focus on
Research
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Faculty of Agricultural and Environmental Sciences
McGill University

McGill's Faculty of Agricultural and Environmental Sciences was founded just over 100 years ago by Sir William Macdonald and has, over this period of time, become internationally renowned for its excellence in research in agriculture, food and nutritional sciences, and environmental sciences.

Our academic staff is at the forefront of discovery; they are training the next generation of scientists and researchers, making use of the extensive laboratory and field facilities that distinguish the Campus. The challenges of producing safe food products, linking quality food to nutrition, diet and human health, and doing all this in an environmentally sustainable manner are today driving the research agenda at Macdonald. Our research programs are making a direct impact on improving the quality of human life and the environment in which we live. Furthermore, our researchers are looking beyond today. They are concerned about tomorrow — about the effects of climate change on agriculture and water, about northern ecosystems, and about the health and nutrition of indigenous peoples.

In this first edition of the Faculty's research newsletter, you will learn more about new research centres and networks recently launched at Macdonald, and about the work of our researchers in the Canadian North.

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Green Crop Network Launched
Tackling the challenges of climate change

Canada's top plant researchers are joining forces with the federal government and industry partners to come up with new ways to use crops to reduce greenhouse gases, provide alternative energy sources and mitigate climate change. The Green Crop Research Network, funded by a $6.6-million investment from the federal government and led by Dr. Don Smith, Chair of McGill University's Plant Science department, was recently announced. The Network will be headquartered at McGill's Macdonald Campus.

"Canada has a unique opportunity to address the challenges of climate change, says Smith. "Although home to only 0.5% of the world's population, Canada occupies 7% of the earth's land area, and accounts for 2%-4% of the global CO2 exchange. The extent of natural carbon cycling is high because the Canadian landscape is largely covered in plant life that has the capacity to use the sun's energy and atmospheric CO2 to build an energy-rich biomass. A northern latitude and dispersed population means that Canadians use a lot of fossil fuel; currently, only 6% of our energy requirements are met from biomass sources."

The realization that agriculture has a significant role to play in climate change and as a source of renewable energy has greatly increased the demand for scientific insights and new crop development in these areas. The Green Crop Network is now taking up the challenge to develop or select crops which will reduce the negative environmental impact of crop production.


PHILIPPE SEGUIN

The versatile canola plant, grown on the Lods Agronomy Field Station at Macdonald, not only produces comestible oil, but can also be used as a biofuel to power automobiles.

The Network's goal is to find ways to reduce greenhouse gas emissions through agricultural activities, which will have economic, environmental and human health benefits. If more carbon can be captured by plants and stored below ground, the soil may become more productive and for longer, thus enhancing the sustainability of agriculture. If nitrogen leakage is minimized, fertilizer costs may be reduced and negative environmental impacts diminished. And, not least, if the fundamental processes of C and N flow through the air-plant-soil continuum are better understood, solutions not yet envisioned may be discovered.

Innovation and Partnership with Quebec's Dairy Producers

Valacta, a new Centre of Expertise in dairy production, was recently launched in Quebec. The new centre integrates the resources of the Programme d'analyse des troupeaux laitiers du Québec (PATLQ) with the Ministère de l'agriculture, des pêcheries, et de l'alimentation du Québec (MAPAQ), the Fédération des producteurs de lait du Québec and McGill University. Valacta has an annual operating budget of $17 million and employs 280 people; it builds on the 40 years of expertise that PATLQ brings to the partnership. The partnership between PATLQ and McGill's Macdonald Campus dates back to 1966 and is a result of the vision of Emeritus Professor John Moxley, a pioneer in the Quebec dairy industry and founder of DHAS/PATLQ. His contributions have laid the foundation for this new centre of expertise in which McGill is proud to remain a partner.

valacta

Focus on Researchers

Don Smith
James McGill Professor and Chair, Plant Science department
Don Smith's research interests are in the area of crop eco-physiology. His work has led to numerous patents, as well as a McGill spin-off company. Recently, Dr. Smith has begun looking at ways to increase the sequestration of carbon dioxide from the atmosphere into crop plants for use in bioproducts and reduction of greenhouse gases.

Lyle Whyte
Canada Research Chair in Environmental Microbiology
Lyle Whyte is looking at microbial biodiversity and ecology in the Canadian Arctic, using classical microbiology and novel genomics-based molecular techniques. His research is deepening our understanding of the processes in extreme ecosystems and will find applications in the decontamination of polluted northern sites.

Murray Humphries
Professor, Natural Resource Sciences
Murray Humphries' research focuses on energetics, the process by which animals acquire and assimilate energy from the environment and allocate this energy between maintenance, growth and reproduction. Dr. Humphries' work will ultimately have implications for human responses to changes in biological systems.

Grace Egeland
Canada Research Chair in Environment, Nutrition and Health
Grace Egeland's research interests include the impact of dietary change on chronic disease in aboriginal populations, gestational diabetes and maternal child health, the impact on public health of environmental policy regarding food contamination, and the interplay of environmental and nutritional exposures in human health.

Harriet Kuhnlein
Founding Director, Centre for Indigenous Peoples' Nutrition and Environment
Harriet Kuhnlein's research interests centre on the traditional food resources of indigenous peoples. This includes research in partnership with indigenous communities to identify food resources (both wild and cultivated) to determine factors influencing food use, patterns of consumption and, ultimately, health of the indigenous communities. Dr. Kuhnlein's research has led to the development of nutritional programs in many developing countries as well as right here in Canada.

Northern Exposure

Nowhere else on earth is the effect of global warming felt more than in Canada's North, where even slight increases in temperature will have a profound effect on the Arctic habitat and food supply. Several Macdonald researchers are actively engaged in research projects in the Canadian North.

Microbes on Mars

Lyle Whyte, Canada Research Chair (CRC) in Environmental Microbiology, is investigating the presence of microbes in the Arctic ice. These "extremophiles" — organisms that live in extreme environments — are new to science. By performing DNA fingerprinting of bacteria found nine metres below the Arctic ice — the deepest sample available — Dr. Whyte and his graduate students identified approximately 60 different kinds of microbes. These microbes are part of lineages that have been in the permafrost, at a temperature of about -16°C, for as long as 20,000 years. Dr. Whyte is trying to determine whether these extremophiles are hibernating or dormant, and what function they may serve. The answers to these questions will give researchers a greater understanding of the low-temperature limit of microbial life on earth and may provide a model for NASA researchers to develop diagnostic tools for the next Mars mission, where similar climatic conditions exist. Dr. Whyte's research is funded by the Natural Sciences and Engineering Research Council (NSERC), the Canada Research Chairs (CRC) program, the Canada Foundation for Innovation (CFI), as well as the Canadian Space Agency and NASA.

Northern Migration

Murray Humphries, a wildlife biologist in the Department of Natural Resource Sciences, studies mammal ecology and physiology in Canada's north. The aims of his research are to measure and predict the responses of biological systems and their effects on mammals through the food web. Species such as beavers are moving from their traditional habitat in boreal forests into the Arctic and are fast becoming an invasive species. Will this northward migration affect the nutritional properties of northern wildlife and what are the implications of a changing climate on the diet and health of the northern communities who rely on this traditional food source? Dr. Humphries' research is funded by NSERC, the Social Sciences and Humanities Research Council (SSHRC) and ArcticNet.

Drilling for core samples in Canada's permafrost.
Photo courtesy Lyle Whyte.

Northern Diets

Researchers Harriet Kuhnlein and Grace Egeland, Canada Research Chair in Environment, Nutrition and Health, both jointly appointed in the School of Dietetics and Human Nutrition and the Centre for Indigenous Peoples' Nutrition and Environment, are keenly interested in the diet and health of Canada's indigenous peoples, who are showing an increased prevalence of cardiovascular risk factors such as obesity, high blood pressure and elevated blood lipids. A recent study demonstrated that the nutritional benefits of the local food supply consumed by this population far outweigh the risks of exposure to contaminants such as mercury and the risks associated with a shift to store-bought diets. Dr. Kuhnlein's and Dr. Egeland's research programs aim to educate local groups on the beneficial relationship between indigenous diets and health.

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