

# **University of New Brunswick**

## **Vice-President (Research) & Office of Research Services**

### **Annual Report 2010-2011**





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**Highlights from the year in research...**

- Saint John campus sees 69 % increase in research revenues from fiscal year 2009-10.
- Compared to other comprehensive universities, UNB ranks second in growth in research revenues since 2006.
- UNB's research revenues per faculty member approach \$100K.
- UNB enjoys significant growth in number of Master's students from 2009-10 fiscal year and Postdoctoral Fellows over the past six years.
- Dr. Myriam Barbeau & Dr. Marc Milner named University Research Scholars for 2010.
- Drs. Kevin Englehart and Wayne Albert receive NSERC Discovery Accelerator Supplements, given to outstanding researchers who show strong potential to become international leaders.
- UNB's Dr. Brigitte Leblon and Research Associate Armand LaRocque involved in US\$1.1M NASA-funded project on St. John River watershed.
- Four UNB research initiatives awarded nearly \$800,000 from CFI.
- Two UNB teams receive over \$1.1M from NSERC Strategic Project Grants program.

## Message from the Provost and Vice-President (Research)

With ongoing world economic turmoil and an ever-increasing federal and provincial focus on balanced budgets and deficit busting, it is probably not surprising that further growth in our research efforts have been arrested. Writing in late January 2012 in an atmosphere heavily laden with rumors of further federal and provincial budget cuts, it is difficult to remain optimistic. Such pessimistic forebodings, however, should be tempered by many identifiable subtexts in this annual report. UNBSJ research performed extremely well with a remarkable growth in research revenue fueled largely by Biology, Business, and Computer Science (p.7). The Graduate School continued to grow with particular increases in Master Students, especially in Saint John. In addition, post-doctoral student numbers continued to rise, reaching an all-time high of 128 (p.18).

In the national context, if we compare UNB to other comprehensive universities, we rank second behind only Simon Fraser in growth in research revenues since 2006 (p.5). Similarly, we rank fourth among comprehensive universities in research revenue per faculty member, nearing \$100,000. Finally, our successes in Knowledge and Technology Transfer continue. In the first decade of the new century, UNB has had 35 patents issued and there are another 67 pending. The University has also signed 101 license agreements which have generated about \$2.5 million. Perhaps, most importantly, UNB technologies have led to 18 start-up companies in that same period (p.15). These data, when normalized per million dollars of research activity, compare very favorably to Canadian and U.S. universities (p.16).



*Dr. Gregory S. Kealey  
Provost & Vice-President  
(Research)*

So, despite the menacing storm clouds gathering in Ottawa and Fredericton, we need to promote UNB research and researchers as part of the solution to the province's economic and social problems. No other provincial investment has the potential for such great returns.

## Message from the Executive Director of ORS

Following the trend from last year which saw slowed growth, our research revenues declined in the 2010-11 fiscal year. The situation, however, was mitigated to some degree by substantial growth in grant revenues on the Saint John campus, largely NSERC and other non-Tri-Council federal government grants. On the Fredericton campus, Canadian non-government grants countered the downward trend and showed marked growth as well.

As we all know, our Tri-Council grants are vital to the university's research activities and any decline is cause for concern. However, our success (94 %) with the newly created NSERC Engage program demonstrates our ability to

compete successfully and attests to UNB's strong partnership abilities. An increase to 29 % in our success rate with SSHRC Standard Research Grants coupled with a 3.4 percentage point increase in the funding rate is positive. Furthermore, with the introduction of SSHRC's partnership programs coupled with UNB's experience in partnering, we are optimistic that UNB will be able to grow its SSHRC funding.

UNB's knowledge transfer portfolio continues to grow. Late in the year, the news of the acquisition of Radian6 by Salesforce.com generated a great deal of positive press about New Brunswick's innovation capabilities. While UNB had not been involved

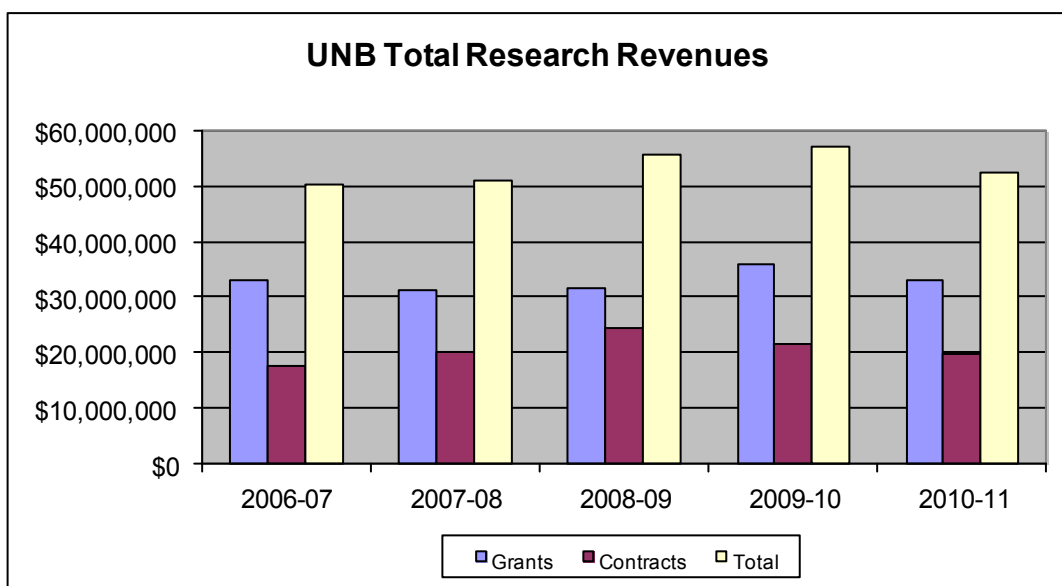


*Dwight Ball  
Executive Director (ORS)*

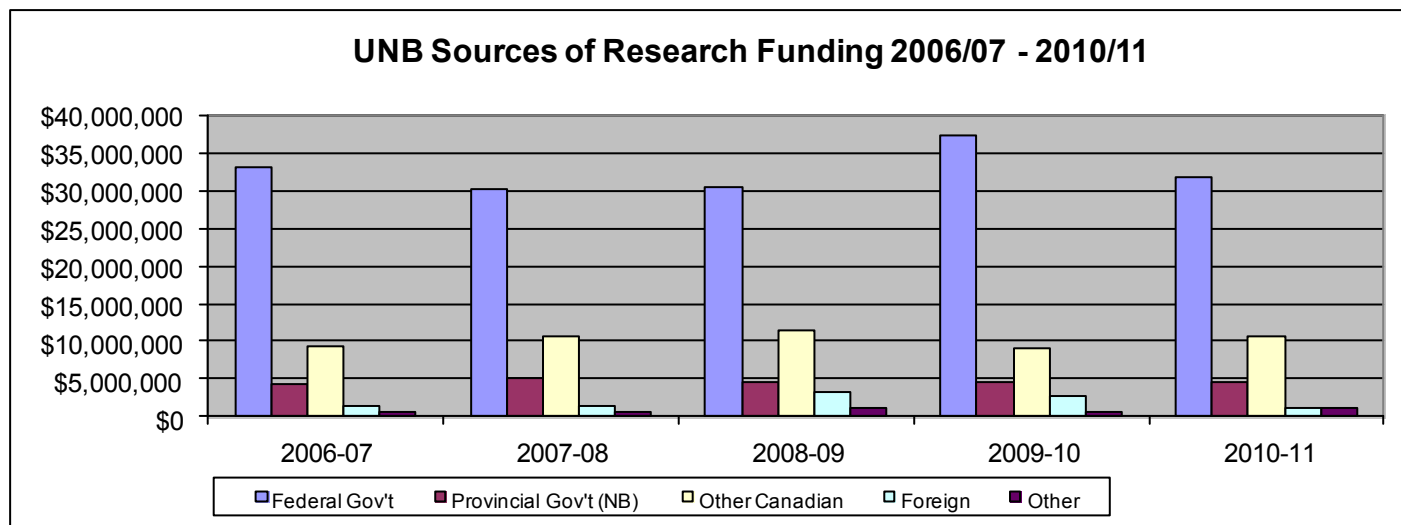
directly in Radian6, we did lay its foundation with the creation of Q1 Labs. Q1 resulted from a licensing deal initiated in October 2000 by ORS.

## Research Revenue

After a decade of continuous growth, the University's research revenues declined by 7 % in 2010-11 from \$57,262,296 in the previous year to \$53,244,192. A decline in Tri-Council grants of \$5,739,222 on the Fredericton campus is troubling, as is a quarter million dollar decline in other Federal government grants. The decline in contract revenues continued from the previous year, attributed to the economic problems of late 2008 and early 2009. However, there were notable bright spots within our revenue metrics. The Saint John campus saw a marked increase in its research revenues, up 69 % from \$3,387,463 to \$5,726,177. This growth is attributed entirely to a \$2,365,810 growth in grant revenues, largely NSERC and other non-Tri-Council Federal government grants. On the Fredericton campus, a \$1.2 million growth in Canadian non-government grants is also worthy of note.

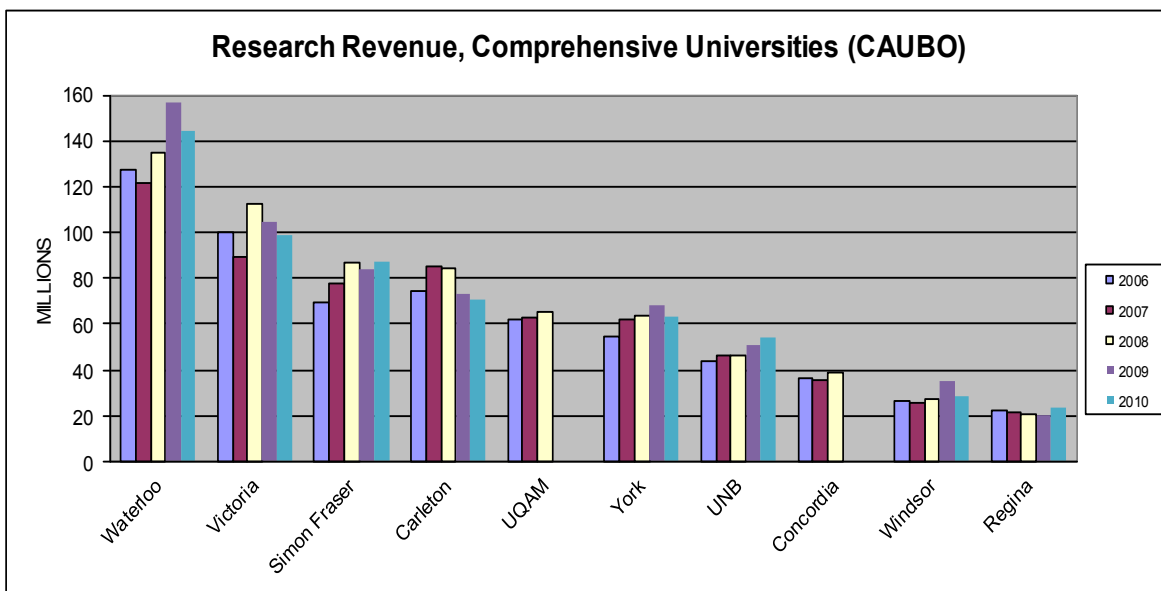


Our Tri-Council revenues are the basis of the University's Canada Research Chair allocation, as well as its Indirect Costs of Research grant, to say nothing of their support for our research enterprise. The CRC and Indirect allocations are based on a three-year rolling average of our Tri-Council revenues and as a result, the growth we saw last year in our Tri-Council revenues coupled with strong growth in Saint John will assist in mitigating, to a degree, the negative impact on our three-year metrics. However, when coupled with the changes seen in the NSERC award process, there is cause for concern signalled by these numbers.

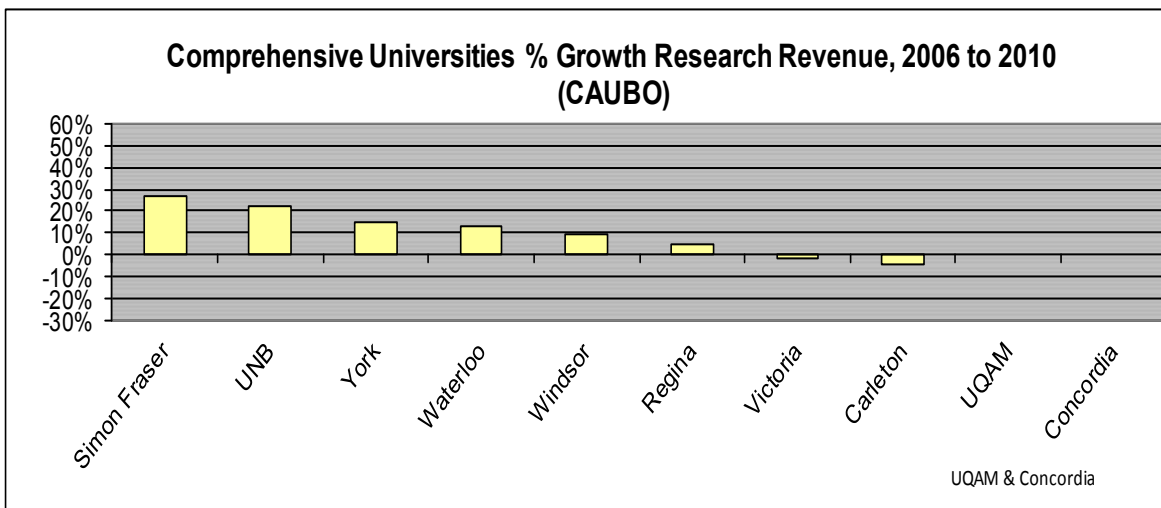


**Research Revenue (continued)**

The Canadian Association of University Business Officers (CAUBO) compiles research-related revenues based on mutually agreed upon definitions. It is this number that is used for inter-institutional comparisons. In the fiscal year 2010-11, UNB's preliminary CAUBO number was \$49,829,552. The inter-institutional comparative revenues graphed below are one year in arrears due to reporting and publication delays. UNB continues to place seventh in its commonly reported peer group with steady growth except in fiscal year 2007-08 (2008). Note that Quebec university numbers have not been published since 2008.



Based on CAUBO statistics, UNB ranks very well amongst its peer group of comprehensive universities in terms of longer-term growth, having outstripped all except Simon Fraser University in the 2006–2010 comparison. Again, the Quebec universities have not reported for two years within this time period.



## Research Revenue (continued)

## Research Revenue per Generating Unit

The following table attributes research revenues by generating unit during the fiscal year. Note that other research revenues are generated by the university, but are not reported on this table (e.g., the Indirect Costs of Research grants).

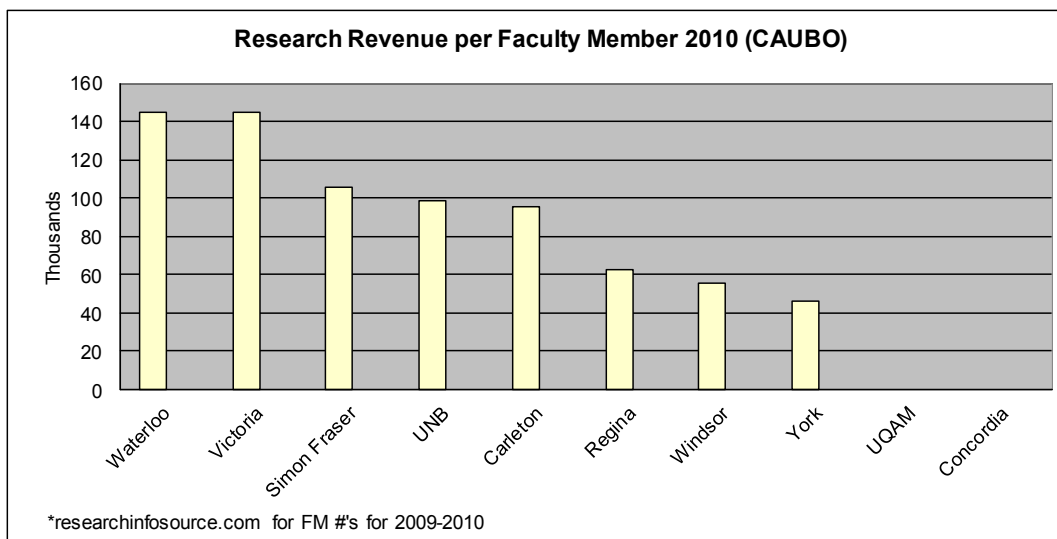
Research Revenues per Generating Unit					
UNIT	Grants	Contracts	Independent Centres	Other	Total
<b>ADMINISTRATION (F)</b>	132,995	77,287			210,282
<b>ARTS (F)</b>	1,751,409	103,904		47,641	1,902,954
Arts	250,000	68,992			318,992
Anthropology	60,251			4,300	64,551
Classics	62,487				62,487
Economics	49,725				49,725
English	83,723				83,723
History	290,617	5,781		38,554	334,952
Conflict Studies/Gregg Centre	170,476	5,781		20,557	196,814
Philosophy	-21,685				-21,685
Political Science	28,224				28,224
Psychology	293,832	29,131			322,963
French	10,207				10,207
Culture & Language Studies	13,539				13,539
Sociology	630,489			4,787	635,276
<b>COMPUTER SCIENCE (F)</b>	1,331,003	253,859		4,000	1,588,862
<b>EDUCATION</b>	1,035,931	297,953		8,000	1,341,884
<b>ENGINEERING (F)</b>	8,096,046	4,297,386		440,694	12,834,126
Chemical Engineering	2,536,957	1,665,353		207,287	4,409,597
Civil Engineering	1,183,671	771,550		74,012	2,029,233
Electrical Engineering	2,329,681	1,142,365		6,000	3,478,046
Mechanical Engineering	722,807	63,550		10,000	796,357
Geodesy & Geomatics	1,290,834	654,568			1,945,402
J Herbert Smith ACOA Chair	32,096			143,395	175,491
<b>FORESTRY</b>	3,073,145	2,139,318		3,175	5,215,638
<b>KINESIOLOGY</b>	446,338	187,346		111,855	745,539
<b>LAW</b>	15,767	90,749		3,000	109,516
<b>NURSING (F)</b>	790,931			95,376	886,307

## Research Revenues per Generating Unit (continued)

Research Revenues per Generating Unit					
UNIT	Grants	Contracts	Independent Centres	Other	Total
<b>SCIENCE (F)</b>	7,373,491	2,633,892		67,719	10,075,102
Math & Stats	393,740			4,000	397,740
Biology	3,488,124	293,168		7,500	3,788,792
Chemistry	1,397,505	286,003		31,500	1,715,008
Earth Sciences (formerly Geology)	838,389	1,703,089		24,719	2,566,197
Physics	1,255,733	351,632			1,607,365
<b>INSTITUTE OF BIOMEDICAL ENGINEERING (IBME)</b>	652,213	1,548,525			2,200,738
<b>CHRONIC ILLNESS RESERCH INSTITUTE (CIRI)</b>	121,114				121,114
<b>CANADIAN RESEARCH INSTITUTE FOR SOCIAL POLICY (CRISP)</b>	206,000				206,000
<b>CDN. RIVERS INSTITUTE (CRI) (F &amp; SJ)</b>	1,207,571	815,180		17,500	2,040,251
<b>SCHOOL OF GRAD STUDIES</b>	2,735,651	4,365			2,740,016
<b>HIL (ELECTRONIC TEXT CENTRE)</b>	233,768				233,768
<b>CENTRE FOR NUCLEAR ENERGY RESEARCH, Inc. (CNER)</b>			1,059,267	350,212	1,409,479
<b>CADMI MICROELECTRONICS</b>			103,621		103,621
<b>ARTS (SJ)</b>	131,813	7,300			139,113
Arts	93,499				93,499
History & Politics	8,000				8,000
Social Science		4,000			4,000
Criminal Justice Studies		3,300			3,300
Psychology	30,314				30,314
<b>BUSINESS (SJ)</b>	7,313	268,627			275,940
<b>SCIENCE &amp; ENGINEERING (SJ)</b>	3,907,031	785,672			4,692,703
Biology	3,634,938	626,827			4,261,765
Physical Sciences	104,538				104,538
Nursing/Health Sciences	12,500				12,500
Computer Science and Applied Statistics	122,055	158,845			280,900
Mathematical Sciences	33,000				33,000

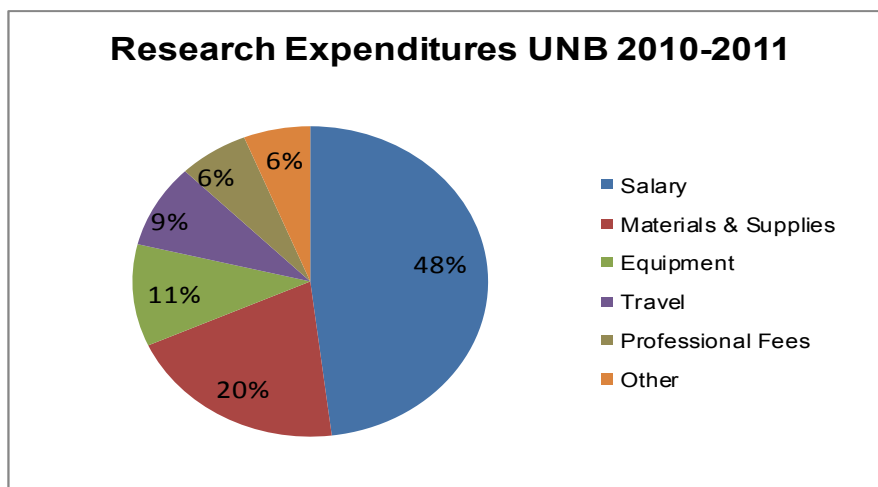
**Research Revenue (continued)**

A metric that is commonly cited when comparing the research intensity at universities is the research revenue generated per faculty member. In order to be able to make such a comparison a credible, independent source is required for the two metrics. For our purposes, we have used Re\$earch Info Source Inc. and CAUBO. In 2010, UNB ranked fourth, just behind Simon Fraser University, at slightly under \$100K per faculty member. This accomplishment is worthy of note and its achievement deserves recognition.



**Research Expenditures**

The majority of the research funding received by UNB goes back into the New Brunswick economy through salaries. In 2010-11, \$21.9 million was spent on student and non-student salaries. Equipment, materials and supplies consumed almost \$14 million and travel \$4 million.



NOTE: All research revenues eventually flow back out as expenses. Due to the timing of different accounting tasks, however, total research expenditures will not equal total research revenues for the fiscal year.



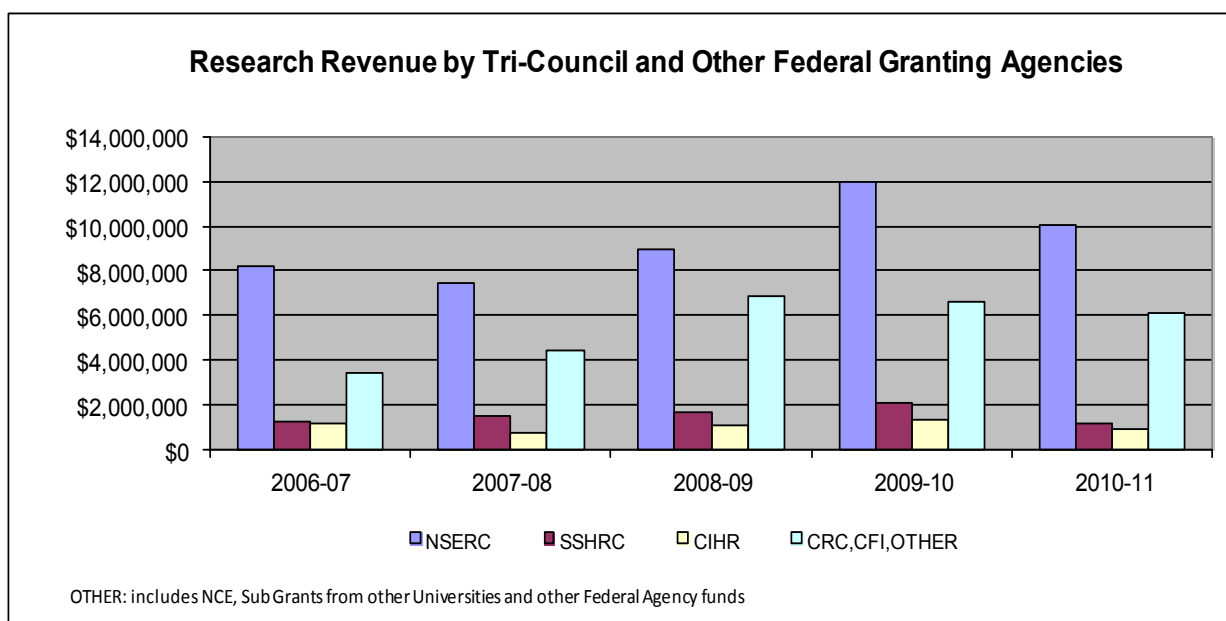
## Indirect Costs of Research



The Indirect Costs of Research program provides funding for research facilities, resources, management and administration, regulatory requirements, accreditation and intellectual property management. The amount UNB receives from this program is contingent on our level of Tri-Council funding based on a three-year rolling average. The university's allocation for 2010-11 was \$3,595,243, and the allocation for the 2011-12 fiscal year is \$3,577,560.

## Tri-Council Funding

As pointed out previously, the university's Tri-Council-sourced research revenues are down. This is cause for concern, not only because of the negative impact this has on our research enterprise, but also because these revenues are the basis of our Indirect Costs of Research grant and the allocation of Canada Research Chairs.



As indicated, grants from Tri-Council are a very important component of UNB's research activities. The details of our successes and lack thereof are being continuously scrutinized. To that end, details of our submissions to and awards from NSERC, SSHRC and CIHR for the calendar year 2010 are depicted on the following table (totals will differ from those presented for fiscal year 2010-11).

Last year's Annual Report was the first time these statistics were reported. In order to facilitate comparisons, we have also provided last year's (2009) metrics.

## Tri-Council Success

Tri-Council - 2010 Results							
Submissions	Program	Submitted	Requested	Successful	Awarded	Success Rate	Funding Rate
NSERC	CRD	1	\$332,247	1	\$332,247	100%	100.00%
	Strategic Project	7	\$3,151,440	2	\$1,140,556	29.00%	36.00%
	RTI	19	\$1,045,810	4	\$230,665	21.00%	22.00%
	Discovery	49	\$12,937,958	28	\$3,943,000	57.00%	30.00%
	Engage	18	\$434,818	17	\$418,395	94.00%	96.00%
	Other	12	\$3,450,833	8	\$1,683,178	67.00%	49.00%
	<b>Total NSERC</b>		<b>106</b>	<b>\$21,353,106</b>	<b>60</b>	<b>\$7,748,041</b>	<b>57.00%</b>
SSHRC	SRG	21	\$2,142,669	6	\$311,448	29.00%	15.00%
	Other	5	\$247,365	0	\$0.00	0.00%	0.00%
	<b>Total SSHRC</b>	<b>26</b>	<b>\$2,390,034</b>	<b>6</b>	<b>\$311,448</b>	<b>23.00%</b>	<b>13.00%</b>
CIHR	OOG	10	\$2,453,576	2	\$125,905	20.00%	5.00%
	Other	4	\$575,410	3	\$295,059	75.00%	51.00%
	<b>Total CIHR</b>	<b>14</b>	<b>\$3,029,986</b>	<b>5</b>	<b>\$420,964</b>	<b>36.00%</b>	<b>14.00%</b>

Tri-Council - 2009 Results							
Submissions	Program	Submitted	Requested	Successful	Awarded	Success Rate	Funding Rate
NSERC	CRD	1	\$230,000	0	\$0	0.00%	0.00%
	Strategic Project	10	\$3,951,391	3	\$931,521	30.00%	23.57%
	RTI	24	\$1,575,810	6	\$286,555	25.00%	18.18%
	Discovery	62	\$14,627,853	32	\$4,465,000	51.61%	30.52%
	Other	20	\$13,640,360	8	\$12,025,786	40.00%	88.16%
	<b>Total NSERC</b>		<b>117</b>	<b>\$34,025,414</b>	<b>49</b>	<b>\$17,708,862</b>	<b>41.88%</b>
SSHRC	SRG	25	\$2,329,749	7	\$269,723	28.00%	11.60%
	Other	12	\$2,118,604	4	\$1,330,437	33.30%	62.80%
	<b>Total SSHRC</b>	<b>37</b>	<b>\$4,448,353</b>	<b>11</b>	<b>\$1,600,160</b>	<b>29.70%</b>	<b>36.00%</b>
CIHR	OOG	7	\$1,880,908	1	\$487,290	14.29%	25.91%
	Other	10	\$1,676,339	5	\$1,286,705	50.00%	76.76%
	<b>Total CIHR</b>	<b>17</b>	<b>\$3,557,247</b>	<b>6</b>	<b>\$1,773,995</b>	<b>35.29%</b>	<b>49.87%</b>

CRD - Collaborative Research Development

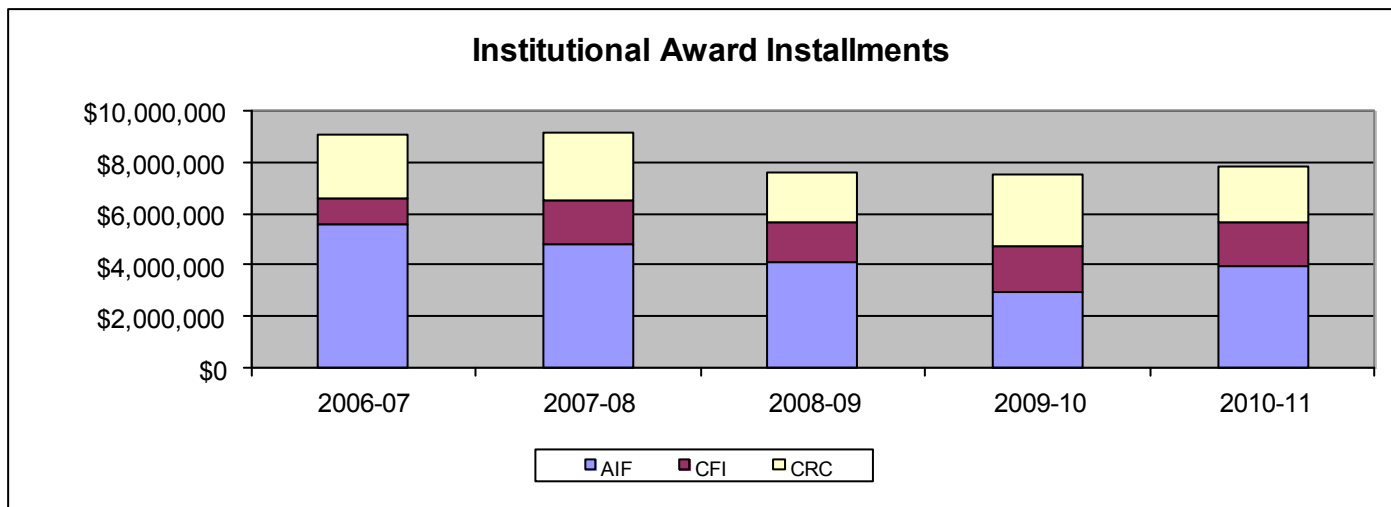
RTI - Research Tools & Instruments

SRG - Standard Research Grants

OOG - Open Operating Grants

## Institutional Funding

As the graph below indicates, the declining trend in Institutional Awards that began in 2008-09 reversed in 2010-11.



### Atlantic Innovation Fund (AIF)

The Atlantic Canada Opportunities Agency announced project approvals for the Round 8 applications in March 2011. One UNB-led project was approved:

Dr. Bruce Colpitts (Electrical & Computer Engineering) was awarded \$2.5 million for his CONNECT project to create and commercialize advanced operational support systems for the Defence & Emergency / First Responders stakeholder communities through the applied research and development of information, communication, visualization, mobile and sensing technologies.

As well, UNB researchers are playing key roles in the following projects let by others:

Dr. Esam Hussein (Mechanical Engineering), Dr. Eric Aubanel (Computer Science) and Dr. Gregory Fleet (Business—SJ) are working with Inversa Systems to develop the next generation of Backscatter Computer Tomography (BCT) technologies to enable its use beyond present niche markets by third parties for a variety of industrial applications.

Dr. Ali Ghorbani (Computer Science), Dr. Virendra Bhavsar (Computer Science) and Dr. Weichang Wei Lu (Adjunct Professor—Computer Science), PhD and Master Students are working with Q1 Labs to develop the Next Generation Simulation of Network Attacks—a tool set that allows network administrators to investigate and pre-assess the impact of actions on the network.

Dr. Ali Ghorbani (Computer Science) is also working with Accreon Inc. on systems intended to build state of the art software applications that incorporate self-managed data adaptive intelligent Information Analysis, Interpretation and Dissemination (IAID) technology.

### Canada Foundation for Innovation (CFI)

In 2010-11, UNB was successful in having eight new CFI projects approved at a value of \$1.2 million, plus an additional \$347,427 in Infrastructure Operating Funds. UNB researchers are leading 33 active CFI infrastructure projects involving \$5.3 million from CFI and \$11.3 million from matching sources.

## Institutional Funding (continued)

## Canada Research Chairs (CRC)

UNB received \$2.2 million for our 15 active Canada Research Chairs in 2010-11\*. During the fiscal year, Dr. Michael Haan (Sociology/Economics) commenced his Tier 2 Chair, and Dr. Lucia O'Sullivan (Psychology) was successful in the renewal of her Tier 2 Chair for the second five-year term. Dr. Barbara Paterson (Nursing) left UNB at the end of her first term as the Tier 1 Chair in Chronic Illness.

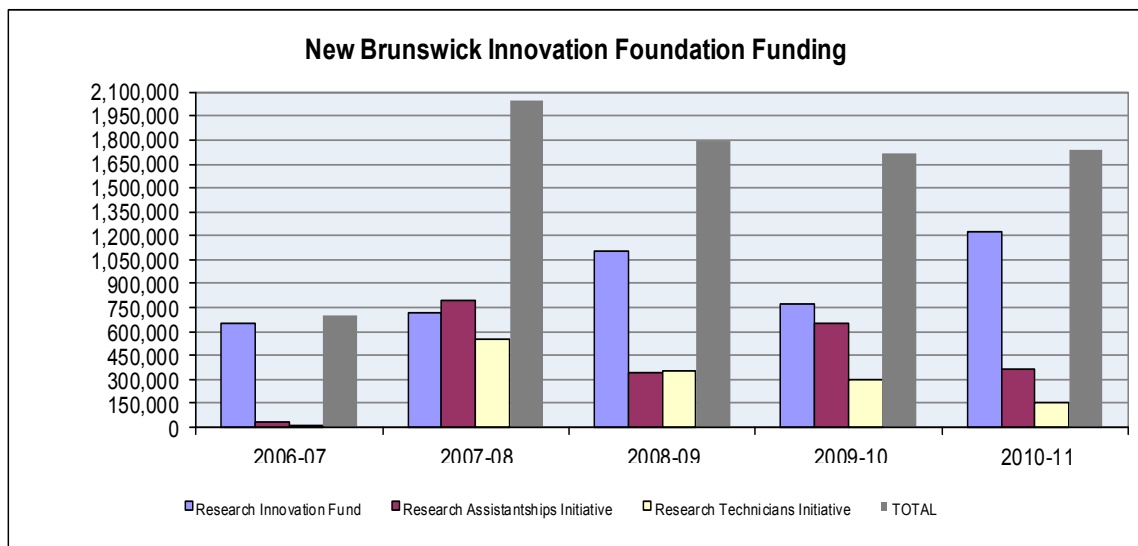
UNB's CRC contingent as of April 30, 2011:

	Name	Department/Faculty	CRC in...	Tier
1	Bruce Balcom	Physics/Chemistry	Materials Science MRI	1
2	Rick Cunjak	Biology (F)	River Ecosystem Science	1
3	José Domene	Education	School to Work Transition	2
4	Michael Haan	Sociology/Economics	Population and Social Policy	2
5	Karen Kidd	Biology (SJ)	Chemical Contamination of Food Webs	2
6	Nicole Letourneau	Nursing	Healthy Child Development	2
7	Kerry MacQuarrie	Civil Eng.	Groundwater-Surface Water Interaction	2
8	Christopher Martyniuk	Biology (SJ)	Aquatic Molecular Ecology	2
9	Kelly Munkittrick	Biology (SJ)	Ecosystem Health Assessment	1
10	Yonghao Ni	Chem./Chem. Eng.	Pulp and Paper Science and Engineering	1
11	Lucia O'Sullivan	Psychology	Adolescent Sexual Health Behaviour	2
12	Om Rajora	Forestry & Env. Mgmt.	Forest and Conservation Genomics and Biotechnology	1
13	John Spray	Geology	Planetary Materials	1
14	Doug Willms	Education	Literacy and Human Development	1
15	Yun Zhang	Geodesy & Geomatics Eng.	Advanced Geomatics Image Processing	2

\* Our full allocation of 16 Chairs will be filled by the nomination of one Tier 1 Chair submitted in April 2011 (a positive CRC decision was confirmed in July 2011).

## New Brunswick Innovation Foundation

The Foundation continues to be a strong supporter of UNB research. During the fiscal year, awards under the Research Innovation Fund jumped to an all time high of \$1.2 million, surpassing the previous high of \$1.1 million in fiscal year 2008-09. Given the University's focus on innovation both in relation to its own business activities as well as in support of the province's innovation agenda, this trend is indeed positive. While the Research Assistantship Initiative and Research Technicians Initiative declined, we have reason to believe this trend will be reversed in the current (2011-12) fiscal year.



## Industrial Research Assistantship Program (National Research Council)

Since 2006, UNB, through ORS, has been providing short-term technical assistance to Canadian companies under this NRC program.

The objective of this initiative is to support the innovative needs of Canadian SMEs through the provision of technical assistance from faculty and staff of the University. UNB provides the expertise of its faculty, staff and associates to meet industry needs for advice on technical issues.

Many SMEs in Atlantic Canada have technical problems and technical-based ideas that they do not have the expertise to address. Through this program, the University is able to assist the entrepreneur in understanding the issues and outlining the options on how to move forward.

The scope of the services could include:

- On-site troubleshooting of issues in manufacturing, packaging, testing, etc.
- Initial assessment of new product concepts or standards
- Literature searches
- Technology searches and reviews
- Selection of equipment
- Assisting with preparation of technical research methodologies
- Preliminary market research as part of a product development process
- Technical training of company staff
- Seminars on specific technical issues of interest to industry
- Ad-hoc advice

**Industrial Research Assistantship Program (National Research Council) (continued)**

UNB is able to provide these services thanks to the support of the National Research Council's Industrial Research & Assistance Program (NRC-IRAP).

For the 2010-11 fiscal year, we completed projects with 18 companies worth a total of \$75,000. For the five years that the program has been in operation, UNB has been involved in 97 such projects.

<b>NRC—IRAP Network Member Program</b>					
	<b>2006-07</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>	<b>2010-11</b>
<b>Projects Completed</b>	18	19	17	25	18
<b># of UNB Faculty Involved</b>	21	23	21	21	16

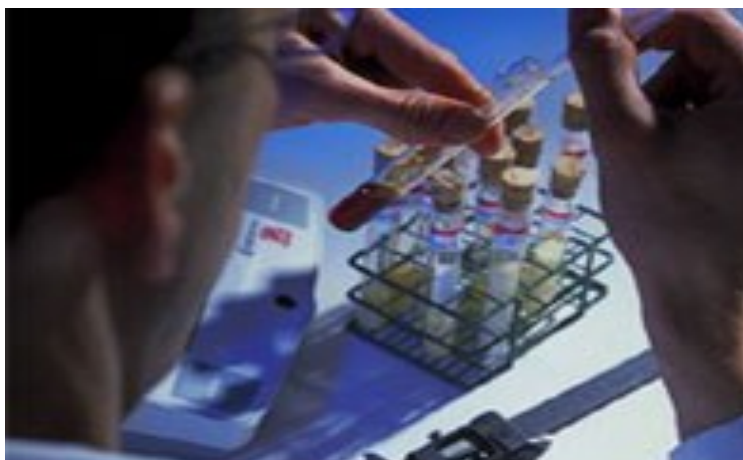
It is important to note that separate from the NRC-IRAP Network Member Program administered by ORS and reported above, the Wood Science & Technology Centre in the Faculty of Forestry & Environmental Management administers a Network Member Program specific to its industry sector.

## Intellectual Property Management, Technology Transfer and Knowledge Transfer

The Industry-Government Services (IGS) division of the Office of Research Services connects business to researchers and guides research to market. In 2010-11, IGS:

- Obtained the following awards (\$79,223 total) from Springboard Atlantic Inc. to assist in moving technologies through the commercialization process:
  - two \$20,000 Proof-of-Concept awards (both in Geodesy & Geomatics Engineering)
  - two \$10,000 Patent & Legal Awards (both in Geodesy & Geomatics Engineering)
  - three Technology Assessment Committee (TAC) awards totalling \$19,223 (Computer Science; Geodesy & Geomatics Engineering; Mechanical Engineering)
- Obtained \$66,973 in funding from other sources to match the above Springboard funds:
  - \$40,000 from the Geode Market Development Fund and \$18,750 from LearnSphere to leverage \$6,000 in TAC awards to support business plan development for a potential UNB spin-off company (Geodesy & Geomatics Engineering)
  - \$8,223 from LearnSphere to leverage \$8,223 in TAC awards to support market assessment for a potential UNB license (Computer Science)
- Entered into 8 technology transfer agreements with industry.
- Filed 23 new patents and saw 4 previous patent applications issued.
- Filed 2 new Section 9 marks (trademarks).
- Assisted in the creation of 1 start-up company.
- Provided knowledge transfer advice and services to Université de Moncton, University of Prince Edward Island, and the New Brunswick Community College; significantly assisted with the Phase 3 Springboard renewal process.

Technology & Knowledge Transfer							
	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2000-2011
Disclosures	21	21	18	15	14	16	206
Patents Filed	19	19	22	22	27	23	177*
Patents Issued	1	8	7	6	4	4	35
Total Patents Pending	35	46	56	64	68	63	n/a
License Agreements	8	16	10	14	14	8	101
Gross Revenue Received**	\$204,813	\$303,701	\$269,107	\$448,991	\$287,190	\$281,390	\$2,460,187
Start-ups Created	0	1	2	2	3	1	18
* covers 67 separate technologies							
** Note: Gross Revenues = Licensing Income + Patent Reimbursements							



**Intellectual Property Management, Technology Transfer and Knowledge Transfer (continued)**

UNB's track record as measured by the common metrics for IP Management, Technology and Knowledge Transfer is very good. The tables below report the number of formal disclosures made by researchers, the number of US patent applications filed, and the number of licence agreements executed at UNB, normalized for size based on research expenditures. The metrics, reported for the 2008-09 and 2009-10 years, compare UNB to the Canadian and United States averages. Disclosures have slipped across the board, and UNB is slightly below the Canadian and US averages. UNB also filed less patents in FY2010, but is still above the Canadian average, although it falls below the US average, which increased for the latest period. The number of license agreements executed at UNB continue to be strong and are above the Canadian and US averages.

Since the establishment of the Intellectual Property Management Program within the Office of Research Services in late 1999, UNB has been active in transferring technologies into the marketplace, with a strong focus on industry collaboration. In the 11-year period from 2000 to 2011, UNB has:

- Managed 206 invention disclosures;
- Filed 52 US Provisional, 43 Canadian, 50 Non-US Provisional and 33 Other (European, PCT, etc.) patent applications (177 total) for 61 separate technologies;
- Seen 35 patents issued;
- Filed 13 Section 9 marks (trade-marks) for the University;
- Completed 101 technology transfer deals;
- Secured licensing revenues and patent reimbursements of over \$2.4 million;
- Assisted in the creation of 18 UNB spin-off companies; and
- Seen UNB start-up companies raise over \$60 million in venture capital investments.

<b>Technology and Knowledge Transfer (Universities)</b>							
<b>(Per \$million Research Expenditures)</b>							
<b>Metric (2009)</b>	<b>UNB</b>	<b>Canada</b>	<b>U.S.A</b>	<b>Metric (2010)</b>	<b>UNB</b>	<b>Canada</b>	<b>U.S.A</b>
<b>Disclosures</b>	.27	.35	.38	<b>Disclosures</b>	.24	.28	.34
<b>Patents Filed</b>	.39	.16	.23	<b>Patents Filed</b>	.23	.15	.32
<b>License Agreements</b>	.27	.13	.10	<b>License Agreements</b>	.26	.07	.07

Source: AUTM Licensing Survey FY 2009, July 15, 2010

Sources: AUTM Canadian Licensing Activity Survey: FY2010 and AUTM U.S. Licensing Activity Survey: FY2010



## Research Ranking

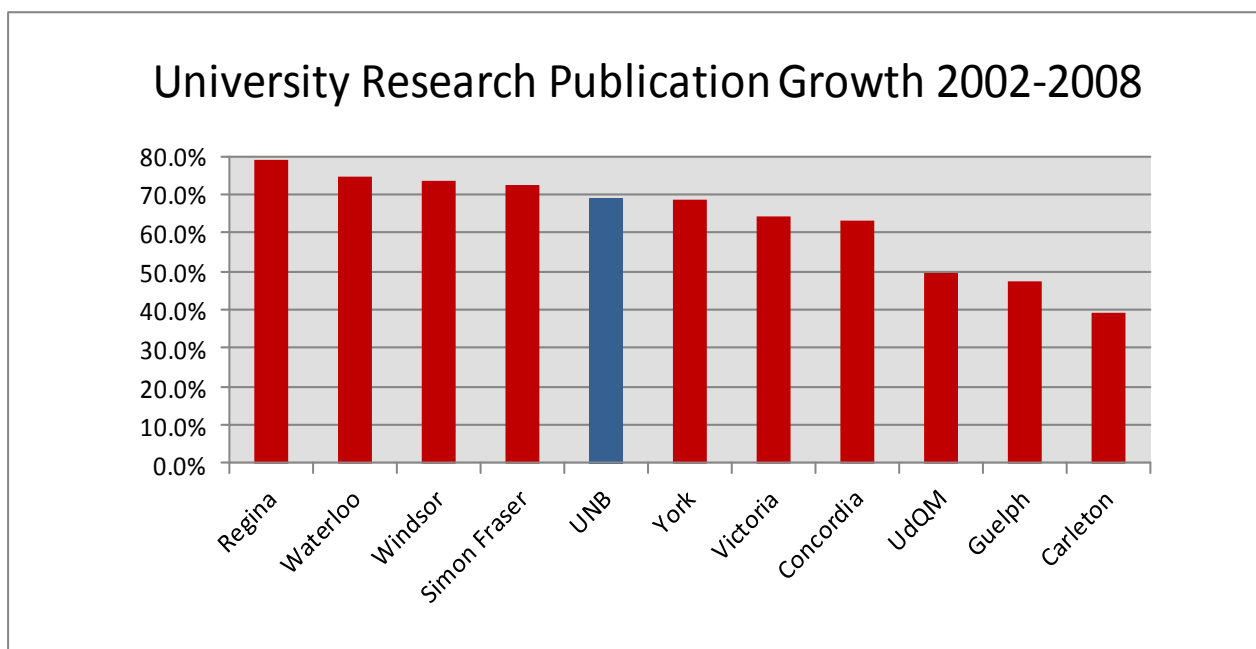
The Research Ranking exercise, completed on a biannual basis, has become an important tool that assists the Office of the Vice-President (Research) in measuring research output of academic units at the University of New Brunswick. This exercise exists in the form of an electronic questionnaire that is completed by each person with the designations of Professor, Associate Professor, Assistant Professor, Adjunct Professor, Honorary Research Professor, Postdoctoral Fellow, Senior Research Associate and Research Associate. Once the data is collected, a committee reviews the submissions per

academic unit and assign a ranking of 1 through 10 to each unit based on their submission. A ranking of 1 signifies research excellence, while a ranking of 10 signifies extremely low research performance.

The on-line portal for the current ranking period (July 1, 2009–June 30, 2011) is now closed and the committee is assessing the submissions. The results for this period will be published in the 2011-12 fiscal year report.

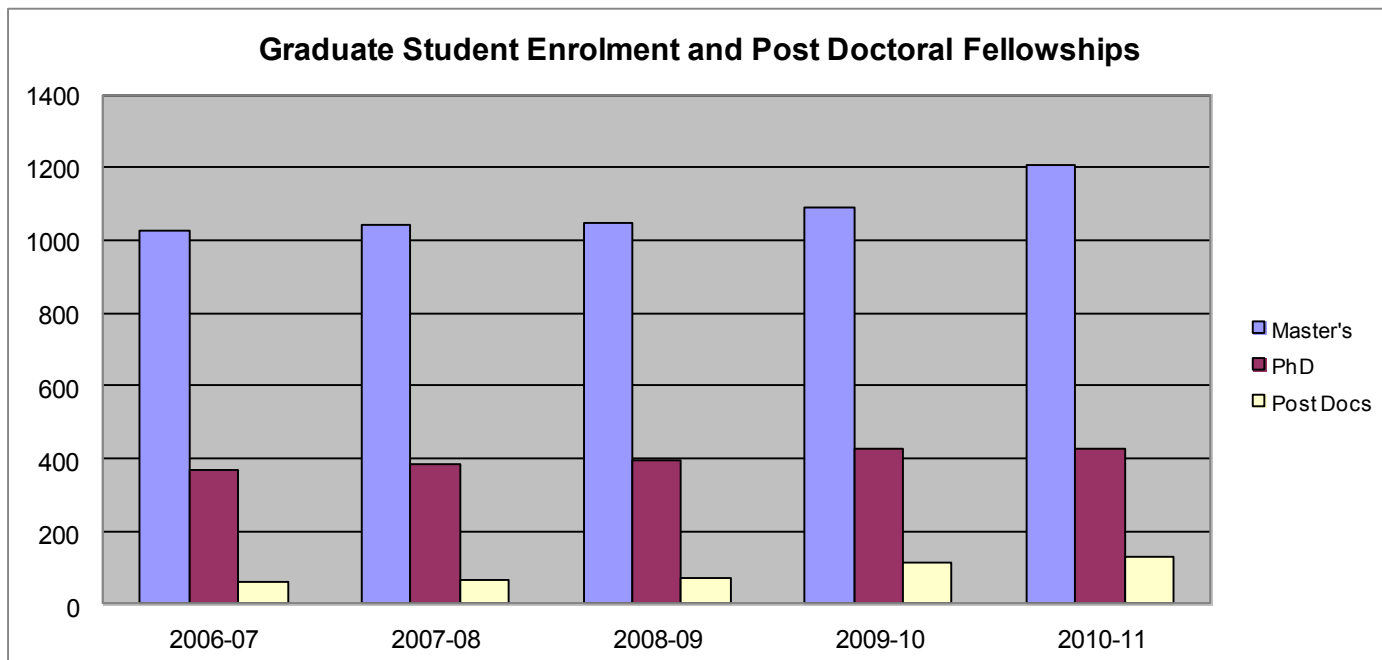
## Research Outputs

A classic metric for quantifying research output is research publications. RESEARCH Info Source Inc. publishes such a metric. Between 2002 and 2008, UNB's growth in publications was 69.3 %, placing us fifth after Regina, Waterloo, Windsor and Simon Fraser.



## School of Graduate Studies

After several years of relatively little growth in the number of Masters students, the growth seen in 2009-10 laid the foundation for significant jump of 10.7 % to 1,208 students in 2010-11. The number of Doctoral students, however, remains at the 2009-10 level, 426. The number of Postdoctoral Fellows continue to climb, moving from 116 to 128 in fiscal year 2010-11. It is worth noting that UNB now hosts over 100 more Postdoctoral Fellows than we did six years ago.



## VP (Research) Representation

The VP (Research) holds the following positions on and off campus as part of the office mandate:

### President:

- Fredericton Knowledge Park

### Chairperson, Board of Directors:

- Canadian Research Institute for Social Policy
- Canadian Rivers Institute
- Chronic Illness Research Institute
- Institute of Biomedical Engineering

### Member, Board of Directors:

- AARMS
- ACENet
- BioAtlantech
- Canadian Research Knowledge Network
- Fredericton Knowledge Park
- Huntsman Marine Science Centre
- International Aquaculture Innovation Centre
- Kings Landing
- Muriel McQueen Ferguson Centre for Family Violence Research
- National Research Council, IIT (Advisory Board)
- New Brunswick Innovation Foundation
- New Brunswick Health Research Foundation
- Populomix Cancer Research Institute
- Springboard (Treasurer)

## Executive Director Representation

The Executive Director of the Office of Research Services represents the Office and/or the University in the following university functions:

- Chair, UNBF Asbestos Steering Committee
- Chair, Biohazards Safety Committee, UNB
- Member, Directors Plus
- Member, Board of Directors, Construction Technology Centre Atlantic
- Member, Board of Directors, CADMI Microelectronics Inc.
- Member, Advisory Board, Huntsman Marine Science Centre
- Representative of the VP Research, Board of Directors, Centre for Nuclear Energy Research

In addition, the Executive Director holds positions related to

### Member:

- Steering Committee, Atlantic Aboriginal Economic Development Integrated Research Program
- Governance Committee, Canadian Research Knowledge Network (Chair)
- Expert Panel on SSHRC Program Architecture Renewal
- Council of Canadian Academies, Expert Panel on State of Science and Technology in Canada

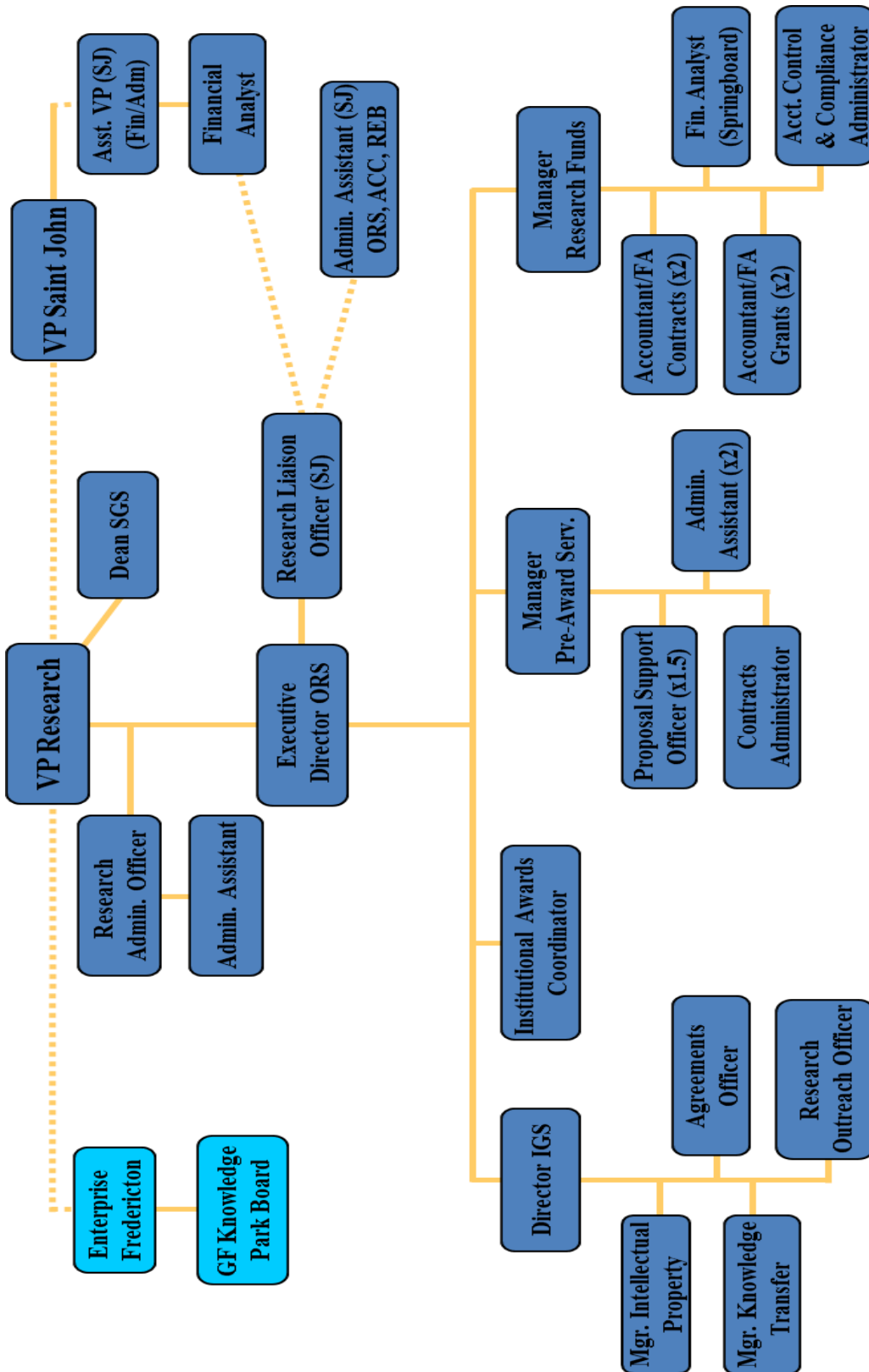
In addition, the VP (Research) holds several positions related to his academic interests:

- Treasurer, Canadian Committee on Labour History
- Chair, Publications Committee, Canadian Committee on Labour History
- Editor, Canadian Social History Series, University of Toronto Press
- Member, Editorial Board, *Acadiensis*
- Member, Editorial Board, *Labour/le Travail*
- Member, Advisory Board, *Labour History* (Australia)
- Member, Advisory Board, *Socialist History* (UK)
- Member, H-Canada Editorial Board

his professional and personal interests:

- Member, Society of Research Administrators International
- Member, Canadian Association of University Research Administrators
- Member, Admissions Committee, Association of Professional Engineers and Geoscientists of New Brunswick
- Fellow, Canadian Institute of Mining, Metallurgy and Petroleum
- Member, Association of Professional Engineers & Geoscientists of New Brunswick
- Certified Geologist, State of Maine
- Member, Cultivation Committee, NB Association for Community Living

**VP (Research) and Office of Research Services Organizational Chart**



= VP Research & ORS (Fredericton and Saint John)  
 = Greater Fredericton Knowledge Park (External to UNB)\*

\* Note: UNB's VP Research is the President of the Greater Fredericton Knowledge Park Board.

## University Research Scholars 2010: Dr. Myriam Barbeau & Dr. Marc Milner

The award of University Research Scholar is intended for University of New Brunswick researchers who have demonstrated a consistently high level of scholarship, and whose research is, or has the potential to be, of international stature. The award shall honour leading researchers at the University. Recommendations for this award are made by a selection committee and approved by the Board of Governors.

### Dr. Myriam Barbeau

Dr. Myriam Barbeau is a marine ecologist whose work promises to yield new and fundamental understanding of the biology of coastal Atlantic Canada.



*Dr. HEA (Eddy) Campbell, Dr. Myriam Barbeau, and  
Dr. Gregory Kealey*

She has studied the organization of Atlantic rocky shallow, mudflat, and saltmarsh communities, and has worked to apply new ecological understanding to the productivity and sustainability of shellfish aquaculture. She has been a highly productive researcher, with 27 publications and 30 conference presentations over the last 5 years, and her graduate students have excelled as well (with one nominated by UNB for NSERC's Doctoral Prize). She has garnered research funding from NSERC (Discovery Grant and Strategic Grant), MITACS (as part of a Network of Centres of Excellence) and several other sources.

Her work is exciting in part because her synthesis of laboratory work, field experiments, and mathematical modeling provides a model for combining theoretical and experimental tools to provide answers to important ecological questions. Dr. Barbeau's career has been accelerating since her arrival at UNB in 1999, and is poised to become even stronger while she holds the University Research Scholar award.

## University Research Scholars 2010 (continued)

**Dr. Marc Milner**

One of Canada's preeminent scholars of the Second World War, Dr. Marc Milner is a remarkably prolific scholar with an enviable reputation as one of Canada's most influential military historians. He has also been instrumental in the growth of the military history program at UNB and is the key architect behind the recently launched Brigadier Milton F. Gregg, VC, Centre for the Study of War and Society.

Author of several acclaimed, award winning scholarly monographs, Dr. Milner has also produced a truly impressive number of still rigorous but more popular books and articles that have almost single-handedly elevated the quality of Canadian naval military historiography. These publications reveal Dr. Milner's rare skill to reach and educate the wider audience while at the same time maintaining high scholarly standards. All three of his refereed, scholarly monographs have been praised in leading journals: *North Atlantic Run: The Royal Canadian Navy and the Battle for the Convoys*, which first appeared with the University of Toronto Press in 1985 and has gone through two paperback editions, the last in 2006; *The U-boat Hunters: The Royal Canadian Navy and the Offensive Against Germany's Submarines* (University of Toronto) in 1994; and *Canada's Navy: The First Century* (University of Toronto), in 1999. Together these works have forced a reevaluation of Canada's neglected but important role in the Battle of the Atlantic. Building on these foundational studies, Dr. Milner has produced four excellent books intended for both a specialist and broader audience, including *Battle of the Atlantic* (Vanwell, 2003, with paperback in 2005), which won the prestigious CP Stacey Prize in Military History. He is also author of dozens of academic and more popular essays, articles and chapters, as well as an editor of the acclaimed book series on New Brunswick Military Heritage.



Dr. HEA (Eddy) Campbell, Dr. Marc Milner, and Dr. Gregory Kealey

Dr. Milner began his career in UNB's History Department in 1986, throwing himself with great energy and enthusiasm into the task of transforming the military history field into one of the most important and popular ones in the department and university. Promoted to Associate Professor in 1988 and Full Professor in 1994, Dr. Milner has also served as Director of UNB's Military and Strategic Studies Program (1986-2005), Co-Director of the New Brunswick Military Heritage Project (2003-), Acting Director for the Centre for Conflict Studies (2005-2006) and, since 2006, Director of the Milton Gregg Centre for the Study of War and Society. He has sat on a long list of national and international research committees and societies, been a consultant and advisor to numerous programs and educational institutions and initiatives, and been an important contributor to the annual Canadian Battlefields Foundation tours to Europe. In support of the Military and Strategic Studies Program and now the Milton Gregg Centre, he has applied for and administered over one and a half million dollars in grants from the Department of National Defence, along with winning external research funds for his own projects. And, for six years (2002-2008), he was chair of the Department of History. On top of this impressive scholarly activity, Dr. Milner has excelled in teaching large undergraduate classes while maintaining a graduate teaching and supervisory load second to none.

His current research program – submitted also as a SSHRC Standard Research Grant – “Normandy: Memory and Meaning,” is an innovative project fusing current scholarly interest in the “making of memory” with the study of the enduring legacy of the Allied invasion of Normandy. In particular, the project looks at the way in which Normandy was “anticipated” by the various combatants, how this anticipated meaning informed contemporary understanding of events as they unfolded, and finally how the clash between what was anticipated and what actually occurred was reconciled in the post war literature. The scholarly world is eagerly awaiting the results of this research.

Dr. Milner is therefore the kind of productive and creative scholar who has shaped the scholarly discourse and informed the broader society both. With this URS designation, UNB proudly acknowledges his major contributions to the research culture of the university, New Brunswick, and Canadian society as a whole.

## UNB Research Success Stories in 2010-11

### Englehart & Albert Receive NSERC Discovery Accelerator Supplement

Posted by UNB on July 5, 2010

UNB's Kevin Englehart and Wayne Albert are two of the New Brunswick recipients of the Natural Sciences and Engineering Research Council of Canada Discovery Accelerator Supplement, valued \$120,000 over three years.

The announcement was held at UNB Fredericton on June 22. Below is the Government of Canada news release.

#### Minister Gary Goodyear announces investment in world-leading research

Fredericton, New Brunswick, June 22, 2010 — One hundred and twenty-five of Canada's top researchers in science and engineering, including three from New Brunswick universities, will benefit from a federal government investment designed to give them the opportunity to become international leaders in their respective areas of study.

The announcement was made by the Honourable Gary Goodyear, Minister of State (Science and Technology), speaking at the University of New Brunswick in Fredericton.

"Our government is investing in science and technology to improve the quality of life of Canadians, strengthen the economy and create jobs," said Minister Goodyear. "This investment will help some of our country's best scientists and engineers become world leaders in areas such as nanotechnology, quantum communications and many more."

The 125 researchers will each receive \$120,000 over three years, for a total investment of \$15 million through the Discovery Accelerator Supplements. This program provides substantial, timely support to outstanding research-

ers who show strong potential to become international leaders.

These awards are allocated to researchers who have received funding through the Natural Sciences and Engineering Research Council's annual Discovery Grants competition.

"These recipients were selected through a rigorous peer-reviewed process and are being provided additional support so that they can maximize the results of their breakthrough," stated Dr. Suzanne Fortier, President of NSERC. "We congratulate all of these recipients for their outstanding research and creativity."

Of the 125 recipients, three researchers in New Brunswick will receive financial support to pursue research at the Université de Moncton and the University of New Brunswick. Funding will support studies of the science behind reading processes, the impact of fatigue to prevent injuries, and the development of more functional prosthetic limbs for amputees.

The Natural Sciences and Engineering Research Council is a federal agency

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*"These recipients were selected through a rigorous peer-reviewed process and are being provided additional support so that they can maximize the results of their breakthrough."*

**- Dr. Suzanne Fortier, President of NSERC**

whose vision is to help make Canada a country of discoverers and innovators for the benefit of all Canadians. The agency supports some 28,000 students and postdoctoral fellows in their advanced studies. The Council promotes discovery by funding more than 11,800 professors every year and fosters innovation by encouraging more than 1,500 Canadian companies to participate and invest in post-secondary research projects.

For the complete list of recipients, please visit the Natural Sciences and Engineering Research Council's Web site ([www.nserc-crsng.gc.ca](http://www.nserc-crsng.gc.ca)).

## Professor Hopes Research Gives People a Foot up on Diabetes

Posted by UNB on September 17, 2010

If you have diabetes and a sore on your foot that just won't heal, then Stacey Reading wants to talk to you.

Actually, what the professor of kinesiology at the University of New Brunswick really wants to do is dunk your injured foot in oxygenated water to see if it will

get better.

"This is something that no one has ever really ever looked at," he said in a recent interview.

"This is pretty new stuff in terms of what we are doing."

Reading said last year he was ap-

proached by a Fredericton company called InVentures Technologies Inc., which produces the equipment that puts the extra oxygen into water.

Read the full story at the Daily Gleaner.

## Web Science: The New Frontier

Posted by UNB on September 27, 2010

To Chris Baker, the World Wide Web's existence has been "like the birth of a new planet."

Two decades in, the web – which helps Internet users access information – has billions of pages, links and other resources that make up the largest information repository in human history.

Baker, a University of New Brunswick researcher, is asking himself, "What now?"

The answers, he says, might be found through work in a new field called web science.

"What's exciting is that there is a movement towards acknowledging that the web as an entity, having only been around for 20 years, has dramatically transformed," Baker says in an interview.

"In order to understand it and try to improve it, we need to turn it into a discipline of its own."

Different than computer science, web science is seen as an interdisciplinary field that includes computer science, but also philosophy, sociology and other disciplines.

Today, Baker is at a meeting of the minds on the topic called Web Science: the New Frontier, at the prestigious Royal Society in London where great scientific thinkers including the web's creator, Sir Tim Berners-Lee, will speak.

The full story appeared in the Telegraph-Journal.

## Diversifying Salmon Farms Works: UNB Researcher

Posted by UNB on September 27, 2010

Growing mussels and seaweed alongside farmed salmon makes sense financially and environmentally, a New Brunswick research scientist says.

Thierry Chopin at the University of New Brunswick in Saint John has been studying the benefits of growing the animals and plants together for 15 years, and has been working with the salmon aquaculture company Cooke Aquaculture to test the integrated system at eight salmon farms.

At \$190-million a year, farmed salmon

is New Brunswick's biggest cash crop. However, fish waste and uneaten feed pose environmental concerns and force farms to move their cages to let sites become clean.

Having mussels and seaweed alongside the salmon balances the ecosystem because after the salmon release nutrients into the water, the mussels absorb the organic components and seaweed takes in the inorganic parts, Chopin says.

Diversified sites can weather bad years for salmon better than sites that grow fish alone, providing economic stability

to farmers, he says.

There's another perk, too: Chopin says the mussels are considerably plumper than the ones people would normally see at the grocery store, with a high concentration of omega-3 fatty acids.

Omega 3 fatty acids reduce the risk of cardiovascular disease.

[CBC New Brunswick.](#)



## Saint John Now Home of Urban & Community Studies Institute

Posted by UNB on October 26, 2010

Saint John is a unique Canadian city. It is rich in urban history and, as New Brunswick's industrial engine, is continuously experiencing major social, economic and technological changes. It is Canada's smallest census metropolitan area, but it faces distinctive challenges surrounding immigration, population migration, poverty and economic development.

Saint John is a living laboratory, an urban area of great interest to researchers across the country and North America. That is why it is the ideal location for the University of New Brunswick's Urban and Community Studies Institute (UCSI).

This multi-disciplinary institute will make its home in historic Beaverbrook House in Uptown Saint John. Its mission will be to promote research, teaching and dialogue on urban and suburban life in New Brunswick, as well as the challenges, opportunities and sustainability issues facing small and medium size urban communities in the province and elsewhere. The UCSI will contribute to public policy discussions about urban growth and decline in New Brunswick, help shape new curricular directions at UNB Saint John, and enhance our understanding of the myriad forces that are currently shaping New Brunswick's urban and suburban communities.

UNB politics professor Don Desserud

has agreed to serve as the inaugural director for the first year of the institute's mandate.

"The Urban and Community Studies Institute is a natural development for the University of New Brunswick's Saint John campus and it is anticipated to become one of the areas of excellence for which UNB Saint John will become known," says Dr. Desserud.

"Our goal is not to duplicate any of the great work being done by our local and provincial organizations and agencies, but to co-ordinate and encourage the study of the urban and community issues we face, and to centralize important research about Saint John."

In the spirit of partnership, the UCSI's remaining membership will eventually consist of a wide range of expertise representing faculty members from both UNB campuses and subject-matter expertise from across the Saint John area and around the province, including in the fields of urban governance, heritage planning, waterfront development, community social and economic planning, inner city revitalization, economic development, and poverty reduction.

Once established, the institute will also deliver a range of public outreach activities, including public lectures, workshops and conferences.

"Not only will the Urban and Community Studies Institute develop a broad, Saint

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*"Our goal is not to duplicate any of the great work being done by our local and provincial organizations and agencies, but to co-ordinate and encourage the study of the urban and community issues we face, and to centralize important research about Saint John."*

**- Dr. Don Desserud, University of New Brunswick professor**

John-specific research base, but we hope it will also be of great benefit to the general public," says UNB Saint John Vice-President Robert MacKinnon.

"I believe that the lessons learned through the work of the Urban Institute will have national and international relevance."

A reception will be held on Wednesday, Nov. 3, at 3 p.m. at Beaverbrook House to kick off this exciting project. Please RSVP by Monday, Nov. 1 to Rosemary Dionne if you plan to attend, 506-648-5594, [rdionne@unb.ca](mailto:rdionne@unb.ca).

For more information, or to arrange an interview, please contact Allison Brinsmead, Communications Officer, UNB Fredericton, 506-458-7969, or email [allisonb@unb.ca](mailto:allisonb@unb.ca).

## UNB Researchers Involved in NASA-funded Research Project on St. John River Watershed

Posted by UNB on November 9, 2010

A million dollar project funded by NASA will include the work of two researchers from the University of New Brunswick.

Brigitte Leblon and Armand LaRocque are part of a multidisciplinary team studying three major watersheds in New Brunswick and Maine. They are examining the Androscoggin/Kennebec, Penobscot and St. John rivers, and the Gulf of Maine to see how much water, carbon and nutrients are moving through forested and agricultural lands, as well as wetlands, into the rivers and the coastal marine environment.

The project recently received a three-year, US \$1.1 million grant under NASA's Research Opportunities in Space and Earth Science program. Although international in scope, the project is particularly relevant to Canada's and New Brunswick's economy and natural resources.

"We want to understand how these materials are changing in quantity and quality through river transport and inter-

action with the coastal ocean currents, which will have broader impacts on socially relevant issues like ground fisheries and harmful algal blooms known as red tides," said Dr. Leblon.

The team will use NASA and RADARSAT-1/2 satellite imagery to assess how dissolved organic carbon and nutrients are travelling through and transformed in these major watersheds, and in what quantity.

The research project will use historical data to develop a baseline of land use and climate change over the past century, and will help predict how hydrology and carbon cycling is likely to be altered with projected changes over time.

"What's unique about this project is that it is one of the first times that remote sensing is being used over both the terrestrial watersheds and the marine environment to examine global climate change questions," said Dr. Leblon.

Dr. Leblon is a professor specializing in remote sensing, photo-interpretation

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*"What's unique about this project is that it is one of the first times that remote sensing is being used over both the terrestrial watersheds and the marine environment to examine global climate change questions."*

**- Dr. Brigitte Leblon, University of New Brunswick professor**

and GIS at the UNB Faculty of Forestry and Environmental Management. Dr. LaRocque is a researcher in the same faculty who specializes in geomorphology, GIS, photo-interpretation and remote sensing.

The research team also includes scientists from Bowdoin College, Michigan Tech University, U.S. Geological Survey, and Yale University. The members represent diverse backgrounds such as terrestrial remote sensing and GIS, aquatic biogeochemistry, hydrology, carbon isotope analysis, and ocean remote sensing.

## UNB Saint John Researchers & Saint John Police Partner to Tackle Domestic Violence

Posted by UNB on November 10, 2010

The Saint John Police Force is assisting in a research study taking an in-depth look at domestic violence.

The force is partnering in a research project at the University of New Brunswick in Saint John that will examine 200 randomly chosen cases of domestic violence in the city since 2004.

Sgt. Joe Oliver, with the force's Family Protection Unit, said the findings of the research could help police better handle cases of assault in the future.

"A lot of resources are burned up during domestic violence investigations so if there's an opportunity to fine-tune what we're doing, to respond ... in a more proactive fashion or timely fashion, if that's something that we can develop down the road, if there's something to be learned from this research ... it's important to keep an open mind," he said.

Oliver said domestic violence investigations are further complicated by the

intimate relationship between both people involved, and he believes the research can help officers navigate those cases more successfully.

"The general understanding is domestic violence is behavioural-based. It's activity that's normally learned in the home and passed on through friendships or interaction with friends [or] family," Oliver said.

"In situations where people are experiencing difficulty, I think they resort to what they know and that's the behavioural aspect side of it. So if they respond in one fashion, traditionally they will continue to respond in that fashion, so you look at those behaviours, those traits, as a police service we can better respond to what's going on in our community. I think we need to be doing that."

He said the force is also hoping to learn how to better utilize and allocate police resources.

"Not only do we need to be providing services to the victim in regards to these investigations, but we may also need

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*"There's been a number of studies that indicate when you provide additional services to suspects there may be an opportunity to prevent future violence, so that's one of the hopes and goals that we have as part of this research.."*

**- Sgt. Joe Oliver, Saint John Police Force Family Protection Unit**

to be providing services to the suspect," he said.

"There's been a number of studies that indicate when you provide additional services to suspects there may be an opportunity to prevent future violence, so that's one of the hopes and goals that we have as part of this research."

Researchers are about halfway through the study and expect to present the finding in early 2011.

[CBC News New Brunswick](#)

## UNB Faculty of Education Launches Bi-Annual Journal Publication

Posted by UNB on November 16, 2010

The Faculty of Education at the University of New Brunswick is pleased to announce the publication of a new thematic education journal, titled *Antistasis: a New Brunswick Education Journal*. This publication is rooted in the vision of education as a public good, a theme that is reflected in the inaugural issue, now available.

The journal will be published twice a year and submissions are welcome from all stakeholders in the field of education including, but not limited to, faculty, school administration, teachers, support staff, parents, provincial school districts and the New Brunswick Department of Education.

The publication is available in limited print, free of charge. You can also find a link to the publication, which is available free in electronic format, on the Faculty of Education webpage at

[www.unbf.ca/education](http://www.unbf.ca/education).

Editor, Theodore Christou, says the publication is intended to create discussion and serve as a reference point on educational issues and topics.

“We hope that this publication will be a bridge, opening pathways and conversations on diverse educational subjects,” said Dr. Christou.

UNB Fredericton Dean of Education, Ann Sherman, says sharing individual experiences and scholarly research can only lead to growth in the field of education.

“To be able to share our experience and knowledge with students and others who might someday apply or extend our teaching and research in schools is exhilarating. Continued learning and professional growth are highly valued and I believe the learning and research opportunities we all participate in do

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*“We hope that this publication will be a bridge, opening pathways and conversations on diverse educational subjects.”*

**- Dr. Theodore Christou, University of New Brunswick professor & Editor of *Antistasis: a New Brunswick Education Journal***

contribute to the public good.”

Submissions and feedback are being accepted for the next issue, the subject of which will be ‘Technology and the Promise of Progress in Education.’ Submissions can be forwarded to the editor prior to Jan. 31, 2011. Guidelines for authors are outlined on the final page of the published document.

For information or submissions, contact Theodore Christou, assistant professor, UNB Faculty of Education, at 506-453-4992, or [antistas@unb.ca](mailto:antistas@unb.ca).

## UNB Researcher Partnering with Industry

Posted by UNB on December 22, 2010

Kevin Englehart's research is changing lives, one person at a time. A professor of electrical and computer engineering and the associate director of the Institute of Biomedical Engineering at the University of New Brunswick in Fredericton, Englehart and his team create "myoelectric" artificial arms and hands for amputees and those born with limb deficiencies.

Clients have ranged in age from four months to 72 years, and each device is custom fitted. The institute has a regular clientele of about 120 people in a "living clinic" environment that combines UNB students and faculty with community and industry partners.

And yes, Englehart has heard the knock against Canadian companies: They aren't competitive and lag in every measure with regard to research and development. He admits it's not an unfair statement. "But in the last five to 10 years," he says, "a lot of people have been trying to change that situation."

One way is to encourage companies to partner with universities. "Developing such industry partnerships is challenging," admits Englehart. In his case, the economics of artificial limbs represent a small market, he says. Pushing the technology envelope is also difficult and expensive, which means partnering with those who can absorb the R&D costs. "For years we did a lot of research that contributed to a body of knowledge but didn't really approach a commercially ready product," says Englehart. "There was no big breakthrough to motivate a company to do clinical trials to bring it to market." However, considerable improvements in prosthetics and key partnerships with, for example, the renowned Rehabilitation Institute of Chicago (RIC) have enabled the budding commercialization of this technology.

At UNB, partnering with industry falls under the rubric of the Office of Research Services (ORS); it represents what Englehart describes as a fundamental paradigm shift that occurred about a decade ago on the Fredericton

campus. "It began with Greg Kealey, UNB's vice-president of research, who changed the way commercial research was done at UNB," says Englehart. "He essentially rebuilt that office. Today there are people here that specialize in intellectual property and individuals dedicated to the health care and government sectors. These people are very knowledgeable and, as a researcher, they have paved the way for me."

### Connecting the dots

Chris Mathis is the manager of knowledge transfer at UNB's ORS. He says its main mandate is "connecting the dots industry needs to what our faculty can provide to solve those needs." The goal at the ORS is to accelerate the transfer of knowledge and technologies to commercial and public partners. Commercial partners receive the benefit of the university's students, faculty, and technologies, as well as access to academic funding sources, to increase their competitiveness and reduce the financial risks associated with R&D.

Mathis envisions a "double-swing door" concept: the ORS provides the outgoing push of technologies as well as the incoming pull to access knowledge. "There's so much more opportunity out there than we can necessarily realize, but what we have at UNB is a double-swing door: requests are coming in, technologies are going out, and we're constantly trying to place research and partnership funding."

Kealey points out that the only way the process can work is through reciprocity. "If there's no market pull, we're not going to succeed in pushing things out,"



he says. "The model works when we're hand-in-glove with local industry." Integration is essential, and Kealey's office strives to offer interested parties an array of services. He wants to elevate industry awareness of what the university brings in terms of resources and funding opportunities and suggests, "You give me a quarter and I'll get you 75 cents."

The numbers reflect his confidence. The ORS experienced 34% growth in research between 2004 and 2008, more than \$55 million a year in research revenue between 2004 and 2009, and more than \$10 million in new ACOA Atlantic Innovation Fund (AIF) commitments. "We've got a lot of licenses and spinouts," says Kealey. "What we've realized to date is still modest, but

**UNB Researcher Partnering with Industry (continued)**

there's a lot of activity. If our bunt singles turn into home runs, I envision considerable economic benefit for the region."

Both Kealey and Mathis cite the functional role of Springboard Atlantic, a network of 14 universities and five colleges that supports the commercialization of research in Atlantic Canada. It works to connect publicly funded research and educational-organization members with industry experts through programs and services. "Any industry member can come into one of the portals and say, 'I'm looking for this.' If you can't provide the solution, you can reach out to colleagues at 19 institutions to satisfy the client's need," says Mathis. "It significantly reduces your investment into what's going to achieve sales."

Indeed, benefits have accrued. The Association of Atlantic Universities notes on its website that 17 universities in 25 Atlantic Canadian communities have a total payroll in excess of \$1 billion, an economic output of \$4.4 billion, \$2 billion in GDP; \$510 million in R&D, and

represent 63% of regional R&D .

[...]

**Changing the game**

Back in Fredericton, Kevin Englehart is working on something he believes is going to be a real game-changer: The Institute has secured AIF funding to develop a new UNB-branded prosthetic hand that will be in clinical trials for the next two and a half years. The application of cutting-edge research into human/machine interface and the installation of smaller and faster microprocessors have produced a device that's much more dexterous, affordable, and capable.

The new technology stems from collaborations with the U.S. Department of Defense through its R&D division, DARPA (Defense Advanced Research Projects Agency). "Between 2005 and 2009, we were seconded as a subcontractor on two projects," says Englehart. DEKA Research and Development Corporation in Manchester, N.H., led one, while the other, which Englehart says

was much more ambitious, involved the Applied Physics Lab at Johns Hopkins University.

"Basically, they wanted the bionic man," says Englehart. "From the very beginning, fundamental researchers like myself knew this was impossible, but they brought people together to discuss brain implants and implants in the nerves." Some of the contracts with DARPA involved some extraordinary engineering. With an understanding of how to build the most complex systems in the world, the researchers at UNB gained a unique sense of what was enough to deliver something an amputee could wear. "We know how to build prosthetics for real life," says Englehart, "and that's what you need at the end of the day."

Read the full story in this month's [Progress magazine](#)

## UNB Researcher Exploring Safer, Greener Buildings for China

Posted by UNB on January 13, 2011

In the cavernous basement that's part workshop and part laboratory beneath the University of New Brunswick's Wood Science Technology Centre in the Hugh John Flemming Forestry Complex, a small house is being constructed with laminated structural wood to test for strength and humidity control.

Meanwhile, 14,000 kilometres away, housing construction companies in Chi-

na are searching for building materials that are earthquake resistant.

Meng Gong, the centre's director, was in China in December meeting with officials interested in our wood, our wood technology and our wood research.

He also visited construction sites in China that are using Canadian wood.

"We discovered there is great potential

for New Brunswick timber manufacturers," he said.

"Right now, wood construction in China is in the infancy stage.

"They can learn a lot from Canada."

Read the full story at the New Brunswick Business Journal.

## UNB Researchers Awarded Nearly \$800,000 from CFI

Posted by UNB on January 24, 2011

Four research initiatives at the University of New Brunswick have been awarded a total of \$790,044 from the Canadian Foundation for Innovation (CFI).

"The investments announced at UNB will further enhance our country's reputation as a destination of choice for outstanding researchers," said Dr. Gilles G. Patry, president and CEO of the CFI. "They will make our universities even more competitive when it comes to attracting the best and brightest researchers from around the world."

Greg Kealey, UNB's vice-president research and provost welcomed the CFI's investment.

"Partnerships, such as the one we have with the CFI, allow us to be a leader in discovery, innovation and entrepreneurship," said Dr. Kealey. "The UNB researchers recognized today are making some significant contributions to our country."

Thanks to a \$368,724 contribution from the CFI and in partnership with the New Brunswick Department of Health, Nicole Letourneau and Ted McDonald will set up a health policy laboratory at the University of New Brunswick.

Dr. Letourneau and Dr. McDonald's project is one of four research initiatives at UNB awarded money last week from the CFI in Guelph, Ont.

The Health Policy Laboratory is where Dr. Letourneau, Dr. McDonald and their team will collect and analyze health statistics from New Brunswick medical records to help provincial health care administrators address the province's most pressing health issues.

The other UNB researchers who were recognized last week were Victoria Chester, professor in kinesiology; Shawn MacLellan, professor in biology; and Adam Dyker, professor in chemistry.

Dr. Chester received \$136,518 for infrastructure for the new Human Performance Lab, which will be a feature in UNB's new Richard J. CURRIE CENTER.

The \$127,872 Dr. MacLellan received will go towards his research in gene expression in bacteria. His work will provide us with a better understanding of how bacterial diseases affect people.

Last, but not least, \$156,930 went to Dr. Dyker to open a specialized laboratory that will allow him to improve the batteries we use in everyday life, by

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*"Our government recognizes that supporting innovation is a key component to helping every region of the country grow and prosper."*

**- Keith Ashfield, Minister of National Revenue, ACOA and the Atlantic Gateway and MP for Fredericton**

making them less toxic and more efficient.

"Our government recognizes that supporting innovation is a key component to helping every region of the country grow and prosper," said Minister Keith Ashfield, Minister of National Revenue, ACOA and the Atlantic Gateway and MP for Fredericton. "We are proud to assist top institutions like UNB get the resources they need to foster innovative technologies."

CFI announced a total of \$61,291,274 in new funds to support 246 projects at 48 institutions across Canada.

For a complete list of the projects awarded, please visit [www.innovation.ca](http://www.innovation.ca).

## UNB Researchers Receive More Than \$1 Million from NSERC

Posted by UNB on January 28, 2011

Two University of New Brunswick research teams were awarded \$1,140,556 last week by the Natural Sciences and Engineering Research Council of Canada's Strategic Project Grants program.

Kelly Munkittrick, professor of biology at UNB Saint John, received \$591,500 to look at the recovery of fish populations near pulp and paper mills.

His research group will visit closed mill sites across the province to see whether the fish populations have recovered from reproduction effects by comparing the results to previous studies done in these areas when the mills were operational.

Brigitte Leblon, professor of remote sensing at UNB Fredericton, and her team were awarded \$549,056. The funding will go towards their work on the development of new sensors for the forest products industry. The project is being done in collaboration with UNB's

Magnetic Resonance Imaging Research Centre, scientists of FP Innovations, University of Toronto and Nagoya University in Japan.

This project will help the Canadian forest products industry achieve high processing efficiency by using sensing technologies that are able to monitor wood product quality in real time.

The funding announcement was made at the University of Waterloo by Gary Goodyear, Minister of State (Science and Technology).

"Supporting science and research is critical to Canada's future economic growth," said Minister Goodyear. "This investment will bring together 100 teams of some of the world's top researchers to work with industry on promising new projects that will help strengthen our economy, create jobs and bring other benefits for communities."

Greg Kealey, UNB provost and vice-president research says enhancing col-

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*"This investment will bring together 100 teams of some of the world's top researchers to work with industry on promising new projects that will help strengthen our economy, create jobs and bring other benefits for communities."*

**- Gary Goodyear, Minister of State (Science and Technology)**

laboration and partnerships is a priority because it will allow UNB to be a leader in innovation and entrepreneurship.

"NSERC's Strategic Project Grants program gives our researchers the opportunity to form partnerships and implement their research in our communities."

In total, the government will invest \$55 million through NSERC's Strategic Project Grants Program in support of more than 120 research teams across the country.



## Professor Developing Less Toxic Batteries

Posted by UNB on February 3, 2011

Adam Dyker's research is successful, someday the batteries in your cell-phone, laptop computer or even your car will be made of materials that are abundant, renewable and much less toxic.

The assistant chemistry professor at the University of New Brunswick has just received almost \$400,000 in research funding to create a laboratory to

develop cutting-edge organic batteries.

"The goal is to make batteries that have the active components, the parts that are actually doing the chemistry, be organic molecules rather than metal-based compounds," Dyker said in a recent interview.

"It's a fairly new area ... The advantages of these are they are safer. A lot of other batteries have toxic metals."

Organic doesn't mean fruits and vegetables, but rather carbon and nitrogen compounds associated with organic chemistry.

"These compounds, unlike metals, are a lot more renewable," said Dyker.

Read the full story at the New Brunswick Business Journal.

## Professor, Programmer Tackle Scary Problem

Posted by UNB on February 10, 2011

Walking into a room full of large, hairy spiders would be a terrifying experience for a person suffering from arachnophobia.

But a University of New Brunswick psychology professor and a Fredericton-

based game designer have worked together to create software to help people learn to overcome their fears of the eight-legged creatures.

Darren Piercy and Carl Callewaert call their new software Fear of Spiders Treatment Game HD.

"This is really interesting," said Piercy in a recent interview.

"It is cutting edge. It is very innovative."

Read the full story at the New Brunswick Business Journal.

## Biomass Energy Testing Lab Opens

Posted by UNB on February 23, 2011

The only biomass energy testing laboratory in Canada certified by the Pellet Fuels Institute was officially opened in Fredericton on Tuesday.

Atlantic Canada Opportunities Agency Minister Keith Ashfield, New Brunswick Natural Resources Minister Bruce Northrup and various officials from the University of New Brunswick cut the ribbon to open the Canadian BioEnergy Centre, which is located near the Hugh John Flemming Forestry Complex.

"It feels great to finally have it officially open," said Michael Albright of the Canadian BioEnergy Centre.

"The funding was much, much needed to support this new, growing bioenergy sector."

The lab has high-tech equipment such as an isoperibol oxygen bomb calorimeter that can quickly test the amount of energy given off by burning various wood pellets and wood chips.

There is also an N-Micro pellet mill that can create pellets of fuel out of various raw materials, standard test sieves with a wide variety of screen sizes to create uniform particles for pellets, a pellet-durability tester that tumbles pellets to see how much dust they give off and an ash fusion test furnace with digital imaging to test residue after burning for hard glassy slag called clinker, which

can damage a stove or furnace.

The lab also has a portable grinder that can grind a variety of wood and agricultural residue used to make pellets and briquettes on site rather than transport large samples to the lab.

The facility is equipped to do testing of stoves and furnaces.

"These new testing capabilities we have at our centre will allow us to ... build the best appliances, make the best fuel," said Albright.

Read the full story at the New Brunswick Business Journal.

## UNB Researcher to Lead Canadian Research Initiative to Address Water Shortages & Flooding

Posted by UNB on March 17, 2011

Within a single generation, recent studies show, water demand in many countries will exceed supply by an estimated 40 per cent, with one-third of humanity having half the water required for life's basic needs. In flood-prone places, meanwhile, catastrophic flood events normally expected once a century can now be expected every 20 years instead.

Kelly Munkittrick, University of New Brunswick Saint John biology professor and Canada Research Chair in Ecosystem Health Assessment, will be named scientific director of the Canadian Water Network (CWN) tomorrow in Waterloo, Ont. Dr. Munkittrick will lead the development of a network of innovative researchers, practitioners and implementers focused on providing clean, safe and sustainable water across Canada and internationally.

The anticipated crises creates a fast-growing need for technologies and services to discover, manage, filter, disinfect and/or desalinate water, improve infrastructure and distribution, and reduce water consumption by households, industry and agriculture. And Canada is well positioned to mobilize and share worldwide its extensive experience gained stewarding nine per cent of the world's freshwater supply.

"Canada can be a leader in global water issues, but it needs an engine that links the capacity with what the needs are in terms of applying knowledge to solving water issues," said Dr. Munkittrick. "CWN looks to fulfill that role, and will work with institutes like UNB's Canadian Rivers Institute, to achieve those goals."

Robert MacKinnon, vice-president UNB Saint John, says not only has Dr. Munkittrick is making a difference internationally with his research, but he's

also making a significant difference here at home.

"Kelly is an exceptional professor who is very popular with his students," said Dr. MacKinnon. "He's one of those professors whose door is always open."

Peter Steblin, chair of CWN's Board of Directors says Dr. Munkittrick is an accomplished and internationally recognized researcher as well as a leader whose skills will complement the team perfectly.

"Kelly has a deep history with CWN and has been involved in many capacities, including serving on the Board of Directors, the Program Management Committee, as a principal researcher and most recently as the lead in developing the watershed consortium," said Mr. Steblin. "I am delighted to welcome Kelly to the role of Scientific Director and look forward to working with him."

Dr. Munkittrick works at the Canadian Rivers Institute at the University of New Brunswick in Saint John, where he assesses the environmental impacts of industrial and agricultural activities and develops methods for environmental effects monitoring and cumulative effects assessment of multiple stressors on aquatic environments.

Dr. Munkittrick was the Associate Director of the Canadian Rivers Institute between 2001 and 2011, and has sat on international boards for scientific societies, technical experts and has led numerous working groups. He has helped organize numerous international meetings and workshops and has participated in several expert panels. He has active research projects that assess environmental impacts in Sri Lanka, Bhutan, Chile, Uruguay, Brazil, the United States and Canada, and he has worked, taught or given invited lectures in more than 25 countries.

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*"Canada can be a leader in global water issues, but it needs an engine that links the capacity with what the needs are in terms of applying knowledge to solving water issues."*

**- Dr. Kelly Munkittrick, University of New Brunswick professor and scientific director of the Canadian Water Network (CWN)**

### About the Canadian Water Network

Established in 2001 and hosted by the University of Waterloo in Waterloo, Ontario, the Canadian Water Network was created by the federal Networks of Centres of Excellence program to connect Canadian and international water researchers with decision-makers engaged in priority water management issues.

CWN brings together the expertise of researchers, engineers and their students with that of practitioners, policy-makers and implementers, pooling resources to respond to water challenges and ensure a healthy and prosperous future for generations of Canadians.

### About the University of New Brunswick

Established in 1785, UNB is one of the oldest public universities in North America. More than 11,000 full- and part-time students from more than 100 countries are studying on campuses in Fredericton and Saint John and several thousand more take UNB courses online and at partner institutions around the world. As the largest research institution in New Brunswick, UNB conducts more than 75 per cent of the province's university research. The university has an annual operating budget of more than \$165 million and employs more than 3,500 faculty, staff and students.

## UNB Researcher Finds Teens from Military Families Face Unique Stressors During Deployments

Posted by UNB on March 24, 2011

The findings of the first-ever Canadian study of adolescents in military families were released today in Oromocto, N.B., by a team led by University of New Brunswick researcher Deborah Harrison.

The study found that students from Oromocto High School who recently had a parent deployed to Afghanistan worried that the parent would either not return home or would return home "different." They felt a sense of responsibility for the emotional well being of the parent and younger siblings remaining at home, and experienced isolation in trying to cope with their problems if the parent remaining at home was stressed or preoccupied by the deployment.

Adolescent girls in particular assumed a large share of the family's emotional burden during long deployments.

Dr. Harrison, principal investigator and sociologist, says that once families are reunited after deployment, the psychological stressors continue if the returning parent has developed Post Traumatic Stress Disorder.

"We found that family life was almost always negatively affected by an injured parent's symptoms of anger and depression," said Dr. Harrison. "Some adolescents reported needing to go through a process of grieving the loss of their family as it had been before the

deployment. They also reported feeling very isolated—along with their families—by the stigma against non-physical injuries that exists in rank-and-file army culture."

The above interview findings were part of a larger study on the mental health and well being of adolescents in Canadian Forces families.

What the researchers didn't expect to find, in their 2008 survey of all the students at Oromocto High School, was that there is virtually no difference between the mental health of adolescents from Canadian Forces families and that of their civilian peers in the same community. Also, Canadian Forces adolescents have a more positive attitude towards school than their civilian peers.

Representatives of the research team and its partner in the project, New Brunswick School District 17, are discussing these and other findings at a two-day symposium in Oromocto this week, which will conclude with recommendations aimed at enhancing the support provided during deployments by the District's schools.

David McTimoney, superintendent of School District 17, says Oromocto High School already has some helpful programs in place and hopes that recommendations from this week's symposium will lead to even better support services for teens in Canadian Forces families.

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*"Participating in this research project and symposium is allowing us to have a second look at our work and determine where improvements can be made."*

**- David McTimoney, superintendent of School District 17**

"I am proud of the strategies that our district student services team has already developed, in an effort to respond to the needs of our students who are touched by the challenges of deployment in the Canadian Forces," said Mr. McTimoney. "Participating in this research project and symposium is allowing us to have a second look at our work and determine where improvements can be made."

This research initiative was undertaken by researchers at UNB, the University of Alberta, Ryerson University, and York University, in partnership with NB School District 17; and was funded by the Social Sciences and Humanities Research Council of Canada.

Oromocto (population 9,000) was the town chosen for the location of this study because it is developed around Canadian Forces Base Gagetown; one of the largest military training bases in the Commonwealth.

## New Grants Funded at UNB, 2010-11

### ACEnet

Virendra Bhavsar  
Zong-Chao Yan

### Archaeological Institute of America

Maria Papaioannou

### Atlantic Association for Research in Mathematical Sciences

John Grant McLoughlin

### Atlantic Climate Adaptation Solutions Association

Paul Arp  
Kerry MacQuarrie

### Atlantic Salmon Conservation Founda- tion

Allen Curry

### American Society of Pharmacognosy Foundation

Christopher Gray

### Canada Research Chair Secretariat

Michael Haan  
Douglas Willms

### Canadian Centre for Ethics in Public Affairs

Jeff Frooman

### Canadian Council on Learning Canadian Foundation for Innovation

Victoria Chester  
Adam Dyker  
Michael Haan  
Nicole Letourneau  
Shawn MacLellan

### Canadian Institutes of Health Research

Jose Domene  
Stephen Lewis  
Judith MacIntosh  
Ted McDonald  
Baukje Miedema  
Lucia O'Sullivan

### Cement Association of Canada

Michael Thomas

### Genzyme Corporation

Ted McDonald

### Grand Lake Meadows

Susan Blair  
Allen Curry

### Great West Life Assurance Company

Carmen Gill

### Harrison McCain Foundation

Karl Butler  
Theodore Christou  
Richard Cunjak  
Jose Domene  
Adam Dyker  
Sara Eisler  
Christopher Gray  
Joseph Hall  
Jula Hughes  
Nicole Letourneau  
Howard Li  
Christopher Martyniuk  
Sean McGrady  
Erin Morton  
Sasha Mullally  
Wei Song  
Lucia Tramonte  
Lin Wang  
Kate Weaver

### Lafarge North America

Michael Thomas

### National League for Nursing

Loretta Secco

### Natural Sciences & Engineering Re- search Council

Wayne Albert (2)  
Christopher Baker  
Bruce Balcom  
Myriam Barbeau  
Yevgen Biletskiy  
Charles Bourque  
David Bremner  
Michael Burt  
Juan Carretero  
Zengtao Chen  
Adam Chrzanowski  
Bruce Colpitts (2)  
William Cook (2)  
Richard Cunjak  
Les Cwynar  
Peter Dare  
Rickey Dubay (2)  
Adam Dyker (3)

### Mladen Eic

Kevin Englehart (2)  
Joseph Hall  
Katy Haralampides  
John Hughes-Clarke  
Heather Hunt (2)  
Ken Kent (2)  
Don Kim  
Dan Kucerovksy  
Peter Kyberd  
Brigitte Leblon  
David Lentz  
Howard Li (2)  
Janet Light Thompson  
Renjun Ma  
Shawn MacLellan (2)  
Christopher Martyniuk (2)  
Sean McGrady (2)  
Julian Meng (2)  
Kelly Munkittrick  
Yonghao Ni (2)  
Remy Rochette  
Seahra Sanjeev  
Ian Smith (2)  
Wei Song (2)  
George Stoica  
Hugh Thomas  
Michael Thomas  
Gilles Villemure  
Joseph White  
Guohua Yan  
Ying Zheng (2)  
Luis Zuluaga

### NB Department of Post Secondary Edu- cation & Training

Lynda Doige  
Laura Romero-Zeron

### NB Health Research Foundation

Victoria Chester  
Christopher Gray  
Nicole Letourneau  
Stephen Lewis  
Jacqueline Low  
Judith MacIntosh  
Shawn MacLellan

**New Grants Funded at UNB, 2010-11 (continued)****NB Innovation Foundation**

Jason Addison  
 Muhammad Afzal  
 Tillmann Benfey  
 Juan Carretero  
 Eduardo Castillo-Guerra  
 Zengtao Chen  
 Victoria Chester  
 Michel Couturier  
 Peter Dare  
 Ghislain Deslongchamps  
 Rickey Dubay  
 Michael Duffy  
 Adam Dyker  
 Mladen Eic  
 Kevin Englehart  
 Andrew Gerber (2)  
 Ali Ghorbani  
 Meng Gong  
 Joseph Hall  
 Bernie Hudgins (2)  
 Dirk Jaeger  
 P. T. Jayachandran  
 Usha Kuruganti  
 Peter Kyberd  
 Brigitte Leblon  
 Nicole Letourneau  
 Howard Li  
 Kecheng Li  
 Shawn MacLellan  
 Christopher Martyniuk  
 Christopher McFarlane  
 Sean McGrady  
 Yonghao Ni (2)  
 Brad Nickerson  
 Jack Passmore  
 Om Rajora  
 Rodney Savidge  
 John Spray  
 Ming Zhong

**NB Regional Development Corp.**

Nicole Letourneau / Ted McDonald / Michael Haan

**Networks Centres of Excellence**

Bruce Balcom  
 David Bremner  
 Liuchen Chang  
 Felipe Chibante  
 Simon Courtenay  
 Ali Ghorbani  
 Viqar Husain  
 Ken Kent  
 Kerry MacQuarrie

Yonghao Ni (2)  
 James Watmough

**Quebec – New Brunswick Cooperation Advanced Education & Research**

Remy Rochette

**Social Sciences & Humanities Research Council**

Patrick Bergeron  
 Theodore Christou  
 Wendy Churchill  
 Lynda Doige  
 Susan Fisher  
 Anette Guse  
 Emery Hyslop-Margison  
 Ted McDonald  
 Marc Milner  
 Erin Morton  
 Elaine Perunovic  
 Ellen Rose  
 Stephen Schryer  
 Alan Sears  
 Demetres Tryphonopoulos