University of Guelph

Strategic Research Plan

2012-2017

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EXECUTIVE SUMMARY

The University's Strategic Research Plan (SRP) helps promote and advance research strengths on which the University has built its reputation for quality and innovation. It reflects the University's mission and its objectives, such as research intensity, internationalism and collaboration.

The SRP identifies areas in which the University can make unique contributions to current and emerging research. It describes seven research themes and areas of strength within the University's Integrated Plan:

- Agriculture, food and the bioeconomy
- Health and well-being in humans and animals
- Economic management, governance and public policy
- Biodiversity, environment and ecology
- Human behaviour, cultural evolution, creative communities
- Technology and applied sciences
- Foundations of science

The SRP's identification of thematic research areas does not diminish the important contributions of individual researchers and creative practitioners. In fact, individual research strengths collectively formed the foundation of the University's strategic research directions.

1.0 INTRODUCTION

The University of Guelph ("the University") is one of Canada's top comprehensive universities because of its commitment to student learning and discovery and to innovative research. The University's mission is to change lives and improve life. It is dedicated to cultivating the essentials for quality of life through basic and applied research. Our goal is to use knowledge and research talent to help people, here and around the world.

The University is proud of its heritage in agriculture and veterinary medicine, as well as its accomplishments and programs in science and engineering, social and applied human sciences, liberal arts, humanities, fine and performing arts, and economics and business. Our rich history enables us to engage in collaborative and interdisciplinary research in a world of innovation and global competition.

As a comprehensive university, the University promotes individual and collaborative research, endeavoring to engage various communities in our research efforts. Investment in research enhances student teaching and learning through incorporating research techniques and discovery into the curriculum, through involving students in research design and execution, and through mobilization and transfer. Creativity in discovery generates innovations that benefit society and the economy. Through fundamental and applied research, we can address challenges and capitalize on opportunities.

The University's Strategic Research Plan (SRP) builds on the University's history and embraces a diverse scholarly community equipped to address key strategic priorities of the University and society. It focuses on key areas and supports opportunities for interdisciplinary, transformative research that span colleges and departments and reach industry and government. The SRP also provides a framework for research funding allocations from programs of the tri-council funding agencies (the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council, and the Social Sciences and Humanities Research Council) such as the Canada Research Chair (CRC) program, and for submissions for major institutional infrastructure funding from the Canada Foundation for Innovation (CFI) and the Ontario Research Fund. Excellence in research and strategic investment of resources aligned with research themes that highlight the University's strengths and identify strategic areas for growth will give the University of Guelph a distinctive edge and comparative advantage.

2.0 PURPOSE

The SRP is intended to promote high-quality, meaningful research toward innovation across all research disciplines and to help raise public awareness of University research. The SRP will help:

- Establish institutional focus, infrastructure and capability to improve individual and institutional research
- Highlight University strengths by identifying integrative research themes across disciplinary and administrative boundaries
- Promote awareness of major research areas and themes, facilitate development of interdisciplinary teams, and enhance opportunities for discovery in multi-dimensional research questions

3.0 PROCESS

The SRP was developed by an advisory committee with two representatives from each college, as well as the associate vice-president (research services) and the vice-president (research). The committee reviewed the existing University of Guelph SRP and college SRPs, as well as SRPs from successful universities that have a profile similar to the University of Guelph. The committee undertook a visioning exercise during which it identified existing strengths and emerging areas of strength and importance. That information was used to create the framework for the SRP. The committee's draft SRP was revised through input from multiple stakeholders, including college deans, Research Services Council and the Senate Research Board.

4.0 FRAMEWORK

The SRP is implemented within a framework emphasizing the following:

Training highly qualified personnel (HQP)

University research is critical to HQP development. There is growing awareness of the importance of research training in many of the University's undergraduate programs. The numerous research clusters and centres at the University — many of which have significant federal and provincial infrastructure support — are attracting excellent graduate students. Holders of Canada Research Chairs and other leading researchers play an important role in

undergraduate and graduate programs. Value-added training—such as research seminars with renowned scholars visiting the campus—is offered by many graduate programs.

Research excellence

Research includes all forms of scholarship creating knowledge. The University encourages research excellence in all fields of inquiry, by individual scholars or through collaborations. Regardless of the mode of dissemination, the University of Guelph retains its commitment to research which is characterized by its quality, depth and impact.

Support for creativity and diversity

The University's vibrancy reflects its diversity and creativity. The University strives for recognition as a centre of discovery and advanced training of HQP and respect for fundamental, discipline-based research. Discovery-based research also presents opportunities to address important societal issues. Applied research is important for knowledge mobilization and transfer, and for collaborations with external partners and communities.

Innovation

Innovation spans the University's offerings, from creative practice in the fine and performing arts to advanced genomics. Broadly defined, it includes advances in the creation of knowledge and its application. University researchers lead in building Canada's stock of innovative ideas, products and methodologies. Research figures prominently in current federal and provincial government policy and commercialization agendas.

Public policy

Research in policy-rich areas such as animal and human health, culture, economy, work, crime, poverty, language, agriculture, food safety and environment (including sustainable water management and climate change) draws the University into critical debate and development of public policies and advancement of societies and governments. University research yields critical new knowledge that informs policy development nationally and internationally.

Collaboration

The University contains a growing number of multi-disciplinary research teams spanning departments and colleges. Further planning and development will

enable us to establish focused research institutes in specific areas that combine research resources, critical activity, opportunity and collaborations. Cross-disciplinary collaboration is a strength, and a distinguishing feature of research at the University of Guelph.

Scholarship

Researchers, educators and administrators study, develop and implement innovations in teaching and learning to enhance classroom practices and lifelong learning. The University is a leader in the scholarship of teaching and learning, a field that has evolved in the past two decades across the entire campus, with specific disciplines taking the lead in pioneering scholarship.

5.0 MISSION AND GOALS

The generation and mobilization of knowledge through research, scholarship and teaching are fundamental to the University's research mission. The overarching mission of the University's research enterprise is to make a difference in people's lives. The University's research mission provides a strategic roadmap for the SRP. To ensure growth and continued success, the University must recruit and retain outstanding scholars who will attract highly qualified graduate and undergraduate students, champion innovative initiatives, strengthen critical areas of research, develop excellence in emerging areas, and strengthen connections between teaching and research.

One of the University's key research strengths lies in its ability to foster cross-disciplinary links, internally and externally. Those links have led to the creation of critical knowledge translation and transfer programs. These programs help mobilize research from concept and discovery to innovation and commercialization and to informing policy and practice. Additionally, the University encourages and supports interdisciplinary initiatives that build on its strengths and that promise significant impact and leverage.

The following are the University's broad research goals for 2012-2017:

- To be a national leader in transforming and mobilizing knowledge to benefit society by moving from ideas to discovery, innovation and commercialization
- To obtain funding for key initiatives and to recruit high-profile faculty members and students
- To build research infrastructure

- To develop extensive collaborative and international networks with academia, industry and government

- To conduct research that provides critical new knowledge relevant to public policy, nationally and internationally

- To increase recognition of the University's high-quality scholarship and its benefits to all sectors of society

6.0 OBJECTIVES

The specific objectives of the SRP are as follows:

- Maximize opportunities for scholarly activity, discovery-based research and innovation

- Enable the development of strong accountability models with industry and government sponsors and partners

- Promote internationally competitive, high-quality and high-impact research and scholarship

- Cultivate and sustain excellence across existing research strengths through strategic investment in emerging areas of research

- Facilitate collaborations across disciplinary and institutional boundaries

- Recruit outstanding students, research fellows and faculty

- Engage in effective communication and dissemination of research results

- Optimize research and scholarship resources, and increase effectiveness and efficiency of research support services

- Forge productive research partnerships within the University and with other institutions in Ontario, Canada and abroad

- Develop large-scale research facilities along with other institutions (e.g. CLS, TRIUMF, iBOL and the Canadian Space Agency)

- Optimize existing investments by leveraging funding and expanding collaborative research and knowledge mobilization
- Attract new research talent by investing in state-of-the-art research space and equipment in fundamental and applied research
- Augment research capacity, when possible, through private-sector contributions and working with University alumni
- Assess risk and develop mitigation strategies for complex and high-risk projects
- Support the development and enhancement of intellectual capital at the regional campuses and research stations
- Foster entrepreneurship and develop industry networks through enhanced services from the Catalyst Centre
- Reduce the gap between basic and applied research through strategic linkages for real-world solutions

7.0 MAJOR RESEARCH THEMES

Creating themes that represent the broad diversity of topics studied at the University is a challenge. The major research themes included in the SRP are intended to highlight critical strengths, to capture the interdisciplinary nature of University of Guelph research, and to illustrate the complex relationships among the arts, human and social sciences, and the natural, physical and applied sciences. The selected themes capture the interdisciplinary nature of the University, as researchers from all seven colleges may be active in any thematic area.

Themes

1. Agriculture, food and the bioeconomy
2. Health and well-being in humans and animals
3. Economic management, governance and public policy
4. Biodiversity, environment and ecology

5. Human behaviour, cultural evolution, communities
6. Technology and applied sciences
7. Foundations of science

7.1 Agriculture, food and the bioeconomy

The University has a long history of research in agriculture, especially in the production and use of food. An international study ranked the University seventh worldwide for its impact on agricultural sciences between 1996 and 2006. A recent Deloitte impact study concluded that the partnership between the University and the Ontario Ministry of Agriculture, Food, and Rural Affairs had direct and spin-off impacts on the Ontario economy worth more than $1 billion per year. The University's agricultural focus has generated a cluster of agri-food organizations, research and technology companies in and around the University. Recent areas of interest include applications of molecular genetics, genomics, bioinformatics, modelling and systems research. These new developments are creating novel crops and livestock, ensuring that agricultural practices are economically and environmentally sustainable, and helping protect the safety of food systems. Consumer reaction to new food and biotech products is also an emerging area of strength. The newly created Institute for Food will help co-ordinate teaching and research across the food chain.

The sub-themes in which the University places particular emphasis include:

- Agricultural products and the bioeconomy
- Sustainable agricultural systems
- Food and health, safety and security
- Plant and animal breeding
- Impact, adaptation and mitigation of climate change
- Enhanced agriculture and food value chains
- Sociological impact, financial assessment and food policy
- Market demand and consumer acceptance of new food and biotech products

7.2. Health and well-being in humans and animals

The University takes an integrated view of, and approach to, health-related issues, from cultural to scientific, from individual to community, from theoretical to applied, and from animals to humans. The development of policy recommendations based on effective practices of management and risk analysis is a priority. The University is well-positioned to make significant and unique contributions to improving human and animal health. This is consistent with the needs of Canadians, as people seek a more integrated approach to health issues and research. The University has made strong gains through CFI investments and CRC successes in areas such as zoonoses and vaccine development.

The sub-themes in which the University places particular emphasis include:

- Animal health, welfare and productivity
- Links among animals, humans and ecosystems
- Comparative health and disease
- Health genomics (nutrigenomics, personalized medicine, food safety and surveillance)
- Nutrition and health and clinical nutrition
- Genomics and biodiversity
- Biomedical technology and ethics
- Neurosciences and behavioural sciences
- Human development and aging
- The human-animal bond
- Population and public health

7.3 Economic management, governance and public policy

The University conducts internationally recognized research into the role of governance structure, effective management and public policy in the development and

performance of organizations, institutions and markets nationally and on a global scale. Strategic areas of research include the effect of institutions and policies on human prosperity and well-being, human resource management, labour market analysis, environmental governance, the criminal justice system, discrimination, income inequality, homelessness, human rights and international politics. Several cross-college collaborations focus on leadership, racial and gender discrimination, and work-family policies. Studies undertaken under this theme help to inform the research community on current and upcoming issues affecting the daily lives of people around the world.

The sub-themes in which the University places particular emphasis include:

- Economics and business of agriculture and food
- Corporate governance and risk management
- International and comparative politics
- Ethical management of organizations
- Economic growth, environmental governance and natural resources policy
- Health policy
- Global community and emerging markets
- Cultural goods and services, social capital and sustainability

7.4 Biodiversity, environment and ecology

The University has a rich history of research in biodiversity, environment, ecology and conservation. The institution continues to make strategic investments in infrastructure and research chairs in this area, and will build on this excellence. The University will continue to support emerging areas such as bioenergy through initiatives such as the National Strategic Network in Bioconversion. A well-defined strength in biodiversity is supported though the Biodiversity Institute of Ontario.

The sub-themes in which the University places particular emphasis include:

- Natural hazard prediction, prevention and remediation
- Planning, development, management and sustainability

- Evolutionary, population and community ecology
- Applied evolution (genotype, phenotype, population responses of plants and animals to changing environments)
- Environmental humanities and eco-criticism
- Ecosystem science and natural resources
- Rural resource management
- Greenhouse gas management and mitigation
- Water management and pollution control
- Climate change impacts and adaptation strategies
- Sustainable agriculture and food production systems
- Alternative energy (in particular, bioenergy)

7.5 Human behaviour, cultural evolution, communities

This theme brings together researchers from all seven colleges to solve some of society's most fundamental and critical issues. The University embraces innovative research within individual clusters and groups and promotes interdisciplinary study. With major strengths in critical, esthetic, historical, and philosophical inquiry and creative response, this theme addresses pressing issues such as gender, family, community, ethnicity and class. Technological innovations such as collaborative tools and global access to historical and archived documents support a new focus on digital applications within the humanities and social sciences. The University has a strong reputation for working with marginalized communities, both nationally and internationally. Researchers explore creative communities through high-impact activities such as the Improvisation Community and Social Practice (ICASP) project, the TransCanada Institute and Scottish Studies.

The sub-themes in which the University places particular emphasis include:

- Families and work
- Justice studies

- Literacies in the 21st century (visual, digital media and print)
- Nations and transnationalism
- Cultural production and performance
- Evolution, cognition and culture (social and natural sciences)
- The arts and humanities
- Urban and rural communities
- Globalization and adaptation
- Development of human thought, cultures and institutions
- Society and the environment

7.6 Technology and applied sciences

This research theme captures significant efforts and resources committed by the University to support basic and discovery science, to highlight links between discovery and applied sciences and engineering, and to facilitate innovation and efforts in commercialization. Discovery-based research includes distinct opportunities to address matters of importance to society, especially generation and translation of knowledge to benefit society and the environment. Interdisciplinary research from across the University reflects growing concern about the changing nature of human communication systems and Canada's media environments. Collaborative research encompasses information and communication technologies within the realm of digital citizenship, linking to questions of access, equality and social inclusion. Technology is also a research tool that is studied to foster innovation through open source, open access and open content projects. This research facilitates collaborative working and learning, innovation in knowledge production, organization and dissemination.

The University has gained science and engineering technology through allocation of CRC chairs and researchers' success in CFI competitions. The University will increase support for facilities such as the Advanced Analytical Centre, which provides access to state-of -the-art analytical equipment.

The sub-themes in which the University places particular emphasis include:

- Biomaterials and bioproducts
- Electrochemistry
- Membranes and surfaces
- Mathematics and modelling of biological systems
- Robotics, artificial intelligence, intelligent systems
- Support for all aspects of life in space
- Water technology
- Information communication and new media (digital media)
- Technology and new media in the fine arts, performing arts and liberal arts
- Ethical evaluation and ethical implications of technology and biotechnology
- Synthesis and fabrication of novel molecules and nanostructures
- Nature, origins and fate of the universe
- Applications for biodiversity (e.g. DNA barcoding)

7.7 Foundations of science

This research theme focuses on the fundamental laws and mechanisms that govern the behaviour of physical and biological systems, from the subatomic scale to the atomic and nanometer scales, to macromolecules to biological cells, from plant life to animals, and from planets to stars and the entire universe. This theme captures the breadth of the curiosity-driven, discovery-based research carried out at the University of Guelph.

The sub-themes in which the University places particular emphasis include:

- Fundamental interactions of matter and their role in the physical sciences, including the structure of atomic nuclei, collective phenomena and structure formation in condensed-matter systems, the structure of nanocrystals and thin

material films, the emergence of new states of matter, and the astrophysics of strong gravitational fields

- Simulations of natural phenomena on computers, together with mathematical modelling and experimentation, in biophysics, chemistry, epidemiology, materials science, nanotechnology, physics and toxicology

- Structure/function relationships in biological molecules and their evolution

- The laws of interactions of biological molecules making up cells, biological membranes, organelles, tissues and living organisms

- Quantum information