

Strategic Research Plan  
Acadia University  
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## Introduction

As a highly regarded university, Acadia is among the best in its category in Canada. Acadia achieves and sustains a strong culture of academic inquiry and innovation by building on the outstanding individual skills of its researchers, by maintaining focus on its core research disciplines, by celebrating the role of undergraduate and graduate research and increasingly, by facilitating a more collaborative and interdisciplinary approach to its research initiatives.

This Strategic Research Plan was developed to engage the university community in the continuing development of a strong and vibrant research environment and to guide Acadia University's involvement in the Canada Research Chairs (CRC) and the Canada Foundation for Innovation (CFI) programs. The Plan reflects the values of the institution, demonstrates respect for a diversity of research choices, a dedication to excellence in knowledge transfer and research training at the undergraduate and graduate student level, and recognition of the value of basic, applied and community-oriented research. It identifies research strengths on which to build the institutional research capacity required to pursue new opportunities and continue developing Acadia's international reputation.

Small universities have a unique role to play in Canadian postsecondary education. Because they include scholars in all disciplines, small universities rarely offer the opportunity to establish a sizeable pool of expertise in one field of study. Many small universities have responded to this challenge by supporting research across a range of disciplines and by supporting collaborations with researchers at other national and international institutions. Research is becoming increasingly interdisciplinary<sup>1</sup> in nature as the questions being asked in the sciences, social sciences and humanities become more complex; faculty at small universities are responding by developing skills essential to interdisciplinary collaboration. Students at small universities derive many benefits from the full participation opportunities afforded them in this dynamic and collaborative environment.

Garfield<sup>2</sup> reviewed several studies that have established that students and faculty at the best small, liberal arts universities in the United States make outstanding contributions to scientific research. In particular, Garfield noted, "select liberal arts colleges have produced a disproportionate share of science graduates and PhDs, compared with larger comprehensive universities having more extensive science curricula and far greater levels of research funding".

The impact of small universities on the research environment in Canada has not been similarly studied. However, historically, Acadia has played a key role in building Canada's research capacity by providing exceptional opportunities for undergraduate students to experience early and thorough engagement with research under the close tutelage of faculty members. Recent survey data from the Faculties of Science, Arts, and Professional Studies confirm that Acadia's Honours undergraduate program has been making significant contributions to Canada's need for highly qualified personnel (HQP). Over the past 5 years, 48% of Acadia's Honours degree recipients have entered graduate school programs and another 20% have entered post degree professional school programs. Furthermore, Acadia's growing, high quality graduate program continues to be successful in supporting Canada's need for development of HQP.

Within the Faculties of Science, Arts, and Professional Studies, the roles of research

and research training for the next generation are of prime importance for an increasingly dominant knowledge-based society. The Social Sciences and Humanities Research Council Report on its Consultations for Transformation to a 'Knowledge Council' (2005) noted that the social sciences and humanities play a crucial role "in wealth creation, civic engagement, and the well-being of Canadians in an increasingly globalized world, where the most precious currency is knowledge."

Acadia is providing the requisite environment for high caliber research programs through its established and newer research centres and through continuing investments in the development of research facilities. A decade ago, Acadia invested \$25M in technology to provide an internationally recognized mobile computing environment that was unique and unparalleled in Canada. This investment in technology has resulted in the development of a mature, fully integrated IT environment, an asset on which the university is building research capacity. It has transformed the undergraduate experience and has extended our borders to enable a richer and broader engagement of students, faculty, and community members in collaborative research.

By virtue of its location and developed expertise, Acadia University researchers bring current 'leading edge' knowledge and ideas to the Annapolis Valley region of Nova Scotia. By working under the various strategic themes and by engaging with the community, government, and the private sector, scholars will pursue opportunities to develop clusters of research activity that will contribute to the economic and social well-being of the Annapolis Valley region of Nova Scotia.

The participation of seven Canada Research Chairs and the continuing development of state-of-the-art infrastructure through the Canada Foundation for Innovation program are serving to enhance Acadia's research environment. These Programs complement and build upon established research centres and foster and facilitate research in strategic areas that will strengthen Acadia's contributions to society. This Plan identifies the themes through which Acadia is building its research capacity and outlines the strategy for its participation in the CRC and CFI programs.

<sup>1</sup> For ease of use only, this Plan adopts the NSERC use of the term 'interdisciplinary'. For administrative purposes, NSERC uses this term to refer to both interdisciplinary and multidisciplinary research, while acknowledging that: "interdisciplinary research is research that involves the interaction among two or more different disciplines and occurs at the interface between disciplines. This may range from the sharing of ideas to full integration of concepts, methodology, procedures, theory, terminology, data, organization of research and training. Multidisciplinary research draws on knowledge from different disciplines but stays within the boundary of one primary field".

<sup>2</sup> Garfield, E. The Role of Undergraduate Colleges in Research. Essays of an Information Scientist: Of Nobel Class, Women in Science, Citation Classics and Other Essays, Vol:15, p.310, 1992-93

## Major Objectives of the Plan

The major objectives of this Plan are to enhance research activity, support knowledge transfer, and encourage innovation at Acadia. In so doing the Plan ensures that the full range of research activity of a faculty with diverse interests is valued and accommodated. It integrates research training for undergraduate and graduate students. It recognizes the value of collaborative and interdisciplinary research activity which leads to the creation of innovative theories, practices and solutions. It acknowledges that high quality interdisciplinary research builds on a strong foundation of disciplinary excellence. Underlying the Plan is the conviction that opportunities to associate research activity with teaching and service to the greater community constitute an institutional strength.

To foster innovation, a key Acadia strategy is to develop and maintain major research facilities and initiatives that support multiple disciplines and which will build institutional research capacity. Acadia will be selective in undertaking such initiatives and will ensure that best use is made of limited resources by considering the following:

- the fit with this strategic research plan
- the potential for broad, interdisciplinary participation
- the strength and leadership of key personnel
- the potential to make a significant regional, national and international contribution
- the institution's traditional and emerging areas of research excellence.

## Major Research Themes

Following consultation with stakeholders and based upon historical successes, existing research strengths, interdisciplinary participation and expertise of faculty members, existing networks and collaborations, active student participation and commitment to the future, Acadia University has established six research themes as the basis for the enhancement and development of its research capacity. These research areas serve a pivotal role in Acadia's research culture.

- **Environment** integrates scholars from all disciplines while linking research areas on issues with environmental consequences.
- **Cultures, Civilizations, and Citizenship** explores the multiple dimensions of our increasingly global, diverse coexistence, and is critical during this period of significant socio-political, organizational and economic transition and profound scientific, technological development.
- **Health and Wellness** reflects the research community's efforts to design research initiatives that explore and examine the complexity of the independent and interdependent variables that influence our health and well-being
- **Information Technology and Society** involves independent and collaborative research at Acadia on the promise and peril of the digital era. Scholarship at Acadia under this theme is particularly distinctive, given that Acadia faculty continue to contribute to and work within a mobile computer-mediated learning and research environment.
- **Materials Science** focuses on research in the development and characterization of complex materials with wide ranging applications in present and future

technologies.

- **Modelling** reflects a growing appreciation that quantitative models can lead to foundational advances in many areas of science and the social sciences.

These major research themes provide Acadia with strategic direction for developing its research infrastructure, while providing opportunities for participation by individual faculty members in one or more themes. As well, it constructs inter-faculty and inter-organizational networks for research collaboration while enabling community integration in support of the social and economic agenda of the region. Acadia carefully nurtures emerging ideas and faculty collaborations, and regularly reviews and enhances its understanding of major themes.

### **Canada Research Chairs Program: Priorities and Sequence**

The primary objective of the Canada Research Chairs strategy is to promote research excellence and to provide leadership within Acadia's research themes. Canada Research Chairs will also enable a cooperative interdisciplinary network that deals with all aspects of the environment including scientific understanding, ethical perspectives and socio-political and economic adaptation. The University's strategy for deployment of the Canada Research Chairs is to make available technical and intellectual expertise that will enhance scholarship which contributes to the attainment of sustainable ecosystems locally, nationally, and globally.

#### **Distribution of Chairs by Research Theme**

<b>TIER</b>	<b>THEME</b>	<b>COUNCIL</b>	<b>APPOINTED</b>
Tier I	Environment	NSERC	2002
Tier II	Environment/ Cultures, Civilizations, and Citizenship	SSHRC	2002
Tier II	Materials Science	NSERC	2002
Tier II	Modelling	NSERC	2004
Tier I	Health and Wellness	SSHRC	2005
Tier II	Information Technology and Society	SSHRC	2005
Tier II	Environment	NSERC	2006

Acadia University is committed to gender equity and provides a supportive environment to women researchers and CRC candidates. In recent years women students have earned approximately 60% of the university's undergraduate research awards and NSERC Postgraduate Scholarships. Likewise, over 60% of Acadia's graduate students are women. Currently the two largest NSERC Discovery Grants and the two largest SSHRC Standard Research Grants are held by women. As Canada Research Chair opportunities become available, the senior officers responsible for the program, the Vice-President (Academic) and the Dean of Research and Graduate Studies will work with

Faculty Deans to consider the recommendations of the CRC Secretariat regarding gender equity and ensure that women candidates are actively recruited.

## **The Research Themes and the Research**

This Strategic Research Plan builds upon Acadia's strengths: its active research centres and facilities, academic programs of note, and a professoriate dedicated to teaching, research, scholarship, innovation, and external partnership. The plan is to enhance and develop the university's research capacity in six areas: the Environment; Culture, Civilization, and Citizenship; Health and Wellness; Information Technology and Society; Materials Science; and Modelling.

### ***The Environment***

Over the years Acadia has developed a significant strength and reputation for its research contributions to various fields of study that converge on the environment theme. Since the creation of the KC Irving Environmental Sciences Center and the Harriet Irving Botanical Gardens, a gift of the Irving family in 2002, Acadia has made further advances in developing its environmental research capacity. The recent creation of the Arthur Irving Academy for the Environment serves to integrate scholars across all disciplines to address local, national, and international environment-related issues.

Acadia is well known for integrated research into ecological systems, the interaction of organisms with the environment, and the implications of human activities for the environment. Research programs span the evolution of the earth over geological time to the recent and often short-term dynamics of local populations, both essential to the understanding of anthropogenic-induced environmental change. Recently, research that focuses on the environment in its broadest sense has integrated scholars across all disciplines and faculties. The resultant interdisciplinary and collaborative foundation makes the environment a logical and significant focus on which to build research capacity. The goal therefore is to build on this solid foundation and establish Acadia as a nationally significant centre for holistic, pan-university, integrated research into ecological systems and human interaction with the environment.

To build on these strengths, Acadia has allocated three Canada Research Chairs under the Environment theme. Dr. John Roff is a Tier I CRC in Environmental Science and Conservation. Dr. Andrew Biro is a Tier II CRC in Political Ecology. A third Tier II NSERC Chair will be nominated in 2006.

In pursuing its research strategy, Acadia University associates all Canada Research Chairs with the Arthur Irving Academy for the Environment. The purpose of the Academy is to enhance innovative, interdisciplinary, and holistic scholarship that explores the relationships of humans with both natural and modified environments. The Academy will: foster cooperative, interdisciplinary approaches to research initiatives by building upon existing collaborations between faculties and with external research institutions; provide a platform to enhance Acadia's global research connections and increase its contributions to scholarship of international significance and application; expand established research into environmental processes, the causes and consequences of environmental change, the relationship of organisms and their environment, the roles

of human cultures and value systems and the relationships between human health and wellness in changing natural environments; assess the consequences of environmental change, the roles of humans, and the relationships between human health and wellness in changing environments; explore the creative, aesthetic, ethical, historical and spiritual aspects of our relationship with the environment; develop innovative community-based approaches to adaptation, environmental management, and governance; and contribute to the development of regional, national, and international policies for sustainable management of the biosphere.

Environmental research is supported through established research centres, networks and facilities, including: The K.C. Irving Environmental Science Centre & the Harriet Irving Botanical Gardens; the Atlantic Co-operative Wildlife and Environmental Research Network (ACWERN); the Acadia Centre for Estuarine Research (ACER); the Centre for Wildlife and Conservation Biology (CWCB); the Atlantic Centre for Global Change and Ecosystem Research (ACGCER). In addition, Acadia possesses lands of environmental significance to the Atlantic region which support field research, including: Bon Portage Island at the most south-western corner of Nova Scotia, Brier Island on Digby Neck in the Bay of Fundy, and the Morton Centre lands on the south shore of Nova Scotia.

In addition, funding from the Canada Foundation for Innovation has enabled the development of facilities that support the environment theme, including the Biomolecular Laboratory and the Laboratory for Eukaryotic Microbiology and Parasitology.

### ***Cultures, Civilizations, and Citizenship***

Acadia's scholars conduct research and have established expertise in areas such as cultural studies, literature, music, religion, education, and the sociological and economic trends affecting labour, organizations, health, youth, senior citizens, and indigenous peoples. Across the Arts faculty, scholars have access to national and international databases, archives, and the unique collections of Atlantic Region Studies materials. Scholars in the humanities are actively engaged in the analysis of culture and civilization in a variety of ways including traditional, discipline-based methodologies and through interdisciplinary initiatives. They develop research that examines the past and the present from different perspectives including identity, gender, ethnicity, textuality, ethics, religion, literacy (print and digital), race, ecology, justice, rights, language and cultural diversity. Members of this scholarly community not only seek to understand culture and civilization but also contribute to the development of culture as active and recognized creators.

Scholars across the university have made significant contributions to public policy in Canada and abroad and to our understanding of democratic rights and peace-making. They have contributed extensively to our knowledge of present-day issues and the forces that have shaped them. They examine the changing nature of citizenship and civic competence, and assess responses of the international community to violations of human rights. They study homogenization of cultural expression in the global village, and the marginalization of youth, rural communities, aboriginal peoples and remote regions in the new service economy. In addition scholars are examining the effect of transformational and disruptive forces upon organizations, both domestically and abroad.

An additional strength of Acadia's Arts faculty lies in its expertise in Atlantic history, culture, and politics, which has contributed not only to the literature but also to regional and national debates. Scholars in the humanities and the social sciences recognize African-Canadian and Aboriginal contributions to the culture of the Maritimes and are studying ethno-cultural diversity, including long-term, historically rooted ethno-cultural communities and newer and emerging immigrant ethnocultural communities. The theme recognizes a commitment to study marginalized communities and marginalized academic fields of interest.

Acadia is one of seven Atlantic Canadian universities which collaborated on the establishment of a Regional Data Centre that allow researchers and graduate students from Acadia to access micro-level data from complex longitudinal Statistics Canada data sets. Scholars have been building research capacity in key areas through the development of research centres including Acadia's Centre for Planter Studies, The Northeast Asia Research Centre (NEARC), and the Centre for the Study of Ethnocultural Diversity.

### ***Health and Wellness***

This theme reflects an interdisciplinary faculty effort to design initiatives that examine the complexity of the independent and interdependent variables influencing Health and Wellness. The challenges confronting the twenty first century in Health and Wellness are reflected by Acadia's wide scope of health research activities that are nationally and internationally recognized. These research activities are supported by the Canadian granting councils, selected foundations, and through meaningful links to health and community organizations. Faculty members are actively involved in research that encompasses such areas as nutrition, kinesiology, medicinal chemistry, physical and biophysical science, behaviour, biochemistry, aging, immunology, recreation, health literacy, education, psychology, sociology, and the environment.

Health is described as a multi-dimensional condition that includes spiritual, physical, mental/psychological, occupational, and social well-being. It is a process of continuous adaptation to the many microbes, irritants, pressures, and problems of an ever-changing internal and external environment. Wellness, an enhanced dimension of health, is identified as a state of well-being involving good physical self-care, using the mind constructively, expressing emotions effectively, interacting creatively with others, and being concerned about the physical and psychological environment.

To provide leadership, Acadia named Dr. Michael Leiter, as a Tier I CRC in Occupational Health and Well-Being. Two research centres, the Centre for Organizational Research and Development (COR&D) and The Centre of Lifestyle Studies (COLS) support research within the Health and Wellness theme.

### ***Information Technology and Society***

Information Technology and Society provides opportunities for a broad interdisciplinary analysis of learning, literacy, culture and technology in society, of changing values and practices in the use of computers and of initiatives concerned with computing in distributed and peer-to-peer systems. The Information Technology and Society theme is particularly relevant and strategic given the technology-rich, mobile

computing environment and specialized facilities that support Acadia's research community and span all of the disciplines.

The digital culture that has evolved at the university thus provides opportunities to observe and study how society is transforming and being transformed by technology, digital media and the associated cultural practices and values. Researchers are studying the interactions of people and communities with information and communication technologies, how they affect broad social issues and what they mean for the production of new knowledge. Researchers are also studying the interactions of people with computer hardware and software and the world-wide web. Questions include the role of technology in learning and literacy, with some emphasis on children with special needs; the engagement of diverse individuals and groups, (such as, First Nations people) in public policy and political debate; the use of new technologies in the production, reproduction and diffusion of creative practices in everyday life, the arts, and the sciences; and the preservation of artistic and scientific works in digital form as part of cultural heritage and workplace literacy, health and productivity.

Another area of research in this theme concerns artificial intelligence. This research examines ways to improve the computer's ability to reason. Such reasoning can be applied to complex problems from a variety of perspectives, including business, the environment and software design. Yet another area includes research on distributed systems which tackles problems arising from computing on multiple machines in many locations over great distances. Current applications of research in distributed computing include the collection of data from harsh environments, storing large amounts of application data in remote locations and the development of models for co-operative distributive systems for applications to areas such as teaching and e-commerce.

Information technology is imperative to the viability of many organizations, including multinational corporations, co-operatives, small businesses, and organizations such as hospitals and not-for-profits. Researchers are studying the impact of information technology on such organizations, seeking to understand its impact on effectiveness and competitiveness and on the human condition within the organization.

Acadia named Dr. Jan Marontate, CRC in Technology and Culture, to build capacity and provide research leadership. To foster and support interdisciplinary research under this theme, Acadia developed the CFI-funded Acadia Digital Culture Observatory, comprised of state-of-the-art technology in a Usability Lab and a New Media Lab

## ***Materials Science***

The Materials Science theme at Acadia University embraces the research interests of a wide range of faculty, students and post-doctoral associates engaged in the study of materials of natural or artificial origin. This field is inherently interdisciplinary, often involving collaborative research efforts with leading academic institutions, government agencies such as the National Research Council and Defence Research and Development – Atlantic, and industrial partners. The necessity to support a broad spectrum of materials research for regional economic development has been increasingly recognized through initiatives such as the establishment of a Materials Technology Network for Atlantic Canada (MATNET) with major funding from the Atlantic Innovation Fund (AIF) in which Acadia faculty participate in key roles.

Leadership in this theme is provided by Dr. Michael Robertson, Tier II Canada Research Chair in Materials Science. The CFI-funded Acadia Centre for Microstructural Analysis (ACMA) provides a cluster of modern microanalytical instruments, several of which are unique in Nova Scotia and the Maritimes. ACMA generates a forum for multi-disciplinary research and collaboration at the interface between the physical and life sciences which is critical to progress in such emerging fields as nano and biotechnology.

Acadia's researchers are developing a fundamental understanding of the bulk and surface properties of materials from the macroscopic down to the molecular and atomic levels. They are working on a diverse collection of problems in materials science ranging from improved corrosion inhibitors, the development of advanced coatings, novel sensor technologies incorporating advanced metallic alloys, the analysis of proteins on surfaces, the characterization of fine-scale carbonate textures by cathodoluminescence, heavy metal uptake in plants, morphological changes in organisms resulting from a changing environment, systematics, pollutants and the effects of environmental contamination. These researchers share common methods and tools that can be used in the fundamental investigation of a virtually unlimited number of important problems across all branches of science. ACMA, the K.C. Irving Environmental Research Centre, and various departments across campus provide critical support and infrastructure, enabling Acadia faculty to address materials related issues which may arise at the local, regional, national or international level.

## ***Modelling***

Quantitative modelling and analysis stand at the foundation of research in many of the natural science, biological science and social science disciplines. Many applied areas of public policy, business, science and engineering depend to a large extent on such modelling. Quantitative models enable researchers to describe, predict, manipulate, and understand a rich variety of complex phenomena ranging from subatomic behaviour that occurs in microseconds to climate change that occurs over several millennia, from user interaction with adaptive software systems to the evolutionary forces that have shaped genomes, and from the behaviour of interacting decision makers in economic environments to the interaction of organisms across spatial and temporal scales. In many applied areas there has been a move to integrate the analysis of data with the analysis of complex quantitative models. By creating a model of real-world phenomena, researchers can explore in a virtual environment many "what if?" scenarios before committing time and resources to experimentation. Exploration of a model can involve predictions under new scenarios, visualization of results, or analysis of logical structure.

The ability to apply quantitative models in so many domains stems from fundamental research in mathematics and statistics and from the use of this fundamental research in the development of new modelling methods. Fundamental research can lead to surprising and innovative methods and applications, such as number theory forming a foundation for cryptography which enables secure network transactions or inductive learning theory, yielding new machine learning algorithms, which can be applied to problems such as handwritten digit recognition.

Acadia has been developing considerable research strength in this new theme. The addition of a Canada Research Chair, Dr. Hugh Chipman, a Tier II CRC in Mathematical

Modelling and the development of the CFI-funded Acadia Centre for Mathematical Modelling and Computation (ACMMaC), which provides high performance computing hardware to researchers in a variety of disciplines, have enhanced Acadia's research capacity in this area. Quantitative modeling is further supported by the Intelligent Information Technology Research Laboratory (IITRL), the Statistical Consulting Centre and the Regional Data Centre.

## **History and Approval Process of the Plan**

Acadia's first Institutional Research Plan was developed to guide the University's participation in the Canada Research Chairs Program. The Vice-President Academic, Dr. Michael Leiter, led the development of the document in direct collaboration with the Deans and the Co-Directors of Research and Graduate Studies. The recommendations of the Academic Sector Planning Committee in its document, Planning Issues for 2000, were a primary reference for the development of this document which was formally submitted to the President on 28 August 2000.

This second iteration of Acadia's Strategic Research Plan is the result of a formal review process initiated by Dr. Ralph Nilson, Vice-President Academic, and led by a committee representative of Acadia's research community which was chaired Dr. Wendy Bedingfield, Acting Dean of Research and Graduate Studies. It was approved by Senate on January 9, 2006.

## **Assessment of the Plan**

To assess this Plan outputs related to its objectives will be measured, namely: to enhance research activity, to support knowledge transfer and to encourage innovation.

Enhanced research activity will be measured by the number of Honours and Masters theses completed, the number of students employed as research assistants, the number and quality of applications made to Acadia's graduate programs and the number and value of tri-council grants, other external research grants and research contracts from government, the non-profit and private sectors.

Enhanced knowledge transfer will be assessed by enumerating articles in refereed publications; peer-reviewed monographs and books; creative work, performances, commissioned work and technical reports; public speaking engagements or colloquia related to research activity; papers and attendance at professional meetings and seminars; hosting and organization of conferences and workshops; patents, licenses or spin-off companies and research awards involving community collaboration. In addition the number of undergraduates who pursue postgraduate training and the number of Masters students who pursue doctoral studies will be monitored.

Innovation, as defined by the Canada Foundation for Innovation will be assessed by measuring the number and value of interdisciplinary grants awarded; the number of invention disclosures and the number of awards from programs for technology development.