

MATTERS

research

exploration

discovering the new frontiers of research

A virtual PIONEER
Searching for SIGNS
Pain RELIEF
Under THE SEA

Letter from the editor



As a kid who grew up in the '80s, my first recollection of anything that came close to a real-life explorer was probably that of Harrison Ford's Indiana Jones. The image remains iconic: weathered flight jacket, brown fedora and whip in hand, Indiana was the epitome of exactly what I thought explorers should be: adventurous, smart and relentless.

Fast forward almost three decades and you can find your very own Indiana right here at Memorial—treasure hunters mapping uncharted territories, solving problems, exploring the unknown, and pushing themselves—and others—to discover the new frontiers of research.

Like the adventurer who first exploded across the screen nearly three decades ago, they're also tenacious thrill seekers on their very own quests of exploration.

And, that's the theme of this issue of *Research Matters*.

Faculty, staff and students from disciplines far and wide are in the midst of innovative, cutting edge and valuable work.

They're curious crusaders whose research is impacting communities, businesses, industries and people across our province, country and around the world.

Minus any whips, they're real life explorers making a difference.

Jeff Green

A handwritten signature of Jeff Green in black ink, written in a stylized, cursive font.

Editor
Research Matters

*If we knew what it was we were doing,
it would not be called research, would it?*

– ALBERT EINSTEIN

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research
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Research Matters is published by the Division of Marketing and Communications for the Office of the Vice-President (Research), Memorial University of Newfoundland. Versions of some articles have previously been published in Memorial's *Gazette*.

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The research objectives of this ground-breaking endeavour include bringing the history of the Métis into the present day.



Understanding the past



Dr. Lisa Rankin

EXPLORING A CHAPTER OF LABRADOR'S HISTORY

by Janet Harron

THE FIRST MULTIDISCIPLINARY and comprehensive study of the Labrador Métis and their history is underway thanks to the efforts of Memorial researchers.

It's all part of a new project that has received major funding from the Social Sciences and Humanities Research Council of Canada (SSHRC) through the Community-University Research Alliances (CURA) program.

Directed by researchers in the Faculty of Arts, Understanding the Past to Build the Future, has received \$999,935 in funding for five years. The project has also received \$250,000 in funding from its partner the Labrador Métis Nation.

The research objectives of this ground-breaking endeavour include investigating Inuit occupation of southern Labrador, collecting and analyzing evidence of Inuit-European interactions, documenting cultural changes, and bringing the history of the Métis into the present day.

Dr. Lisa Rankin of the Department of Archaeology and her team initiated the research after the Labrador Métis Nation requested it in meetings with team members.

Dr. Rankin has worked closely with the Labrador Métis since beginning her Labrador fieldwork in 2001.

As part of this new project, she and her team are conducting new archaeological research to better understand the pre-contact and early contact period of Inuit occupation in southern Labrador. These investigations will be located around Inuit dwelling structures near Sandwich and Alexis Bays.

The team is planning to incorporate the information into school curricula for southern Labrador, and material for adult literacy support. This will in turn result in greater local content for use in social studies and history classes, hopefully attracting student interest and stimulating learning.

Métis students and adults will also be trained in archaeological field methods, archival research and ethnographic and educational work. ■

SIGNIFICANT STUDY

Several Memorial researchers are contributing to the Labrador Métis study:

Team member Dr. Hans Rollmann

of the Department of Religious Studies is conducting research in European and North American church archives as part of the project. His research on Moravian, Methodist and Anglican missions in Labrador will provide details of interactions between Inuit and Europeans along the Labrador coast. These church records are significant because they essentially document the origin of the Labrador Métis people, including marriages between resident Inuit women and European visitors. Moravian archival records also detail aboriginal movements between the north coast and southern Labrador.

Retired Memorial anthropology professor Dr. John Kennedy,

a pioneering scholar of the economic and social history of the southern Labrador coast, is searching archives for ships' logs, journals and diaries describing Labrador's social conditions of the 18th and 19th centuries. He will also be working closely with four Métis research assistants to examine historic stigma and contemporary Métis culture and identity.

Another Memorial University figure on the research team is **Dr. Mario Blaser, Memorial's Canada Research Chair in Aboriginal Studies**. His role is to work with community members to "translate" the results of the research into documentaries for educational purposes and for the wider public.

EXPERTS EXPLORE NEW WAYS TO INCREASE LOBSTER POPULATION IN RURAL NEWFOUNDLAND by Darcy MacRae

Seeding the waters

THE MARINE INSTITUTE (MI) is helping to bring the lobster population back to historic levels along Newfoundland and Labrador's south coast and is using a technique that has produced positive results in other regions to get the job done.

Together with the Fish, Food and Allied Workers (FFAW) union, provincial fish harvesters, the provincial Department of Fisheries and Aquaculture and the federal Department of Fisheries and Oceans, the Marine Institute is contributing to a lobster enhancement project in Placentia Bay that oversees the seeding of coastal waters with stage-four lobster larvae.

It could take close to a decade to see the full impact of the project, but based on the results of similar ventures in other parts of North America, the

Marine Institute is confident lobster stocks in Placentia Bay can be improved.

The lobster enhancement project, which was born out of concerns raised by fish harvesters and led by the FFAW, involves collecting egg-bearing female lobsters from Placentia Bay and placing them in a hatchery at the Marine Institute. The eggs hatch to larvae at the Marine Institute and the larvae are raised in a tank through stages one, two and three of their growth cycle before being released back into a suitable habitat in Placentia Bay when they reach stage four, at which time they are about 12 millimetres in length.

Stage-four larvae actually look like miniature lobsters and have a much greater chance of reaching adulthood than stage one, two and

The Marine Institute is exploring ways to restore lobster populations in rural Newfoundland.



three larvae. The adult female lobsters are then released back into Placentia Bay.

“Between stages one and three, the larvae are defenseless and are basically food for everything in the water. At stage four, that’s where they start settling into the bottom and start hiding from predators,” said Chris Dawe, of the Marine Institute’s Centre for Aquaculture and Development.

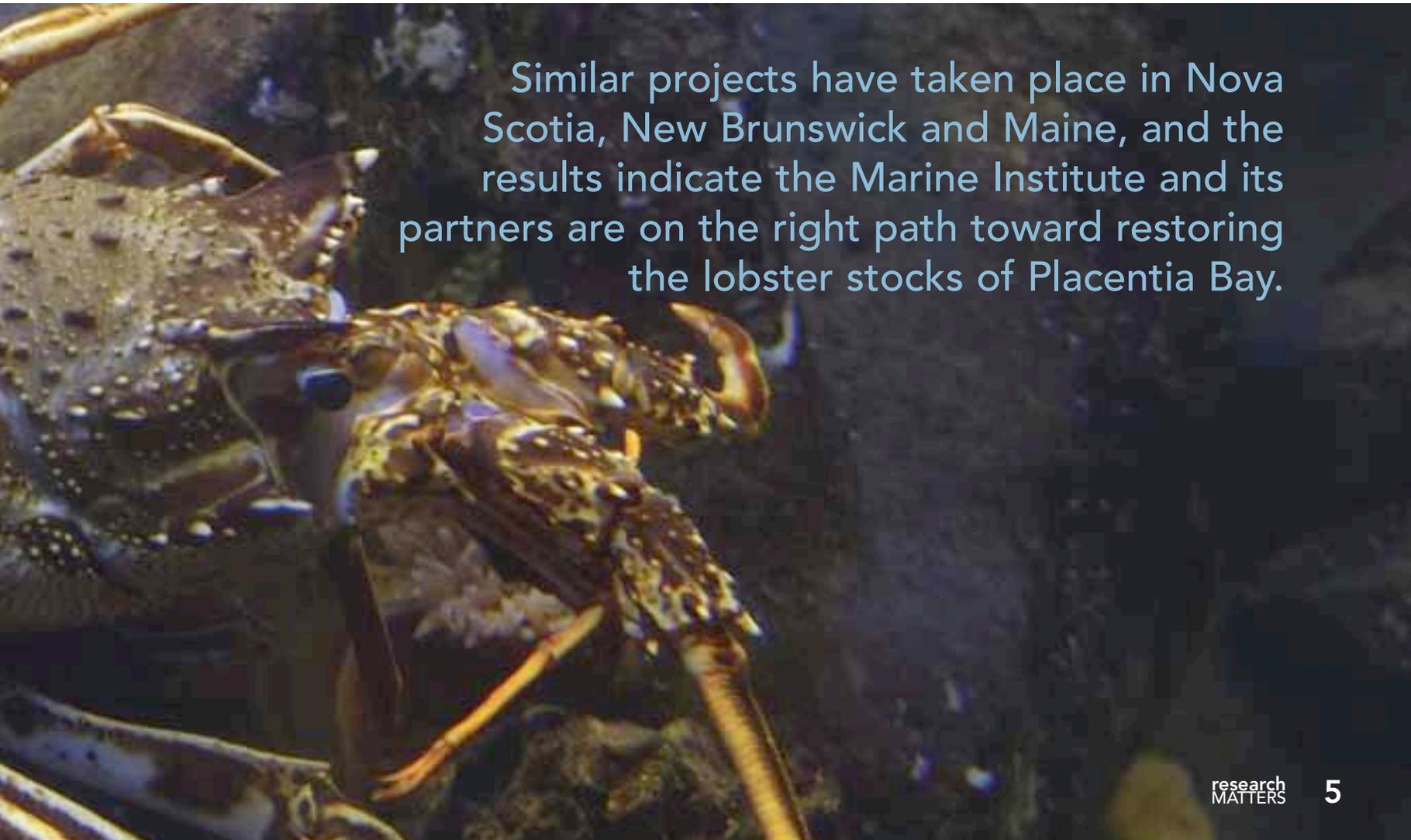
Similar projects have taken place in Nova Scotia, New Brunswick and Maine, and the results indicate the MI and its partners are on the right path toward restoring the lobster stocks of Placentia Bay.

Another encouraging aspect of the lobster-enhancing project is the technology and theory behind all the work could be applied to other sectors of the fishery in the future.

“There’s a lot of potential with this project. I think the enhancement can work for other species,” said Mr. Dawe. “One example is the northern pacific salmon fishery in B.C. and Alaska that’s heavily supported by hatcheries. The majority of their catches are not from natural reproduction, but from the hatcheries that are set up on all major rivers.”

A major objective of the project is tracking the success of the stocking, utilizing diver surveys and possibly genetic fingerprinting to do so.

Future phases of the project continue to be investigated, including selecting a site for a commercial hatchery in Placentia Bay. ■



Similar projects have taken place in Nova Scotia, New Brunswick and Maine, and the results indicate the Marine Institute and its partners are on the right path toward restoring the lobster stocks of Placentia Bay.

“ Digital games represent everything that I believe exemplifies good education.”



GAMING REVOLUTION

STUDY OF VIDEO GAMES NO CHILD'S PLAY

by Heidi Wicks



Matthew White

FACULTY OF EDUCATION PhD student Matthew White is incorporating a more contemporary twist to his career in education—one that most students will relish.

In fact, it's an uncommon approach to higher learning.

His thesis focuses on learning through the intervention of commercial, over-the-shelf games versus games developed strictly for the purpose of education.

"Games occupy a significant part of my free time," explained Mr. White, who is completing his PhD studies under the supervision of Dr. Bruce Mann of the Faculty of Education. "I've written a few programs for various institutions, and once I learned programming, I had a bunch of game ideas floating around in my head for years. Programs like RPG Maker and Game Maker sort of helped me entertain the possibility that I'd be a designer of some kind, and here I am."

According to Statistics Canada, Mr. White is one of this country's three youngest PhD candidates. He turned 22 in 2009.

As far as career goals go, he'd like to work in education through games and simulations—either at a university or developing new software/hardware.

"There's some great advancement in brain-controlled computing that really interests me," he said. "I have always wanted to be a professional game designer—start my own studio and really start something revolutionary."

Mr. White was one of only 25 lucky recipients worldwide to receive a scholarship to attend the 2009 Game Developers Conference in San Francisco, the largest gathering of industry professionals in North America. He also participated in the Tokyo Game Show, which took place in September 2009.

"Digital games represent everything that I believe exemplifies good education," he said. Regarding the great debate on whether video games rot the brains of youth and create an anti-social generation, Mr. White clearly disagrees.

"Games can help us tap into how we can best harness the latent power of digital games to be intrinsically motivating, entertaining, engaging and extremely complex, and put the knowledge and skills that players are learning toward our various educational foci," he said. "Certain games prompt players to examine complex issues and what's more important is that the players are doing this of their own volition." ■

ONE-OF-A-KIND

art

VISUAL ARTISTS GATHER AT GRENFELL COLLEGE TO LEARN UNIQUE PRINTING PROCESS



From left, David Scott Armstrong of York University, Professor Marlene MacCallum of Grenfell's visual arts program and Rachel Anstey, research assistant, Grenfell College, put a plate through the press.

// This type of work is not being done anywhere else. //

by Pamela Gill

VISUAL ARTISTS from all over North America are turning to experts in western Newfoundland to explore a one-of-its-kind process that is being done only at Sir Wilfred Grenfell College, Memorial's campus in Corner Brook.

Specifically, the artists are interested in exploring and learning more about four-colour photogravure. Photogravure is a historical photographic process which combines traditional intaglio, or etching, techniques with photography to create a print that has the qualities of both an etching and a photograph.

"We're basically taking a digital photo and converting it back to analogue – we're reversing the typical process," said Marlene MacCallum, professor of visual arts at Grenfell College, who began to develop her photogravure printing practice in 1993.

Prof. MacCallum, along with visual arts faculty members professors David Morrish and Pierre LeBlanc, has conducted workshops on the process, thanks to a multi-year Social Science and Humanities Research Council of Canada (SSHRC) Research/Creation Grant.

Their project is titled, "Creating the visual book through integration of the divergent technologies of photogravure and digital processes." Their workshop, held in August 2009, marked the halfway point in their research and is part of the knowledge mobilization and dissemination of the project.

The trio attracted attention from all over the country and the United States, drawing participants from York University, University of Alberta, the University of Toronto, the Nova Scotia College of Art and Design, and Crown Point Press in San Francisco.

Also contributing to the five-day workshop were Grenfell research assistants Jackie Barrett and Rachel Anstey.

"This type of work is not being done anywhere else," said Asa Muir-Harmony of Crown Point Press, whose workshop and press in California is dedicated to the creative process and the art and craft of printmaking, primarily etching. "I'm excited to see how I can integrate what I've learned here in my own set up."

Grenfell experts showcased the entire process of creating a four-colour photogravure from the starting point of a digital file to the final stage of a traditionally printed four-colour photogravure print. In essence, the group of artists started with a digital image and produced colour separations which were used traditionally in the intaglio printmaking process.

The Research/Creation Grant is one of SSHRC's newer granting initiatives and was established as a pilot program in 2004. Profs. MacCallum, Morrish and LeBlanc were the first Memorial faculty members to receive one of these grants when they were awarded \$146,000 for their collaborative initiative. In their research, they explore how historical and contemporary technologies co-exist and expand on each other's limitations. The impact of integrating the different tools/technologies is considered in all stages of the work, from the initial genesis through to transmission to the audience and its reception.

The objective is to investigate the creation of book works and other forms of sequential imagery using an integrated approach to the technologies of printmaking, photography and digital imaging. ■

A close-up photograph of a light blue piggy bank. A large, tan, textured bandage is applied to the side of the piggy bank, partially covering its eye and snout area. The piggy bank has small black dots for eyes and a visible snout. The background is a plain, light color.

PAIN relief

RESEARCHERS EXPLORE WAYS OF LIVING WITH CHRONIC PAIN



Drs. Sandra LeFort and Shirley Solberg

One in five people in the province suffer from chronic pain and that chronic pain costs Newfoundland and Labrador an estimated \$1.5 billion a year.

by Sharon Gray

TWO RESEARCHERS from Memorial's School of Nursing are leading one part of a five-year \$2.5 million project to address the issues of chronic pain management.

Theme One of this six-themed project, organized by the Community Alliances for Health Research and Knowledge Translation on Pain (CAHR), is titled "From the ground up: Alliances to address chronic pain in the community." CAHR-pain is a Canadian research network funded by the Canadian Institutes of Health Research to provide knowledge translation to communities in the area of pain.

Team leaders for Theme One are Drs. Sandra LeFort and Shirley Solberg from Memorial, and Dr. Thomas Hadjistavropoulos of the University of Regina's Centre on Aging and Health. Additional collaborators are from the Atlantic provinces.

The team has also partnered with Lynn Cooper of the Canadian Pain Coalition, an advocacy group for pain patients, as well as with Carol Stanley of the Newfoundland and Labrador Long Term Pain Association.

The project will engage communities of chronic pain sufferers and families as well as providers of health care and relevant organizations in participatory action research to explore the chronic pain experience, the needs of people with chronic pain and what services, supports and resources need to be provided.

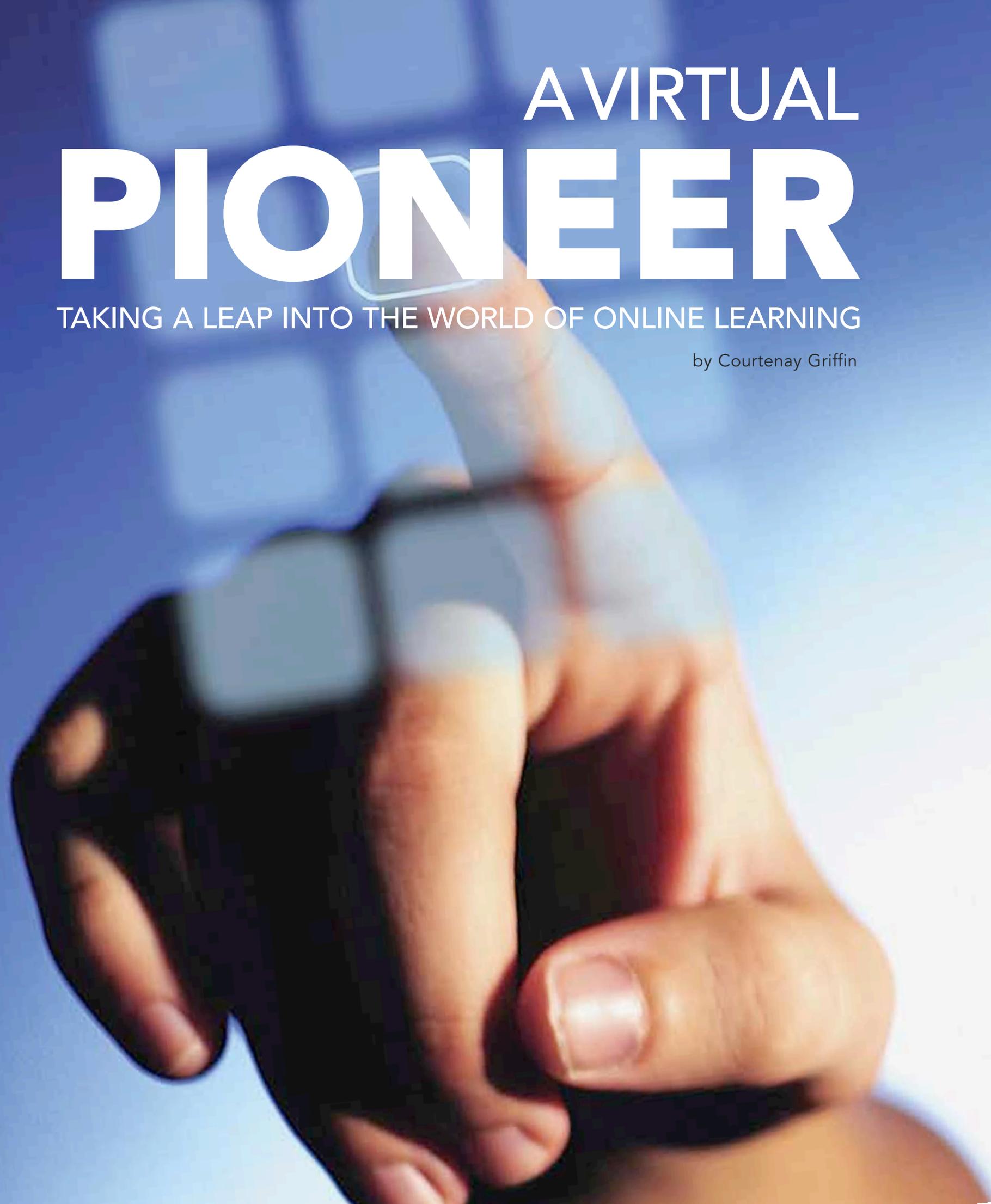
"We are conducting an in-depth review of the scientific, policy and lay literature to identify existing resources and emerging technologies for both patients and providers of care, and best practice and models of community-based care for chronic pain," explained Dr. Solberg.

"We are holding focus groups with people who have chronic pain and their families to identify the major issues they face and then work on strategies to improve pain management approaches for them," added Dr. LeFort.

The Newfoundland and Labrador Long Term Pain Association is a group of people with chronic pain who are working to reduce waiting lists, increase available treatment resources and improve access to medications. The association states that one in five people in the province suffer from chronic pain and that chronic pain costs Newfoundland and Labrador an estimated \$1.5 billion a year, more than heart disease, cancer and AIDS combined.

Dr. LeFort said one of the goals of the project is to develop a tool kit to help people with chronic pain learn ways of dealing with it.

"There's a lot of information out there, but people aren't accessing it," she added. ■

A close-up photograph of a hand holding a pair of glasses. The hand is positioned in the lower half of the frame, with the fingers gripping the temples of the glasses. The background is a solid blue color with a faint, light-colored grid pattern. The text is overlaid on the upper portion of the image.

A VIRTUAL PIONEER

TAKING A LEAP INTO THE WORLD OF ONLINE LEARNING

by Courtenay Griffin

MARLENE BROOKS IS NOT A GAMER. But now she finds herself immersed in a virtual world in which you can be anything you want, create whatever you want, and socialize with people from around the world.

“I never played games—I can remember when my brothers would play Battleship for hours, but it was something I was just not interested in,” said Ms. Brooks, of Memorial’s Distance Education and Learning Technologies. “But almost three years ago I was introduced to the virtual world of Second Life.”

On her first visit to this online 3D environment, Ms. Brooks took notice of Harvard University’s presence and their application of virtual world technology for law students. As an adult educator, she was intrigued by the potential use of Second Life as a teaching and learning tool, and found herself asking questions that she wanted answered. What was the purpose of such an environment? How can it be effective as a teaching tool? And how can educators leverage this environment to engage students in their learning at Memorial?

In 2007, she began her first year of research completely immersed in the Second Life environment, abandoning her real life to explore and answer these questions. More than two years later she is still exploring, but she’s not the only one. There are currently more than 6,000 educators and researchers in universities, colleges, and business training programs around the globe who are also examining the use of virtual world technology for teaching and learning.

“At Memorial, we have integrated Second Life into several courses in various disciplines such as

engineering, business and women’s studies,” said Ms. Brooks. “Our team at DELT provides the land, materials and knowledge of Second Life, while faculty members supply the content expertise.”

She and her team won a national award from the Canadian Network for Innovation in Education with the Faculty of Engineering and Applied Science for the integration of Second Life in an engineering course. Since then, she’s been contacted by educators from Australia, Brazil, England, France and other countries who are fascinated with her work in pioneering Second Life as an educational tool.

“I have learned there are a number of ways to use virtual world environments to enhance student learning, where students are active rather than passive learners,” she said.

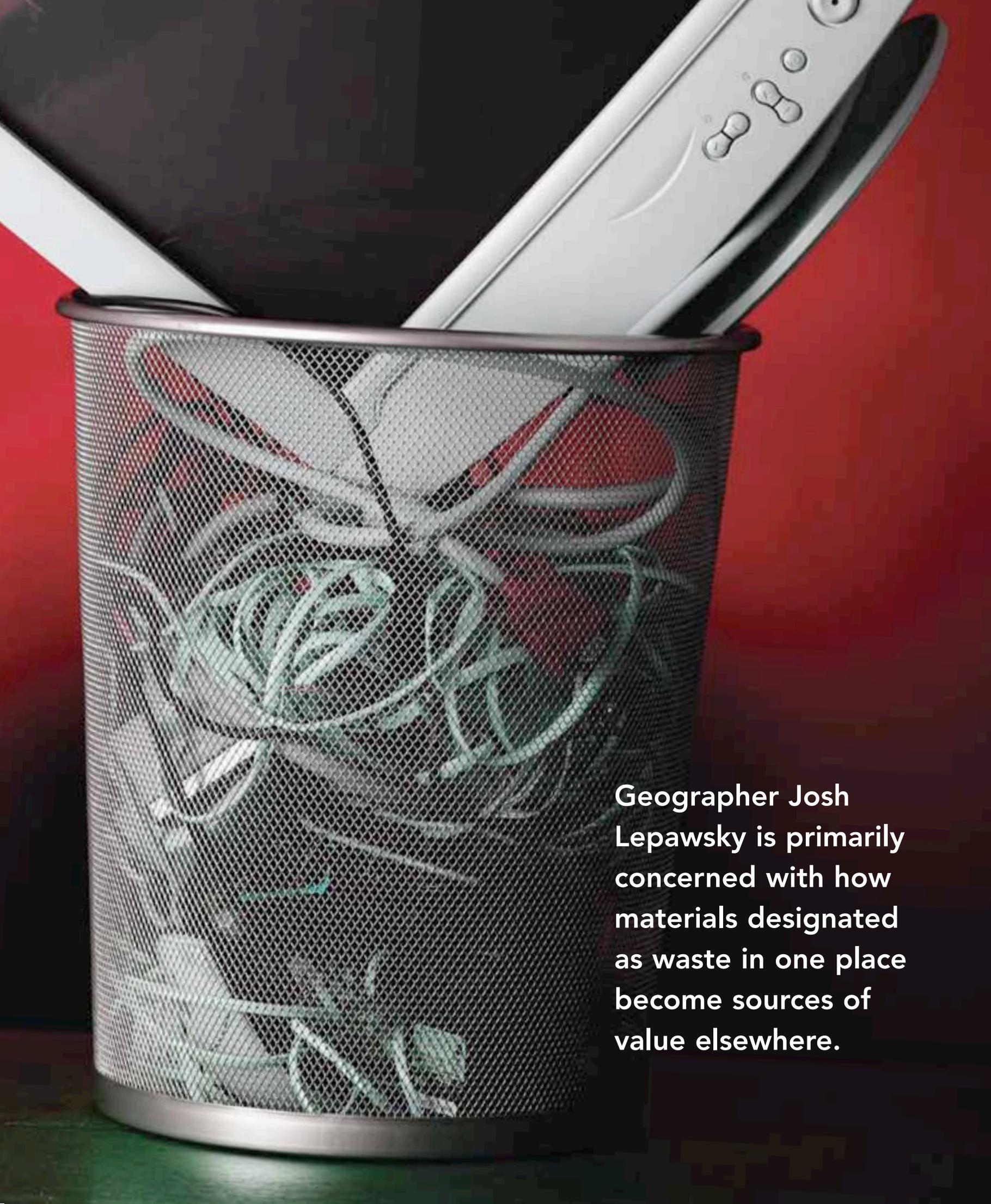
As a researcher, Ms. Brooks’ focus is on enhancing the university experience for students through the creation of immersive teaching and learning environments. Her aim is to promote virtual world technology as an opportunity for students to get excited about their learning and to realize that learning can be fun.

“Learning is more than paper and pencil, multiple choice tests and writing papers,” she added. “And we are only at the beginning of our exploration with this technology. What we create now will appear modest to what we will be able to create in the future...as technology improves along with our understanding.” ■



Marlene Brooks

“ There are a number of ways to use virtual world environments to enhance student learning, where students are active rather than passive learners. ”



Geographer Josh Lepawsky is primarily concerned with how materials designated as waste in one place become sources of value elsewhere.



Dr. Josh Lepawsky

Digging deep into e-waste

PROFESSOR PONDERES WHAT TO DO WITH ELECTRONIC TRASH

by Janet Harron

THE OLD ADAGE that one man's trash is another man's treasure is getting a new spin as a result of ongoing research in the Faculty of Arts.

And helping lead the way is the Department of Geography's Dr. Josh Lepawsky who's interested in what is happening to Canada's electronic waste.

He has been awarded a Canadian Environmental Research Grant by the Social Sciences and Humanities Research Council of Canada (SSHRC) for a project titled Blurred Borders: Mapping Canada's Role in the International Trade and Traffic of Electronic Waste.

The grant of \$248,000 over three years is funding field-work for himself and graduate students in Singapore, Bangladesh and Kenya. Dr. Lepawsky received the grant earlier this year.

Much of Canada's electronic waste ends up in developing countries where working machines and parts are re-invented, sometimes re-configured, while plastics and aluminum are melted down and used in new products. The environmental and health effects of this phenomenon are well documented but there is another side to the story.

Electronic waste materials, although highly toxic, are crucial for the survival of domestic industries in countries such as Kenya and Bangladesh, and are a significant source of employment, said Dr. Lepawsky. The establishment of international conventions to halt such trade results in a tangle of issues and questions — all of which Dr. Lepawsky hopes to answer in his research.

He is primarily concerned with how materials designated as waste in one place become sources of value elsewhere.

Although waste itself falls under provincial jurisdiction in Canada, there are federal regulations over the import and export of hazardous materials. Canada is a signatory to international conventions that ban exporting such materials as e-waste. However, bilateral trade agreements do allow shipment of such materials to the United States which in turn acts as a gateway to developing countries.

Criminal Intelligence Service Canada (CISC) names e-waste as an important revenue stream for organized crime. As part of his project Dr. Lepawsky hopes to examine closed case files to determine generic patterns detailing what criminal organizations are involved and what international connections they are using.

There is currently no way of knowing exactly how much and what kind of e-waste is exported from Canada because of the way in which trade data is collected. But there is no such grey area in terms of its economic benefits to developing countries. In some cases, Dr. Lepawsky said, those selling the recycled raw materials are enjoying profit margins approaching 300 per cent whereas the original manufacture of a computer monitor might have made a profit margin of three to five per cent.

"This is exactly why this research is so important — separating the economic from the moral is not a realistic description or assessment of the actual situation on the ground," said Dr. Lepawsky. "In purely economic terms the recycling of e-waste works but we have to consider the consequences of the atrocious health and environmental conditions as well." ■

Only known solution

MEDICAL RESEARCHERS LOOK FOR BETTER ANSWERS REGARDING LUNG TRANSPLANTS

by Sharon Gray

MEDICAL RESEARCHERS Drs. Bridget Fernandez and Michael Woods are doing leading edge genetic research on pulmonary fibrosis, a condition that is not strongly genetic in most populations. But in Newfoundland it's a different story, and that difference may lead to finding a more effective therapy.

Pulmonary fibrosis causes abnormal formations of fibre-like scar tissue in the lungs. As the disease progresses, lung tissues thicken and become stiff and breathing becomes difficult. To date there is no cure; the only treatment is a lung transplant.

The researchers are working with local respirologists, radiologists, pathologists and laboratory scientists to identify the gene for familial pulmonary fibrosis.

"We hope by discovering the gene's role in lung physiology it will eventually lead to more effective therapy," said Dr. Fernandez.

"Fortunately, in some cases, just because an individual has a mutated gene for pulmonary fibrosis does not necessarily mean they will suffer from pulmonary fibrosis," said Dr. Woods. "Once the gene (or genes) is identified that cause pulmonary fibrosis in these families, physicians should be able to provide more informed clinical care for family members. Without the gracious co-operation of these families none of this work can be performed."

The two researchers have garnered much support in this endeavour. The Newfoundland and Labrador Lung Association, with the Peggy Lewis Memorial Walk Committee, has committed \$110,000 over six years to support idiopathic pulmonary fibrosis (IPF) research at Memorial. The walk is a memorial to Peggy Lewis, who was just 43 years of age when she died from IPF in 1991. Her son, Chad Lewis, died at age 29 in 2002 as a result of this disease. Ms. Lewis' oldest son, Kevin Jr., was diagnosed at age 25 but

received a successful double lung transplant in 1998 and continues to do well today.

It's not the first time that pulmonary fibrosis research by Drs. Fernandez and Woods has drawn public support. The late Craig Dobbin and his wife Elaine brought this rare and deadly disease to public attention; Mr. Dobbin suffered from IPF and survived with a single lung transplant performed at the University of Pennsylvania in the mid-1990s. He eventually passed away in 2006.

And then there's Myles Burry of Wesleyville, who was 11 years old in January 2006 when he presented a \$750 cheque to Dr. Fernandez. He raised the money selling Christmas cards that he designed, all in support of research on a disease that runs in his family.

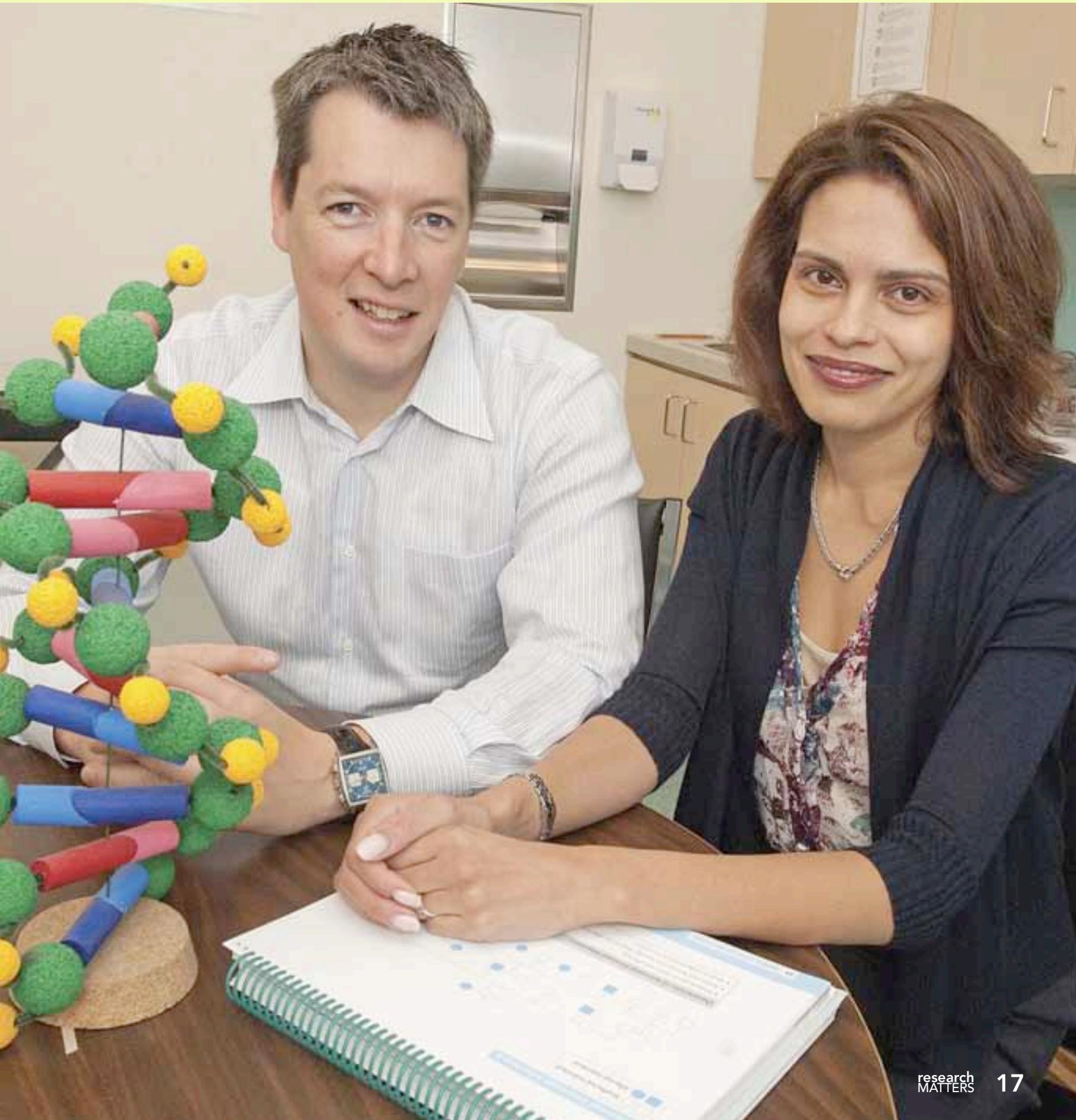
It's a familiar story to the two researchers. Work begun by Dr. Fernandez has already identified 11 Newfoundland families with a strongly genetic form of the disease. In these families, disease susceptibility is conferred by an autosomal dominant, incompletely penetrant gene.

As director of the Provincial Medical Genetics Program, Dr. Fernandez and nurse co-ordinator Barbara Noble are in close touch with families affected by familial pulmonary fibrosis. In the laboratory, Dr. Woods and his team are hard at work looking for the genes involved in this devastating disease.

Pulmonary fibrosis in Newfoundland is suggestive of what is known as "novel genetic etiology." Dr. Woods explained that known mutations in particular genes have been excluded in the Newfoundland families; the research team is now looking to determine if mutations in novel genes are causing the familial form of pulmonary fibrosis. ■



// We hope by discovering the gene's role in lung physiology it will eventually lead to more effective therapy. //



searching for SIGNS

EXPERTS EXPLORE THE LINK BETWEEN MARS AND NEWFOUNDLAND

by Jeff Green

“Planetary and space exploration is thriving and Canada is playing a leading role in this initiative.”





A CONTINGENT OF SCIENTISTS is using its search for small signs of life in the barren rock and waterways on Newfoundland's west coast to help guide the eventual search for subsurface life on Mars.

It is painstaking work but the end result could have far-reaching implications.

The team—made up of researchers from Memorial, the Carnegie Institution of Washington, East Carolina University and NASA—is scouring the Tablelands in Gros Morne National Park.

They're searching for microbial life to give them clues of what existence would be like on Mars—present-day or sometime in the past.

They chose the region because the rock is some of the most distinct in the world and similar to what scientists believe to be on Mars.

The area they're concentrating on is one of a handful of what are known as Mars analogue sites in Canada—and the only one in this province—which is giving experts an opportunity to approximate the geological, environmental and biological conditions on Mars.

"Planetary and space exploration is thriving and Canada is playing a leading role in this initiative," said Dr. Penny Morrill, an assistant professor from the Department of Earth Sciences and the principal investigator on the project.

Currently, there are more than 11 Canadian planetary analogue sites which are giving scientists valuable clues of life beyond Earth.

Dr. Morrill's study is attempting to figure out whether or not there are any measurable indicators of past or present life within the unique rocks on Newfoundland's west coast.

In particular they're interested in sites where a chemical reaction known as serpentinization would have taken place. That's a reaction between groundwater and a special kind of rock called peridotite which is rich in iron and magnesium.

It originates from the Earth's mantle.

"This type of rock is observed mainly on the ocean floor. However, there are a few rare continental locations where present-day serpentinization is occurring, and the Tablelands in Gros Morne National Park is one such location. It is of interest because peridotite is also found on Mars," explained Dr. Morrill, who is also a NASA Astrobiology Institute (NAI) collaborator.

"The serpentinization reaction produces hydrogen gas and groundwater with high pH values similar to that of household bleach. Hydrogen gas is very energy rich for micro-organisms, but not every micro-organism can live in these high pH conditions."

Finding rocks from the Earth's mantle on a continent is rare so the team of scientists jumped at the opportunity to comb the Tablelands region.

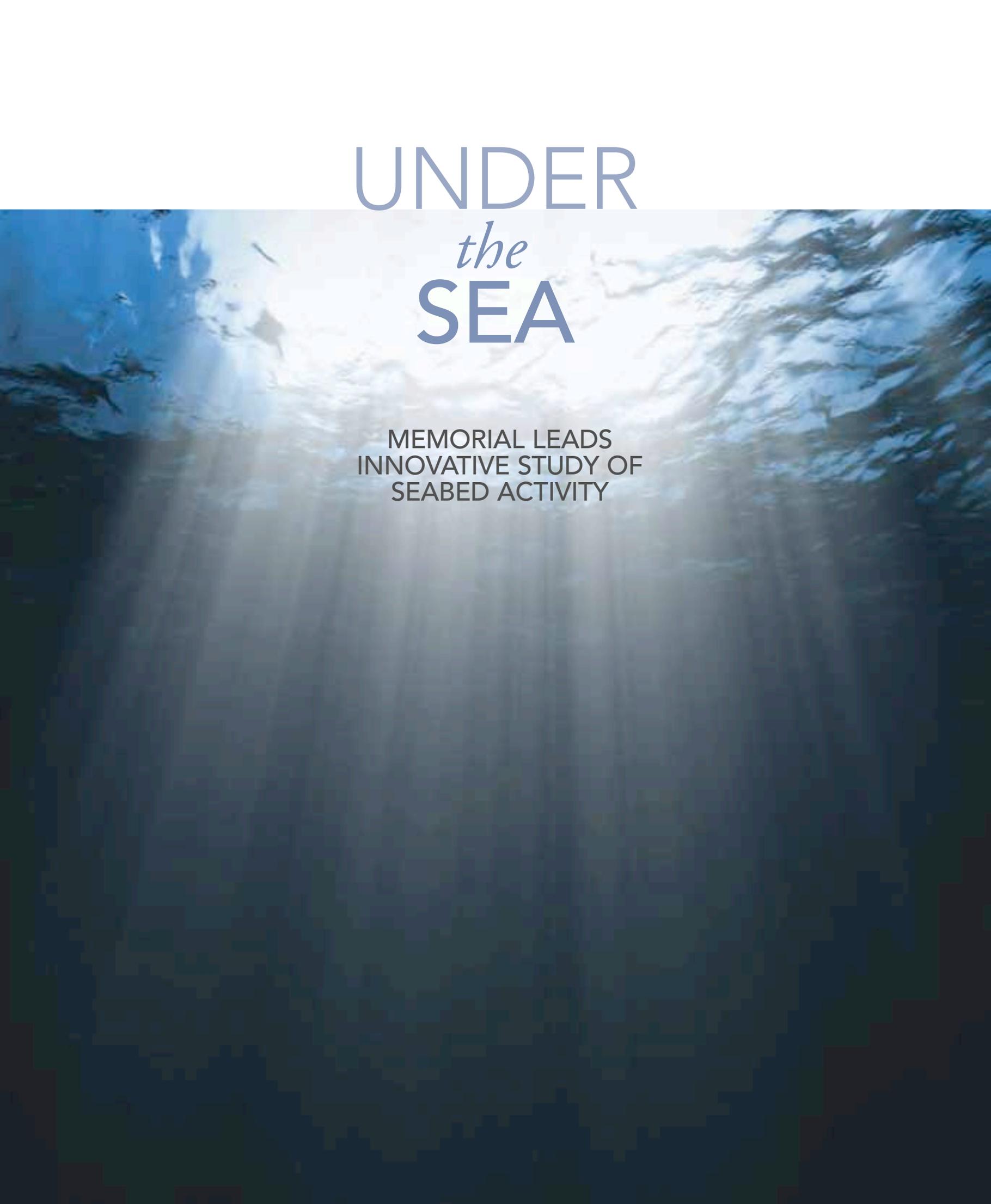
"In the case of Newfoundland, approximately 500 million years ago the ancient Iapetus Ocean began to close due to a process known as plate tectonics," explained Dr. Morrill. "During this process rocks from the mantle were emplaced on the continental crust now known as western Newfoundland.

"During the last glaciation period fresh unaltered rock was exposed to groundwater and this provided the starting materials for serpentinization."

Dr. Morrill is particularly interested in gases produced by micro-organisms such as methane, as well as chemical and isotopic signatures of biological reactions.

"Methane has been detected in the Martian atmosphere, but it is not known how the methane was formed," she noted.

"Preliminary data showed that there was a great deal of microbial life living in the high pH springs of the Tablelands," Dr. Morrill added. "The next step is to identify what micro-organisms can survive in these conditions and determine how they harness their energy for growth and survival in high pH waters." ■



UNDER *the* SEA

MEMORIAL LEADS
INNOVATIVE STUDY OF
SEABED ACTIVITY



Dr. Vlastimil Masek

“The overall objective is to enhance the ocean technology sector in Atlantic Canada through developing novel, environmentally neutral platform ocean technologies.”

by Kelly Foss

A TEAM OF UNIVERSITY RESEARCHERS will soon have a new way to observe what takes place on the ocean floor.

Led by Associate Professor Dr. Vlastimil Masek, the Ocean Network Seafloor Instrumentation Project, which commenced in 2007, is a five-year multi-disciplinary research and development project to design, fabricate and validate a seafloor array of wireless marine sensors for use in monitoring seabed processes, including applications such as geological imaging and earthquake detection.

The project team includes researchers from the Faculty of Engineering and Applied Science, as well as the departments of Earth Sciences and Physics and Physical Oceanography. The team also includes technical staff from the St. John's-based company, Rutter Inc.

The end result will be the creation of individual compact and low-cost sensors, called SEAformatics pods, which can self-power through ocean bottom currents, and communicate with each other and with the Internet, allowing observation of the ocean floor from shore.

“The overall objective is to enhance the ocean technology sector in Atlantic Canada through developing novel, environmentally-neutral platform ocean technologies,” said Dr. Masek. “The pod will contain ocean bottom sensor technologies for long term use in harsh marine environments; a device to harvest energy from ocean floor currents to power marine technologies; a wireless networking system to enable communication of marine data to end users and data compression algorithms to process vast quantities of seismic and other marine data.”

Initially the pod was envisioned as a seismic platform targeted toward geological imaging, tsunami warnings and seismic monitoring applications. However, it has been designed with a number of generic sensor interfaces to allow the attachment of third-party equipment for use in other applications.

Examples of such alternate uses include underwater surveillance and port security or as recharge and data upload nodes to prolong deployment of autonomous underwater vehicles. The pods could also be used by oil exploration and production companies as part of a smart oilfield monitoring network.

“The traditional approach to ocean observing has utilized stand-alone moorings that were later recovered to obtain the recorded data,” said Dr. Masek. “These systems provide no real-time information and do not allow end users to interact with the sensing equipment. Equipment malfunctions cannot be detected until the mooring is recovered and large data gaps result. As well, battery life and on board data storage is finite, which limits deployment duration. The SEAformatics project attempts to bridge the gap between the traditional approach and cabled observatories which are costly to build and maintain and do not work well in areas where seabed conditions present a danger to the telecommunications cable.”

Dr. Masek said the project is challenging, but in the end will produce a system with a broad range of applications in the ocean that will improve the understanding of the seabed and the ocean above.

The SEAformatics project has received about \$3.2 million in federal, provincial and industry support. ■



Dr. Jeffrey Pittman

“ Strong auditor monitoring should help prevent financial reporting failures that can have catastrophic social and economic consequences. ”

AUDITING

by Meaghan Whelan

IN THE AFTERMATH of the surge in high-profile financial reporting failures worldwide around the turn of the century, countries eager to restore investor confidence in their capital markets began to implement major reforms to regulations governing the external monitoring of public company auditors.

Auditors are hired by organizations to review their financial statements to improve their reliability such that the public is not misled. As such, they are required to be unbiased and independent in their evaluations.

In the United States, the auditing profession recently shifted from a peer-review model to government oversight of public company audits through the Public Company Accounting Oversight Board (PCAOB).

“The regulatory changes that created the PCAOB were supposed to improve transparency, and Dr. Clive Lennox, a colleague from Nanyang Technological University in Singapore, and I were interested in exploring whether these changes were actually effective,” explained Dr. Jeffrey Pittman, CMA professor of accounting in Memorial’s Faculty of Business Administration.

“This is important since strong auditor monitoring should help prevent financial reporting failures that can have catastrophic social and economic consequences.

“The old system relied on peer review, which Congress, media and many others saw to be a ‘you scratch my back, I’ll scratch yours’ situation,” Dr. Pittman added. “From the perspective of

the organizations to be audited, however, the peer review system was considered to be informative because the reports contained both an overall opinion on the audit firm’s quality and an evaluation of its quality control systems.”

The new PCAOB inspections fail to provide that information and Drs. Lennox and Pittman’s research suggests that audit clients do not perceive that these reports are valuable for signaling audit quality.

In Canada, auditors are inspected by the Canadian Public Accountability Board (CPAB). It issues general reports on audit firms operating in this country, which some critics believe doesn’t go far enough in fostering transparency.

Dr. Pittman’s research on the regulatory transition in the US implies that capital market participants would ignore PCAOB-style inspection reports even if they were available.

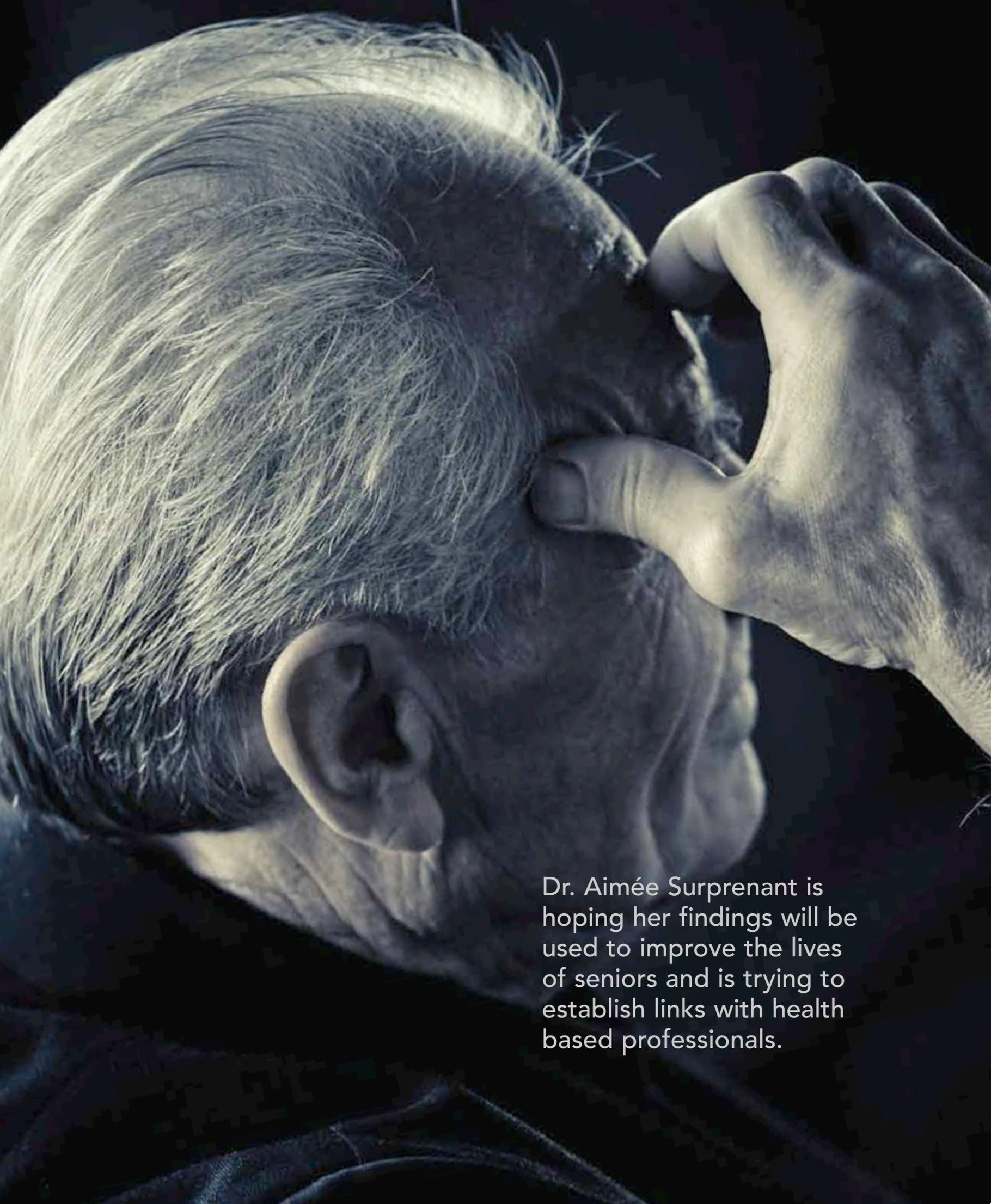
“Although the regulatory system governing external auditing is still relatively new, there are some indications at this early stage that it is strengthening auditing in Canada,” Dr. Pittman concluded.

“Auditing the auditors: Evidence on the recent reforms to the external monitoring of audit firms” will be published in a forthcoming issue of the *Journal of Accounting and Economics*.

Memorial awarded Dr. Jeffrey Pittman the President’s Award for Outstanding Research this year and the Petro-Canada Young Innovator Award in 2005. ■

the auditors

EXPLORING THE IMPACT OF REGULATORY CHANGE
ON PROFESSIONAL AUDITORS



Dr. Aimée Surprenant is hoping her findings will be used to improve the lives of seniors and is trying to establish links with health based professionals.

NEW RESEARCH AIMS TO HELP REDUCE THE IMPACTS OF HEARING LOSS ON MEMORY

Hearing aid

by Kelly Foss

IT MAY BE widely accepted that older people are more forgetful, but Dr. Aimée Surprenant, a professor of psychology, said that may have more to do with hearing loss than cognitive impairment.

While looking into the impact of noise on memory, she found that noise, particularly background speech babble, had significant impact on memory performance both in auditory and visual tests.

“It occurred to me that older adults are always hearing things in noise because almost everyone gets a bit of hearing loss as they get older,” she said.

“Hearing loss doesn’t just make sound less intense. It also distorts it a little bit so it’s like adding a bit of noise to the signal.”

That led her to wonder whether the age-related differences in memory can be traced to some of the difficulties older individuals might have in taking in the information.

“Because of hearing loss it takes them more effort to understand each word,” explained Dr. Surprenant. “If you have to put all of your limited resources into hearing each word, then your performance will also be affected.”

Dr. Surprenant has begun testing those theories through a number of experiments she is conducting on volunteers. Those experiments have established a direct link between hearing ability and a person’s ability to recall a list of words in order.

“We’ve found that for relatively meaningless pieces of information the hearing loss does predict performance on a memory test,” she said. “However, as we add more and more meaning to the stimuli and make it more complicated, the hearing loss becomes slightly less important because you can compensate for hearing loss by doing other things.”

Part of her study incorporates auditory training to see if individuals can improve their memory when they are trained to focus their attention more precisely on a signal. The process would include putting the individuals through a variety of memory and cognitive tests, providing them with 10 hours of auditory training and then testing them again to see if their performance improved.

Dr. Surprenant is hoping her findings will be used to improve the lives of seniors and is trying to establish links with health-based professionals. ■

Dr. Aimée Surprenant



Translating HISTORY



MUSIC PROFESSOR DECODES ANCIENT HAWAIIAN OPERA

by Jeff Green

AT FIRST GLANCE it's an odd match.

The meticulous archival work of an ethnomusicologist and the high-tech wizardry of forensic scientists seem to be worlds apart.

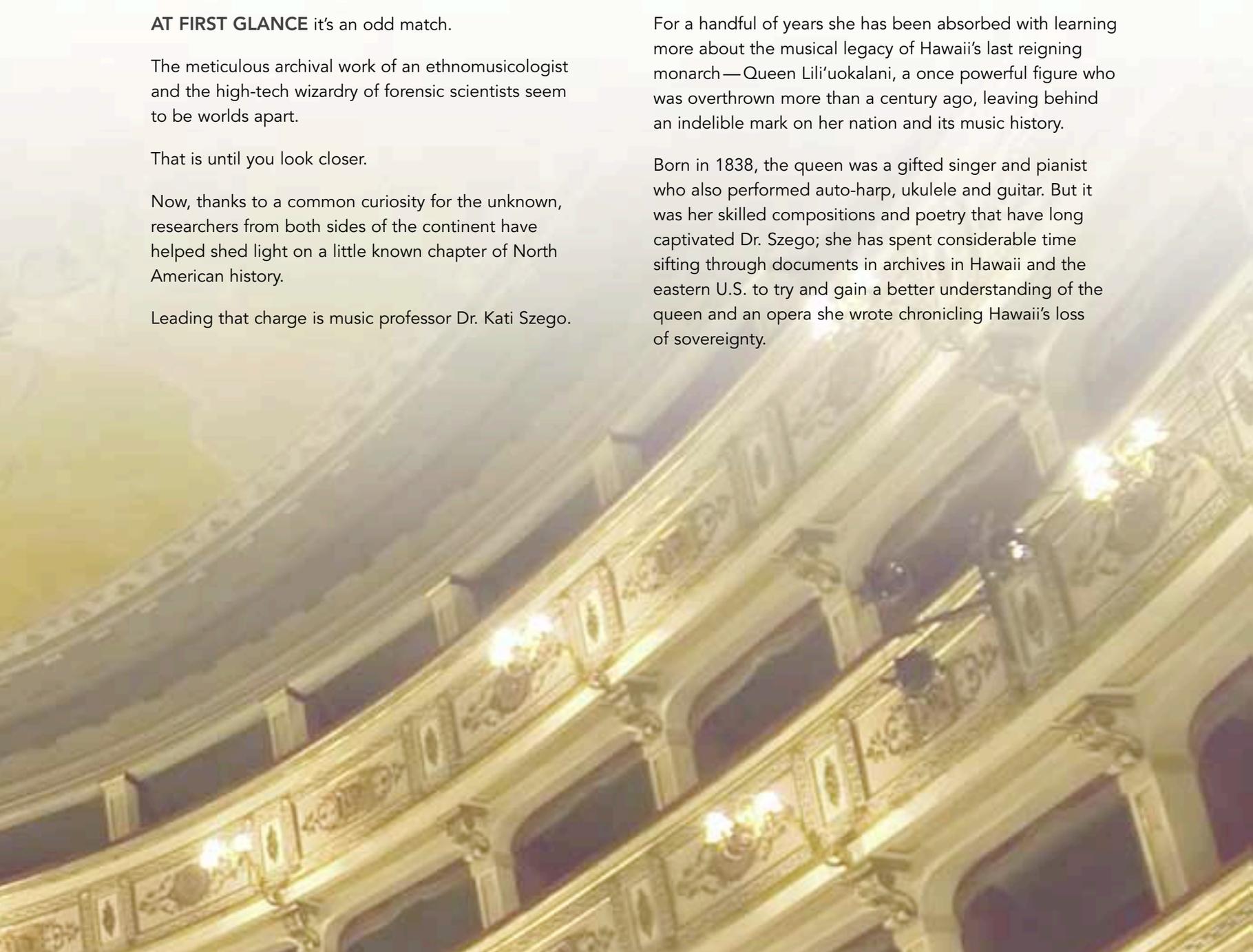
That is until you look closer.

Now, thanks to a common curiosity for the unknown, researchers from both sides of the continent have helped shed light on a little known chapter of North American history.

Leading that charge is music professor Dr. Kati Szego.

For a handful of years she has been absorbed with learning more about the musical legacy of Hawaii's last reigning monarch—Queen Lili'uokalani, a once powerful figure who was overthrown more than a century ago, leaving behind an indelible mark on her nation and its music history.

Born in 1838, the queen was a gifted singer and pianist who also performed auto-harp, ukulele and guitar. But it was her skilled compositions and poetry that have long captivated Dr. Szego; she has spent considerable time sifting through documents in archives in Hawaii and the eastern U.S. to try and gain a better understanding of the queen and an opera she wrote chronicling Hawaii's loss of sovereignty.





Dr. Kati Szego

"She was a prolific composer, from an illustrious musical family, that helped shape the course of Hawaiian music history," Dr. Szego noted.

Queen Lili'uokalani ascended the throne in 1891, but her reign was marred with turmoil. She was overthrown by American insurgents in 1893 and later arrested. Her monarchy crumbled and Hawaii was annexed to the U.S. in 1898.

During this saga, the queen turned pencil to paper, handwriting an opera libretto entitled *Mohailani*, recounting some events of the coup.

Despite its dramatic backdrop, Queen Lili'uokalani's libretto took an unexpected twist—she wrote her lyrics in the comic opera style of Gilbert and Sullivan, the famed British librettist/composer pair.

Fast forward nearly a century and amazingly that document is still largely intact, tucked away in the Hawaii State Archives. Although researchers have known about it for years, nobody had studied the libretto in detail until Dr. Szego.

"I certainly did not discover the opera; many people before me had seen it, but it had been lying dormant for at least a century," she explained.

That's when she turned to some high-tech collaborators for help.

The historic opera was written using a soft pencil so the original document is smudged in many places. Some passages are illegible or barely readable to the naked eye.

Dr. Szego recruited forensic specialists from the Honolulu Police Department.

"I had read about some work in 'lifting' ink off of paper, and started scouting around to see what could be done with pencil," Dr. Szego noted. "It was—and is—a painstaking process, but the thrill of making out just a single letter or word is hard to describe."

Thanks to lots of patience—and some funding from the Social Sciences and Humanities Research Council—she's making strides deciphering the historic text from another era.

"While I have long admired Queen Lili'uokalani, my respect for her has only deepened," Dr. Szego added. "Here she was, probably in her late 50s, trying her hand at a completely new medium—comic opera in rhyming English. That took creative intelligence and guts, not to mention the courage it took to challenge such a powerful group of American men in the midst of such a personal and national tragedy." ■

//She was a prolific composer, from an illustrious musical family, that helped shape the course of Hawaiian music history.//

Calorie COUNTERS

HEALTH EXPERTS EXAMINE BODY'S ROLE IN BURNING CALORIES

by Mandy Cook

A TEAM OF exercise science specialists at Memorial are taking a closer look at how the body acts as a calorie-burning machine.

Allied Health Services (AHS), a network of athletic performance and health services within the School of Human Kinetics and Recreation (HKR), offers specialized physiological testing to determine how many calories your body requires to maintain basic organ function.

Dr. Amy Butt, co-ordinator of AHS, said determining your basal metabolic rate (BMR) is for anyone who would like to tune into their body's unique caloric needs.

"Through a technique called indirect calorimetry, test administrators can determine how much energy your vital organs need in the run of a day just to keep you alive," said Dr. Butt. "From there, a person can look at their overall daily energy expenditure and energy intake to see if they are balancing the equation."

The test requires AHS clients to follow strict pre-test instructions, such as fasting for 12 hours and being driven early in the morning to the School of HKR.

BMR testing is done with individuals lying on a bed, while a large plastic bubble with tubing is placed over the head in order to measure oxygen and carbon dioxide levels.

Anyone—from weekend warriors to serious athletes to wellness-seekers—can sign up for a BMR assessment, which costs about \$195. Clients will undergo a minimum of two testing sessions to ensure accuracy of results and will need to book off about an hour and a half of their day. The data produced will then permit AHS exercise science professionals to advise the client in dietary and exercise planning.

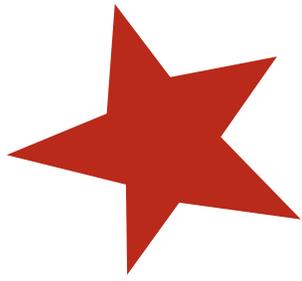
The BMR testing became of interest to Allied Health Services for a few reasons. First of all, the service can benefit the health of the community. In addition, this state of the art technology can help advance research and education within the School of HKR.

Dr. Butt said restrictive diets may negatively affect a person's metabolism. She explained that through the determination of BMR, individuals can gain a better understanding of how much fuel they need in order to balance their energy needs.

"This service can benefit lots of people, such as those who are frustrated with yo-yo dieting and can't understand why, once they go off their diet, they gain the weight back, or a high performance athlete who has to target a particular weight goal for a weight class," said Dr. Butt. "This can benefit anyone in the community." ■

// This service can benefit lots of people, such as those who are frustrated with yo-yo dieting and can't understand why, once they go off their diet, they gain the weight back. //





OF NOTE

Award-winning faculty

Compiled by Jeff Green



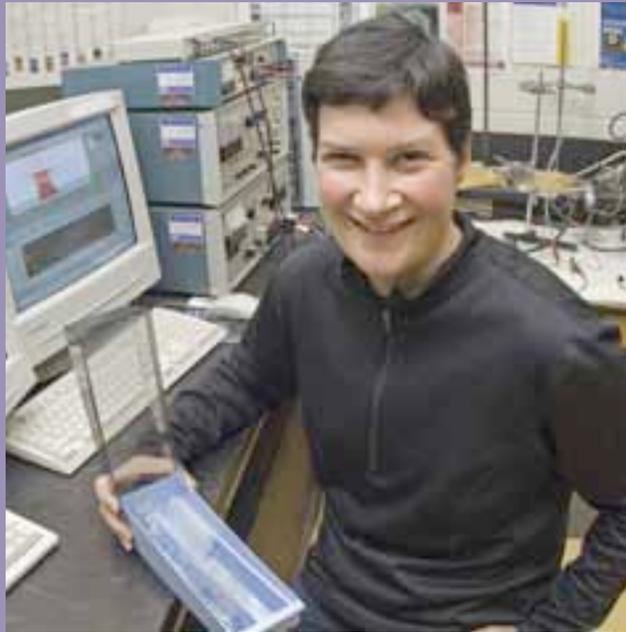
Dr. Beverley Diamond

DR. BEVERLEY DIAMOND, a professor of music and folklore who has been a trailblazer in the area of ethnomusicology in Canada, was named a Trudeau Fellow in May 2009, one of the most prestigious humanities awards in Canada. The lucrative fellowship, which includes \$225,000 paid over three years, will allow Dr. Diamond to advance and expand upon her important work. Dr. Diamond was renewed as this country's only Tier 1 Canada Research Chair in a music discipline in September 2009.



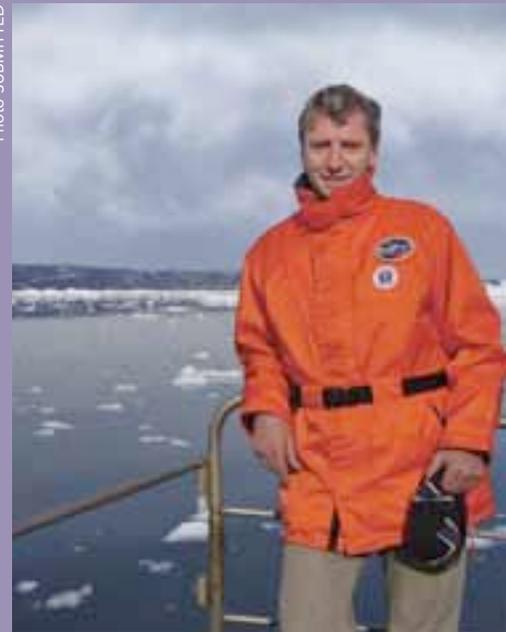
Drs. Patrick Parfrey and Sean Brosnan

In another first for Memorial, the Royal Society of Canada (RSC) has named two University Research Professors to the society. **DR. SEAN BROSINAN**, former head of the Department of Biochemistry in the Faculty of Science, and **DR. PATRICK PARFREY**, Faculty of Medicine, were inducted at a ceremony in Ottawa on Nov. 28. This marks the first time professors from biochemistry and medicine at Memorial have been named to the RSC. Drs. Brosnan and Parfrey have a long history at Memorial and have known each other for years – they even attended the same university in Ireland. Dr. Parfrey earned his M.B. (medical degree) at University College, Cork, while Dr. Brosnan did his B.Sc. and M.Sc. in Ireland and his D. Phil. at Oxford. Dr. Brosnan joined the Department of Biochemistry in 1972 and is cross-appointed to the Faculty of Medicine; Dr. Parfrey joined the Faculty of Medicine in 1984. The accomplishments of the two men during their careers at Memorial would fill several books. Both have a long list of research accomplishments, publications and honours. Both have devoted themselves to training graduate students and both have strong spousal partnerships. Dr. Brosnan has collaborated with his wife, Dr. Margaret Brosnan, on research on the functional organization of the liver. Dr. Parfrey's wife, Dr. Benvon Cramer, is chair of the Discipline of Radiology in the Faculty of Medicine.



Dr. Kris Poduska

Photo SUBMITTED

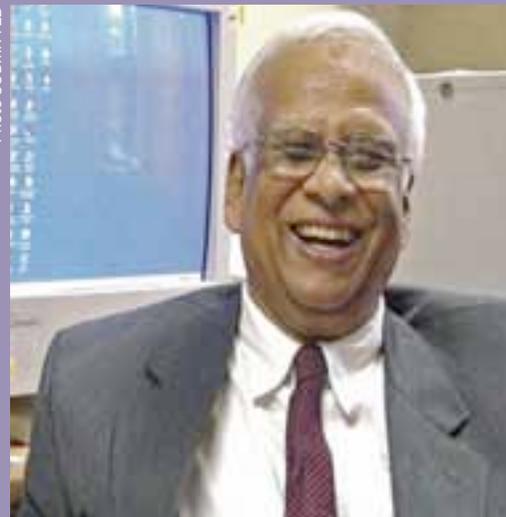


Dr. Ralf Bachmayer

DR. KRIS PODUSKA, an associate professor in the Department of Physics and Physical Oceanography, and **DR. RALF BACHMAYER**, an associate professor in the Faculty of Engineering and Applied Science and the Marine Institute, are the 2009 recipients of the Petro-Canada Young Innovator Awards. Each received \$25,000 for future research. Dr. Poduska's studies involve determining how the synthesizing of materials can affect their properties. Meanwhile, Dr. Bachmayer's research on underwater gliders earned him this award. In recent years, there has been a dramatic increase in the use of autonomous underwater gliders in applications in both the coastal and the deep ocean.

DR. AZIZ RAHMAN, an electrical engineering professor with Memorial's Faculty of Engineering and Applied Science, was formally inducted as a new Fellow into the Canadian Academy of Engineering in July 2009. Dr. Rahman is internationally recognized for his outstanding contributions to the design, development, analysis, control and application of interior permanent magnet (IPM) synchronous motors and associated drive systems.

Photo SUBMITTED

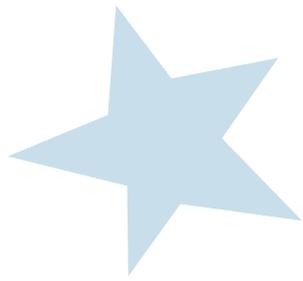


Dr. Aziz Rahman

DR. MARIO BLASER, an associate professor of archaeology, was appointed Memorial's new Canada Research Chair in Aboriginal Studies in September 2009. Dr. Blaser is receiving \$100,000 annually for five years, for a total of \$500,000 for his work as a tier two chair which is tenable for five years and renewable once. Tier two chairs are for exceptional emerging researchers, acknowledged by their peers as having the potential to lead in their field. His research will build on his work and collaborations with colleagues and Aboriginal leaders from North and South America. Memorial is now home to 26 Canada Research Chairs studying diverse topics such as healthy aging, Irish history and cold ocean systems.



Dr. Mario Blaser



student researchers

SHINE

★ Spotlight on success



The Rock Enerji team included Adam Gogacz, Jennifer Cranshaw, Burcu Gacal Isler, Tiffany Piercey and Dr. Elliot Burden.

Photo SUBMITTED

They may have gone into the Canadian regional Imperial Barrel Award competition in April 2009 as underdogs, but the Memorial University team emerged as the clear winners. Calling themselves Rock Enerji, **TIFFANY PIERCEY, BURCU GACAL ISLER, JENNIFER CRANSHAW** and **ADAM GOGACZ**—all graduate students from the Department of Earth Sciences—successfully beat participants from three other Canadian universities to be named the top team in the country. The group also won the right to represent Canada at the Imperial Barrel Award in June 2009 where they clinched third in the international event.



Photo SUBMITTED

Nicole Renaud

A geography master's student received a prestigious internship that took her to Peru for three months during the fall 2009 semester. **NICOLE RENAUD** worked with the climate change division of CARE, an international NGO, to try to influence rural development policy at the international level. She worked to identify strategies and mechanisms to secure water access for marginalized populations as an adaptation tool to climate change. The internship, Students for Development, is managed by the Association of Universities and Colleges of Canada and is made possible with the financial support of the Government of Canada through the Canadian International Development Agency.



Ping Lu

PING LU, a PhD candidate from the Department of Physics and Physical Oceanography, was chosen as one of the first recipients of the Vanier Canada Graduate Scholarship, a prestigious doctoral scholarship valued at \$50,000 per year for up to three years. The scholarship was announced in May 2009. Mr. Lu is one of 55 recipients chosen by the Natural Sciences and Engineering Research Council of Canada (NSERC), one of three federal research granting agencies responsible for the administration of the award. **WILL OXFORD**, who completed his master of arts from Memorial in 2007, also received a Vanier Canada Scholarship.



Photo SUBMITTED

Andrew Trant

The rugged and ecologically-rich forest covering central Labrador's Mealy Mountains is offering a Memorial PhD student fascinating clues on how climate change is affecting vegetation and wildlife in this sensitive region of the province. **ANDREW TRANT** is focusing his work on traditional Innu land in the area, digging soil pits, taking samples and studying the various strategies trees use to persist in the harsh and often volatile habitat. He has spent several seasons in the region. The biology student's research is focused on forest ecology—investigating how the treelines in the Mealy Mountains are—and will—respond to climate change.

Photos in this issue of *Research Matters* are courtesy of:

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