

MATTERS

research

Census of Marine Life wraps final year

Do you have a salty tooth?

Merchant seafarers
and their travels

Fish fuel

Cold hands could
mean life or death



Letter from the editor

I've worked at Memorial for five years, but I've only been the editor of *Research Matters* for about five months. Since I started in this new role, people have been asking me how I like it. The answer comes immediately: I love it. I love that one day I'll be talking to a researcher in the Faculty of Arts about the life of sailors in the mid-19th century and the next I'll be learning about offshore safety from a faculty member in Engineering or Human Kinetics.

I talk to students researchers, like the bright recipients of the 2010 Ocean Industries Student Research Awards, and administrators who help researchers access funding. At every level, research is valued, supported and celebrated.

And it is growing.

From 2002-2007, Memorial's research funding grew by 116.7 per cent—the highest growth in research funding among Canada's top 50 research universities. And in October 2010, Research Infosource Inc. released data that showed Memorial's research funding in 2009 exceeded the national average. This boost in funding is helping our researchers advance knowledge, inspire a new generation and shed light on the unknown.

What you'll find in these pages are just a few examples of the depth and breadth of research at Memorial.

I hope you enjoy this issue of *Research Matters*.

Meaghan Whelan



Editor
Research Matters

- 2** **Coming home to roost**
by Kelly Foss
- 4** **Cold hands could mean life or death**
by Michelle Osmond
- 6** **New research into preventing childhood obesity**
by Jennifer Deon
- 8** **Understanding the oil and gas industry's response to climate change**
by Leslie Vryenhoek
- 10** **Do you have a salty tooth?**
by Sharon Gray
- 12** **Telling their stories: Grenfell professor investigates the lives of Mennonite women in Mexico and Belize**
by Pamela Gill
- 14** **The emotional health of women after breast cancer surgery**
by Michelle Osmond
- 16** **Census of marine life wraps final year**
by Kelly Foss
- 18** **Professors patent cancer detection process**
by Jeff Green
- 20** **Wading into new waters**
by Darcy MacRae
- 22** **Affecting effectiveness: How emotion plays a part in the way students learn**
by Heidi Wicks
- 24** **Merchant seafarers and their travels**
by Janet Harron
- 26** **Using fish oil as fuel**
by Jackey Locke
- 28** **Of note: award-winning faculty**
- 30** **Student researchers shine**
- 32** **Research funding**

Editor

Meaghan Whelan

Assistant Editor

Joyce MacKinnon

Contributors Writers

Jennifer Deon
Kelly Foss
Pamela Gill
Sharon Gray
Jeff Green
Janet Harron

Jackey Locke
Darcy MacRae
Michelle Osmond
Leslie Vryenhock
Heidi Wicks

Art Director

Andrea Jackson

Graphic Designer

Helen Houston

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*.

Please address any comments or suggestions to Meaghan Whelan, editor, *Research Matters*, Office of the Vice-President (Research), Memorial University, St. John's, NL, A1C 5S7, email: research@mun.ca or telephone: 709 864 4073.



COMING HOME TO ROOST: How the Gulf of Mexico oil spill is impacting Canadian birds

By Kelly Foss

A PROFESSOR WHO HAS SPENT HIS LIFE studying the behavioural ecology of marine and terrestrial birds has mounted a considerable effort to track the migration of gannets from Newfoundland and the Gulf of St. Lawrence to the Gulf of Mexico.

Dr. Bill Montevecchi is a university research professor in the Department of Psychology. He was worried about the environment these particular Canadian birds would face as they completed their annual migration in light of the oil that was spilled in the area following the Deepwater Horizon drilling rig explosion in April 2010.

Together with his colleagues, collaborators and his research group at Memorial University, Dr. Montevecchi managed to attach more than 100 global location sensors on breeding adults and 26 satellite tags on flightless juveniles before they left four of the six North American colonies of gannets—Funk Island, Baccalieu Island, Cape St. Mary's and Bonaventure Island in Quebec.

Environment Canada, the Canadian Wildlife Service and the National Science and Engineering Research Council of Canada supported their efforts. Media coverage regarding the researcher's cry for help in monitoring the birds also

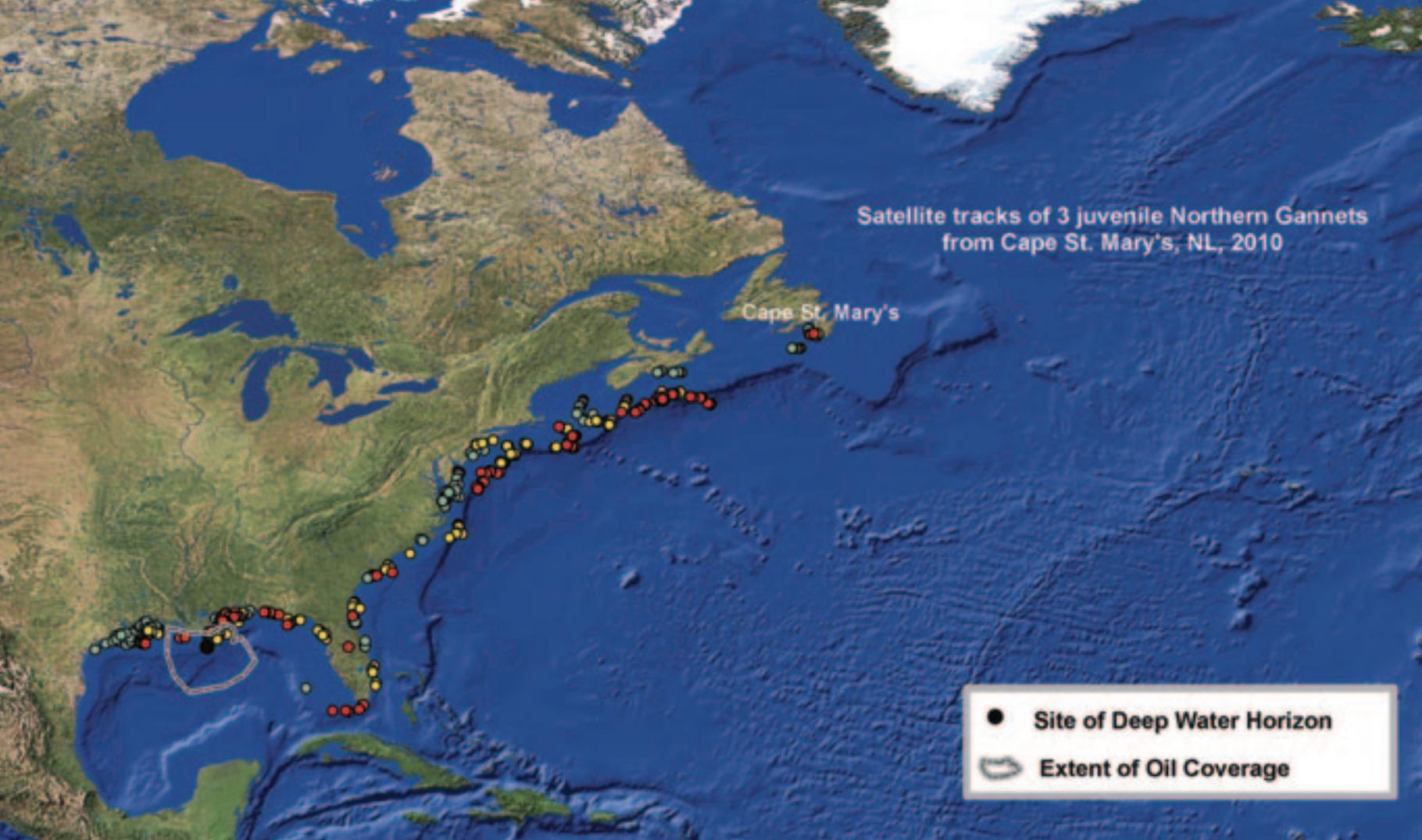
Cape St. Mary's



According to Dr. Montevecchi, the first oiled bird recovered in the Gulf of Mexico disaster was a northern gannet from Canada, highlighting the far-reaching consequences of the catastrophe.

Juvenile gannet with satellite tag taped under tail. Antenna can be seen extending beyond tail feathers. PHOTO CREDIT: G. Herzog





resulted in a donation by Memorial alumna, Alex Dalziel of Ottawa. His contribution has provided public access to the satellite-tracked movements of the juvenile gannets (www.seaturtle.org/tracking/?project_id=559).

“More than 100,000 of our young and adult birds go to the Gulf of Mexico,” Dr. Montevecchi said. “We had people at Cape St. Mary’s in the spring watching for oiled birds returning from the gulf, and thankfully most of our breeders managed to get out of there before the explosion. Many younger gannets didn’t.”

In fact, according to Dr. Montevecchi, the first oiled bird recovered in the Gulf of Mexico disaster was a northern gannet from Eastern Canada, highlighting the far-reaching consequences of the catastrophe. Of all the seabirds recovered, the northern gannet ranks third following year-round Gulf of Mexico resident species—the laughing gull and brown pelican. As of December 2010, well after the capping of the wellhead at the Deep Water Horizon site, oiled gannets and other birds are still being recovered.

“While there is little that we could do to prevent them from going back, we can at the least, act to increase our knowledge about seabird migration and to assess the

risks that these seabirds have been and will be exposed to in the Gulf of Mexico,” said Dr. Montevecchi.

The support he received will allow for immediate and long-term studies of the migratory patterns of Canadian seabirds, particularly those which migrate to the Gulf of Mexico. He and his research group are initiating a three-year research program with the goal of applying 150 satellite tags to northern gannets in Newfoundland and Quebec.

Though preliminary migration data of these species confirm their use of the marine areas affected by oil in the Gulf of Mexico, Dr. Montevecchi is aiming to expand this research to understand the proportions of individuals from different colonies that migrate to the Gulf of Mexico, when they arrive there and where they go within the gulf. This information will help assess the potential influences of the oil spill in the Gulf of Mexico on bird populations that originate from colonies in Eastern Canada and in the Canadian Arctic.

“Now we have the opportunity to see what’s happening in real time instead of trying to piece it together after the fact,” he said. ■

COLD HANDS

could mean LIFE or DEATH

by Michelle Osmond



“The results of this research could help solve the problems associated with escaping and surviving in cold water.”

DR. SCOTT MACKINNON LIKES TO PUSH PEOPLE TO THE LIMIT. Some of his research involves inducing motion sickness and dunking volunteers into cold water to see if they can perform safety and survival tasks—all in the name of science.

Prompted by the Cougar helicopter crash in March 2009 and the subsequent inquiry, Dr. MacKinnon and his team started a project to try and answer some of the questions around escape and evacuation that came out of that inquiry: Can people do this in cold water? Is it even possible? Will they have the strength and the dexterity?

“Our team proposed this research program to Petroleum Research Atlantic Canada (PRAC). We have the facilities and could answer some industry and regulatory questions almost immediately,” said Dr. MacKinnon, who teaches in the School of Human Kinetics and Recreation. “The results could help manufacturers, trainers and regulators solve the problems associated with escaping and surviving in cold water, which, in turn, could mean life or death.”

Dr. MacKinnon and his team are using a temperature regulated immersion tank in HKR; a fish hold which was taken from an old fishing boat. The first phase was about survival once they’ve escaped the helicopter. It involved simulated swimming away from the crash site, turning on their emergency locator beacon, putting on a spray shield, and then putting on thermal protective gloves. All while immersed in water and wearing a survival suit.

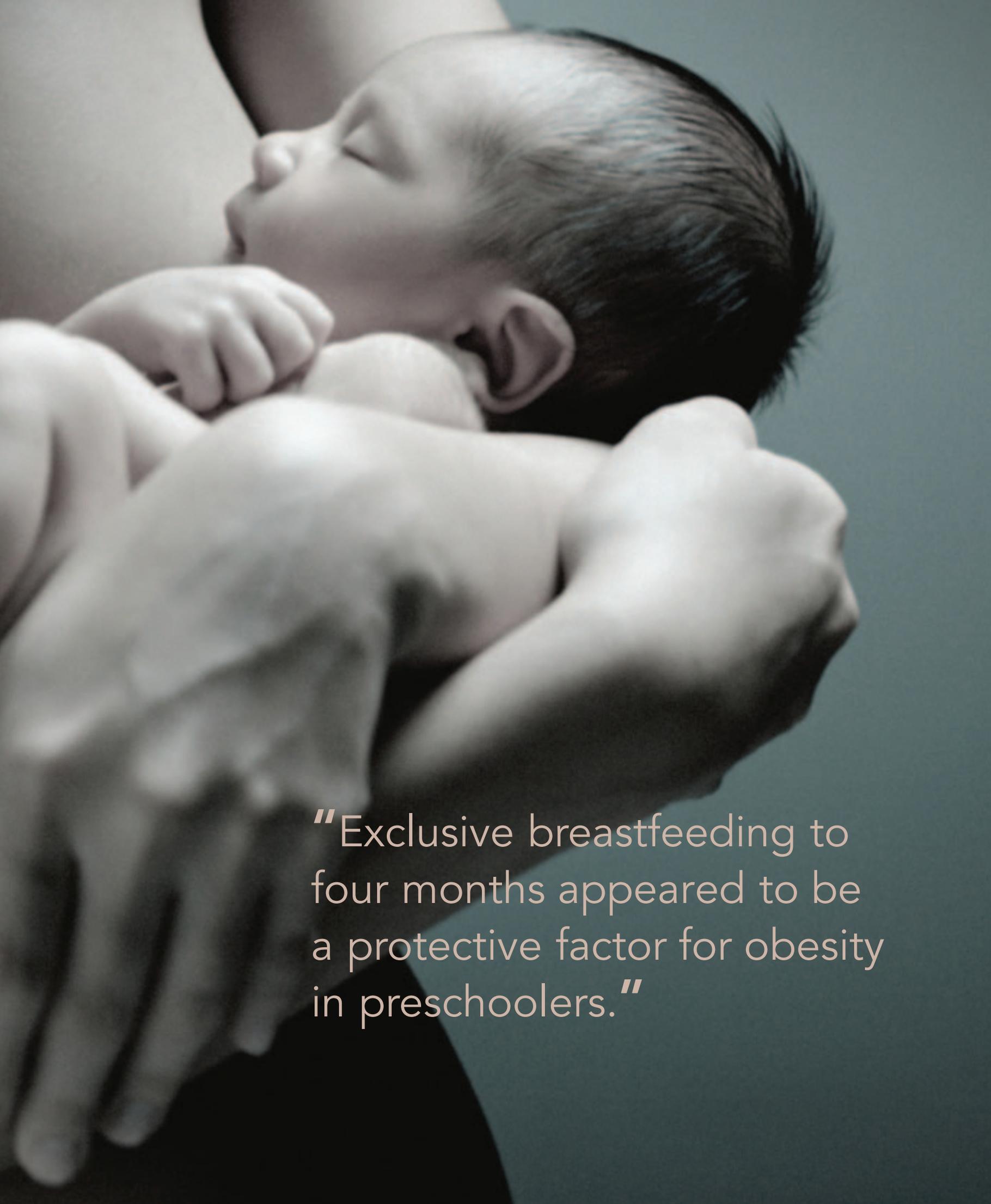
The second phase involved escaping. A mock up of a helicopter seat and window were fabricated in the tank. Subjects, who were seated and underwater from the neck down, had to activate the helicopter underwater escape breathing apparatus (HUEBA), punch out a window, unlatch their seat harness and

get out. This part was done in both daylight and dark (using blackout goggles).

Even though, as Dr. MacKinnon noted, results from both phases indicated that participants were able to complete the tasks in the allotted time, he also pointed out that as we move from prescriptive to performance-based standards more work is still needed to improve the health and safety of offshore workers. “Many of the legislative requirements for escape and survival from helicopters are based on prescriptive standards that define exactly how to do something but allows little or no flexibility on how to achieve them. As we move to exploration in the north we need to consider performance-based standards for safety and survival that allows for flexibility on how this is achieved. Then we can more quickly adapt to new situations and exploit emerging technologies.”

Dr. MacKinnon has teamed up with researchers at the National Research Council’s Institute for Ocean Technology, the Marine Institute, Virtual Marine Technology and the Faculty of Engineering and Applied Science to undertake several large research projects related to escape, evacuation, survival and rescue (EESR) in harsh environments. “St. John’s has a considerable research cluster and a growing expertise in offshore safety, survival and training. This has attracted attention from oil and shipping companies, and often regulatory bodies and classification societies looking to this group for advice and guidance,” he said. “Survival in cold water will become even more relevant as exploration in the Arctic opens up. Even how long it will take us to get to a crew to rescue them, assuming they’ve managed to escape, is an issue. Help could be a long ways away. There’s still a lot work to be done to make sure people come home safe and sound.” ■





“Exclusive breastfeeding to four months appeared to be a protective factor for obesity in preschoolers.”

NEW RESEARCH INTO PREVENTING

Childhood OBESITY

By Jennifer Deon

CAN BREASTFEEDING HELP PREVENT OBESITY IN CHILDREN IN NEWFOUNDLAND AND LABRADOR? IT MIGHT.

School of Pharmacy researcher Laurie Twells (who has a joint-appointment to the Faculty of Medicine) and her colleague pediatrician Dr. Leigh-Ann Newhook have discovered a small but significant relationship between exclusive breastfeeding and preschool obesity.

The implications are far reaching. Several studies on obesity in children show an association between excessive body fat and risk factors such as high blood pressure, high cholesterol, increased incidence of asthma and increased risk of Type 2 diabetes (a disease that until recently was only diagnosed in adults). Obese children are also more likely to experience psychological problems and lower levels of income and educational attainment in the future.

In this study, to examine the link between breastfeeding and preschool obesity, the heights and weights of over 1,000 children born in 2001 were measured during pre-kindergarten health fairs in 2005. This information allowed Dr. Twells and Dr. Newhook's team to calculate the body mass index (BMI) of each child. Researchers also collected information regarding how the child was fed as an infant and for how long, the mother's education and smoking status, and whether the child was born pre-term or full-term.

"Based on direct measures of heights and weights, we found that one in three preschool children in this province are overweight or obese," said Dr. Twells. "In analyzing the data, we were able to conclude that exclusive breastfeeding to four months appeared to be a protective factor for obesity in preschoolers."

"We know that in this province, six out of every ten adults are overweight or obese," she explained. "Research

shows that obese children are more likely to become obese adults."

"Providing more evidence for this link between exclusive breastfeeding and possible protection from obesity is extremely important to families and health care practitioners in Newfoundland and Labrador."

The findings are particularly important to pharmacists, as they serve as an important resource for new mothers.

"Pharmacists are often consulted by new mothers about the safety of breastfeeding when taking medications, which medications are safe to take during breastfeeding, as well as how best to manage common complications such as engorgement, thrush and mastitis," Dr. Twells said. "They play an important role in promoting the exclusive practice of and the continuation of breastfeeding."

Memorial's School of Pharmacy is incorporating these research findings into the teaching curriculum at the school, as this study provides even more evidence to support mothers in their choice of feeding method.

Dr. Twells noted that there are many factors that are both associated with and predictive of obesity, including genetics, individual lifestyle choices, community structure, societal values and public policy.

"There is still significant work to be done as we combat the debilitating health complications that accompany obesity," she stated. "This research is one small piece of the overall puzzle that can be used by new mothers and front-line health care practitioners, such as pharmacists, to support and promote exclusive breastfeeding as one way to reduce childhood obesity in our province." ■

Understanding the oil and gas industry's response to

CLIMATE CHANGE

by Leslie Vryenhoek



IN THE DECADES SINCE CLIMATE CHANGE STORMED THE WORLD STAGE, it's grown from a fringe environmental concern to a mainstream economic, political and social force. No industry has been more at the forefront of the issue than the oil and gas industry.

A Memorial researcher is exploring how different players in this industry took steps to address climate change through the years, and how those responses changed as public opinion and governments turned up the heat.

Dr. Natalie Slawinski hopes her research will shed light on how public policymakers and corporate decision-makers can balance short-term economic considerations with long-term environmental and social impacts.

Dr. Slawinski is an assistant professor of strategic management in Memorial's Faculty of Business Administration. Her PhD thesis, supervised by Dr. Tima Bansal of the Ivey School of Business at the University of Western Ontario, examined current corporate responses to climate change, and included interviews with over 50 managers and executives at nine companies operating in Alberta's oil sands.

She expected to find similarities in corporate responses, since companies tend to imitate one another to contain their costs and risks. However, striking differences emerged. While some looked only at the short-term economic impacts of their climate change related initiatives, others took a longer-term approach to explore the impact of their response on their company, the environment and society. That long-term thinking, she found, could offer a distinct competitive advantage.

In an article published in the *Ivey Business Journal* and reprinted in *The European Business Review* (July/August, 2010), Drs. Slawinski and Bansal provided a list of best practices to help firms balance short and long-term goals when dealing with climate change.

Now, Dr. Slawinski is embarking on a longitudinal study examining historical climate change responses in the oil and gas industry to see how they've evolved over time. The project received \$27,000 in funding from the province's Research & Development Corporation of Newfoundland and Labrador (RDC), through its Industrial Research and Innovation Fund (IRIF). Again, she will collaborate with Dr. Bansal.

Dr. Slawinski explains that in the mid-1990s, many oil and gas companies ignored climate change and others actively denied it. "The Kyoto Protocol left many companies feeling threatened. Some were going as far as denying the science as part of their PR efforts," Dr. Slawinski explained. "Other companies were very engaged with the issue from the start."

Despite exposure to the same external forces — scientific data, public opinion and public policy shifts — corporate reactions varied. "I want to understand what the sources of these differences were, and how organizational cultures and strategic goals led to different perceptions of the issue."

"Companies that take a long-term approach to climate change mitigation may have a distinct competitive advantage."

The research will involve pouring over archival materials and interviewing current and retired executives who can speak — confidentially — to what influenced corporate decisions. She expects to learn what role non-governmental organizations, public opinion and other external factors had in influencing companies' climate change strategies.

Given the importance of energy production to Canada's economy, she believes it's crucial that government policymakers understand how and why corporations invest in climate change mitigation, and what the long-term impacts will be on companies and society.

"If we can understand in a deeper way what drives corporate action on climate change," Dr. Slawinski asserted, "then we can find strategies that companies can use to reduce their greenhouse gas emissions, while remaining competitive." ■

DO YOU HAVE A SALTY TOOTH?

by Sharon Gray

EVEN IF YOU NEVER USE A SALT SHAKER,

the chances are your daily diet contains too much sodium. From bread to canned vegetables to pizza, the average person's diet is rich in sodium, most of it added during the industrial preparation and processing of foods. While much of this sodium is added as salt (sodium chloride), it can also sneak into food in a number of other forms such as monosodium glutamate and baking soda.

Biomedical researcher Dr. Bruce Van Vliet is an expert on the effect of sodium on blood pressure and its relationship to cardiovascular disease, the number one cause of death in Canada.

Dr. Van Vliet says like a sweet tooth, we all have a salty tooth. The good news is that you can re-program your palate—but it takes some effort and close attention to what you eat.

"Three-quarters of the sodium in food is added by the food industry. Only 10 per cent occurs in food naturally. If companies weren't adding salt to food we could control it more easily," he explained.

Even if you carefully add up the amount of sodium listed in purchased food, and try to keep within a reasonable daily limit, you may still be eating too much sodium.

"The number on, for example, a can of soup is stated as a percentage of the maximum daily limit," said Dr. Van Vliet.

"Starting to eat a high sodium diet early in life is a terrible thing."

“The daily limit of 2,300 milligrams is the most you should be consuming—an adequate intake would be about 65 per cent of this or 1,500 milligrams.”

Dr. Van Vliet’s research is helping us to understand precisely how a lifetime exposure to salty foods affects our blood pressure, and the underlying mechanisms. In societies where sodium consumption is high, such as North America, blood pressure rises as a person ages. This is a slower phenomenon that isn’t necessarily reversible with medication or dietary changes.

“The more sodium the society eats, the more the blood pressure rises with age,” explained Dr. Van Vliet. “And when I say with age, I mean over decades. You can’t see it in an individual very easily, so it’s hard to investigate. But what we can do is look at it in animal models.”

With the help of funding from the Canadian Institutes of Health Research, Dr. Van Vliet and his colleagues performed experiments to illustrate that salt-induced hypertension has both rapid and slow phases, with varying levels of reversibility.

Dr. Van Vliet is particularly concerned about the exposure children have to a high sodium diet and its contribution

to a “slow and insidious” rise in our blood pressure during aging.

“There are a growing number of studies which show that the earlier in life you are exposed to salt, the more profound the effect will be,” said Dr. Van Vliet. “Starting to eat a high sodium diet early in life is a terrible thing.”

This raises the question of whether sodium consumed by a mother when she is breastfeeding, or even pregnant, could increase her child’s risk of hypertension later in life.

“The maternal nutritional environment during pregnancy seems to alter the offspring in a long-term way. It can’t change the offspring’s genetic code, but it can change the manner in which the offspring’s genes are used,” explained Dr. Van Vliet. “We want to find out if the sodium a mother consumes during her pregnancy can have this kind of reprogramming influence on her baby’s genes.”

Dr. Van Vliet’s findings could eventually influence the dietary recommendations for pregnant women. ■





Ninety-year-old Sarah Bueckert Fast still sews three braided mats a week. She easily shared with Dr. Doreen Klassen her recollections of moving to Mexico as a six-year-old.

Telling their **STORIES:**

Grenfell professor investigates the lives of
Mennonite women in Mexico and Belize

by Pamela Gill

DOREEN KLASSEN'S MENNONITE HERITAGE and her passion to learn more about Mennonite communities around the world took her to Belize and Mexico. It might seem like an unlikely locale to find Mennonite communities, but during her travels, Dr. Klassen encountered a rich Mennonite culture, which provided an abundance of participants for her research on women's storytelling in Low German (her mother tongue).

How these communities came to be in Mexico and Belize has to do with perceived threats to their way of life in the previous areas in which they'd lived. As modern civilization encroached on their lands in more northern climes, the communities moved south to relatively isolated places.

"There was a combination of factors," explained Dr. Klassen, who teaches in the social/cultural studies program at Grenfell Campus, Memorial University of Newfoundland. "They were moving for religious reasons, but they also had to move to countries where there would be an interest in developing agriculture."

With respect to developing the livelihood of their families, historians sometimes suggest the men were the integral force. Dr. Klassen's work investigates where the women found themselves amid this migratory turmoil.

"You always hear the stories of the men who went to look for land," she said, "but who packed the suitcases, kept the farm running and took care of the children?"

In 1922, many Mennonite families moved to Mexico with the advent of the Manitoba Schools Act, which required children to be educated in the language of the land in public schools. When land shortages became a problem in Mexico, they migrated to Belize, and when life became more radical in Belize, some moved on to Bolivia.

These isolated communities may have offered a purer existence, but today they are making strides to improve education levels and social programs, especially in the area of treating addictions.

"There's a great range of attitudes about education," said Dr. Klassen. "Some groups believe knowledge has to be pragmatic and requires minimal schooling. Others have a full high school curriculum and already have realized college graduates."

She said changes are coming because many women want better options for their children.

"These women are determined that the next generation will have more education," she said. "I don't think I ever heard a woman who made sacrifices say 'I'm doing this for myself.' They were working for change on behalf of their children, trying to respect their elders, while working within the culture from the inside out."

Dr. Klassen's work in Mexico was facilitated by contacts at the Low German Concerns Division of the Mennonite Central Committee (MCC), a worldwide organization that responds to basic human needs and works for peace and justice. Her research in Belize was instigated by Belizean students at Grenfell, who prompted her to study Mennonite communities in their country. Dr. Klassen actually stayed with the family of three Grenfell students (sisters) while in Belize.

She said going to Belize added a wonderful richness to her research experience, since the Mennonite communities there are so varied.

"You always hear the stories of the men who went to look for land, but who packed the suitcases, kept the farm running and took care of the children?"

Some Mennonites have the best paved roads in the country, surrounded by large fields of beans, corn or rice, depending on the season. Others travel by horse and buggy, bringing crates of chickens to the country's largest chicken-killing plants. Still others operate Caribbean Tire, a family-owned chain of automotive shops.

"This range of occupational pursuits allowed me to speak with a variety of women about their recollections of immigration to Belize, childhood play, courting and marriage, physical and spiritual health and illness, and current issues in their lives," said Dr. Klassen.

The stories of the 30 women she interviewed in Belize will join those of 40 women from Mexico to form the basis of her next book. ■



EARLY DISCHARGE:

The emotional health of women after breast cancer surgery

by Michelle Osmond

RESEARCH HAS SHOWN that patients with breast cancer differ from other patients undergoing day surgery because they require more emotional support, counselling and information to alleviate anxiety and fear.

WOMEN WHO HAVE HAD SURGERY FOR BREAST CANCER

used to be hospitalized for a week to 10 days after surgery. However, in recent years these women are increasingly operated on as outpatients. Not only does it potentially save money, but research indicates that these women have a better physical and mental recovery than women who stay in hospital. Some researchers have suggested that an early discharge can be empowering for women in their recovery, provided they are ready for it.

Some Memorial researchers noticed that there was a lack of research on the psychosocial needs of women who have breast cancer surgery as an outpatient. No one had asked these women if their emotional and informational needs had been met during their ordeal.

Doreen Dawe along with Lorna Bennett, Doreen Westera and Dr. Anne Kearney from the School of Nursing felt that this information was crucial for health care workers. After all, research has shown that patients with breast cancer differ from other patients undergoing day surgery because they require more emotional support, counselling and information to alleviate anxiety and fear.

The researchers wanted to know: if women were not being admitted to hospital, were their emotional and informational needs being met? For this study, psychosocial needs include the emotional needs, that which provides the patient with comfort and peace of mind, and informational needs, the information needed post-surgery for a positive recovery.

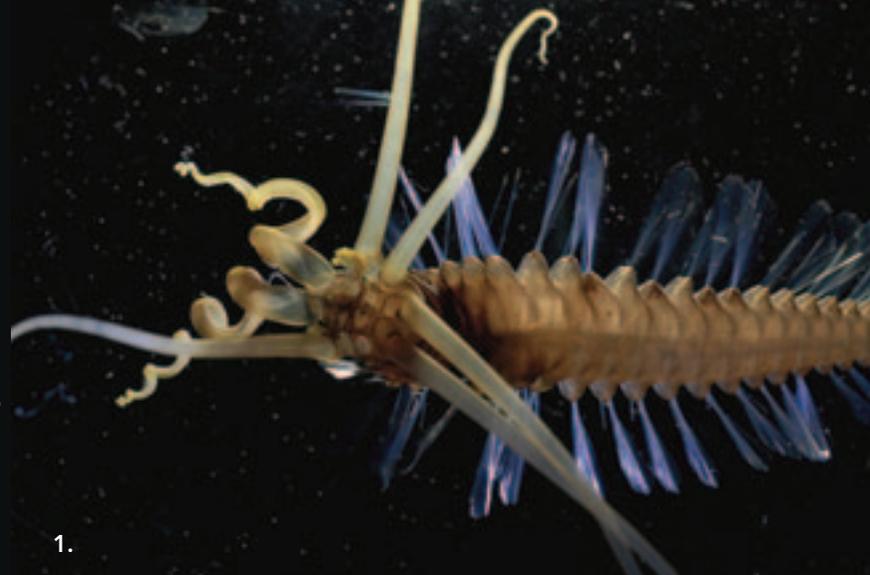
“The motivation for this research came from another project where my colleagues and I interviewed volunteers who work with women who are newly diagnosed,” explained Dawe. “At that time, volunteers had access to these patients in the hospital setting. The women in that study acknowledged the importance of the role of the volunteer visitor for emotional support; that it was the women who had gone through a similar experience who could really understand them and their emotional needs, and offer emotional support.”

With 19 participants at an average age of 53 years, the researchers discovered several things that could have implications for health care workers. For example, women preferred that outpatient surgery occur in the morning; the community health nurse needs to visit the day after and every day until initial recovery has occurred; all women should be assessed for their ability to travel to the community health office for follow-up; the amount and timing of information are critical; women should be given the option of staying over night; and contact with survivors is an integral part of the intervention.

Dawe says she was surprised that many women wanted to go home early after the surgery. “Initially they expressed being apprehensive but they liked the idea of recovering at home. They also talked about needing the support of being able to talk to someone who had gone through this experience,” Dawe explained. “The most outstanding negative feeling expressed by the women in this study was feeling that they had been rushed out of the hospital after the surgery when they needed time to recover from the anesthetic before going home.” ■

Census of Marine Life wraps final year

by Kelly Foss



As mysterious as the moon, the ocean holds many secrets.

Marine explorers from more than 80 countries have spent the last decade prying into those secrets in one of the largest scientific collaborations ever conducted—a global attempt to improve our understanding of the diversity, distribution and abundance of life in the ocean. To get there they spent nearly \$650 million worldwide, as more than 2,700 scientists spent over 9,000 days at sea and countless days in labs and archives.

In October 2010, they delivered the historic first global Census of Marine Life. The resulting books, maps, databases, videos, websites, journals and photo galleries can be found at www.coml.org.

After 10 years of studying everything from the seashore to the deep sea and from whales to microbes, Dr. Paul Snelgrove says one thing researchers have discovered for certain is that it will take much longer to have a full understanding of life beneath the waters. A professor at the Ocean Sciences Centre who is jointly appointed to the Department of Biology, Dr. Snelgrove says the census answered many questions but raised many others.

“We’ve counted many things but know some environments are still poorly sampled, and we know little about the specific roles of all of these species. But the community of scientists the census has created is keen to continue working together.”

While there is no clear mechanism to continue the international program at the moment, Dr. Snelgrove said there are projects

that began with the census, including the NSERC Canadian Healthy Oceans Network (CHONe), led by Dr. Snelgrove and based out of Memorial University, which will continue well beyond 2010.

Dr. Snelgrove also played a key role in the final years of the census as the university received funding for him to co-ordinate the synthesis phase. This phase brought the 17 different projects involved in the census together.

“We realized it was a shame not to bring these pieces together—to put the ocean back together, as it were, so we funded smaller initiatives to bring together data sets and ideas from different projects.”

Among those projects was Dr. Snelgrove’s book, *Discoveries of the Census of Marine Life: Making Ocean Life Count*, which summarizes each of the projects.

These efforts as part of the census have greatly benefitted Memorial University.

“The census certainly helped raise the university’s profile in marine sciences and biodiversity, so it’s been very good for us in that sense,” he said. “I think we’re in a good leadership position for the future, but funding is getting tighter and tighter and we have to work harder and harder to convince central Canada that the oceans matter.”

“I think the census has helped with that. It’s been very successful at outreach and communication, and through it marine life has gotten into newspapers around the world. I hope that has convinced people who live far from the ocean that they should care and should put resources towards research.” ■

1.



2.



3.



4.

1. In October 2007, US and Filipino scientists travelled to the Celebes Sea in Southeast Asia, searching for new species living in its deep water. When they discovered this extraordinary worm—which they named Squidworm—they knew they had something completely different. WHOI scientist Larry Madin and National Geographic Society photographer Emory Kristof led the expedition, which was supported by the NOAA Office of Exploration, the National Geographic Society, and the WHOI Ocean Life Institute (OLI). PHOTO CREDIT: Laurence Madin, Woods Hole Oceanographic Institution

2. Christmas tree worm (*Spirobranchus giganteus*) found at Lizard Island. PHOTO CREDIT: John Huisman-Murdoch Univ.

3. Flamingo tongue snail (*Cyphoma gibbosum*) was photographed near Grand Cayman, British West Indies, and is listed in the Gulf of Mexico biodiversity inventory. PHOTO CREDIT: Kacy Moody

4. The final diving lessons for this young Weddell seal (*Leptonychotes weddellii*). It is the size of his mother who is waiting under the water. He will very soon be independent. PHOTO CREDIT: Galatée Films

5. Researcher Dr. Niel Bruce of the Museum of Tropical Queensland studies specimens in lighted aquarium on Lizard Island Reef. PHOTO CREDIT: Gary Cranitch, Queensland Museum

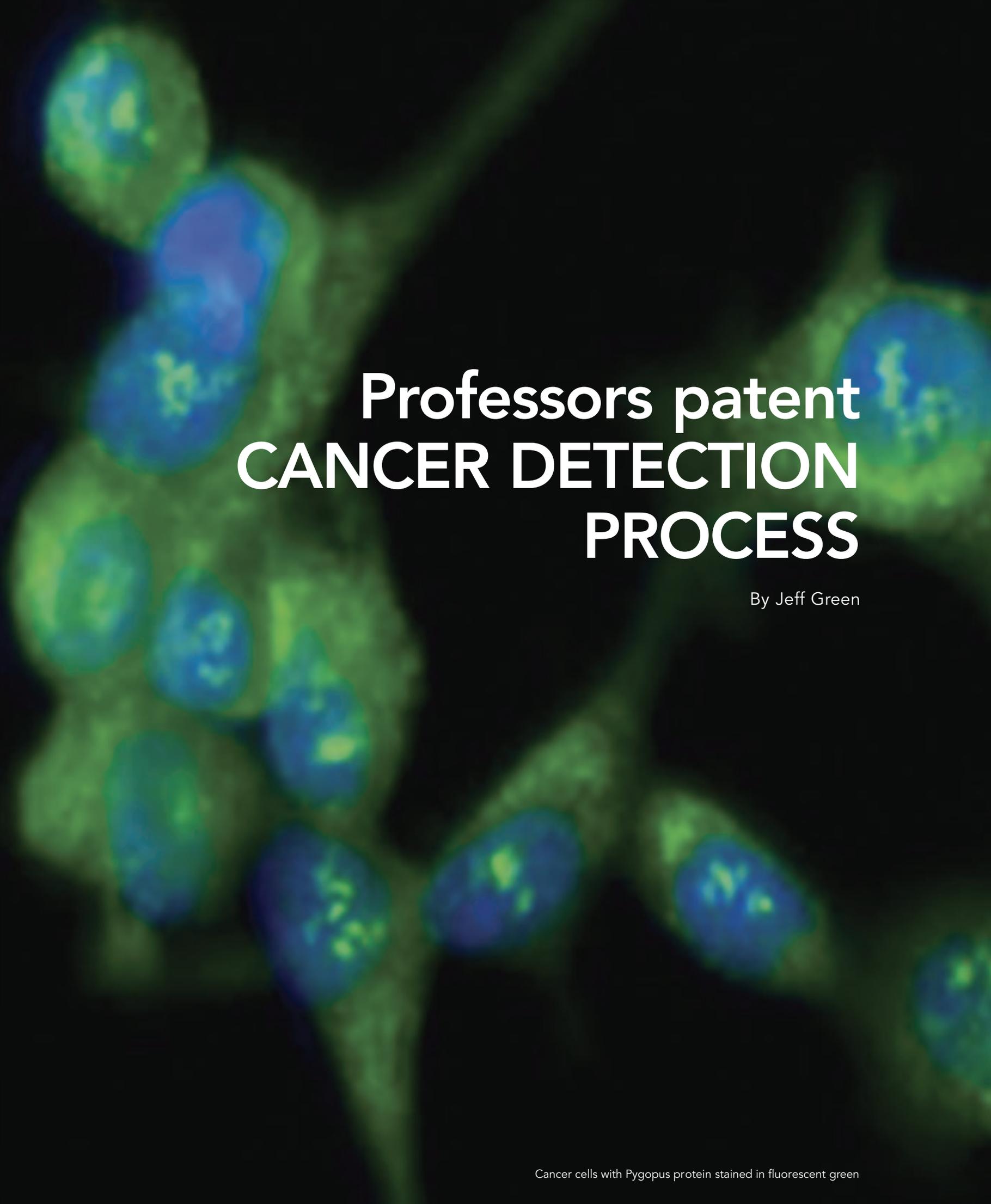
6. Mike Goebel and Birgette McDonald of the US AMLR program inspect a leopard seal on a beach at Livingston Island Antarctica. PHOTO CREDIT: Dan Costa



5.



6.

The background of the entire page is a microscopic image of cancer cells. The cells are stained with fluorescent dyes, making their nuclei appear bright blue and their cytoplasm and membranes appear in shades of green. The cells are scattered across the frame, with some in sharp focus and others blurred, creating a sense of depth. The overall lighting is dark, highlighting the glowing cells.

Professors patent **CANCER DETECTION PROCESS**

By Jeff Green

RESEARCH INTO THE FIGHT AGAINST CERTAIN TYPES OF CANCER IS TAKING A GIANT LEAP FORWARD.

Two cancer experts from the Faculty of Medicine have successfully patented a cancer detection process.

Dr. Ken Kao, a professor of biomedical science, and Dr. Cathy Popadiuk, an associate professor of obstetrics and gynecology, have been granted a patent for an invention developed by their team of research staff, postdoctoral and graduate students utilizing the Pygopus gene.

Pygopus is needed for normal development of embryos.

It's a powerful gene that fuels cells to keep growing and dividing, which is needed for fetal growth, but then must be carefully controlled after birth. Cancer cells hijack the Pygopus gene and use it to their advantage to out-compete normal cells and form tumours.

"We have figured out the mechanism of how cancer cells hijack Pygopus and used this knowledge to develop a diagnostic kit for cancer detection," Dr. Kao explained.

Patenting the gene is important for researchers.

It legally stakes a claim to the discovery and protects them from competition to pursue commercialization of the invention.

For Drs. Kao and Popadiuk it means they're able to maintain the fact they were the first to discover the utilization of Pygopus in the development of certain types of cancer. "Cancer testing in the pathology labs is a critical tool that oncologists use to guide treatment of their patients. But they need reliable results to make important decisions. In breast cancer diagnosis, for example, the ER/PR test is important. A Pygopus test may refine the testing process to eliminate false results."

Their research is having far-reaching implications and could help to save the lives of people battling many cancers such as cervical, ovarian, lung and breast. "We have found that the test also applies to other malignancies like prostate cancer," added Dr. Kao. With help from the Dr. H. Bliss Murphy Cancer Care Foundation, they've received generous funding from the Avalon Chapter of the Motorcycle Ride for Dad for Prostate Cancer Research

and the Research & Development Corporation of Newfoundland and Labrador (RDC).

The researchers collaborated with Memorial's Genesis Group Inc. to finalize the patent and will continue to work with Genesis with the goal of further commercializing their team's findings.

"We have figured out the mechanism of how cancer cells hijack Pygopus and used this knowledge to develop a diagnostic kit for cancer detection."

Dr. Kao credited the Genesis Group for its commitment to the development of the cancer diagnostic kit. The separately incorporated entity supports university faculty, students and staff engaged in research, development and outreach.

The next step, he added, is to find a commercial partner to push the development of the invention forward.

"Commercial development of a product is the only way medical technology advances can reach the patient," said Dr. Kao. "We are presently working with NovaLipids, a Memorial-based biotechnology company, but we are open to other partners."

Meanwhile, Dr. Kao said if the team is successful in finding a commercial partner and there are any royalties obtained from a product resulting from the patent, the money will go back into Memorial research.

"Those funds will be put back into the lab for staff and graduate students so they can continue their work, to make more discoveries," he said. ■



Wading into new

WATERS



THE CREATION OF CFER HELPS MI IMPROVE PROVINCE'S FISHERIES RESEARCH CAPABILITIES

by Darcy MacRae

APPLIED RESEARCH LED BY THE MARINE INSTITUTE'S newest centre will result in a better understanding of fish stocks and the health of Newfoundland and Labrador's marine ecosystem, providing information that was not available in the past. The Centre for Fisheries Ecosystem Research (CFER) will play a vital role in the future of fisheries in Newfoundland and Labrador, as well as the future of rural communities in the province.

"We have not had a strong, local capacity in fisheries research in Newfoundland and Labrador for a long time. But there is hope that with CFER, we can turn that around," said Dr. George Rose, scientific director, CFER. "I think the payoff down the line will be tremendous. For starters, the actual research that is getting done is going to add incrementally to the knowledge that we have about our marine fisheries ecosystems. With the people who are going to be trained here and employed here, we're going to have a whole new capacity of knowledge and scientific horsepower that was never present before."

The Government of Newfoundland and Labrador helped launch CFER in July 2010 by providing the Marine Institute with \$11.75 million to establish the centre. This includes \$6.5 million toward the human resources and operating costs of the centre, over the next five years, and \$5.25 million for the chartering of large research vessels for offshore research. The Research & Development Corporation of Newfoundland and Labrador (RDC) contributed \$1.5 million to CFER.

"We've already taken on several new projects that we wouldn't have been able to take on before CFER and there's going to be a lot more of that," explained Dr. Rose. "But we're also picking up some of the pieces that were dropped over the past couple of decades. There is so much to be done and we can't start off doing everything. So my strategy is to try to pick some projects that have maximum potential, like the winter cod survey we'll be doing with the help of the RV Celtic Explorer."

In October 2010, the Marine Institute revealed its plans to charter the RV Celtic Explorer, a state-of-the-art fisheries and oceanographic vessel, from the Irish Marine Institute in Galway, Ireland, for research directly related to CFER activities. The vessel arrived in St. John's in early February to conduct an overwintering survey of cod stocks in Newfoundland and Labrador waters involving collaboration with university and government scientists. The transit across the North Atlantic was used to conduct research involving CFER and collaborating scientists from Memorial University, post-secondary institutions in Ireland and other oceanographic institutes.

"Chartering the RV Celtic Explorer is an important step toward establishing CFER as the premiere university-based authority on fisheries and ecosystems research in Eastern Canada," said Glenn Blackwood, executive director, Marine Institute. "CFER aims to create a better understanding of fish stocks and the status of Newfoundland and Labrador's marine ecosystems, both at present and in the future. Having the RV Celtic Explorer at our disposal greatly aids our efforts in this regard."

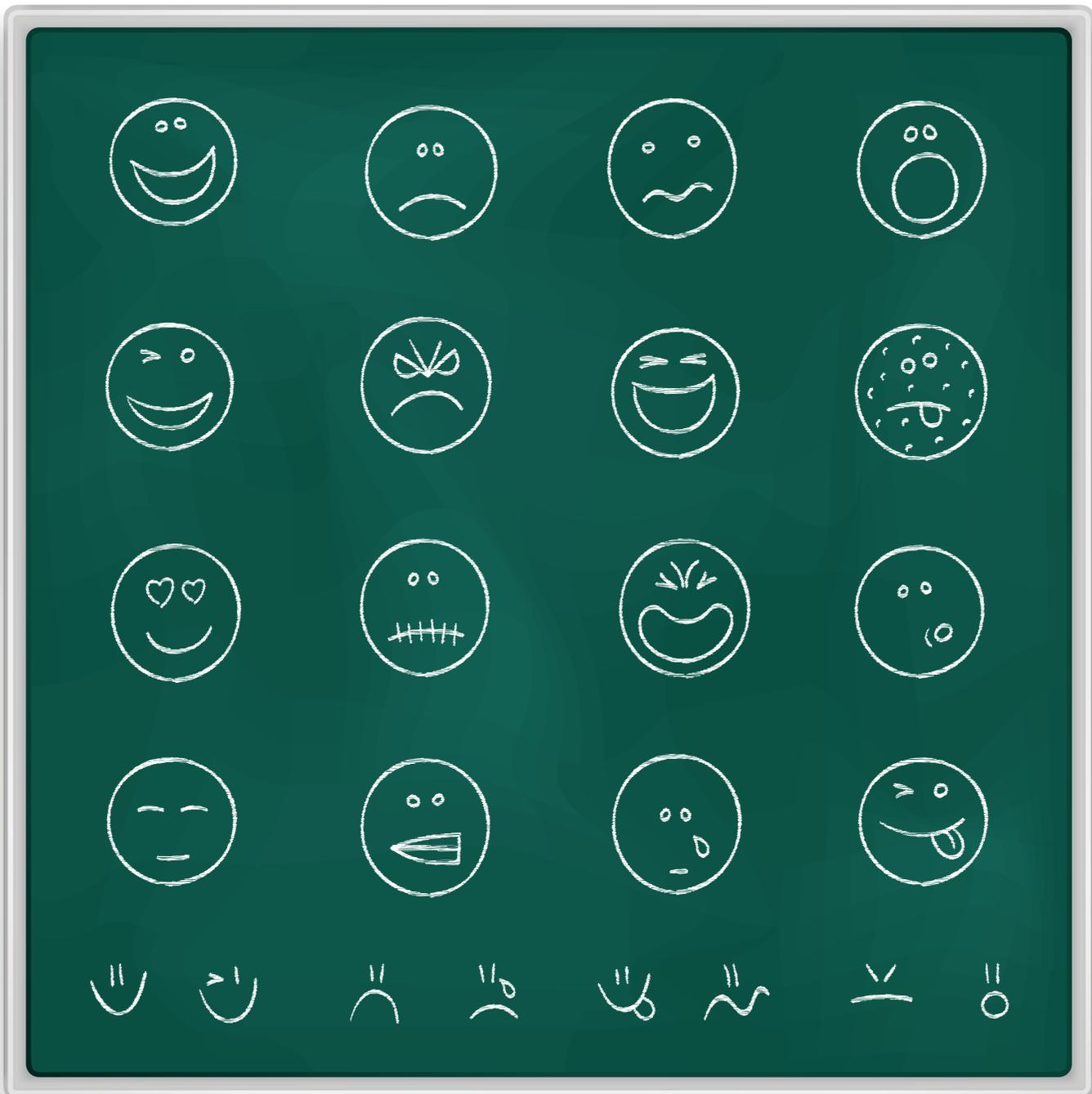
Dr. Rose says CFER represents an opportunity to permanently establish fisheries research at MI and create a new chapter in the province's research capabilities. The establishment of the Centre for Fisheries Ecosystem Research is expected to help create linkages and partnerships between MI and researchers from countries such as Ireland, Norway, Iceland, New Zealand and the United States.

"CFER supports a vision of a long-term future for the fisheries of Newfoundland and Labrador," said Dr. Rose. "The establishment of the centre could help make significant improvements to the fisheries sciences research capabilities in the province, while creating opportunities to collaborate with respected Canadian and international fisheries scientists." ■

AFFECTING EFFECTIVENESS:

How **emotion** plays a part in the way students learn

By Heidi Wicks



“IS EFFECTIVE TEACHING THE SAME ONLINE AND ON-CAMPUS?”

WHILE STUDENTS ARE EVALUATED ON A DAILY BASIS, THE SHOE IS RARELY ON THE OTHER FOOT.

Universities and colleges are increasingly challenging themselves to improve the effectiveness of teaching, according to the work of Dr. Jerome Delaney, Albert Johnson, Dr. Trudi Johnson, and Dr. Dennis Treslan, Faculty of Education/Distance Education and Learning Technologies (DELT), at Memorial University.

The quartet has recently released *Students' Perceptions of Effective Teaching in Higher Education*—an award-winning publication that explores the emotional connections between students and instructors, and how that affects the effectiveness of their learning.

Mr. Johnson received a Masters Thesis Project Award from the Canadian Society for the Study of Higher Education (CSSHE) in Montreal and presented the team's research in a spotlight event in St. John's in late 2010.

“Student rating of instruction was introduced into North American universities in the mid-1920s,” said Mr. Johnson. “However, the desire to clarify the qualities that make university teaching effective has been revitalized in light of the increasing strategic focus universities and colleges are placing on enhancing teaching and learning.”

The growth of online distance education has led researchers to question the characteristics of effective teaching in an online environment and whether they're the same as effective teaching in a face-to-face setting. And if so, how are these characteristics manifested through electronic media?

Using a unique online approach to data gathering, students were asked to isolate the characteristics they believe are essential to effective teaching at the university level. An open-ended online survey was made available to over 17,000 graduate and undergraduate students at Memorial University during the winter semester of 2008. The data led to student definitions

of nine characteristics and sets of instructor behaviours that students perceive as essential to effective teaching.

Those nine characteristics for on-campus students, in order of the number of times they were mentioned in the survey results, were: respectful, knowledgeable, approachable, engaging, communicative, organized, responsive, professional and humorous.

Respondents to the distance portion of the survey place emphasis on the nine characteristics in the order of: respectful, responsive, knowledgeable, approachable, communicative, organized, engaging, professional and humorous.

“In short, research into the affective domain has identified compelling linkages between positive emotions and enhanced learning and creative thought,” said Mr. Johnson. “Past researchers have found that students' perceptions of what constitutes effective instruction transcend time, and those qualities of what makes effective teaching are emotionally-charged.”

The results reflect the experience of Meghan Mitchell, BA(Hons.)'08, who has completed a number of classroom and distance courses. “The best distance courses, and on-campus courses, all have professors who are engaged with the class and passionate about the subject they teach,” she explained. “In a distance course, this comes through when the professors interact with the technology available and use the video, discussion board and other online tools to connect with students.”

This research has been presented at the annual conference of the Canadian Network for Innovation in Education (CNIE), the Edge 2009 conference, the 26th annual conference on Distance Teaching and Learning in Madison, Wisconsin, and through an online session with the Canadian Institute for Distance Education Research (CIDER), which was held in November, 2010. ■

View the full research report at www.distance.mun.ca/survey.

“The family researcher has a goldmine of information here ... the website will showcase the stories of individuals and their travels.”

DR. VALERIE BURTON AND A DEDICATED TEAM OF students and staff have undertaken a huge project — sharing the stories of those who toiled as part of the British Empire’s merchant marine from 1863 to the 1920s and enhancing the experience of family historians using the Maritime History Archive as a result.

“What is fascinating about these documents is what they tell us about the world that generated them and what that in turn says about our own world,” said Dr. Burton, who has received a one-year SSHRC public outreach grant to develop a website called *More Than a List of Crew*. “These documents sit in that space and time where the concerns of the government meant that resources could be given to maintaining information on seafarers in locations all over the globe.”

Since the early 1970s, Memorial’s Maritime History Archive has been home to what Dr. Burton confidently calls, “the largest archive of working people that exists in the world.” This archive consists of nearly 80 per cent of the crew lists of all British-registered vessels that sailed from the mid-19th to mid-20th centuries and includes documents from colonies that were part of the British Empire during that time, including Australia, Canada, Newfoundland and India.

“The family researcher has a goldmine of information here,” said Dr. Burton, who hopes to build bridges between professional users of the archive and individuals interested in genealogy.

“Ideally, I’d like to try to make academics think more like family historians in their conception of time — for example, looking at the passage of time through ordinary events such as births and deaths rather than the large events that professional historians tend to focus on.”

Team member and graduate student Meaghan Walker is looking at the material culture of seafarers and their world of goods. When a crew member died during the voyage (a not infrequent occurrence) a list of his or her possessions was made by the master. Often the price they fetched in a shipboard sale is noted, and this lets researchers know

shipmates were concerned to provide some income to the deceased’s dependents at home.

“Meaghan knows how well clothed, or more often, how poorly clothed men were for their work on the ocean; how smartly attired they might have been going ashore in a foreign port, and who had books to read at sea or pictures of loved ones to contemplate. All of these details are indicative stories, and a way into a past world,” Dr. Burton explained.

Rather than a direct transfer of information or an index of individuals, the website will showcase the stories of individuals and their travels. Voyages will be depicted as tracks on a globe with sections on “Port Life” and “‘Next After God’: the Shipmaster”

“One section, ‘How do you know he’s a “sailor”?’ is so titled to provoke the realization that not all seafarers were male, nor worked under sail,” explained Dr. Burton.

“We are aiming for the website to act as a toolkit for researchers — it will enable them to truly understand the world of these seafarers and to be able to ask the right questions. It will make their research more rewarding and more expeditious.”

“We discover something every day, including unlikely puzzles. There must have been ship owners who were well-read because one had a liking for Robbie Burns, naming his East India vessel after a favourite poem. But what was it like for a crew on a passage to Calcutta in the 1860s to work and live in the *Land O’Cakes!*”

The site is expected to be available to the public in September 2011, the 40th anniversary of the arrival of the first batch of agreements in Newfoundland. Altogether, 12 km of agreements were shipped to St. John’s in the 1970s. ■

Maritime History Archive
www.mun.ca/mha

Using fish oil as **FUEL**

By Jackey Locke



The outcome of this project has the potential to dramatically decrease fuel costs in remote areas for both plants and fishing vessels

A MEMORIAL UNIVERSITY RESEARCH PROJECT is investigating the possibility of converting marine waste to an environmentally-friendly biofuel. With assistance from the Newfoundland and Labrador Green Fund, Dr. Kelly Hawboldt, an associate professor of engineering at Memorial, is determining the feasibility of using fish oil as a blend with petroleum-based fuel for powering fish plants and marine vessels.

“There is significant potential in this province for animal and, specifically, marine waste to be converted to biofuels,” explained Dr. Hawboldt. “This research will go towards making biofuels more feasible in the province. The cost and transportation of fuel is challenging for many small communities and companies, and the on-site generation of an alternative fuel is both economically and environmentally advantageous.”

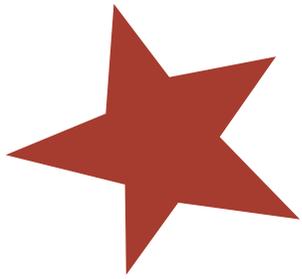
Biofuels are fuels derived from plant material and residues such as agricultural crops, waste from animal processing, or by-products from agricultural or forestry initiatives. In cases where the quality of the fuel required is lower or the engine is flexible in terms of fuel quality, the oil from the processing of vegetables and animals can be directly used for power generation and heating. There are lower emissions of greenhouse gases and other toxins throughout the production, use and disposal of these biofuels.

While the total reductions of greenhouse gases will depend on the type of conversion technology used, as well as the species of fish processed, 13-74 per cent reductions are possible. Furthermore, all other regulated emissions such as sulphur dioxide and particulate matter can potentially decrease by 10-50 per cent with biofuel use.

Dr. Hawboldt’s research is investigating the industrial process needed to transform the raw material available in Newfoundland and Labrador to a useful biofuel. The research will determine if it is feasible to blend fish oil derived biofuel with existing fuels to meet the energy requirements of fish plants or vessels by using small scale processing systems. Fish biofuel could be generated on-site and used as heating oil for boilers in the plant or in the surrounding community, or could be turned into a diesel blend for local marine vessels.

The outcome of this project has the potential to dramatically decrease fuel costs in remote areas for both plants and fishing vessels, a significant factor for rural parts of Newfoundland and Labrador.

In addition to the benefit to the environment, fish biofuel would be a more cost-effective option for rural communities, significantly lowering fuel costs. ■



OF NOTE

Award-winning faculty



PHOTO CREDIT: Chris Hammond

It's not often that a researcher gets to choose which award to accept. In May 2010, **DR. MICHELLE PLOUGHMAN**, a post-doctoral fellow in the Faculty of Medicine who works with Eastern Health, won three different fellowships for her work on health, lifestyle and aging with multiple sclerosis. She chose the fellowship from the Canadian Institutes of Health Research (CIHR), which offered \$50,000 per year for two years plus a \$5,000 research allowance. But the recognition for her work doesn't stop there. She also received the \$3,500 NLCAHR/CIHR Gold prize in Aging Research and was awarded the CIHR Institute of Aging prize.

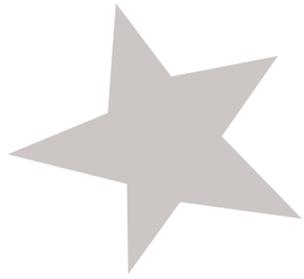
Imagine a child in hospital was given the wrong medication or too much medication. Now imagine you're on the health care team that has to figure out what went wrong and how to make sure it doesn't happen again. That's the case study from the "Patient Safety Interprofessional Education (IPE) Module" that won **DR. ANNE KEARNEY** from the School of Nursing and her colleagues The Academy for Health Improvement Duncan Neuhauser Award for Curricular Innovation. Based on evidence that when health care professionals communicate effectively and know how to work as a team, the quality of patient care increases, the module was made up of nursing, medicine and pharmacy students.



PHOTO CREDIT: Chris Hammond

DR. FAISAL KHAN, a professor of process engineering in Memorial's Faculty of Engineering and Applied Science, is the new Vale Research Chair in Process Risk and Safety Engineering. The chair is supported by Vale, the Research & Development Corporation of Newfoundland and Labrador (RDC), and the Atlantic Canada Opportunities Agency (ACOA). Associated with Memorial's Faculty of Engineering and Applied Science, the Vale Research Chair in Process Risk and Safety Engineering will help find solutions to the unique challenges faced by process industries, providing inherently safer design and operations, especially in harsh environments.

PRIVATE AND PUBLIC SECTOR DONATIONS will support the creation of The Stephen Jarislowsky Chair in Culture Change in Rapidly Developing Modern Societies, a new \$2 million academic chair in the Faculty of Arts focusing on culture change and the strategies required to affect immigration integration and retention. In the chairholder's work, broader understanding of cultural issues will be fostered through the engagement of policy makers and the public. A search committee has been appointed by the Faculty of Arts to identify possible candidates for the position's initial five-year term. Funds are still being raised to acquire an additional \$275,000 to support the chair.



student researchers SHINE

★ Spotlight on success



PHOTO CREDIT: RDC

MORE THAN \$1 MILLION IN FUNDING was awarded to 22 of Memorial's top students through the inaugural Research & Development Corporation (RDC) Ocean Industries Student Research Awards. In total, eight doctoral, 12 master's and two under graduate students are receiving \$1,037,000 in support of their ocean research over a three-year period.

The investment supports research in areas relevant to Newfoundland and Labrador's ocean industries including offshore petroleum, ocean engineering, marine safety, fisheries and aquaculture and marine science. The students are enrolled in the Faculty of Science, Faculty of Engineering and Applied Science and the School of Human Kinetics and Recreation at Memorial University.

SUBMITTED PHOTO



CAROLYN MOULAND, a psychology student at Memorial's Grenfell Campus, attended the 2011 American Psychology-Law Society Conference/4th International Congress on Psychology and Law in Miami, Florida in March. She presented research conducted while working as a research assistant for Kelly Warren during the summer of 2010. Children participating in the CSI activity camp held by Community Ed at Grenfell prepared questions for and conducted an investigative interview with an eyewitness to a mock crime. The presentation is entitled "Children as Investigators: Can children help us learn how to create the ideal witness interview?" The objective of the research is to gain a better understanding of what details children view as important in the context of a crime with the hopes that an ideal technique for questioning child eye witnesses can be developed.

The 2010 Codère Canadian Purchasing Research Foundation (CPRF) Doctoral Thesis Scholarship has been awarded to **BEZHAD HEZARKHANI**, a PhD student in the Faculty of Business Administration. Mr. Hezarkhani is the first student in the PhD in Management program and is expected to graduate in 2011. His research investigates how organizations can employ co-ordinating transshipment contracts for balanced risk sharing, improved resource utilization and better inventory management. This is expected to have practical implications for supply chain professionals working in the oil and gas industry. The Canadian Purchasing Research Foundation (CPRF) is a non-profit organization established in 1996 by the Purchasing Management Association of Canada (PMAC) to support and promote research and education in the field of purchasing and supply chain management.

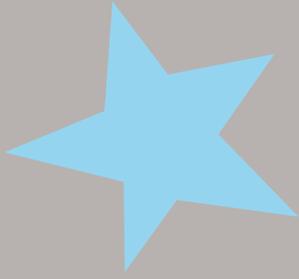


Submitted photo

SUBMITTED PHOTO



The Marine Institute is providing three graduate students the opportunity to contribute to a major project that could provide lasting benefits to a provincial fishery. **MELANIE UNDERWOOD**, **EMMA POSLUNS** and **JESSICA KENNEY** have been working out of the Marine Institute's Centre for Sustainable Aquatic Resources (CSAR) since the spring of 2010, providing research into the advancement of the yellowtail flounder fishery in Newfoundland and Labrador. The goal of the research is to improve the operational efficiencies of the yellowtail flounder fishery, both in and out of the water.



research FUNDING

Ottawa invests in Memorial research in big way

DIVERSE RESEARCH PROJECTS—ranging from medical genetics to fish technology—got a major boost from the federal government early in 2010, when Ottawa announced almost \$10 million in funding for Memorial-led research and development.

The Faculties of Medicine and Engineering and Applied Science, along with the Marine Institute, received funding under Round VII of the Atlantic Innovation Fund (AIF) announced by the Atlantic Canada Opportunities Agency (ACOA).

The Population Therapeutics Research Group (PTRG), a not-for-profit team within the Faculty of Medicine, will receive \$1.8 million from the AIF over a three-year period.

Two innovative projects from the Faculty of Engineering and Applied Science received substantial funding to further position Memorial as an international leader in oceans-related research. A project involving the university's autonomous underwater vehicle (AUV) will receive \$2.1 million over a four-year period. The funding will help integrate sonar and advanced feature-based navigation and adaptive mission control systems for the university's Explorer AUV. The other project, involving the use of high frequency radars to monitor ocean activity, was awarded \$1.7 million over a four-year period from AIF.

The Marine Institute's Centre for Sustainable Aquatic Resources will receive roughly \$1.8 million from the AIF over a five-year period to develop and commercialize new bottom trawl fishing technology.

C-CORE, a separately incorporated entity of Memorial, will receive \$2.2 million from AIF over a four-year period to go towards research in radar-based satellite monitoring.

In total, the units netted \$9.6 million in funding.



PHOTO CREDIT: Darcy MacRae

Federal funding fuels more comprehensive ocean research through the Canadian Healthy Oceans Network (CHONe).

A **\$580,000 INVESTMENT** from the National Sciences and Engineering Research Council of Canada (NSERC) will allow students—and CHONe collaborators—the opportunity to link up with global experts exploring ocean issues. In addition to NSERC and Fisheries and Oceans Canada, CHONe has also received considerable support from a number of other key partners including the provincial government, which has contributed \$1 million in cash, and Memorial, which has contributed \$427,000 and has provided office space, salary support for a postdoctoral researcher and financial and administrative services to the network.



PHOTO CREDIT: Chris Hammond

Major funding for Cayuga language revitalization

DR. CARRIE DYCK was awarded nearly \$1 million from the Social Sciences and Humanities Research Council (SSHRC) to preserve and maintain the Cayuga language. Dr. Dyck said she and her Six Nations community partners are thrilled. The research team will focus its energies initially on three key groups—children of under five years of age enrolled in a pre-school immersion program, people between 40 and 70 years of age who were discouraged from speaking Cayuga while growing up but who understand it, and adult second language learners who are currently at the advanced intermediate level.

\$16 million in infrastructure upgrades for the Ocean Sciences Centre

MORE THAN \$16 MILLION in federal-provincial funding will make the Ocean Sciences Centre, already a leading edge facility, unique in the world. Funding from the Canada Foundation for Innovation (CFI), the Research and Development Corporation of Newfoundland and Labrador (RDC), the Government of Newfoundland and Memorial University will substantially expand and enhance the facility with state-of-the-art equipment and laboratories. Pressurized holding tanks will enable the study of deepwater organisms under natural conditions and a level 3 containment facility will allow the specialized study of invasive species and marine diseases. As well, a stable cold water source, drilled 500 metres through solid rock, will allow for the live study of deepwater species year round.



PHOTO CREDIT: Chris Hammond

Meet Memorial University. The natural place where people and ideas **become**.

OUR STUDENTS – 21st-century explorers from more than 80 countries, 17,500 strong, intrepid and curious, ready to take risks and adventures to achieve their potential, to become



OUR PEOPLE – engaging and committed faculty and staff, expert guides who facilitate exploration and experiential learning to help others become

OUR RESEARCH – spanning many disciplines, with faculty and students focused on expanding our understanding of our world and solving its problems, making ideas become



OUR ALUMNI – more than 65,000 seasoned explorers and problem solvers, inspirational exemplars of the transformational power of a Memorial University education

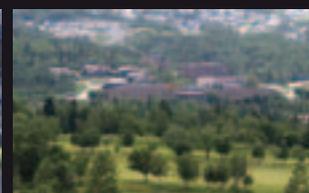
OUR CAMPUSES – four diverse learning and exploration environments uniquely shaped by our North Atlantic location and heritage, each offering the freedom to explore and experience the world



St. John's campus



Harlow campus, UK



Grenfell Campus, Corner Brook



Marine Institute campus, St. John's



Office of the Vice-President (Research) | Memorial University of Newfoundland | St. John's, NL | A1C 5S7
Canada | Phone 709 864 2530 | Fax: 709 864 2559 | research@mun.ca | www.mun.ca/research