Research Report 2014–16
MEMORIAL UNIVERSITY OF NEWFOUNDLAND
Foreword

Do unto others.

Those iconic words— the Golden Rule—hung on the wall of Dr. Richard Marceau's office as a daily reminder of how he approached life and work. Richard wanted the best for friends and colleagues. He also wanted the best for Memorial and Newfoundland and Labrador.

In the three years he spent at our university, Richard touched and inspired many people at Memorial and in our wider community. His positive impact will be felt for years to come.

Always generous with his time, Richard was passionate about the critical role Memorial’s research—across all disciplines—plays in increasing our understanding of important issues, in addressing opportunities and challenges, and in strengthening Newfoundland and Labrador.

This report captures our university’s diverse research activities covering the period of 2014–2016, during which—under Richard’s leadership—we focused on intensifying our strategic research efforts.

Research Infosource recently released new rankings for Memorial, noting our research growth in various areas. We place second among Canada’s medical/doctoral universities for research income growth from 2001–2015, an increase of 204.6%. Richard would have been delighted with that news and our progress.

Memorial is a better university because of Dr. Richard Marceau. This report is a tribute to his vision and achievements.

Richard was a valued colleague and friend and he is certainly missed.

— Dr. Ray Gosine, Vice-President (Research) Pro Tempore
Oct. 28, 2016
From a modest start nearly seven decades ago to multi-disciplinary, multi-national, multi-million dollar collaborations, Memorial University’s commitment to research excellence has been unwavering.

As Newfoundland and Labrador’s university, we have a special obligation to the people of our province—a commitment that’s exemplified through the visionary work of our faculty, staff and students.

Two years ago, the Board of Regents approved our Strategic Research Intensity Plan (SRIP), a roadmap that builds on our institutional Research Strategy Framework supporting Memorial’s vision “…to be one of the most distinguished public universities in Canada and beyond…” by 2020.

We’re well underway to meeting that goal.

MAKING A DIFFERENCE

SRIP is working. Since its launch, funding from Tri-Agency competitions has increased; graduate programming has expanded; and investments for critical infrastructure have surged. We have streamlined processes and renewed models of customer service, which are key research enablers; and there are now more specialized researchers conducting more specialized research.

On each of our campuses, in every discipline, school and faculty, researchers share a common goal: to make a difference. Whether that’s empowering the next generation, saving lives, advancing knowledge or creating new technologies, we’re lucky to have such passionate creators, inventors and critical thinkers here at Memorial.

Through the ongoing, and increasingly important, support of our funding partners and collaborators, the impact of Memorial’s research is being felt throughout our province and around the world like never before.

And, the best is yet to come!

Warm regards,

Richard J. Marceau
Vice-President (Research)
Researchers are starting from the ground up to understand Newfoundland’s boreal forest soil and how farmers can turn that land into productive agricultural acreage.

Dr. Adrian Unc, associate professor of soil science with Grenfell Campus’s Boreal Ecosystem Research Initiative and its Environmental Science Program, says without a clear understanding of the fertility of the island’s unique boreal forest soil, farmers won’t be able to efficiently fertilize their land.

He’s working with researchers at Memorial, graduate students in Grenfell’s new master of science program in boreal ecosystems and agricultural sciences, as well as the provincial and federal governments.

With every soil sample, Dr. Unc is finding the soil systems are more complex than he expected. In other parts of the world, efforts to ensure soil fertility target the top four to 10 inches of earth. However, using these traditional management systems might not work for Newfoundland’s unique soil.

It’s still a working hypothesis, but Dr. Unc believes deeper layers of soil have a greater impact on the biology and biochemistry of the top layer. So, managing only the top layer of soil may not work here—meaning researchers need to develop new management practices specifically for Newfoundland that account for the particularities of soil layers a little deeper into the earth.

And the work doesn’t end there.

The province also faces the challenge of developing infrastructure to enable the smooth transfer of information among agriculture researchers in both the provincial government and Memorial.

Dr. Unc and his team are trying to identify the best research while at the same time create an infrastructure that does not exist—yet.

**FUNDER**

- Research & Development Corporation of Newfoundland and Labrador

**SPECIAL THANKS**

- Nagels Hill Agri-Products
Collaborative approach brings dietary advice to seniors living with diabetes in rural N.L.

While many seniors living with diabetes express an interest in changing their diets to improve their health, most don’t know where to start. Drs. Caroline Porr and Lan Gien from the School of Nursing and their team want to change that.

MANAGING DIABETES
They’re working on a research project that aims to clarify dietary information and make it more accessible to seniors attempting to better manage their diabetes in rural Newfoundland and Labrador.

Research shows that seniors have a hard time changing their diet because the educational materials they receive don’t relate well to their traditional foods. Some of the Newfoundland and Labrador dishes seniors have enjoyed throughout their lives are precluded or should be consumed in moderation. Foods that are approved for everyday consumption tend to be too expensive or inaccessible for most seniors living in the province.

FOCUSING ON PRACTICAL ADVICE
The team held a research focus group in Conception Bay North to find out what types of information seniors thought they needed to better manage their diabetes. Most notably they wanted to know what kind of foods they should eat and if the recommended foods could be bought at the local grocery.

Drs. Porr and Gien and the team then explored with seniors how information could best be communicated. Most seniors rely heavily on advice from friends and family for information, whether out of trust or due to literacy barriers. Seniors liked the idea of sharing expert information with one another. As a result, the team is working with the Centre for Innovation in Teaching and Learning to provide tailored dietary advice to rural diabetic seniors through a series of easy-to-access videos.

COLLABORATIVE APPROACH
These videos and lesson plans will offer clear and relatable advice from other seniors, dietitians and the Canadian Diabetes Association. The team is also collaborating with the Seniors Resource Centre, folklorists and even a linguistics expert to ensure that Newfoundland and Labrador’s dialect and culture are captured and represented accurately.

Bridging the gap for seniors between diets and dialects, diabetes self-management and accurate information, and healthy foods and traditional dishes won’t be easy, but it’s a feat this team hopes will become a little less challenging thanks in part to their research project.

FUNDER
- Newfoundland and Labrador Centre for Applied Health Research
- School of Nursing

TEAM INVESTIGATORS
- Renee Crossman, Doreen Dawe, Dr. Karen Parsons, School of Nursing
- Drs. Jill Alison, Catherine Donovan, Barbara Roebotan, Yanqing Yi, Division of Community Health and Humanities, Faculty of Medicine
- Dr. Stephanie Young, School of Pharmacy

SPECIAL THANKS
- Bay Roberts 50+ Club
- Mallard Cottage
- Centre for Innovation in Teaching and Learning
Newfoundland and Labrador has a lot of catching up to do when it comes to developing harm reduction policies and programs, as well as carrying out critical drugs studies research involving people who use substances.

Dr. Christopher Smith, assistant professor in the School of Social Work, aims to change that with a new Research Exchange Group he founded through the Newfoundland and Labrador Centre for Applied Health Research that began meeting in July 2015.

The interdisciplinary, inter-sectoral, user-centred group is helping identify policy-relevant research priorities related to substance use, harm reduction and addiction treatment services across Newfoundland and Labrador.

The team is conducting a needs assessment of injection drug users in the greater St. John’s region. Dr. Smith says data collected as part of this large-scale, community engagement assessment would be useful for the development of new harm reduction programs.

MEANINGFUL IMPACT
Dr. Smith’s policy-driven scholarship seeks to make a meaningful impact on the every day lives of people who use drugs, with the hope of situating Newfoundland and Labrador as a Canadian leader in harm reduction practice and drug policy reform.

His primary goal is to ensure those who use drugs are involved in research and policy-making.

Dr. Smith has assembled a large multidisciplinary research team, including researchers from the Faculty of Medicine, School of Nursing and School of Social Work, and has met a multitude of community partners. These include Eastern Health, the Department of Health and Community Services, THRIVE, Street Reach, Choices for Youth, Stella’s Circle, the Safe Harbour Outreach Project and the AIDS Committee of Newfoundland and Labrador, which will serve as the primary project partner.

The second project involves the development of a “peer training” program that will enable people with lived experience of substance use to become actively involved in the provision of harm reduction services, and, eventually, other aspects of harm reduction policy and practice such as outreach, research, evaluation and policy development/implementation.

SAVING LIVES
There’s plenty of work to do. But Dr. Smith’s goal is the creation of an independent, user-run, user-led organization in St. John’s that will serve as a source of empowerment among people who use drugs. Currently there’s no such organization in this region of Canada.

The intent is to create opportunities for past or present people who use drugs to train researchers, policy-makers and front-line social service providers and, in turn, help save lives.

Since January 2016, Dr. Smith has published two books related to his research: *Addiction, Modernity, and the City: A Users’ Guide to Urban Space* and >>
Critical Approaches to Harm Reduction: Conflict, Institutionalization, (De-)Politicization, and Direct Action, which he co-edited with Zack Marshall, a Canadian Institutes of Health Research Fellow and doctoral candidate in the Division of Community Health and Humanities in the Faculty of Medicine. Dr. Smith wrote the book’s preface and contributed one of the 11 chapters, which includes contributions from leading researchers in the fields of public health, history, epidemiology and sociology from areas including Canada, the United States and Portugal.

COLLABORATORS
• Tree Walsh, harm reduction manager, AIDS Committee of Newfoundland and Labrador
• Zack Marshall, PhD candidate and CIHR Fellow, Division of Community Health and Humanities, Faculty of Medicine

PARTNER
• Newfoundland and Labrador Centre for Applied Health Research

FUNDER
• AIDS Committee of Newfoundland and Labrador
Music of the heart

DR. JANE GOSINE

Researchers explore social, expressive and cultural benefits of community music therapy

Music has the power to energize, calm or evoke intense emotional responses.

It’s been said that music can be far more powerful than language as it can help individuals with disabilities overcome communication barriers. For Dr. Jane Gosine of the School of Music, that’s the kind of experience she searches for in her research.

As a result of volunteering with Easter Seals Newfoundland and Labrador, Dr. Gosine embarked on a three-year research project. The goal was to examine the benefits of music therapy on teens and young adults primarily with a diagnosis of cerebral palsy. She collaborated with Deborah Hawksley and Susan LeMessurier Quinn, accredited music therapists and professional associates in the School of Music.

BUILDING A SENSE OF COMMUNITY

Music therapists take an eclectic approach to developing both a musical and therapeutic relationship with their clients. They utilize therapeutic interventions such as improvisation, song writing, vocalization, movement to music, music listening and lyric analysis to promote physical, social, emotional and spiritual health.

The project examined how music therapy and collaboration with well-known local musicians, such as Kellie Walsh, Kellie Loder, Whitney Rowe, Ashelin and Séan McCann, could increase participants’ self-confidence, communication skills and sense of community.

One thing clearly evident was that participants used music as a form of communication or a form of expression. Considering some of the individuals in the group were non-verbal or experienced severe limitations to how they could move or perform with instruments, this finding was significant. The desire to participate with the group motivated and enabled participants to overcome some of their everyday challenges to perform.

INTERNATIONAL COLLABORATION

The research benefited from collaboration with Dr. Leonard Lye and students from the Faculty of Engineering and Applied Science, who built a special guitar stand to allow greater independence for group members with limited mobility. It also led to an international collaboration in the United Kingdom with music therapist Ray Travasso who works with the East Anglia Children’s Hospices and its Treehouse Choir. The project is examining how singing together can build a sense of community and contribute to increased well-being for the choir’s participants.

Through her research, Dr. Gosine has seen how music can promote inclusion and create a sense of community and belonging—an experience that has left a profound impression on her—one she’ll carry through with her into future research projects.

FUNDERS

- Social Sciences and Humanities Research Council of Canada/Vice-President’s Research Grants Program

COLLABORATORS

- Music Therapists Deborah Hawksley and Susan LeMessurier Quinn
- Dr. Leonard Lye and students from the Faculty of >>
Engineering and Applied Science

PARTNERS

- Easter Seals Newfoundland and Labrador
- East Anglia Children’s Hospice (EACH)
  Treehouse Choir
Empowering educators teaching science, technology, engineering and mathematics

All across the province, the classroom setting where children sit attentively in their seats is quickly becoming a thing of the past. Traditional learning methods are being disrupted; students are bustling about the classroom and teachers are enjoying every minute of it.

While it may sound chaotic, it’s exactly what many teachers are relying on to teach subjects like science, technology, engineering and mathematics (STEM). Dr. Karen Goodnough, a researcher in the Faculty of Education, says not all primary/elementary teachers feel confident teaching STEM subjects and are open to trying new methods.

NEW STYLE OF TEACHING
With increasing demands, teachers find it hard to stay up-to-date on STEM subjects. Some are not specialists in STEM subjects; others may not have the tools or know where to start; while others lack the resources, time or opportunity. Often it requires embracing a new style of teaching to better inform and instruct students in these subjects.

Dr. Goodnough and her team lead The Memorial University/Hibernia STEM Teacher Inquiry Program, a project funded by the Hibernia Management and Development Company Ltd. Each year they help between 60-80 teachers build confidence through inquiry-based classroom practices in STEM subjects.

What this looks like in the everyday classroom is often the introduction of new tools or new teaching styles to capture students’ attention and help them better understand the material.

INTERACTIVITY KEY TO LEARNING
Some classrooms incorporate iPads as a new means of interacting with subject content. Others have explored video games or computer coding to teach children about building models, programs or applications. Some teachers ask students to review teacher-made videos before class, while other teachers eschew the traditional desk and chair arrangement in favor of a more fluid and active learning spaces.

Interactivity is key. Children collaborate via whiteboards and observe how other children approach problem solving. They write. They ask questions. They are active and engaged. These new tools and teaching approaches enable students to learn at their own pace and help make the subject matter relevant to their lives.

ENHANCING TEACHER EXPERIENCES
Dr. Goodnough and her research team are in constant contact with teachers, providing support. For their part, the teachers are committed to intensive learning; they re-group with the research team and other educators, sharing their experiences and ideas for the classroom. In the end, it’s all about enhancing the experience for teachers and helping foster student success.

The program is headed into its third year with no signs of slowing down. Learn more about the program online.

FUNDER
• Hibernia Management and Development Corporation Ltd.

SPECIAL THANKS
• St. Andrew’s Elementary
All across the world, energy demands are at an all-time high. This global issue is complex — no two regions are exactly alike and each faces a unique challenge. Managing the global energy crisis requires some mass-scale creative problem solving.

Dr. Kevin Pope, an expert in thermo-fluids and renewable energy in the Faculty of Engineering and Applied Science, and his team of graduate students have joined the global brigade by helping small, remote communities in Newfoundland and Labrador lessen their dependence on diesel-generated power by utilizing readily available natural resources to create renewable energy.

**HOME COURT ADVANTAGE**

As an island in the Atlantic Ocean, positioned at the crossroads of the Labrador and Gulf currents, Newfoundland receives plenty of wind. In fact, the onshore gales of the province have the highest wind velocity of any in Canada. While this can be troubling for many other industries, it’s an advantage for the energy sector.

Dr. Pope and his engineering research team are assisting Nalcor Energy in its integration of wind turbines and hydrogen equipment with the existing diesel generators in Ramea, a small remote community on the south coast of the island. The turbines support the community’s electrical grid during high-load periods. When the load is low the wind energy is used to produce hydrogen gas that is then converted back to electricity through a hydrogen-fuelled generator. This helps support the community when wind speeds are too low to operate the turbines.

**SEARCHING FOR NEW SOLUTIONS**

High precipitation and ice accretion, unsteady wind conditions and limited accessibility are the main barriers the province faces in creating a reliable wind power development. Using data collected in their research, Dr. Pope and his team tackle these challenges by proposing new solutions for site selection, improving performance and energy storage technologies.

Nalcor Energy says the project at Ramea is one of the first in the world to integrate wind, hydrogen and diesel generation into one isolated electrical system. They’ve documented an average reduction in Ramea’s diesel fuel usage by approximately 18 per cent annually. That’s essentially 710 less tonnes of greenhouse gas emissions and a reduction of 190,000 litres of diesel every year.

Dr. Pope recognizes that the solutions he and his team create for Ramea could have a global impact if utilized in other similar regions throughout the world. This capacity to make an impact is the motivation that drives the team to continually overcome the challenges they face in their work.

**FUNDER**

- Research & Development Corporation of Newfoundland and Labrador

**PARTNER**

- Nalcor Energy, with funding from the Atlantic Canada Opportunities Agency
A fighting chance

DR. LALEH ALISARAIE

Researchers aim to develop new drugs for infants diagnosed with cystic fibrosis

It’s a small step in the right direction and one that could have a big impact, giving fresh hope to some of the most vulnerable.

Cystic fibrosis (CF) is the most common fatal genetic disease affecting children and young adults in Canada. For those living with it, every day can be a battle to breathe comfortably. Symptoms vary, but more importantly, there’s still no known cure. Dr. Laleh Alisaraie wants to change that. She would like to give those living with CF—particularly infants—the fighting chance they deserve to live longer, healthier lives.

HEALTH-RELATED RESEARCH

CF is caused by a mutation in a gene affecting the movement of salt in and out of cells. The result is salty sweat, plus thick mucus, that can obstruct the lungs and making it hard to breathe. CF knows no limits; it can also affect the pancreas, liver and kidneys. Dr. Alisaraie is leading a new research study in the School of Pharmacy with the long-term goal of developing drugs for infants diagnosed with CF. Effective treatments at an early stage would help prevent organ damage, allowing more babies to survive.

Utilizing computer calculations and molecular modelling simulations, Dr. Alisaraie hopes to better understand why CF occurs in the first place.

MENTORING NEXT GENERATION

Not only is she advancing CF research, Dr. Alisaraie is also motivating a new generation of researchers. One such researcher is Blake Power, an undergraduate student in the Department of Chemistry, Faculty of Science.

He received funding from the University Student Summer Internship Program (USSIP) and the Memorial Undergraduate Career Experience Program (MUCEP) to work with Dr. Alisaraie. Both programs are net gains of Memorial’s Strategic Research Intensity Plan, which is structured to strengthen research at Memorial on all levels.

CHALLENGING BUT CRITICAL

Dr. Alisaraie’s team is made up of scientists and collaborators, such as Dr. John Hawboldt, a pharmacist clinician with the School of Pharmacy. The team’s next step is to design drugs based on the knowledge gained from their research. The goal is ambitious and challenging, but a critical one.

Current disease modifying therapy for CF is restricted to two expensive medications. Their research—and potential subsequent breakthroughs—would help put Memorial on the map and hopefully develop novel medications that will allow greater patient access to state-of-the-art therapy and a cure for the troubling disease.

FUNDER

- Memorial University of Newfoundland

COLLABORATOR

- Dr. John Hawboldt, School of Pharmacy

STUDENT

- Blake Power, undergraduate, Department of Chemistry, Faculty of Science
Peering into the past

DR. MEGHAN BURCHELL

Using biology and chemistry of shells for archaeological interpretation

You’ve probably heard of people reading used tea leaves to predict the future, but one Memorial researcher is using seashells to peer into the past.

Dr. Meghan Burchell, an environmental archaeologist with the Faculty of Humanities and Social Sciences, is examining shell middens in British Columbia, which are essentially large deposits of shells created by the harvesting, consumption and disposal of shellfish. Some of these shell middens date back thousands of years.

The first to integrate the biology and chemistry of shells into archaeological interpretation, Dr. Burchell is using shells to build a precise environmental and cultural record to interpret how people lived and interacted with the environment thousands of years ago. With a PhD in anthropology—and trained in archaeology and earth sciences—she’s curious about the strategies these people employed in times of environmental and ecological change.

She uses the example of the decline of the salmon industry between 2,000–4,000 years ago on the central coast of British Columbia. The salmon disappeared from the archaeological record, only to reappear later on. She examines shells from that period to see if there’s environmental change in their chemistry, which would impact salmon—and other fish—populations.

A typical research mission involves collecting living and archaeological shells and analyzing their microstructure, daily growth lines and shell chemistry. Dr. Burchell performs this analysis with a custom-designed microscope with a mounted drill and a precision saw, among other instruments.

Just as trees lines record a tree’s life, shell lines do the same for shellfish. Shell midden sites that have built up by people over thousands of years provide considerable information about the environment, like water temperature and salinity.

With a team of undergraduates and one master’s student in the areas of archaeology and engineering, Dr. Burchell is able to get an incredibly precise sea surface reconstruction and seasonal data from shells. This data denotes climatic and environmental change and can provide archaeologists perspective as to how and why people made the decisions they did in the past.

STUDENTS

Undergraduate
• Anna Sparrow, Archaeology
• Maggie Way, Archaeology
• Emma Culligan, Engineering and Applied Science
• Daniel Reese, Archaeology
• Megan Webb, Archaeology

Graduate
• Natasha Leclerc, Archaeology

FUNDER
• Social Sciences and Humanities Research Council of Canada

SPECIAL THANKS
• Ocean Sciences Centre
Newfoundland and Labrador has the highest incidence of familial colon cancer in the world.

Having the highest rate of all colorectal cancers in Canada, a person from Newfoundland and Labrador has a 30 per cent higher risk of contracting the disease and of dying from it than someone from Ontario.

While diet plays a role in the prevalence of colorectal cancer, the high frequency by which Newfoundlanders and Labradorians contract the disease led some researchers at Memorial, including Dr. Patrick Parfrey of the Faculty of Medicine, to believe there’s something bigger at play.

INTERNATIONAL COLLABORATION
Genes determine many of your traits such as your eye color, hair type or if you’ll have dimples. It may also play a role in whether or not you’re at risk for colon cancer. Dr. Parfrey and his team are investigating which genetic factors predisposing to this deadly disease make its occurrence so prevalent in Newfoundland and Labrador and whether that knowledge can play a role in preventing the cancer.

In collaboration with the University of Toronto and with international consortia, the multidisciplinary project has integrated input from molecular biologists, molecular geneticists, pathologists, clinical geneticists, surgeons, clinical epidemiologists, qualitative researchers, data management and health policy experts.

The project enrolled 750 consecutive incident patients from the population in the Newfoundland Familial Colorectal Cancer Registry to collect data on family history, epidemiology, diet, tumour pathology and genes. The work has yielded many insights that helped form the Familial Colorectal Cancer Clinic in 2010.

Participants from Central and Eastern Newfoundland had their family risk assessed to recommend colonoscopy screening frequency, among other lifesaving information.

HUNT FOR KNOWLEDGE
During the last 15 years, the project has identified that the high rate of familial cancer was not the result of a high penetrance (inherited mutations causing susceptibility to cancer) but perhaps a missing hereditability yet to be discovered.

Now with further funding, the team is preparing to develop a genetic mutation panel to hold all known mutations that cause familial colorectal cancer in the province. What started as a mission to identify the genetic cause of colon cancer has since become a hunt for the gene mutations responsible.

It’s worth noting that in addition to potentially saving lives and improving health outcomes for people around the world, the project is also providing invaluable experience for students who’ll pave the way for future genetic discoveries.

CO-INVESTIGATORS
• Drs. Mike Woods, Sevtap Savas, Roger Green, Jane Green, Christine Way, Peter Wang and Elizabeth Dicks, Faculty of Medicine

PhD STUDENTS
• Susan Stuckless, Tyler Walsh, Geoff Warden, Angela Hyde and Elizabeth Hatfield, Faculty of Medicine
FUNDERS

- Canadian Institutes of Health Research
- Department of Health and Community Services, Government of Newfoundland and Labrador
- Atlantic Canada Opportunities Agency
Newfoundland and Labrador is a hot-spot for visitors but a research team has uncovered just how popular the island portion of the province is for non-native terrestrial mammals.

The Rock—as it turns out—is so popular that almost half of the terrestrial mammals living there come from away.

Understanding the island’s community of terrestrial mammals, both native and non-native, and their impacts, is the topic of Dr. Shawn Leroux’s collaborative research project with Memorial alumnus and current biology PhD student Justin Strong. Dr. Leroux is an assistant professor in the Department of Biology.

Not much is known about the relationships among different terrestrial mammal species or the impact of non-native mammals on the island’s terrestrial mammal food web.

FIRST-EVER TERRESTRIAL MAMMAL FOOD WEB
Using data collected from provincial documents on native and non-native terrestrial mammals, as well as consulting existing research from Memorial and beyond, the team set out to better understand when non-native terrestrial mammals appeared on the island—and ultimately the impact of their arrival over time.

Their research led to the development of the first-ever terrestrial mammal food web for the island. A food web is a map of who eats whom, which is typically gleaned from animal diet studies. The hope is that the research will help inform future resource management decisions.

BIG CONSEQUENCES
The team discovered there are some big consequences when non-native species are introduced. For a large animal with few predators—such as the mighty moose—it has had free reign over forests and it appears they are preventing the natural regeneration of boreal forest communities on the island.

The arrival of some non-native species has increased the number of prey available for predators such as the coyote, a top non-native predator, which has flourished since they first arrived on the island around 1985. The thriving coyote population could have a devastating impact on native mammals if not effectively monitored and managed.

However, the increase in prey species due to the arrival of some non-native species may have a positive impact on some terrestrial mammals previously considered endangered in Newfoundland. For example, the arrival of the southern red-backed vole to Newfoundland may be contributing to the recovery of the previously endangered and native species, American marten.

More detailed information about Dr. Leroux and Mr. Strong’s research has been published in the peer-reviewed, open access journal PLoS ONE.

FUNDER
• Natural Sciences and Engineering Research Council of Canada

STUDENT
• Justin Strong, PhD student
Waste not, want not

DR. JOINAL ABEDIN

Industry can save money and protect environment: soil scientist

Saving money and creating a cleaner, greener environment.

That’s the vision Dr. Joinal Abedin has for Labrador. For him, opportunities in his adopted home are as immense as the Big Land itself. The soil scientist at the Labrador Institute is heading up a new project that could dramatically change the mining industry and, in turn, help keep harmful pollutants from seeping into surface water.

LABRADOR RESOURCES
Dr. Abedin is studying the effectiveness of biochar, a centuries-old practice of turning forestry waste into a soil enhancer. With mega-projects such as the Lower Churchill hydroelectric development well underway in Central Labrador, forests are being harvested to make room for progress. He wants to see that waste wood used to produce biochar.

ECONOMICAL AND SUSTAINABLE
Doing so would be beneficial to another longstanding and economic vital industry in Labrador: mining. As exploration of sulfide-bearing ore continues, waste rock turns into sulphuric acid known as acid mining drainage (AMD) when it's combined with water and air. AMD is harmful to fish and other aquatic life.

Adding biochar to mine waste is a no-brainer, contends Dr. Abedin. If it were, it could offer an economically viable and sustainable solution for managing sulfidic mine waste, preventing Labrador’s vital and rich natural ecosystem from being contaminated.

That innovative research is important to industry—and future generations—of the Big Land.

It’s also the kind of work that defines Memorial’s leadership when it comes to world-class research addressing provincial, national and international issues.

FUNDER
- Research & Development Corporation of Newfoundland and Labrador
Every second counts when finding and rescuing an offshore worker who has accidentally entered the sea.

This fundamental truth isn’t lost on Dr. Robert Brown, a professional engineer and research scientist at the Marine Institute’s Offshore Safety and Survival Centre Research Unit. He and his team are testing personal locater beacons—devices worn by offshore workers to help locate them quickly should they find themselves in the ocean.

COMMITMENT TO SAFETY
Safety is paramount within the offshore sector. The industry is continually working to advance equipment and procedures; this research project is a testament to that commitment.

The devices currently used in the offshore industry are regulated to withstand harsh conditions of a maritime survival situation while still successfully transmitting a distress signal.

BASELINE RESULTS
As part of his research, Dr. Brown will perform baseline tests with the devices on special mannequins that replicate the standard height and weight of real people.

Once complete, the baseline results will represent optimal performance of the locater beacons and act as a point for comparison when the team performs followup tests with the beacons in harsher offshore conditions.

In addition to the offshore industry, different beacon designs are being utilized throughout various sectors.

Dr. Brown and his colleagues aim to improve the understanding of how these devices work in realistic conditions and hope their research will provide guidance to manufacturers, regulators and industry. In the end, he hopes efforts can help improve emergency response for all people who work and play at sea.

FUNDERS
- Research & Development Corporation of Newfoundland and Labrador
- Petroleum Research Newfoundland and Labrador

SPECIAL THANKS
- Offshore Safety and Survival Centre (OSSC)
Financial institutions may need to adapt their approach to aboriginal entrepreneurs, researchers say

A research team in the Faculty of Business and Administration—led by Dr. Tom Cooper—is examining the unique challenges faced by Aboriginal entrepreneurs in accessing financing from mainstream banking institutions.

Research by Dr. Cooper, as well as Prof. Pauline Downer and recently retired Dr. Alex Faseruk, indicates financial institutions may need to adapt their approach in working with Aboriginal entrepreneurs and band-owned enterprises.

Dr. Cooper, who has studied Aboriginal businesses since 2007, says the credit profiles of Aboriginal business people may be very different than those of their non-Aboriginal counterparts. He notes that people living in an Aboriginal community don’t own their homes—rather, the band retains ownership. Therefore, that rules out a common financing avenue of mortgaging a home to start or expand a business.

Aboriginal business owners also face two complex taxation regimes—they’re not taxed when they sell goods and services on First Nations land, but they are taxed once they sell products or work outside their communities.

These challenges can make working for a band-owned enterprise more appealing for a young Aboriginal entrepreneur than starting a small business.

COMPLEX CHALLENGES

Band-owned enterprises also face their own challenges. While they’re more likely to be trusted in their communities than non-Aboriginal businesses, this trust demands that the Aboriginal business align its interests with the culture and expectations of the community, or risk failure.

They may also face changes in business leadership following band council elections that are held every two years. In an earlier study of Aboriginal-owned fishing enterprises in Atlantic Canada, Dr. Cooper found this had a direct effect on the bottom line.

As it turns out, this Memorial-led research is increasingly important as more Aboriginal communities and entrepreneurs try to start more businesses with help from land-claim settlement dollars, through joint ventures or financing from mainstream banking institutions.

CREATING FUTURES

Dr. Cooper says a better understanding of Aboriginal entrepreneurs and the challenges they face can lead to better policy decisions—and it can’t come soon enough as growing Aboriginal populations in rural parts of Canada seek better economic opportunities for themselves and their communities.

COLLABORATORS

• Dr. Alex Faseruk, retired professor, Faculty of Business and Administration
• Prof. Pauline Downer, Faculty of Business and Administration

FUNDER

• Ulnooweg Development Group Inc.
## Financials

### REPORTS 2014–16

#### TOTAL RESEARCH FUNDING

**2006/07 TO 2015/16**

<table>
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<th>Year</th>
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<td>2007/08</td>
<td>$87,128,000</td>
</tr>
<tr>
<td>2008/09</td>
<td>$90,196,000</td>
</tr>
<tr>
<td>2009/10</td>
<td>$90,674,000</td>
</tr>
<tr>
<td>2010/11</td>
<td>$97,871,000</td>
</tr>
<tr>
<td>2011/12</td>
<td>$110,005,000</td>
</tr>
<tr>
<td>2012/13</td>
<td>$101,461,000</td>
</tr>
<tr>
<td>2013/14</td>
<td>$91,620,000</td>
</tr>
<tr>
<td>2014/15</td>
<td>$94,362,000</td>
</tr>
<tr>
<td>2015/16</td>
<td>$90,267,000</td>
</tr>
</tbody>
</table>

#### TOTAL RESEARCH FUNDING

**2006/07 TO 2015/16**

#### SOURCES OF RESEARCH FUNDING

**2011/12 TO 2015/16**

<table>
<thead>
<tr>
<th></th>
<th>2011/12</th>
<th>2012/13</th>
<th>2013/14</th>
<th>2014/15</th>
<th>2015/16</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Federal Govt</strong></td>
<td>$46,332,220</td>
<td>$47,814,030</td>
<td>$40,737,067</td>
<td>$40,857,431</td>
<td>$39,172,843</td>
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<tr>
<td>(includes Granting Councils)</td>
<td></td>
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<tr>
<td><strong>Private Sector</strong></td>
<td>$26,474,110</td>
<td>$21,994,760</td>
<td>$28,211,113</td>
<td>$31,335,018</td>
<td>$30,708,710</td>
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<tr>
<td><strong>Non-Profit</strong></td>
<td>$7,352,660</td>
<td>$5,263,053</td>
<td>$5,263,559</td>
<td>$6,352,165</td>
<td>$6,523,698</td>
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<tr>
<td><strong>Provincial Govt - NL</strong></td>
<td>$29,244,910</td>
<td>$25,968,214</td>
<td>$17,202,834</td>
<td>$15,542,765</td>
<td>$1,2218,673</td>
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<tr>
<td><strong>Other^</strong></td>
<td>$601,330</td>
<td>$420,631</td>
<td>$205,158</td>
<td>$274,259</td>
<td>$1,643,107</td>
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<tr>
<td><strong>Total</strong></td>
<td>$110,005,250</td>
<td>$101,460,693</td>
<td>$91,619,731</td>
<td>$94,361,639</td>
<td>$90,267,031</td>
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</tbody>
</table>

^Other includes Individual, Provincial Government (Other), United States Government and Other.
# Financials

**REPORTS 2014–16**

## TOTAL RESEARCH SPEND

**2006/07 TO 2015/16**

<table>
<thead>
<tr>
<th>Year</th>
<th>Dollar Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/07</td>
<td>$75,674,000</td>
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<td>2007/08</td>
<td>$69,044,000</td>
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<td>2008/09</td>
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<td>2011/12</td>
<td>$107,078,000</td>
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<tr>
<td>2012/13</td>
<td>$127,816,000</td>
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<tr>
<td>2013/14</td>
<td>$87,782,000</td>
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<td>2014/15</td>
<td>$104,395,000</td>
</tr>
<tr>
<td>2015/16</td>
<td>$91,166,850</td>
</tr>
</tbody>
</table>

Note: *For the 2011-12 fiscal years, the increase in research revenue is due to changes in the methodology of allocating expenses on R&D.*

Specifically, expenditures on research infrastructure have been included. Effective 2011-12, and subsequent years, Total Research Spend has included expenditures on research infrastructure.
Credits

INVOLVED PARTIES

SPECIAL THANKS

Memorial University
   Office of the Vice-President (Research) Portfolio
   Division of Marketing and Communications
   Financial and Administrative Services
   Ocean Sciences Centre
   Offshore Safety and Survival Centre
   Centre for Innovation in Teaching and Learning
   Students, staff, researchers and faculty featured in this report

Moira Baird

Perfect Day

David Howells

Nagels Hill Agri-Products

St. Andrew’s Elementary

Easter Seals Newfoundland and Labrador

Bay Roberts 50+ Club

Mallard Cottage

AIDS Committee of Newfoundland and Labrador

Lester’s Farm

Funding partners and research collaborators featured in this report