

OutFront

**RESEARCH
THAT MATTERS**



*Dr. Ian Folkins – challenging
weather predictability*

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DALHOUSIE UNIVERSITY RESEARCH PROJECTS: KEY FUNDING RESOURCES

While Dalhousie University receives research dollars from more than 500 funding agencies and private sector companies, it is also the recipient of over \$50 million from the public sector. Below are some of the key government groups that have provided support:

AIF – ATLANTIC INNOVATION FUND, managed by the Atlantic Canada Opportunities Agency, is designed to strengthen Atlantic Canada's economy by accelerating the development of a knowledge-based industry. www.acoa.ca/e/financiel/aif/



NSERC – NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA makes strategic investments in Canada's capability in science and technology. www.nserc-crsng.gc.ca



SSHRC – SOCIAL SCIENCES AND HUMANITIES RESEARCH COUNCIL OF CANADA promotes and supports university-based research and training in the social sciences and humanities. www.sshrc-crsh.gc.ca



CIHR – CANADIAN INSTITUTE OF HEALTH RESEARCH funds more than 8,500 researchers in universities, teaching hospitals and research institutes across Canada. www.cihr-irsc.gc.ca



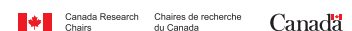
CFI – CANADA FOUNDATION FOR INNOVATION provides 40 per cent of infrastructure costs for quality research projects; research institutions must then secure the remaining funds from other government sources and the private sector. www.innovation.ca



NSRIT – NOVA SCOTIA RESEARCH AND INNOVATION TRUST FUND helps the province's researchers pursue projects with social and economic benefits in virtually any sector. The fund helps Nova Scotia's research institutions to secure grants from the Canada Foundation for Innovation. www.gov.ns.ca/econ/



CRC – CANADA RESEARCH CHAIRS PROGRAM invests \$300 million a year to attract and retain some of the world's most accomplished and promising minds, in the effort to make Canada one of the world's top five countries for research and development. www.chairs.gc.ca



NSHRF – NOVA SCOTIA HEALTH RESEARCH FOUNDATION works with the health research community and other stakeholders to invest the province's health research resources in a manner that will best serve to improve the health of Nova Scotians. www.nshrf.ca



A CANADIAN FIRST

This issue of *OutFront* celebrates the opening of Canada's first College of Sustainability at Dalhousie University. A unique and singular academic unit, the College will facilitate the creation of new knowledge and new solutions to environmental and sustainability issues.

Dalhousie has more than 140 professors across nine faculties engaged in research and scholarship related to environment, energy and sustainability. These scientists and scholars range from professors in the early stages of their careers to well-established prize-winning, world-renown experts. Their work informs policy and leads to commercial inventions.

It is their business to ask tough questions, seek answers in novel ways and, in doing so, create new knowledge that will guide human understanding and behaviour, shape governmental policies and work with industries to maximize positive environmental impact. Dalhousie's research, societal and economic impact is aligned very clearly with the Nova Scotia government's sustainable prosperity policy.

The way research is carried out is changing. Increasingly researchers work collaboratively in networks, centres and institutes. Many initiatives are linked to private and public sector partners and communities. Some linkages are virtual, supported by electronic communications. Still others are played out within local environments; others span vast areas of land, oceans and national boundaries.

The latest statistics from the Science and Engineering Indicators (2003) show that Canada contributes 3.5 per cent of the world's scientific knowledge; the rest must be accessed from abroad.

At the same time 40 per cent of Canadian publications in the natural sciences and engineering are co-authored with foreign collaborators. This is more than twice as many as was reported in 1988. Researchers working on environment, energy and sustainability can no longer work on research in national silos.

Nor can they work in disciplinary isolation. This issue of *OutFront* demonstrates how, for instance, physical changes in the environment and sustainable sources of energy are linked implicitly to history and to social and behavioural change.

These new ways of doing research across disciplines and in greater connection with society enable the university to strategically position itself as a hub for knowledge creation and transmission. As a hub, Dalhousie's research on environment, energy and sustainability not only has local impact, it has global reach. Seated as we are in the front row of the Atlantic Rim, our work not only reaches out across the full breadth of Canada but also across the oceans and beyond.



Martha Crago, PhD
Vice-President, Research
Dalhousie University

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“Big building lots fragment wildlife habitat, encourage isolation and result in much less walking and a lot more driving (and paved roads).”



BUILT TO LAST

Communities today are markedly different from those of years gone by. No longer do we live off of the land or work close to home. Instead, many of us endure long commutes, depend on foods imported from other countries and perhaps don't even know our neighbours.

Dalhousie's Dr. Jill Grant says this sprawl is really due to a century of low energy prices. "Cheap oil and gas prices have meant that people can afford to drive further and, in most cases, own two cars," says Grant. "An increase in energy costs may just create the conditions required for change."

The change Grant hopes for involves redesigning the "built environment," which refers to the design, management and use of constructed surroundings and their relationship to the human activities that take place within them.

Her work focuses on fostering sustainable communities, those that are resilient, efficient and adaptable. They can survive economic stresses and make optimal use of renewable resources. Sounds logical but often practicalities overrule logic, especially when it comes to convincing engineers – and citizens – that bolder solutions are needed.

"Just think about the exurbs (a suburb in the country) where there is a low density of people. This is possibly one of the most inefficient plans, yet more exurbs are still in development," says Grant. "Big building lots fragment wildlife habitat, encourage isolation and result in much less walking and a lot more driving (and paved roads). This is not an efficient, sustainable model."

Grant is an advocate for building places that have healthy, long-term prospects. This means developing high-density communities that are creative and connected. Their "built environments" encourage an active lifestyle, inclusivity, diversity and tolerance, all of which are central to attracting people to the province and, perhaps more importantly at a time when many Nova Scotians are exiting in droves, keeping them here.

One of her research challenges is to demonstrate the need for community investment that encourages physical activity, enables energy efficiency and is more equitable for all.

"There needs to be a fundamental change in philosophy to enable the way we develop to positively contribute to human health and make optimal use of renewable and non-renewable resources," Grant says. ■

○ Dr. Jill Grant and student Jeff Haggett





Abriel Photo

○
○
○ Dr. Peter Duinker

COVERING ALL THE BASES

When Dalhousie’s Peter Duinker talks about developing “scenarios” contemplating full-out war or world peace for the year 2050, don’t mistake him for a political scientist. It’s actually an examination of forest sustainability, something with local relevance and global importance.

As part of the Forest Futures Project of the Sustainable Forest Management Network, Duinker is going across the country meeting with diverse groups to see how these situations would affect their interactions with forests.

“We’ve developed four plausible scenarios that depict the evolution of our forests and forest sector from the present to 2050,” says Duinker. “We want to discuss how they would affect forest lands and what it would mean to the people who use them.”

The project’s goal is to help define a sustainable future for Canada’s forests by giving decision-makers information to guide policy development and hopefully put us on a more sustainable path.

The workshops are highly collaborative, involving people from government, industry, recreational groups, hunting organizations, First Nations and environmental groups.

On the table for consideration are such factors as climate change, geopolitics, global energy, air pollution, invasive species, new technology, biodiversity, wood harvests and forest amenities. These and other themes are presented in the narratives of the four scenarios.

“Without a sound approach and common sense, our forests could be in jeopardy.”



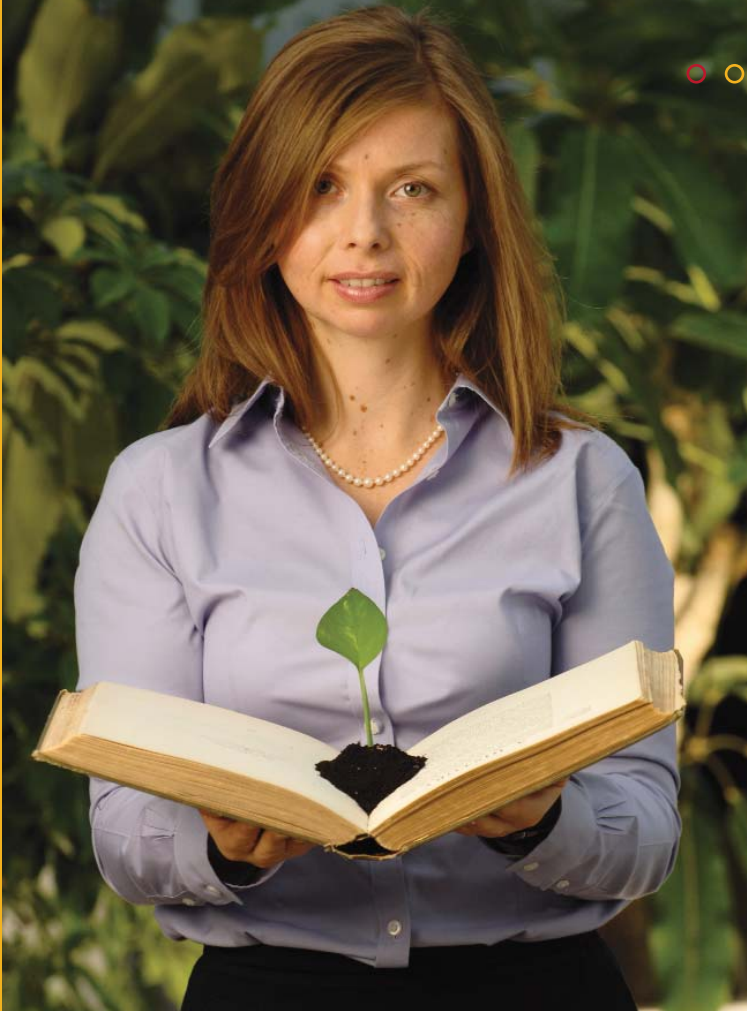
“Goods from the Woods” paints a situation in which CO₂ emissions have led to modest climate changes to which society can readily adapt. Forest ecosystems are in good shape, we have excellent relations with our American neighbours, and invasive species are well under control.

Juxtapose this with “Turbulence in the Woods,” which envisions tripled energy prices, huge impacts due to climate change, rising international hostilities, stressed-out forests choked by air pollution, and much higher temperatures. You quickly see the importance of this “working backwards” approach.

The other two scenarios, “Peace in the Woods” and “Restoration in the Woods,” provide contracting variations.

“This is a pragmatic approach to reality,” says Duinker. “The public consciousness has been raised about the ability to guide the future with present-day policy. Without a sound approach and common sense, our forests could be in jeopardy.”

Given that Canada has 10 per cent of the world’s forests, using them in a manner that maintains their long-term health is important not just to Canadians, but to the world. ■



Abriel Photo

THE HUMAN QUOTIENT OF SCIENCE

Dr. Claire Campbell provides a compelling argument for why historians and the humanities are absolutely essential for a sustainable environment. She feels firmly that no matter how great the scientific argument about an approach to preservation, if it's presented without any consideration for the society living within the natural setting, it won't be realistic.

"As long as sustainability focuses on the life cycle of the bee, we're not going to be advancing the idea of sustainability. There is so much more to consider than the strict biology," says Campbell.

"Discussions about sustainability need to focus on the present and the future, but we can't make an informed decision unless we look at the past and integrate a human context into the solution."

"There are models and precedents in history that we can make use of when considering new approaches."



Scientists have been talking about ocean warming and climate change for years. Marine life and animal populations have experienced alarming changes for some time. Documented research shows us that. But it's only in the last 10 years – perhaps inspired by Al Gore's *An Inconvenient Truth* – that enough people are actually becoming affected in ways that could evoke real change. Campbell feels it's because the scientific realities were finally translated into human language.

Although social scientists aren't the "movers and shakers in sustainability," they need to be much more involved, she says. Campbell was recently named to the interim executive of Dalhousie's new College of Sustainability, where she advises alongside chemists, biologists and physicists, providing historical insight to the issues.

"There are models and precedents in history that we can make use of when considering new approaches," she says. "We want to avoid changing whole ecosystems to get the desired result – instead it's better to study what has been successful in the past. Environmental historians provide that knowledge."

Campbell shows the power of that statement when describing her study of Ontario's Georgian Bay. "If you consider the physical changes that have occurred over the last several centuries, it's imperative to be able to articulate how much change is from human activity and how much is environmental, caused from the natural world pushing back. It's the blend of this knowledge that enables us to save the places that we inherit." ■

PASSING DANGEROUS GAS

“A big burp into the atmosphere.”

That’s how Dalhousie’s Dr. Lawrence Plug describes the release of trapped methane from Alaskan and Siberian lakes. He is fresh back from northern Alaska, where he spent three weeks gathering information about the amount of methane melting permafrost is emitting.

Some permafrost contains up to 90 per cent dead plant material and, when it thaws around and beneath lakes, the rotting vegetation gives off methane. In terms of global warming, this gas is roughly 20 times more potent than CO₂. Plug is trying to understand the magnitude of these methane releases in the past, present and future, in order to make more reliable predictions about climate change.

He and his colleagues do this in several ways – by taking permafrost samples and analyzing them for plant content, by coring lakes, and by measuring the methane trapped in winter lake ice. The latter was the focus of his most recent trip. These measurements are integrated into computer models developed by Plug at Dalhousie.

“About 10,000 years ago, there was a warming period that caused hundreds of thousands of lakes to form by melting permafrost. The presence of, and expansion of these lakes, is a natural process. But the process seems accelerated today, as these northern regions warm up,” explains Plug. “The bubbling methane gets trapped in the winter ice. When the ice is pierced, or melts in spring, the methane escapes. There is enough methane that, in places, it can burn like a torch through the ice for 20 minutes. It’s spectacular to watch, yet disconcerting from a scientific perspective.”

Plug and his students use their computer models to simulate lake expansion and the subsequent methane release expected over the next century or two. Within a year, his permafrost findings will be integrated into global climate models, which currently don’t consider the methane from these permafrost lakes. This will provide more reliable predictions of future climate variations, and a view into how lakes have influenced climate in the past.

Plug and colleagues were accompanied on this past trip by a contingent of journalists from the *Los Angeles Times*. “Our camp was in northwest Alaska near Bering Strait. It was –20 degrees Celsius with a wicked wind,” laughs Plug. “We lived in tents so it was pretty chilly. The reporters were happy to leave after a couple of days, after joking that the living conditions were tougher than documenting the invasion of Iraq. Thankfully, no gunfire though.”

Next summer, Plug will head to Siberia, which has roughly one million square kilometres of permafrost and thaw lakes. “It’s a different situation there, in summer at least ... warm and lots of bugs.” He says he’ll love every minute of it. “These are remote, beautiful and important landscapes.” ■

In terms of global warming, this gas [methane] is roughly 20 times more potent than CO₂.



○ Dr. Lawrence Plug



FIGURING OUT THE FLAW

Gasless cars – they’re the way of the future. High fuel prices and an increased interest in protecting the environment have meant the development of hybrid cars. Ten years from now, the car’s engine could look different still. And it’s quite possible that Dalhousie’s Dr. Heather Andreas and her research team will have played a part in this transformation.

The potential comes in supercapacitors. Like batteries, they store energy but unlike batteries, they won’t wear out after being recharged many times. Andreas says this because the electrodes inside capacitors don’t change from one material to another like battery electrodes do. Instead, they rely on a combination of carbon and water-based electrolytes to store charge electrostatically (one type of charge is stored on the carbon and this charge is balanced by opposite charges stored in the electrolytes). In theory, they should last forever and the process of making the material is also more environmentally friendly.

However, capacitors have a flaw to be fixed before they’ll start showing up under vehicle hoods. “They don’t hold their charge for very long,” explains Andreas. “Even just sitting on the shelf fully charged, they go dead after about seven days.” This challenge forms the basis of her research. “Once we determine the ‘why,’ we can start to develop a solution.”

The long-term potential might be to pair a supercapacitor with a battery and a fuel cell. Batteries have more energy but have less power, making them more useful in driving long distances at

The ideal scenario would be a design in which the engine defaults to the power source that meets its current requirements.



constant speeds. Capacitors don’t last as long but are more powerful, meaning they could support acceleration or up-hill driving. The ideal scenario would be a design in which the engine defaults to the power source that meets its current requirements.

Andreas says enhanced public knowledge and the growing support for sustainable systems is good news for her type of research. “Heightened interest in an issue usually means more research capacity and support. And certainly with unstable gas prices and fears of an oil shortage in the future, this issue is getting a lot of attention.”

Andreas, who moved here from Alberta, says Halifax and, more specifically, Dalhousie have enabled her to collaborate with some of Canada’s most respected researchers in materials science. She and her colleagues are involved in many programs aimed at enhancing Dalhousie’s energy and advanced materials research and together they just might change the way cars of the future are powered. ■



Abriel Photo

○ Dr. Heather Andreas and PhD student Jennifer Black

GO AHEAD, SPREAD THE WEALTH

It can be tricky to follow the thought processes of Dr. Daniel Rainham, Dalhousie's incoming Elizabeth May Chair in Sustainability and Environmental Health. But once you do, his ideas make a lot of sense.

For example: "Sustainability requires that our uses of natural capital for human and non-human ends do not exceed the supply available." Translation: You can't use more than you have and still exist over the long term.

"Current global environmental assessments indicate that human activities, partially driven by an impractical vision of progress, are eroding the environmental conditions required to sustain human beings and other species with which we share this planet." In other words, we're using more than we have.

And lastly: "For humans to live sustainably, we must strive toward a restrained and equitable use of natural capital to promote societal well-being, rather than the accumulation of material wealth and affluence for individual gain." Interpreted: Perhaps we should stop trying to amass things – or stay 'ahead of the Jones' and instead live healthfully and peacefully.

"You would expect that people who consume more would live healthier and longer, but that is not necessarily the case."



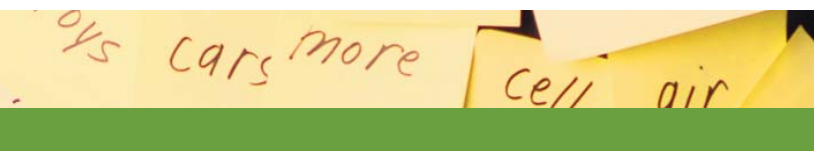
Abriel Photo

It's his ability to present common sense in a scientific framework that makes Rainham's work so compelling. He says with the world population on the rise and a finite number of resources, we're running into a problem. But it isn't necessarily the people with the most who will survive.

"You would expect that people who consume more would live healthier and longer, but that is not necessarily the case," says Rainham. "People with less are living almost as long or as long as people in more well-off societies. For example, people in Sweden, Denmark and Norway – countries using far less resources than Canada or the United States – are leading very healthy lives.

Rainham is interested in using empirical evidence to research why some people are healthier than others, based on societal and consumption indicators. How does the consumption of resources relate to life expectancies, infant mortality or cardiac-related deaths? Is it better for human health to leave a larger consumption footprint or a smaller one?

He doesn't have the answer to these questions yet but they form the foundation for what he aims to accomplish as the new Elizabeth May Chair. Still, his insights thus far give the sense that his findings will be humbling; those with more can share the wealth and the finite resources available and still remain healthy while helping to improve the health of those who are less fortunate. ■





Abriel Photo

AVOIDING TRAGEDY

There is a growing challenge in the Annapolis Valley and other heavily farmed areas. It involves balancing a sustainable rural economy with a healthy environment.

“We need to promote and develop our local food economy, but we must also recognize that agricultural activities can contribute to water quality issues in groundwater, rivers and streams,” says Dalhousie’s Dr. Rob Jamieson. “We must make sure that farming practices are not putting drinking water sources at risk, or damaging aquatic ecosystems.”

Water contamination from agriculture can arise from several sources. The application of inorganic and organic fertilizers to grow crops can result in nutrients leaching into groundwater and stream systems. With livestock farming, manure can contaminate a water system either through surface water runoff, leaching into groundwater, or by animals wading in streams and rivers. The latter also weakens the riverbanks, causing erosion and sediment issues.

“We are working to understand the sources and behaviour of pathogens in rural environments, and preventing their entry into rivers and streams”, says Jamieson. “This is an important public health issue, as these water bodies are used for drinking water, irrigation water and recreation.”

The contamination of a public water system in Walkerton, ON, in 2000 was a tragic event which raised awareness of these risks. In recent years, there have also been several cases where microbial contamination of fresh produce, such as spinach, has been linked to contaminated irrigation water.

“It is becoming increasingly important to meet this issue head on,” says Jamieson. “We need to develop alternative approaches that protect our water, but encourage local agriculture and help farmers maintain a sustainable and profitable farming practice.”

There are some practical changes that can have an immediate impact on water and food safety, such as putting up fences to keep livestock out of streams or installing improved drainage systems to prevent runoff water from coming in contact with manure. Artificial wetlands show potential to treat manure runoff and decrease these public health risks.

For crop growers, Jamieson’s research team is conducting field studies to test computer simulation models, which will then be used to develop more efficient nutrient management application strategies. “When applied fertilizer amounts are greater than what the plants need, excess nutrients leach into surface and groundwater systems. This wastage is costly for the farmer and bad for the environment. The idea is to develop fertilization scenarios that maximize crop growth while minimizing nutrient loss,” Jamieson says.

Using science will strike a healthy balance between protecting the natural resources and supporting the increasingly important rural livelihood. ■

“We are working to understand the sources and behaviour of pathogens in rural environments, and preventing their entry into rivers and streams.”





Abriel Photo

A BRASH CALL FOR ATTENTION

Swooping through the air like professional acrobats, tree swallows are welcomed for their voracious appetite for insects. The adults are fiercely protective of their young, frequently dive-bombing trespassers (including curious humans) to drive them from the area. But one less obvious intruder is having a strange impact on the little bird – everyday noise.

Dalhousie’s Dr. Marty Leonard has researched the swallow for several years and has found that noise may be causing confusion for the tree swallow family.

“The young use a loud call to beg for food, with the parents relying on the rate and pitch to determine which young to feed (they only feed one per trip),” says Leonard. “Low-pitched environmental noise can interfere with the parent’s ability to hear the calls, potentially confusing the parents and making the chicks call louder to be heard. This can disrupt feeding and make the nest more obvious to predators.”

While this brash call for attention may jeopardize the long-term survival of the tree swallow, Leonard is hoping noise might actually protect another species that’s close to decimation on an island just off the shore of Guysborough County, N.S.

Estimates suggest that fewer than 140 pairs of the Roseate Tern, a small seabird with a prominently forked tail, remain across Canada. While studying the endangered bird on Country Island to determine the impact of a nearby natural gas development, one of Leonard’s students discovered a massive gull population feeding with gusto on Tern chicks.

“The smaller Terns couldn’t protect their young from the aggressive gull attacks,” says Leonard. “If something didn’t change, the birds would be in further jeopardy of extinction.”

Recent graduate Jennifer Rock and Dr. Marty Leonard

“I think that it is important to understand the factors that put species at risk and then determine how we can reduce their impact...”



She and her students are now collaborating with the Canadian Wildlife Service (CWS), and in a conservation effort, there is a new policy to divert gulls away from the island to allow the Roseate Tern a chance to repopulate and breed successfully.

“A non-lethal, low-tech approach was adopted to discourage the predators,” says Leonard. “Essentially, as the Tern is getting ready to nest, CWS employees create a commotion to keep the gulls away from the island.”

The commotion should dissuade gulls from making the island a destination, and hopefully put the Roseate Tern in a less precarious situation during their breeding season.

“I think that it is important to understand the factors that put species at risk and then determine how we can reduce their impact to conserve bird populations, whether it’s by protecting critical breeding habitat or by mitigating external impacts.” ■



○
○
○ Dr. Ian Folkins

“Given the size of a thunderstorm and the factors that influence it ... it’s impossible to factor that storm into a weather prediction.”



THE WONDERS OF WEATHER

Dalhousie’s Dr. Ian Folkins has his head in the clouds ... thunder clouds, to be precise. He is researching ways to better forecast weather in the Tropics, an area covering more than half of the Earth, extending from Mexico to Australia and from southern Africa to the Middle East.

“This area is tremendously vulnerable to extreme rainfall in heavy bursts from thunderstorms, causing flash floods and potential lightning strikes,” explains Folkins. “It also suffers from extreme dry conditions that can be detrimental to agriculture and water supply. The weather there is fickle and can change quickly. It’s very difficult to reliably predict.”

People living outside the Tropics are also affected by its weather, since many conditions in mid-latitude regions of the world originate there. For example, Folkins says a weather event in Indonesia can significantly affect Nova Scotia’s 10-day forecast.

Part of what makes the weather in the Tropics so difficult to predict is the size of the thunderstorm clouds, in comparison to what meteorologists typically study. In weather forecast models, the atmosphere is divided into grid boxes measuring about 100 kilometres. This works for, say, North America, where disturbances generally come from large storm systems. However, a thunderstorm may only span one kilometre, meaning it is incapable of being modelled within the traditional grid box.

“Given the size of a thunderstorm and the factors that influence it (such as small changes in ocean temperature, moisture and wind speed), it’s impossible to factor that storm into a weather prediction,” says Folkins. “The earth is over 12,000 kilometres wide. It is an absurd idea to think that you can divide the atmosphere into boxes.”

His ultimate research goal is to improve rainfall prediction in the Tropics. He uses sophisticated computer modelling to try to improve how current climate models represent the effects of thunder clouds.

“To the lay person, the unpredictability of the weather may be an inconvenience, a reason to change your plans. To an atmospheric scientist, the volatility is what makes the subject fascinating and challenging.” ■

SAY IT ISN'T SO

When you consider the impact of global climate change, displaced polar bears, melting ice and tepid oceans usually come to mind. Not many of us conjure up distress for the common insect. But Dalhousie's Dr. Shelley Adamo does. And if her predictions become reality, we're all in for some unpleasant repercussions.

Adamo is looking into the effects of climate change on the immune and reproductive systems of insects. "An insect's body temperature isn't constant. It's dependent on the conditions around it," she explains. Her concern is that an increase in temperature will result in a weakened immune system and increased reproduction – factors that could significantly change our insect dynamic.

Right now Nova Scotia is the northernmost range for many bugs. Thankfully, one of the most common mosquito carriers of the West Nile Virus is rare in this province. But a change in climate could lead to an increase in its numbers.

If the climate warms, signalling insects to put more energy into reproduction, it could lead to a decrease in disease resistance. We could end up with more mosquitoes, more susceptible to contracting the West Nile Virus. This is precisely the hypothesis that Adamo and student Amy Bartlett are working to prove.

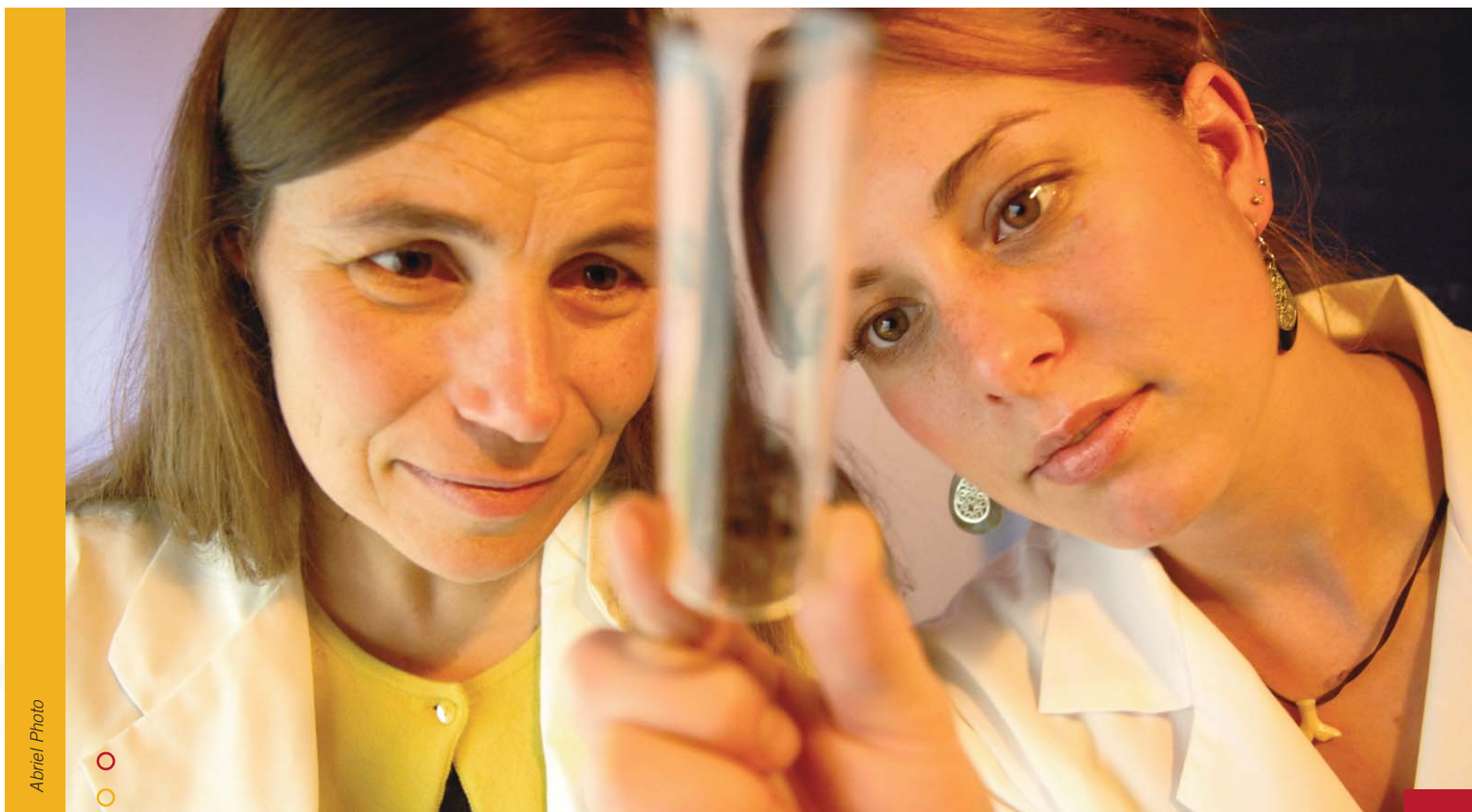
We could end up with more mosquitoes, more susceptible to contracting the West Nile Virus.



Their research is in the early stages but pre-testing shows they are certainly on to something. "Insects only have so much energy and they have a strong instinct to breed. Once the temperature warms up, reproduction becomes a priority – they make hay while the sun shines – and we think this is to the detriment of the immune system," says Adamo.

In their preliminary research, Adamo and Bartlett are using the larger, easier-to-work-with field cricket. Local crickets can be collected in the fall by luring them with a taped cricket mating song. In special growth chambers, the crickets are exposed to pathogens in order to determine whether temperature plays a role in their ability to ward off disease.

"Next to the Arctic, the temperate zone (e.g., Nova Scotia) will be the most affected by increasing temperatures. The impact will be far-reaching. The more we understand it, the better we can prepare for it," Adamo says. ■



Abriel Photo



Dr. Shelley Adamo and student Amy Bartlett

INTERNATIONAL AMBIGUITY

If a ship is owned by a Canadian, registered in Panama, captained by a Norwegian, crewed by seafarers from many other countries and sailing from port to port, which nation's laws and practices govern? It reads like a modern-day riddle but with an international industry like shipping, this is a common situation.

With so many different legal systems involved comes the risk of gaps and substandard operations; in this case, ships with poor environmental and safety practices, labour abuses and other social injustices. This threatens sustainable economic development, particularly for the less affluent countries.

Dalhousie's Dr. Moira McConnell is interested in developing effective international standards, particularly in the maritime sector. Her current research is in achieving "decent work" for seafarers, the more vulnerable of the world's workers.

"In the context of labour standards, when ships operate transnationally, there are many complex issues and it can be unclear which workplace standards apply," says McConnell. "The issue is broad, from social security to work hours to something as simple as the provision of drinking water. Without international standards that are effectively implemented and enforced by the responsible State, there is risk of exploitation and poverty, which can snowball to the seafarer's family and their ability to sustain an acceptable living standard."

As a special advisor to the International Labour Organization, McConnell has helped draft a comprehensive international agreement merging 70 international legal instruments, some dating as far back as 1920, on this issue.

"The issue is broad, from social security to work hours to something as simple as the provision of drinking water."



McConnell's concern for international gaps isn't just with the ocean as a workplace; she is also very interested in environmental protection and related human health and economic impacts.

"A big threat to our oceans is the discharge of ships' ballast water that contains an invasive species that survives," she says. "This could have significant economic, environmental and human health impacts. It's not like an oil spill, which can be cleaned up; there is no remedial action for an invasive species."

But how do you regulate this? Is it pollution? Does it fall under environmental or shipping law, or both? McConnell has worked with lawyers from six countries – China, Brazil, South Africa, Iran, Ukraine and India – to research and recommend "best regulatory practices."

Through research, McConnell and her colleagues are working to help countries achieve sustainable economic development by establishing clear, enforceable, legal approaches to protect humans and the environment – and not a moment too soon. ■

○ *Dr. Moira McConnell*



CHASING CORAL EGGS

Dalhousie's Drs. Christopher Taggart and Barry Ruddick are quite the dynamic duo. Their latest success began with an idea by Taggart and an ensuing discussion about why it wouldn't work. Ruddick did some quick calculations to prove the idea was flawed, but instead found that it had great potential. Thus, the concept of effectively measuring dispersion in the ocean, or in any fluid, was born.

Dying coral was the initial impetus for their research. To find out whether it could be "reestablished" was contingent first upon understanding how far coral eggs and larvae could be dispersed.

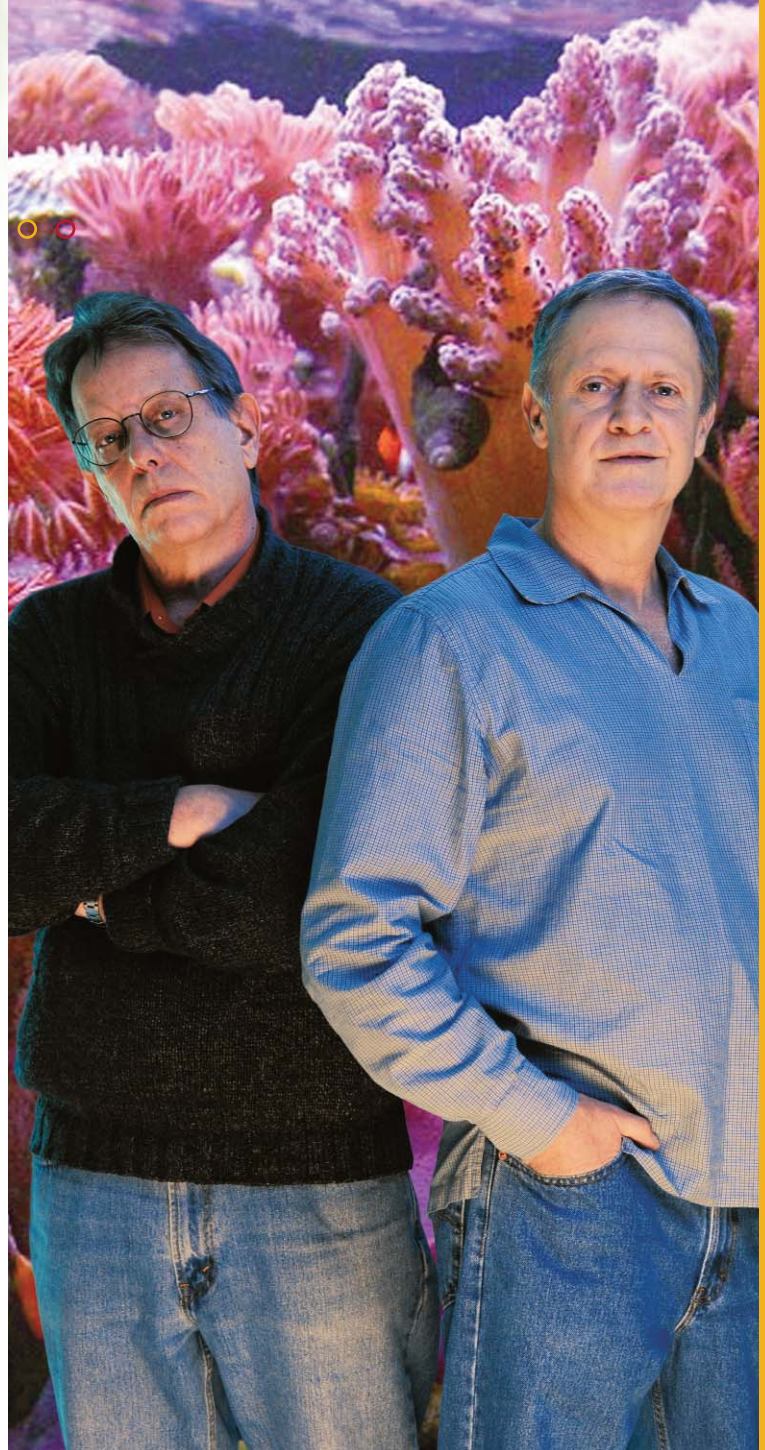
Ruddick and Taggart – with help from various team members – developed the technique whereby tiny particles that mimic coral eggs and larvae were set free in the ocean. Magnetic collectors were placed within a 100-kilometre radius to attract the floating particles, made up of silica-glass and magnetite.

"It is a remarkably simple, inexpensive solution to a very important problem," says Ruddick.

The scientists simply count the number of particles caught to determine dispersion patterns. Their method has proven effective even in rough ocean conditions. "We tested it off the Florida coast, in the midst of hurricane season," Ruddick explains. "The collectors performed as expected and didn't suffer from the bad weather. It's the simplicity of the technique that makes it so robust."

Their findings showed that coral eggs and larvae can travel fair distances – at least 10 kilometres – which holds great promise for rebuilding the coral population. "Coral is particularly interesting because it is both an animal and a plant. It's made up of two different organisms that need each other to live," explains Taggart. "When the ocean temperature rises, it can bleach the coral, meaning the plant part is expelled from the animal part.

"The collectors performed as expected and didn't suffer from the bad weather. It's the simplicity of the technique that makes it so robust."



Abriel Photo

Now that we have shown that the coral eggs can disperse, it will be up to the coral reef ecologists to determine if the larvae can effectively recolonize a new population."

While this will be instrumental in answering the coral "connectivity" question, the application is broad. It can help figure out the 'how far' questions about the potential impact of invasive species, or where the residual heavy metals from oil drilling end up.

"It's a pragmatic method with many applications," says Ruddick. "As long as we can shape the particle to mimic what is being studied, we can pretty much study the dispersion ability of anything in water." ■





○
○ Dr. Steven Mannell

“In this century an understanding of sustainability will be critical for every person in a leadership role in every sector of society.”

FINAL WORD

(We invite researchers to share their thoughts in Final Word, OutFront's regular guest column. This edition's guest is Dr. Steven Mannell, Interim Director, College of Sustainability and Professor, School of Architecture at Dalhousie University.)

CANADIAN FIRST – COLLEGE OF SUSTAINABILITY

Global concern for achieving sustainability and protecting our environment is growing. New ways of thinking will be necessary to inspire solutions to the tremendous challenges that lie ahead: economic globalization, climate change, energy and water security, human population, food and urbanization. Decisions will need to be informed by broad and diverse perspectives.

Dalhousie's new College of Sustainability provides an interdisciplinary forum for collaborative teaching and learning to address global issues in sustainability. The College developed out of a series of grass-roots meetings, a major university-wide workshop and follow-up working sessions. Working together, faculty, staff, administrators and students freely imagined the teaching and scholarship that would best serve the creation of new knowledge and practices around issues of environment, sustainability and society.

The College transforms the way our researchers, students and graduates take on the challenges facing our world, and supports the goal of the United Nations Decade of Education for Sustainable Development (2005–2014) “to integrate the principles, values, and practices of sustainable development into all aspects of education and learning.”

The College is Canada's first, offering an approach that cuts across disciplinary boundaries and drawing upon the principles of the humanities, social science and design to complement those of science, management and technology. In North America, only the School of Sustainability at Arizona State University offers a similar scale and breadth of study.

The teaching is integrated with many existing Dalhousie degrees and programs, providing a rigorous disciplinary basis for responsive, issues-oriented study. The continual flow of individual students, teachers and community leaders through the College means an ongoing exchange of ideas, expertise and passions. It provides a common place for the study of sustainability-based problems and will host an exciting range of public lectures, seminars and other activities.

In September 2009, the first students enter the College's unique transdisciplinary undergraduate programs in Environment, Sustainability and Society (ESS). They will initially be able to combine studies in ESS with almost every bachelors degree. And the undergraduates will be joined by interdisciplinary research, scholarship and graduate programs. By 2015, the College expects to have 1,000 students.

In this century, an understanding of sustainability will be critical for every person in a leadership role in every sector of society. The College of Sustainability offers the opportunity for every Dalhousie student and professor to engage meaningfully with issues of Environment, Sustainability and Society. ■

INTRODUCING DR. MARTHA CRAGO

Dr. Crago joined Dalhousie as Vice-President, Research for a five-year term on July 1, 2008. She comes from the University of Montreal, where she served as Vice-Rector (International and Governmental Relations).

■ EDUCATION

BA Honours, Sociology and Anthropology
McGill University (1968)

MSc (Applied), Communication Disorders
McGill University (1970)

PhD, Communication Disorders
McGill University (1988)

■ CAREER PATH

Started as a speech-language pathologist and a faculty lecturer, teaching and running a demonstration clinic at McGill while undertaking major public health projects in remote and Arctic areas of Quebec.

Began her PhD in 1984, with three children under the age of six. All spent considerable time in Aboriginal communities while she was doing research on how children learn languages and cultural patterns of interacting.

Spent a sabbatical year at the Max Planck Institute in Germany for Psycholinguistics.

Returned to McGill as the Dean of Graduate and Postdoctoral Studies (eight years). Continued collaborative research centered on bilingual children with language impairment. With colleagues (and CFI support), founded a funded Research Centre for Language Mind and Brain.

In addition to the Deanship, she served as Editor of Applied Psycholinguistics, a journal published by Cambridge University Press; as President of the Canadian Association of Graduate Studies; and as a member of the Council of Graduate Schools of the USA and the American Graduate Studies' wing of the American Association of Universities (the leading 61 research universities in North America).



Abriel Photo

In 2005, became Vice-Rector of International and Governmental Relations at the University of Montreal. Created the International Forum of Public Universities, with 20 other world-class institutions, to focus on international scientific research partnerships.

■ RESEARCH INTERESTS

The interaction of the innate and culturally shaped aspects of language acquisition across languages and language learners.

■ BIGGEST FUTURE RESEARCH CHALLENGE

Helping Dalhousie become an exciting hub situated in a front-row seat on the Atlantic Rim for strategic research that has local, national and global impact and partnerships.

■ THE DALHOUSIE DIFFERENCE

Small and friendly enough to get to know people and powerful enough to make a difference in the creation of knowledge. Also, well connected to work with governments, industries and communities of scholars and citizens, both here and abroad.

■ BEST THING ABOUT HALIFAX

The friendliness of the people, the water views and the long luxurious autumns.

■ ON A PERSONAL NOTE

“Moving here has been like falling onto a very comfortable feather bed. Thanks to all who made it so easy and pleasant.”

OUR CONGRATULATIONS

Congratulations to **Renee Lyons** (Health & Human Performance) who was elected Fellow to the Canadian Academy of Health Sciences. Fellows elected to the Academy are recognized by their peers nationally and internationally for their contributions to the promotion of health science. They have demonstrated leadership, creativity, distinctive competencies and a commitment to advance academic health science.



Congratulations to **Stan Kutcher** (Psychiatry). He is the recipient of the 2008 Canadian College of Neuropsychopharmacology Medal; the 2008 Physician Health Promotion Award from Doctors Nova Scotia; and has been named a Best Doctor in Canada. The Physician Health Promotion Award celebrates the contribution the physician has made to promote health and safety and preventative care among Nova Scotians; and the CCNP Medial honours individuals for a meritorious career in, and outstanding contribution to neuropsychopharmacology in Canada. Like Dr. Lyons, Dr. Kutcher was also elected Fellow to the Canadian Academy of Health Sciences.



Congratulations to **Esther Lau** (recently graduated PhD student, Clinical Psychology) who was awarded the Ken Bowers Student Research Award from the Canadian Psychological Association (CPA) for her thesis work entitled, "Neurocognitive and psychosocial outcomes in patients with obstructive sleep apnea treated with continuous positive airway pressure." This prize is given to the student with the most meritorious submission to the Clinical Section of the CPA Annual Convention.



Congratulations to **Nuala Kenny** (Bioethics), recipient of the 2008 Award for Distinguished Service, awarded by the Canadian Healthcare Association. The award recognizes outstanding contributions or achievements in furthering progress and governance in the health sector; consistent and noteworthy service and leadership, particularly at the national level; personal efforts to assist and advance the efficiency and performance of Canadian organizations; personal efforts to foster public policy and legislation related to health care; and furtherance of public policy and legislation related to health care. Dr. Kenny is also the recipient of the 2008 Canadian Bioethics Society Lifetime Achievement Award.

Congratulations to **Jeanette McGlone** (Psychology) who received the Canadian Council of Professional Psychology Program's 2008 Award for Excellence in Professional Training for her "outstanding contributions to the training of professional psychologists through teaching, supervising and mentoring with exceptional professionalism, dedication, expertise, and warmth."



Congratulations to **Donald Mitchell** (Psychology) upon being awarded an honorary degree from the University of Montreal for his contributions to research in optometry and psychology. As noted on the University of Montreal's website, "Doctors honoris causa represent an ideal of personal achievement and active participation in society."



Congratulations to **Dianne Mosher** (Medicine) who was awarded the Canadian Rheumatology Association's Distinguished Rheumatologist Award 2008. This is the Association's highest award and is awarded yearly to a rheumatologist who has made an outstanding contribution to arthritis care and research in Canada. Dr. Mosher is the first woman, and the youngest person to have received the award.



Congratulations to **Andrew Cochrane** (Continuing Education) upon being elected to the position of President of the Canadian Association for University Continuing Education (CAUCE) for 2008–09. The Association consists of professional continuing educators from approximately 50 universities across the country, the private industry, and the public sector.



Congratulations to **Peter Duinker** (Resource & Environmental Studies) who shared in the 2007 Nobel Peace Prize with Al Gore in association with his work as a research scholar at the International Institute for Applied Systems Analysis (IIASA) on the second assessment report of the Intergovernmental Panel on Climate Change in 1995. Dr. Duinker was lead author on a chapter in the report titled, "Wood Production under Changing Climate and Land Use."

CONSULTING FOR SUSTAINABILITY



Erin Chalk, Christina Lord, Deborah Buszard, Timothy Bethune, Muhammed Kottapalli, Christopher Lefort and Hana Nelson participate in consultation sessions for Dalhousie's College of Sustainability. The College developed out of a series of grass-roots meetings, a major university-wide workshop, and follow-up working sessions. Working together, faculty, staff, administrators and students freely imagined the teaching and scholarship that would best serve the creation of new knowledge and practices around issues of environment, sustainability and society. Dr. Buszard is the advisor for Environmental, Energy and Sustainability Research to the Vice-President, Research. She is also the director of the Environmental Sciences Program for the Faculty of Science.

OutFront RESEARCH THAT MATTERS

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