

DALHOUSIE UNIVERSITY

Canada Foundation for Innovation and Canada Research Chairs STRATEGIC RESEARCH PLAN SUMMARY

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(full document: http://researchservices.dal.ca/files/Strategic_Plan_2006.pdf)

1. Introduction and Objectives

Dalhousie University and its affiliated teaching hospitals constitute the largest, comprehensive, research-intensive, academic organization in Atlantic Canada with eleven Faculties and eighty academic Departments. The “June 2007 President’s Strategic Focus” outlines as a vision: *“Advancing provincial and regional development by offering a diverse student body of 17,000 (by 2010) an outstanding personal experience at a national university built around an excellent learning environment, acclaimed research strengths, broad program choices, and successful career preparation in cooperation with supportive external stakeholders.”* Building on a strong undergraduate base, Dalhousie seeks to have internationally recognized programs in research and graduate and professional studies. Canada and the world are experiencing great social and economic change driven by new knowledge, technology and innovation. Dalhousie’s objectives in research, training and innovation are responding to these changes in areas of importance to the institution and the region.

The objectives of this plan are to: maintain and build capacity for excellent research in areas of current strength or emerging strategic opportunities that are of importance to the region; recruit outstanding scholars to Dalhousie; enhance research networking and collaboration in the institution and region, as well as nationally and internationally; provide an excellent training environment for highly qualified people; and achieve translation of research results for the benefit of society.

2. Research Planning and Priority Setting

Dalhousie encourages diverse strategies to build and enhance research programs. These include the identification of strengths and priorities and the creation of interdisciplinary groups through Department, Faculty and University planning sessions. These strategies have fostered new partnerships with other universities, the affiliated teaching hospitals, governments and industry. This research plan has been reviewed by Faculty representatives and Deans, affiliated teaching hospitals, the Dalhousie Research Advisory Committee, and approved by the University Senate and the President.

3. Major Themes for Research and Research Training

This plan identifies six strategic themes of research strength and emphasis. Health Studies and Ocean Studies remain as long-standing areas of special emphasis. Other important, developing themes are Materials Science, Information and Communication Technology, Energy, and Society and Culture. There are two major cross-cutting themes throughout the University - Environmental Studies and High Performance Computing - that are important components of several major research themes.

Health Studies

Health studies encompasses the largest area of research at the University and affiliated teaching hospitals representing 60% of external research funding and the activities of over five-hundred faculty members. Dalhousie is the major training centre in the Maritimes for life sciences and health professions research personnel. Through an allocation of twenty-two Canada Research Chairs to this research theme (Table I), the University will continue to emphasize and build capacity in health studies in three main sub-themes which have extensive interaction and interdependence across the university.

a) **Genomics, genetics and biomolecular structure and function** will be developed in relation to: comparative and microbial genomics, genetics and gene identification; neuroscience with emphasis on neuroplasticity and neuroregulatory controls; cardiovascular and stroke biology; cancer biology; molecular modeling for small molecule therapies; infection, immunity and inflammation with an emphasis on host response to stimuli, and development and testing of vaccines; and biomaterials/tissue engineering.

b) **Clinical research and translation to care** will be developed in relation to clinical trials and health outcomes and best practices in relation to: brain/nerve function and repair, mental health, pain, visual sciences, transplantation, rehabilitation medicine, cardiovascular health, and cancer care.

c) **Health, environment and society** will be developed in relation to: social, environmental and cultural determinants of health; food and water safety; sector health involving children, youths, women and the frail patient; and health promotion and education.

These sub-themes are connected by three cross-cutting themes: informatics, bioethics, and health law.

Ocean Studies

Ocean Studies encompasses ocean-related disciplines of engineering, science, social science, law and public policy, as well as management and international development activities. It involves more than one hundred researchers in six faculties, and a wide array of disciplines, including Biology, Chemistry, Earth Sciences, Engineering, Food Science, History, Law, Marine Affairs, Medicine, Oceanography, Physics, Political Science, Resource and Environmental Studies, and Sociology and Social Anthropology. Ocean Studies also promotes interactions and partnerships between university researchers, and the local community of marine experts, in various federal and provincial departments and agencies and the international ocean research community. Dalhousie has allocated ten Canada Research Chairs to enhance research capacity in this research theme (Table I). Three sub-themes will be developed.

a) **Ocean environmental processes** will be developed in relation to: marine observation and prediction with an expanded role for marine ecology and biogeochemistry; atmospheric processes and climate involving earth and space-based observation; earth system evolution with emphasis on geodynamics, tectonics and earth surface processes; and environmental statistics.

b) **Marine resource use and conservation** will be developed in relation to: endangered species/biodiversity; renewable resources with emphasis on effects of fishing on ecosystems, and aquaculture and wild stocks; biotechnology and genomic/genetics with a focus on the genetics of

population structuring, stock mixing, forensics; informed aquaculture through pedigree analyses; and live gene banking for endangered species.

c) **Ocean management, health and policy** will be developed in relation to ocean law and governance, coastal community health and public policy, risk assessment and impacts, and adaptation strategies.

Materials Science

This rapidly growing multi-disciplinary and inter-faculty initiative includes highly respected scientists in the Faculties of Science, Medicine, Dentistry, Engineering, and Architecture and Planning, and is facilitated by the Institute for Research in Materials. Their work involves a range of new and innovative materials that are fostering many collaborative projects with government agencies and the private sector as well as other themes at the University including Health Studies, Energy, and Information and Communication Technology. Dalhousie has deployed seven chairs in Materials Science (Table I) to build on current strengths.

Investigation of the relationships between **structure and properties** of materials has been greatly facilitated by the CFI-funded project - Facilities for Materials Characterization. In particular, there is an important opportunity to bring strength in solid-state **NMR and other technologies of materials characterization** to focus on studies of **nanomaterials, high temperature superconductors, ceramics**, and use of organic polymeric materials for electronics and solar cells, as well as in batteries and fuel cells. The use of **combinatorial synthetic** approaches is central in this work. In the theme of **structure and performance of materials**, Dalhousie has strengths and opportunities in the areas of **chemical power sources, prevention of degradation of materials, tissue engineering, and intelligent structures and materials**.

Information and Communication Technology (ICT)

The burgeoning diversity of information and communication technology and its applications makes ICT a fundamental research theme in the modern research environment that spans the disciplines of engineering, computer science, information management and law. Dalhousie has deployed six Canada Research Chairs to support research in ICT (Table I).

The Faculty of Computer Science, through multidisciplinary initiatives and partnerships, is building capacity for research in **electronic health, electronic commerce**, and other areas such as tele-learning and tele-medicine and data management and visualization. **E-Health**, a focus of Dalhousie's Global Information Networking Institute (GINI), addresses how to improve the productivity of patient health care. Current research areas include medical outcomes, quality of service, privacy and patient records, and data compression. Dalhousie has created the first Canadian interdisciplinary Master's degree in **electronic commerce**. The program brings together the disciplines of computer science, business and law, and provides a fertile environment for the pursuit of collaborative and interdisciplinary research involving data security and privacy, public key infrastructure, on-line consumer protection, regulatory and jurisdictional issues, dispute resolution mechanisms, web concepts and applications for business, web architectures and networking.

In **management informatics**, Dalhousie's Faculty of Management and the Centre for Management Informatics Research undertake to seek solutions for complex problems in organizational management that effectively engage people and ICT. A Killam Chair supports this theme.

In **communications technology** in the Faculty of Engineering, the focus of the research is on internetworking, digital signal processing, wireless technology, VLSI design and digital communications, photonics and fiber optics. Two of these areas are associated with National Centres of Excellence. A Killam Chair has been awarded to develop research in wireless technology.

Energy

Following an extensive period of discussion and consultation with the Dalhousie community, a broad research theme of **energy** has evolved from a narrower focus of oil and gas research. It is clear that the development of sustainable supplies of energy, the conservation of energy and the impacts of energy use on the environment are major areas of future research. At Dalhousie, the **energy** research theme involves four emphases: traditional petroleum resources of **coal, oil and gas** with a focus on understanding the geophysical structures and hydrocarbon reservoirs of the Atlantic offshore; **energy transportation** with emphasis on design and assessment of pipelines; **alternative and renewable energy sources** with an emphasis on coal bed methane and power generation from biomass conversion or wind power; and **climate change and the environment** with emphasis on the effects of offshore resource development and on carbon dioxide sequestration in underground coal beds or salt structures. These energy sub-themes are closely linked with more general themes at the University such as: law, public policy and society, risk management, data mining, health and safety, materials science, environmental studies, and high performance computing. Dalhousie has allocated two Canada Research Chairs in the Oil and Gas sub-theme of **energy** (Table I).

Society and Culture

Dalhousie's society and culture research theme encompasses two overlapping clusters – **societies** viewed from a local, national and global context, and **cultures** – their representations and presentations. Employing a wide range of disciplinary approaches, Dalhousie's research strength in this area focuses geographically, but not exclusively, on the Atlantic Rim. Our research provides insights into how cultures deal with technological changes, environmental stress, and struggles among different cultures. Our strengths and commitments to these areas of research are reflected in institutes and centres such as the Centre for Foreign Policy Studies, the Atlantic Research Data Centre, and in our participation in the Atlantic Metropolis project. Dalhousie has deployed three Canada Research Chairs with a focus on **European studies** (Table I) for this theme. These Chairs will help develop an European Studies program and build upon the University's research linkages with the European Union, NATO, the Nordic Council and the UN.

Cross-Cutting Themes

Dalhousie has two important cross-cutting themes that interconnect Faculties and major research themes: **environmental studies** and **high performance computing**.

The interaction of humans with the environment has become an increasing concern to the global community as a result of the accumulation of carbon dioxide in the atmosphere, the reduction in the quality of the environment as a result of various types of pollution, the destruction of wildlife habitats and the need to achieve sustainable growth. **Environmental studies** of alterations to the environment, remediation of environmental damage and the effects of a changed environment is occurring in every Faculty, encompassing the ocean environment, air and water quality, health-related issues, management of risk of environmental damage and legal and social issues associated with environmental changes. Although environmental issues are identified in the majority of the six

research themes, the University plans to focus on improved linkages of the various communities and increased interdisciplinary research and education programs concerning the environment.

High performance computing is a fundamental requirement in many of the research themes outlined in the Dalhousie research plan. It is crucial that the University builds capacity in high performance computing through partnering with the national high performance computing networks, and in particular with ACEnet, the Atlantic network. This initiative will be achieved through support of ACEnet's activities, through linking with ACEnet and through future initiatives to host ACEnet-supported infrastructure at Dalhousie. A Killam Chair in Computational Science supports this theme.

4. Gender Representation in Deployment of Canada Research Chairs

Dalhousie has addressed, and continues to address, the issue of gender representation in relation to its Canada Research Chairs nominations through three principal strategies:

1. In the allocation of Chairs, we have considered and continue to consider the likely representation of women and men in the filling of the Chairs.
2. We have rigorously observed the University's policies on academic recruitment and employment equity.
3. We will split three Tier I Chairs into six Tier II Chairs, since this increase in the number of junior Chairs will increase the likelihood of recruiting women.

We have set a minimum objective of 24% of Chairs allocated to Dalhousie being filled by women.

5. Assessment of Success in Meeting the Objectives of the Strategic Research Plan

Dalhousie's success in achieving the objectives of the research plan will be assessed by: the quality and number of publications by faculty; the quality of faculty recruited to Dalhousie; the level of research funding through grants and contracts; the quality and number of graduate students and postdoctoral fellows; the level of involvement of faculty in national and international symposia; the number of external prizes and awards received by faculty; the extent of industry and community collaboration with Dalhousie; and the number of invention disclosures filed and other mechanisms of research translation.

Table I
Allocation of Canada Research Chairs ¹

THEMES	CHAIRS			FUNDING SOURCE			
	Tier I	Tier II	Total	CIHR	NSERC	SSHRC	
Health	1 Genomics, Genetics and Biomolecular Structure and Function	5	7	12	10	2	
	2 Clinical Research & Translation to Care	1	3	4	3		1
	3 Health, Environment and Society	1	2	3	2	1	
	4 Interdisciplinary Links	1	2	3	2		1
Oceans	1 Environmental Processes	3	3	6		6	
	2 Marine Resources and Conservation		3	3		3	
	3 Environmental Mgt, Health and Society	1		1			1
Materials Science	3	4	7		7		
Information and Communication Technology	2	4	6		6		
Energy (Oil and Gas)	1	1	2		1	1	
Society & Culture (European Studies)	1	2	3			3	
TOTALS ²	19	31	50	17	26	7	

¹ Three NSERC Tier I Chairs have been split into six Tier II Chairs.

² Twenty-one Canada Research Chairs have been approved for outstanding researchers at Dalhousie while twenty-nine Chairs have been approved for external candidates.