


UNIVERSITY of GUELPH

RETURN ON RESEARCH

ANNUAL REPORT 2014-2015




BUILDING RELATIONS, FROM OUR UNIVERSITY TO YOUR TABLE

The University of Guelph takes pride in being at the forefront of research in many disciplines, including agriculture and food. In fact, we are often referred to as Canada's food university. Our researchers have a strong reputation for new plant variety development, livestock genetics and health, and public health research and education. Initiatives at Guelph such as the Food Institute and the Centre for Public Health and Zoonoses help ensure that food is healthy, safe and sustainable. The Guelph Family Health Study is engaging 3,000 families (such as the Kaye family, pictured here) over 20 years to promote healthy food and lifestyle behaviours in early life. All these initiatives go toward making the University of Guelph one of the world's top universities in agricultural science, and underline its commitment to quality research in food, health, the environment and business.

WELCOME

Malcolm Campbell
Vice-President, Research

Over a century ago, researchers in our founding colleges made remarkable discoveries and developed exceptional innovations in agricultural productivity, animal health, and domestic science. They shared their insights and inventions with the world at large – transforming their disciplines, and improving the lives and livelihoods of those who adopted their ideas.

This long-standing tradition epitomizes the research we conduct at the University of Guelph today. Our research covers the continuum from the structure of atoms to the composition of the universe, from the functioning of the molecules of life to the biodiversity contained within entire ecosystems, and from the conceptual underpinnings of artistry to the sweep of human history. Our research illuminates the nature of human existence, from our creative outputs and entrepreneurial activities, to the cohesive bonds that hold society together.

Collectively, University of Guelph research provides the insights and innovations necessary to promote and sustain the health and well-being of humans, animals, agriculture, the environment, and society – globally. Our discoveries are fuelling job creation, supporting sustainable food production, protecting the environment, improving the quality of life, and empowering those who are frequently marginalized.

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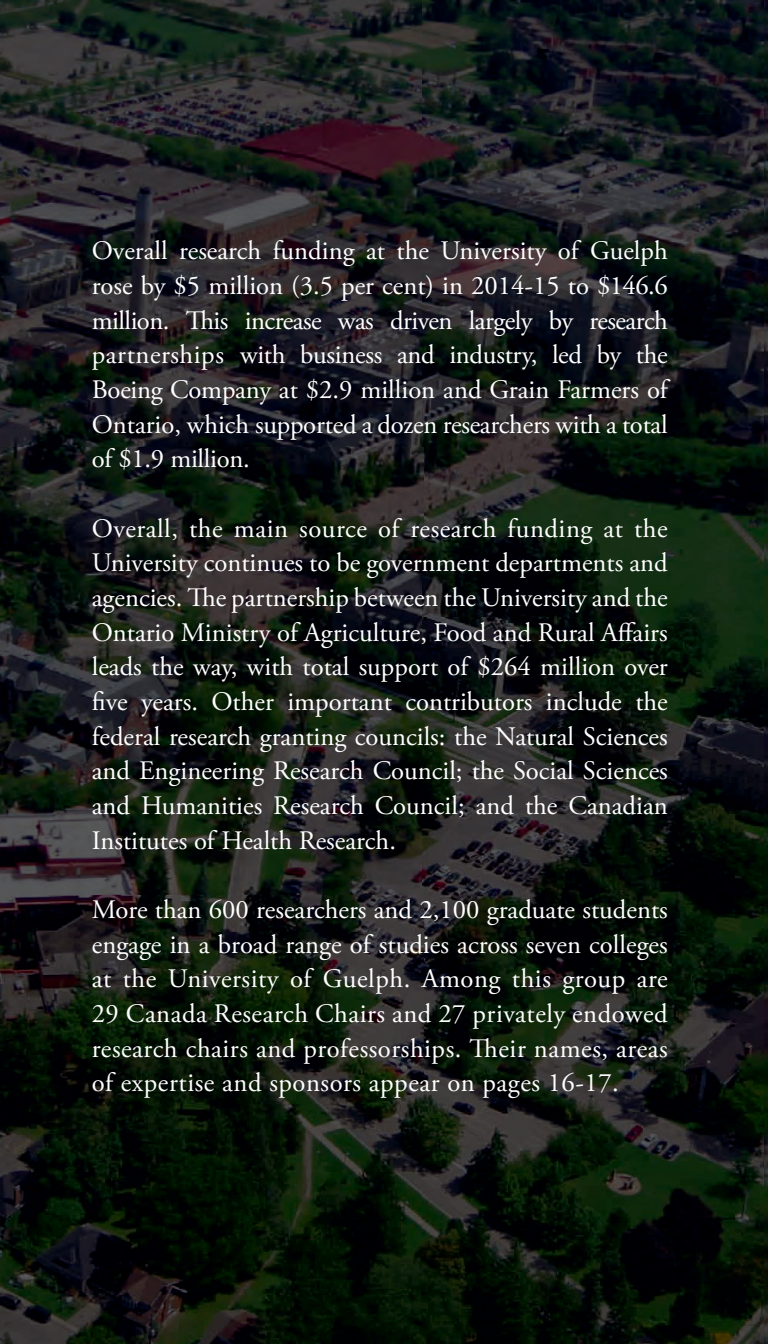
GAINING INSIGHT INTO OUR UNDERSTANDING OF INDIVIDUALS, SOCIETIES

One of the nation's top playwrights and directors, Prof. Judith Thompson is internationally known for works that give voices to people who are rarely heard. Since joining the School of English and Theatre Studies in 1992, Thompson has written 19 plays and directed, produced and acted in many others. Thompson is an officer of the Order of Canada, and most recently was elected to the Royal Society of Canada, considered the country's senior academic honour. The scene here is from a new revival of her first play, *The Crackwalker*, originally produced in 1980.

Photo credit: Joseph Michael Photography



Overall research funding at the University of Guelph rose by $5 million (3.5 per cent) in 2014-15 to $146.6 million. This increase was driven largely by research partnerships with business and industry, led by the Boeing Company at $2.9 million and Grain Farmers of Ontario, which supported a dozen researchers with a total of $1.9 million.

Overall, the main source of research funding at the University continues to be government departments and agencies. The partnership between the University and the Ontario Ministry of Agriculture, Food and Rural Affairs leads the way, with total support of $264 million over five years. Other important contributors include the federal research granting councils: the Natural Sciences and Engineering Research Council; the Social Sciences and Humanities Research Council; and the Canadian Institutes of Health Research.

More than 600 researchers and 2,100 graduate students engage in a broad range of studies across seven colleges at the University of Guelph. Among this group are 29 Canada Research Chairs and 27 privately endowed research chairs and professorships. Their names, areas of expertise and sponsors appear on pages 16-17.

A STELLAR YEAR FOR RESEARCH

$146.6 MILLION

Overall research revenue at Guelph rises $5 million

740 RESEARCH ACCOUNTS

270 RESEARCH SPONSORS

41 NEW PATENTS FILED

2014-2015 3.5%

WORLD-LEADING AGRICULTURAL RESEARCH

The new $25-million Livestock Research and Innovation Centre at Elora helps make the University of Guelph a world leader in dairy research. With the capacity to conduct studies using up to 600 cows at once, the research facility has the ability to examine a multitude of research themes, including cow health, reproduction, nutrition, welfare, life cycle analysis and value-added milk products. This multidisciplinary centre will bring together scientists, students and stakeholders from Ontario and beyond to study environmental, social and economic issues for the dairy industry.

Photo credit: Karen Mantel

OUR MAJOR PARTNER

Ontario Ministry of Agriculture, Food and Rural Affairs provides a strong research foundation

The 10-year partnership (2008-2018) between the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the University of Guelph invests in agri-food and rural research that supports a thriving agriculture and food sector, strong rural communities and safe food, healthy animals and a healthy environment.

It funds a diverse research program and oversees laboratory services, the veterinary clinical education program, highly qualified personnel program, research stations and infrastructure, all of which contribute $1.15 billion to Ontario's economy every year.

The partnership research program is based on three key research and innovation funding programs. The Research Program funds projects across eight diverse themes. With $53 million in research and research infrastructure funding in 2014-15, the partnership was able to leverage $37 million from non-OMAFRA sources, including business and industry. The Knowledge Translation and Transfer Program funds research that accelerates the transfer of research knowledge into use. And the Gryphon's LAAIR (Leading to Accelerated Adoption of Innovative Research) funds innovative University of Guelph studies that will accelerate the commercialization of new products and services to improve the competitiveness of the Ontario agri-food and rural economy.

Laboratory Services is a Canadian testing facility that delivers solutions to a breadth of clients throughout industry, government and academic sectors with more than 150 professionals on staff and direct access to University of Guelph researchers. Laboratory Services has two operational units: the Agriculture and Food Laboratory (AFL) and the Animal Health Laboratory (AHL). Both labs keep Ontario's food safe through initiatives such as the milk testing program.

The partnership supports students through its Highly Qualified Personnel and Veterinary Clinical Education Programs.

$1.15 BILLION
TO ONTARIO ECONOMY EVERY YEAR

Ontario

$53 MILLION IN RESEARCH FUNDING

$37 MILLION FROM PRIVATE/INDUSTRY ORGANIZATIONS

800,000+ MILK SAMPLES TESTED BY AGRICULTURE AND FOOD LAB

100+ STUDENTS SUPPORTED SINCE 2008

DEVELOPING LOCAL SOLUTIONS TO GLOBAL PROBLEMS

An innovative packaging system that improves the shelf life of produce has been developed by a team led by plant agriculture professor Jay Subramanian. Using nanotechnology to keep fruit fresh during handling and shipping, Subramanian's work has already helped significantly reduce post-harvest losses in mangoes in Sri Lanka and India. Next in line is banana storage in Africa, where some of the world's best fruit spoils before it reaches a market. New funding support from the International Development Research Centre and Foreign Affairs, Trade and Development Canada will allow researchers to broaden this successful initiative to Kenya, Tanzania, and Trinidad and Tobago.

In 2014-15, Guelph researchers were engaged in more than 240 funded research studies in 65 countries.

Under the Guelph-Brazil Initiative led by environmental sciences professor Richard Heck, two dozen researchers are studying everything from greenhouse gas emissions to potential cancer treatments.

Also in 2014-15, a national water research network based at the University of Guelph was awarded $4.6 million over five years to study water and environmental issues in China. Researchers in the Canadian Water Technology Exchange, led by engineering professor Ed McBean, will work with a new research centre to be established in the Tianjin Binhai New Area near Beijing.

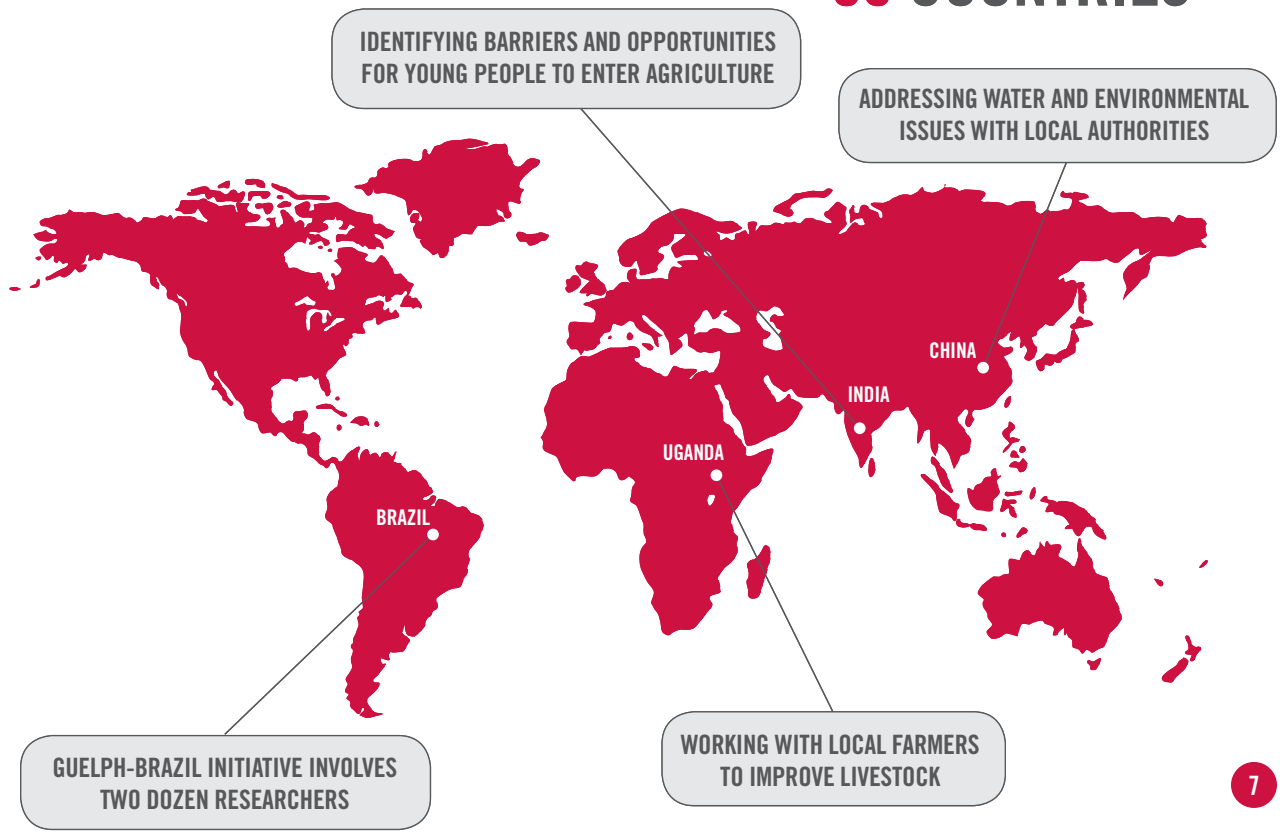
Prof. Sharada Srinivasan, Sociology and Anthropology, is leading a research program on young people's trajectories into farming in India. The global phenomenon of an aging farming population, poor current returns on farming and an apparent lack of interest among youth in agrarian and rural futures have attracted considerable attention among policy-makers and researchers.

University of Guelph students take part in global initiatives as well. PhD candidate Natalie Carter conducted feed trials in central Uganda, comparing productivity of local and crossbred pigs' diets, as part of a joint study between the University of Guelph and the International Livestock Research Institute. Her research results are helping improve pig growth, promote sustainable smallholder pig production and alleviate poverty in this area of East Africa.

GLOBAL LEADERSHIP

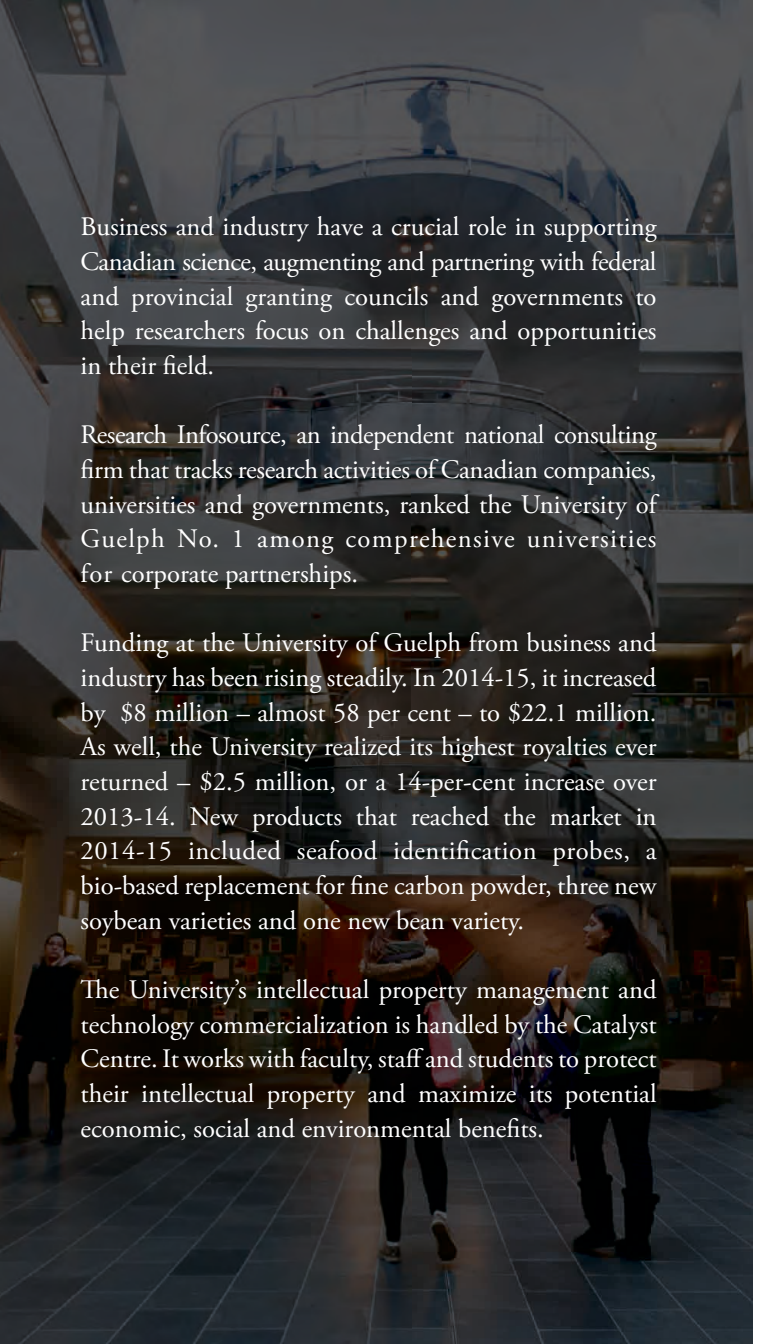
New initiatives strengthen international presence

240 FUNDED RESEARCH STUDIES
65 COUNTRIES



DEEP PARTNERSHIPS BUILD BETTER UNDERSTANDING

Fractured sedimentary bedrock aquifers provide the community water supply for the cities of Guelph and Cambridge, and for thousands of others across the globe. The bedrock wells in southern Ontario typically go to depths of 100 metres, but in parts of the United States and elsewhere, they may penetrate more than three times that depth. The speed of groundwater flow in fractured bedrock is typically large – several metres per day – and the behaviour of contaminants in bedrock aquifers is in general poorly understood. Prof. Beth Parker, School of Engineering and director of the G360 Centre, is involved in intensive studies of representative contaminated bedrock industrial sites in Guelph-Cambridge and in California, Wisconsin and New York. This bedrock research, supported primarily by the Natural Sciences and Engineering Research Council, received a huge boost in 2014-15 with $2.9 million awarded from the Boeing Company.



Business and industry have a crucial role in supporting Canadian science, augmenting and partnering with federal and provincial granting councils and governments to help researchers focus on challenges and opportunities in their field.

Research Infosource, an independent national consulting firm that tracks research activities of Canadian companies, universities and governments, ranked the University of Guelph No. 1 among comprehensive universities for corporate partnerships.

Funding at the University of Guelph from business and industry has been rising steadily. In 2014-15, it increased by $8 million – almost 58 per cent – to $22.1 million. As well, the University realized its highest royalties ever returned – $2.5 million, or a 14-per-cent increase over 2013-14. New products that reached the market in 2014-15 included seafood identification probes, a bio-based replacement for fine carbon powder, three new soybean varieties and one new bean variety.

The University's intellectual property management and technology commercialization is handled by the Catalyst Centre. It works with faculty, staff and students to protect their intellectual property and maximize its potential economic, social and environmental benefits.

HIGHEST LEVEL EVER

Guelph is the leading comprehensive Canadian university for corporate partnerships

2012
2013 **$9.8 MILLION**

2013
2014 **$14 MILLION**

2014
2015 **$22.1 MILLION**

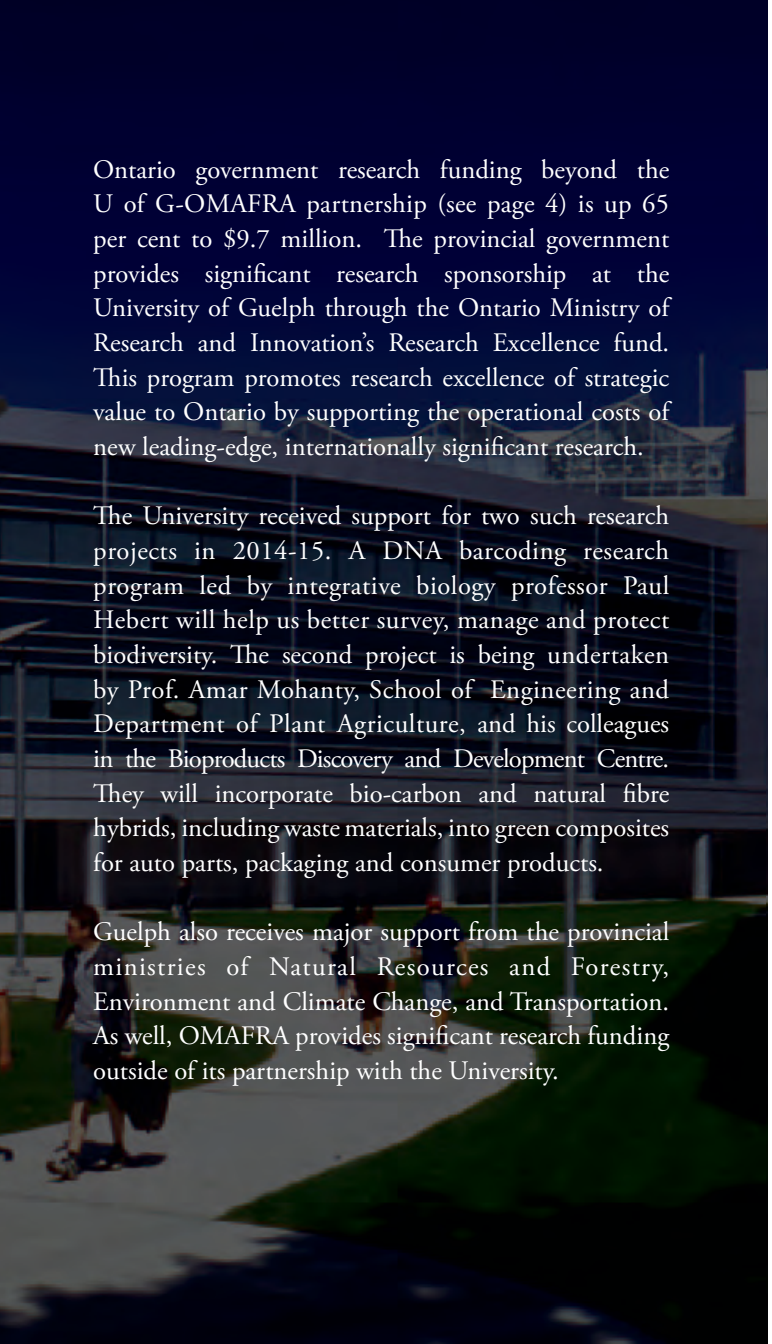
IN 2014-15, GUELPH HAD MORE THAN 200 ACTIVE INTELLECTUAL PROPERTY LICENSE AGREEMENTS.

RESEARCH AWARDS HELP YOUNG SCIENTISTS GET ESTABLISHED

Ontario Ministry of Research and Innovation Early Researcher Awards help attract and retain the next generation of research talent for Ontario. These awards support researchers with first-rate skills in science, engineering, creative arts, business and entrepreneurship in the early years of their careers. University of Guelph professors Shohel Mahmud, David Mutch, Kieran O'Doherty and James Uniake received these awards in 2014-15.

Uniacke (left) studies how cancer cells cope with stress; he wants to use that knowledge to create new anti-tumour therapies. Mutch (second from left) is looking for ways to improve the health of Ontarians and reduce health-care costs, using omega-3 fats to prevent and treat metabolic syndrome. Mahmud (second from right) is developing new technologies to harvest energy from the sun, sound, waste heat and vibration in an environmentally friendly way. And O'Doherty (right) hopes to inform sound policy around controversial science and technology subjects, such as vaccine hesitancy or hydraulic fracturing.

Photo by Martin Schwalbe



Ontario government research funding beyond the U of G-OMAFRA partnership (see page 4) is up 65 per cent to $9.7 million. The provincial government provides significant research sponsorship at the University of Guelph through the Ontario Ministry of Research and Innovation's Research Excellence fund. This program promotes research excellence of strategic value to Ontario by supporting the operational costs of new leading-edge, internationally significant research.

The University received support for two such research projects in 2014-15. A DNA barcoding research program led by integrative biology professor Paul Hebert will help us better survey, manage and protect biodiversity. The second project is being undertaken by Prof. Amar Mohanty, School of Engineering and Department of Plant Agriculture, and his colleagues in the Bioproducts Discovery and Development Centre. They will incorporate bio-carbon and natural fibre hybrids, including waste materials, into green composites for auto parts, packaging and consumer products.

Guelph also receives major support from the provincial ministries of Natural Resources and Forestry, Environment and Climate Change, and Transportation. As well, OMAFRA provides significant research funding outside of its partnership with the University.

WHERE GOOD THINGS GROW

Ontario invests heavily in Guelph research

Ontario 65%

$9.7 MILLION

- ONTARIO MINISTRY OF RESEARCH AND INNOVATION
- ONTARIO MINISTRY OF AGRICULTURE, FOOD AND RURAL AFFAIRS
- ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY
- ONTARIO MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE
- ONTARIO MINISTRY OF TRANSPORTATION

PERKING UP ENVIRONMENTAL SUSTAINABILITY

Prof. Amar Mohanty, Department of Plant Agriculture and School of Engineering, and his team at the University of Guelph's Bioproducts Discovery and Development Centre, have created a bio-composite resin using coffee chaff as one of the major ingredients. It's the world's first fully certified compostable single-serve pod for coffee, called PurPod100, certified by the Biodegradable Products Institute for industrial composting. The single-use coffee cup format has grown exponentially, driven by convenience and consumer preference. But it has a huge environmental impact. The PurPod100 will help decrease consumer waste and greenhouse gas emissions, and offer a sustainable alternative for single-serve beverages.

Photo by Mido Melebari

The Canada Foundation for Innovation (CFI) invests in state-of-the-art facilities and equipment to attract and retain the world's top talent. Prof. Claudia Wagner-Riddle, School of Environmental Sciences, received more than $1 million from CFI to create a facility – unlike any other in North America – to understand long-term agro-ecosystem sustainability and soil health. Soil is the basis of sustainable production. Its care is vital for food, fuel and fibre for the growing world population. Wagner-Riddle will focus on fundamental processes that control greenhouse gas emissions, carbon sequestration, and nitrogen water contamination. This will help in monitoring how climate change affects soil. She received matching funding from the Ontario Ministry of Research and Innovation.

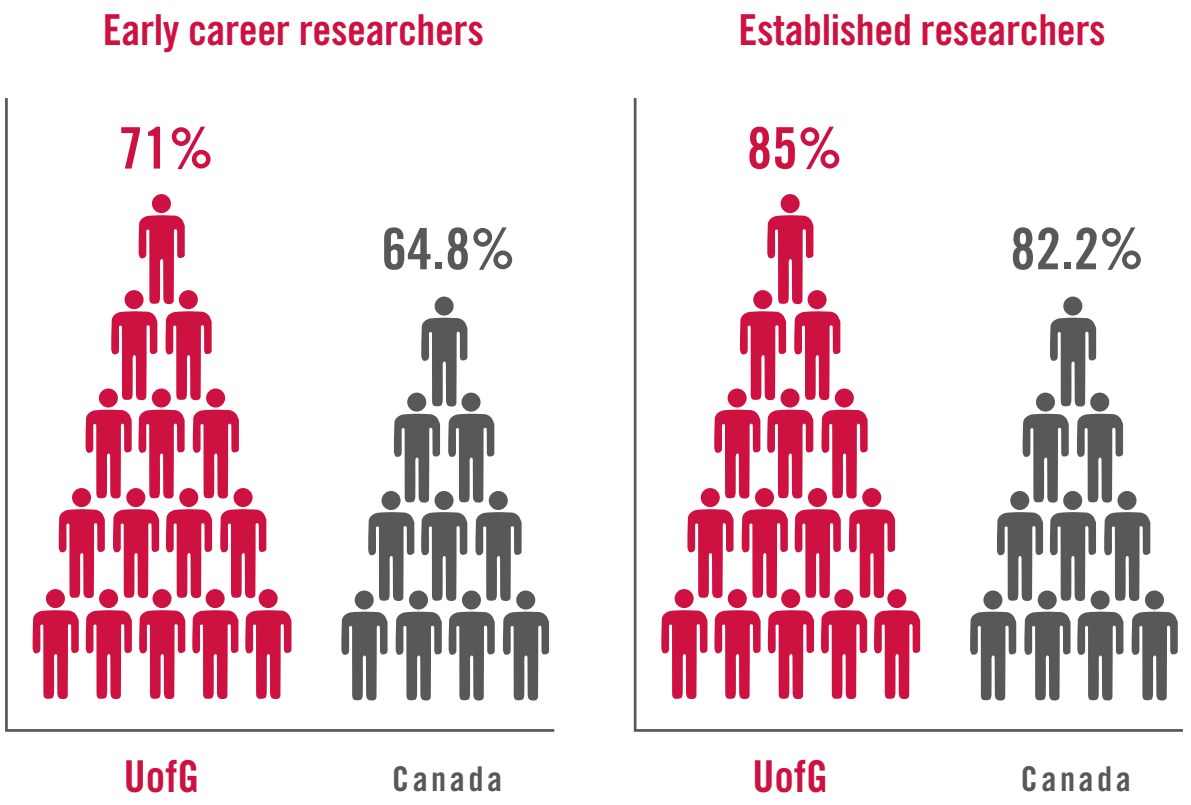
Another important national source of research funding is the Natural Sciences and Engineering Research Council (NSERC). Competition for research funding is intense for researchers who are early in their careers, which is where NSERC's Discovery Grants help. At Guelph, Prof. Emily Chiang, School of Engineering, is using her grant to find ways to make industrial and mining waste safe for use in new products. Prof. Philip Millar, Human Health and Nutritional Sciences, studies the effects of heart failure to ultimately provide better treatment.

NSERC Discovery Accelerator Supplements were awarded to Profs. Aaron Berg, Department of Geography, and Andrew McAdam, Department of Integrative Biology. Berg and his research group explore issues in hydrology using remote sensing and hydrological models. McAdam's research group takes empirical approaches to understanding the evolution and ecology of organisms.

AHEAD OF THE PACK

Guelph researchers lead the way in Discovery Grant funding program success

Natural Sciences and Engineering Research Council Discovery Grants



ADDRESSING THE NINE BILLION PEOPLE CHALLENGE

The world's population will reach an estimated nine billion over the next two generations. This increasing global population creates enormous food security concerns. At Guelph, geography professor Evan Fraser (centre) is leading the way through various creative projects. His Feeding Nine Billion program creates engaging educational resources about global food security for students, food system reformers, researchers and the public. The resources are designed to spur public action to create a more sustainable food system in the face of a changing global climate and economy.

Photo by Mido Melebari

FOR THE HEALTH OF ALL

New veterinary research facilities announced

The Ontario Veterinary College (OVC) benefits Ontario through research and teaching. It is ranked first in Canada among veterinary schools and fourth worldwide. The Ontario government is helping maintain this research innovation and excellence, with $23 million in funding to support critical infrastructure renewal and expansion. This will provide students with up-to-date facilities for hands-on research opportunities.

OVC researchers in the Department of Population Medicine are also actively engaged in a wide spectrum of game-changing research in areas such as mental health, ecohealth and livestock production. Prof. Andrea Jones-Bitton surveyed farmers and veterinarians across Canada to gather information about mental health and resilience in these two occupations, which suffer some of the highest rates of depression and anxiety. Prof. Sherilee Harper investigated the health of indigenous populations living in climate-sensitive areas such as the Canadian Arctic and Uganda, in an ongoing collaboration with the international Indigenous Health Adaptation to Climate Change project. And Canada's first national dairy study, led by Prof. David Kelton, collected data from dairy farms across Canada to serve as a benchmark for the industry to improve animal welfare, production and management.

At OVC's Mona Campbell Centre for Animal Cancer, faculty and staff offer comprehensive and collaborative clinical research in companion animal cancer investigations. With advanced tools for diagnosis, treatment and investigation, the centre is in the forefront of cancer research for pets and has cancer specialists in areas such as medicine, radiation and surgical oncology. It is the only institute in Canada equipped with a state-of-the-art linear accelerator offering precise positioning of the patient and tumour targeting. Current research at the centre includes a clinical trial of 500 dogs newly diagnosed with osteosarcoma. Pictured right are trial participant Cujo and his owner Valeria Martinez, with clinical studies professors Paul Woods and Brigitte Brisson and clinical research co-ordinator Vicky Sabine. The centre's research helps improve dogs' health by assessing new diagnostic and therapeutic tools. This work is sponsored by the Morris Animal Foundation and the National Cancer Institute.

Photo by Karen Mantel

LEADERSHIP

Donor-supported research at the University of Guelph

Christine Baes
Semex – Canadian Dairy Network (CDN) – Holstein Canada Professorship in Dairy Genomics

Theresa Bernardo
IDEXX Chair in Emerging Technologies and Bond-Centred Animal Healthcare

Jason Coe
Nestlé Purina PetCare Canada Chair in Communications

Steve Crawford
Professorship in the Department of Integrative Biology; Saugeen Ojibway Nation

Brady Deaton
Michael McCain Family Chair in Food Security

Ian Duncan
Emeritus Chair of Animal Welfare

James Fraser
Scottish Studies Foundation Chair

Dan Gillis
Professorship in the School of Computer Science; Saugeen Ojibway Nation

Ernesto Guzman
Pinchin Family Chair in Bee Health

Linda Hannah
Kinross Chair in Environmental Governance; Kinross Gold Corp.

Alexandra Harlander
Burnbrae Farms Professorship in Poultry Welfare

A. Max Jones
Professorship in Integrated Plant Production Systems for Vegetatively Propagated Horticulture Species

David Kelton
Dairy Farmers of Ontario Dairy Cattle Health Research Chair

Elijah Kiarie
McIntosh Family Professorship in Poultry Nutrition

Gisèle Lapointe
Dairy Farmers of Ontario Professorship in Dairy Microbiology

Donna Lero
Jarislowsky Chair in Families and Work

Ralph Martin
Loblaw Chair in Sustainable Food Production

Ali Navabi
Grain Farmers of Ontario Professorship in Wheat Breeding

Lee Niel
Col. K.L. Campbell Chair in Companion Animal Welfare Science

Nigel Raine
Rebanks Family Chair in Pollinator Conservation; W. Garfield Weston Foundation

Neil Rooney
Professorship in the School of Environmental Sciences; Saugeen Ojibway Nation

Praveen Saxena
Gosling Chair in Plant Preservation

Cynthia Scott-Dupree
Bayer CropScience Chair in Sustainable Pest Management

Adronie Verbrugghe
Royal Canin Veterinary Diet Endowed Chair in Canine and Feline Clinical Nutrition

Tina Widowski
Col. K. L. Campbell University Chair in Animal Welfare
Egg Farmers of Canada Chair in Poultry Welfare

Catherine Wilson
Francis and Ruth Redelmeier Professorship in Rural History

To be announced
Libro Professorship in Regional Economic Development for Southwestern Ontario

Canada Research Chairs

Aaron Berg
Hydrology and Remote Sensing

Susan Brown
Collaborative Digital Scholarship

Myrna Dawson
Violence Prevention

Monique Deveaux
Ethics and Global Social Change

Trevor DeVries
Dairy Cattle Behaviour and Welfare

Kari Dunfield
Environmental Microbiology of Agro-ecosystems

John Dutcher
Soft Matter and Biological Physics

Hermann Eberl
Computational Biomathematics

James France
Biomathematics in Animal Nutrition

Evan Fraser
Global Food Security

Amy Greer
Population Disease Modelling

George Harauz
Myelin Biology

Paul Hebert
Molecular Biodiversity

Nina Jones
Eukaryotic Cellular Signalling

Allan King
Animal Reproductive Biotechnology

René Kirkegaard
Risk Management and Regulation

Joseph Lam
Cystic Fibrosis and Microbial Glycobiology

Alejandro Marangoni
Food, Health and Aging

Ed McBean
Water Supply Security

Barbara Morrongiello
Child and Youth Injury Prevention

Linda Parker
Behavioural Neuroscience

Kathryn Preuss
Chemistry of Molecular Materials

Carla Rice
Care, Gender and Relationships

Sharada Srinivasan
Gender, Justice and Development

Carl Svensson
Gamma-Ray Spectroscopy and Rare Isotope Physics

Merritt Turetsky
Integrative Ecology

Scott Weese
Zoonotic Diseases

Chris Whitfield
Molecular Microbiology

David Wright
Lipids, Metabolism and Health

Fellows of the Royal Society of Canada

Academy of the Arts and Humanities
Ric Knowles
John Leslie
John McMurtry
Judith Thompson
Elizabeth Waterston

College of New Scholars, Artists and Scientists
Evan Fraser
Ryan Norris
Merritt Turetsky

Academy of Science
Derek Bewley
Arend Bonen
Chris Gray
Paul Hebert
Gabriel Karl
Ken Kasha
Peter Kevan
Jacek Lipkowski
Larry Milligan
Bernhard Nickel
Larry Peterson
Bruce Sells
John Simpson
Chris Whitfield

NSERC Industrial Research Chair

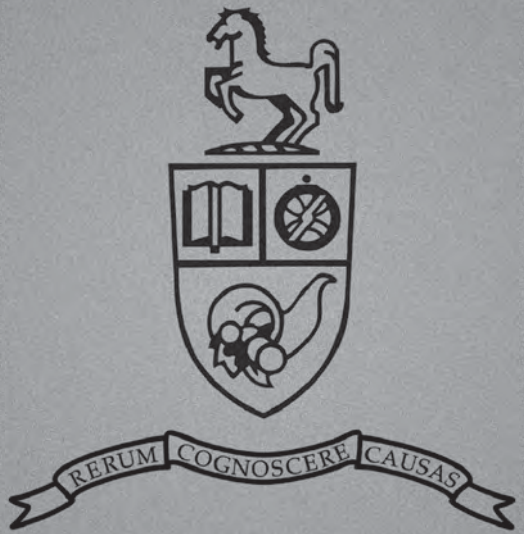
Beth Parker, Groundwater Contamination in Fractured Media
Sponsor: The Boeing Company, Schlumberger, Syngenta

Pierre Elliott Trudeau Foundation

Evan Fraser, Fellow

Premier's Research Chair

Amar Mohanty, Biomaterials and Transportation
Sponsor: Ontario Ministry of Agriculture, Food and Rural Affairs



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