIFAR is neither a granting agency nor a research institution. For over 30 years we have been bringing Canada's and the world's best researchers together to create transformative knowledge and engage with stakeholders to harness this knowledge for humanity's betterment. Today, our 11 research networks connect almost 400 Fellows and advisors from 104 institutions in 17 countries to focus on questions of global importance, aiming to improve human health, transform technology, build strong societies, and sustain the Earth.

Since I became president, CIFAR Fellows and Senior Fellows have told me that CIFAR has opened up new ways of thinking, changed their

research directions and spawned new collaborations with researchers in different disciplines. Many Fellows remarked that CIFAR is what an ideal university should be: an outstanding group of scholars meeting on a regular basis to discuss an important question.

CIFAR is currently identifying new research networks through our first-ever Global Call for Ideas. Over 750 researchers from 27 countries submitted 260 letters of intent covering questions in areas ranging from health and biology to green energy to the environment to atomic structure. In August, a selection panel recommended a shortlist of seven finalists. These research teams are developing full proposals addressing sustainability of life on Earth, novel energy solutions, brain and consciousness, and other profound questions. (See <http://www.cifar.ca/global-call-for-ideas> for a description of the pro-

cess and the shortlisted proposals.)

Our world has been transformed during Canada's almost 150 years of nationhood. Insulin, discovered in Canada in the 1920s, is now synthesized in bacteria and yeast. The once revolutionary fax machine is nearly obsolete. We can easily transmit photos instantaneously to anywhere in the world. Smallpox is history. A Canadian born today will on average live 45 years longer than our ancestors born in 1867!

What will the world look like in 2167? How can we pass on to our grandchildren a world worth inhabiting? Canada and the world will look vastly different in 150 years and research and innovation will be the single most important drivers of change. Our challenge is to ensure that Canada remains at the epicentre of the global research networks that are catalyzing these profound changes and opportunities.

Research and Innovation

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new industries and offer an edge to established enterprises, and

- Reinforcing the global networks of creativity that are associated with world-class universities and innovation clusters.

Unfortunately, nothing in Canada has recently come close to matching these investments.

Why then am I still optimistic? I become optimistic watching Canadians respond with joy to a Nobel prize in literature just won by an iconic 82

year-old recluse – or remembering the golden moments of the 2010 Winter Olympics. I take heart, too, from countless conversations with gifted and ambitious students, or with the outstanding young scientists I have met on campuses and in research institutes across this country.

We truly have an army of very talented individuals and teams just waiting for a little more oxygen and better provisions to reach the peak. Ottawa knows exactly what it and the

provinces must do. As the 2007 S&T Strategy says: "To succeed in an ever-more competitive global arena, Canada must have researchers, research facilities, research equipment, talent, and firms that are nothing short of excellent by world standards. Canada has built a strong research and talent foundation. Now we must take it to a new level by making strategic choices and focusing our resources where we can achieve the most benefit."

For the sake of successive generations of Canadians, let us hope that more strategic choices and focused investments in research excellence will be made in the very near future.

R&D. Is in our DNA.

Developing one of Canada's most significant natural resources is a huge responsibility—and one that we take seriously. Counted among Canada's top 20 corporate R&D spenders, our focus is on developing the oil sands in ways that create economic value for Canadians and limit our impact on the environment. That's why Syncrude has been an industry leader from the beginning—innovating in all areas of oil sands development.

For more information on our research initiatives, visit research.syncrude.ca

The Syncrude Project is a joint venture undertaking among Canadian Oil Sands Partnership #1, Imperial Oil Resources, Mocal Energy Limited, Murphy Oil Company Ltd., Nexen Oil Sands Partnership, Sinopec Oil Sands Partnership, and Suncor Energy Ventures Partnership.



WHEN YOU PUT RESEARCH
AND INNOVATION FIRST,
EVERYONE WINS.



CANADA'S TOP
100
CORPORATE
R&D SPENDERS
2013
RESEARCH
Infosource

GM has committed to invest \$850 million in research and development in Canada to expand activities in light-weighting materials, mechatronics, software and communications, further leveraging Canadian expertise in these strategic and important technologies. These cutting-edge technologies are critical to the development of tomorrow’s vehicles to serve the needs of tomorrow’s customers.



One day

can

last

a lifetime

January 28 is Bell Let’s Talk Day. We’re working hard to ensure its impact is felt for generations. Bell Let’s Talk supports mental health research taking place across the country through research chairs, fellowships, and project grants like:

\$2 million to Montréal’s Douglas Mental Health University Institute for the Douglas-Bell Canada Brain Bank, the only world-class brain centre of its kind in Canada.

\$1 million to Queen’s University to establish the world’s first chair in anti-stigma research.

\$1 million to the University of British Columbia to establish the Bell Youth Mental Health IMPACT Project.

\$500,000 in additional funding for the Bell Mental Health Training Awards, supporting the next generation of young Canadian researchers in partnership with Brain Canada.

Visit bell.ca/letstalk

