

University of Alberta
2010 Strategic Research Plan (SRP) Summary
for
the Canada Foundation for Innovation (CFI) and
the Canada Research Chair (CRC) Program

Introduction

The University of Alberta is recognized as one of Canada's top research-intensive universities. Its five campuses are home to 31,000 undergraduate students, 6,000 graduate students, 3,500 faculty and 6,200 support staff. With an operating budget of \$1.3B and approximately \$500M in research revenue annually, the university's teaching and research activities span eighteen Faculties (www.ualberta.ca).

In 2006, the University adopted President Indira Samarasekera's document "*Dare to Discover: A Vision for a Great University*" as its guiding context for establishing the institution's goals as it entered its second century. *Dare to Discover* defined four cornerstones upon which a great university is built: talented people; learning, discovery and citizenship; connecting communities, and transformative organization and support (www.president.ualberta.ca/daretodiscover.cfm). These cornerstones articulate that a great university educates scientifically literate, socially conscious, creative citizens; undertakes cutting-edge research and scholarship that advance the economic and social well-being of the region and nation; effects societal change by serving as a source of public intellectuals; rises to the responsibility of helping to solve global challenges; and uses transformative organizational structures and infrastructure. In all these respects, a great university has an international reputation for excellence. Embracing this vision, the University of Alberta has adopted President Samarasekera's objectives to be one of the top publicly funded universities in the world.

Dare to Discover, and its accompanying academic plan *Dare to Deliver* (www.president.ualberta.ca/pdfs/DaretoDeliver.pdf), jointly define the context in which the University of Alberta considers and prioritizes all initiatives across the academy in teaching, in research and scholarship, and in local and global partnerships. The University of Alberta's *Strategic Research Plan for CFI and CRC* is evolving within this context. This summary is based upon that full plan.

The University of Alberta [SRP for CFI and CRC](#) has six core objectives: (1) build on existing research strengths and develop emerging research strengths, in ways that define a unique position for the university; (2) partner in innovative ways with the Provincial and Federal governments, the health care sector, industry, and international partners; (3) foster trans-disciplinary synergies at all levels that advance understandings; (4) promote outstanding areas of special emphasis while maintaining the flexibility to respond to new opportunities; (5) maximize the benefits of research through effective knowledge translation and technology transfer; and, (6) expand graduate and undergraduate programs in support of our research strengths. These broad objectives determine how we support and pursue our research, scholarship, and creative activities, within the institution and with our partners.

Major Research Themes and Institutional Support for Advancement

Social Sciences, Humanities, and Fine Arts

Key theme areas: digital social sciences and humanities; cultural studies; Central and East European studies, comparative experimental linguistics; analytic and cultural philosophy; transforming research in education; printmaking, drama, and music performance and ethnomusicology; economics of energy, natural resources, and environmental management and policy; interdisciplinary health studies; population health, health law and policy.

Strategic Institutional Support: The Peter and Doris Kule Institute for Advanced Studies was established in 2009, building on the institution's strength in Ukrainian and Eastern European studies and diaspora research. Digital humanities and comparative experimental linguistics have been strengthened with recent senior appointments. Current efforts build on provincial support for cyber-infrastructure and increased connections with computing sciences, sociology, computational linguistics, economics, and medicine. Ethnomusicology labs and facilities for music performance have been developed and are expanding. The Health Law Institute brings legal expertise to questions of the ethics, environment, economics and social facets of such sciences as genomics and nanotechnology. The *School of Energy and Environment* (SEE) links activities in economics, policy, and law with the institution's traditional science and engineering strengths in natural resource development and environmental studies.

Informational and Communications Technologies

Key theme areas: high performance and distributed computing, computational intelligence and machine learning; and telecommunications, remote sensing and wireless sensing networks.

Strategic Institutional Support. The University has allocated and filled many senior and junior base-level positions in this area, in partnership with *Alberta Innovates—Technology Futures'* Chairs Program. This program recruits senior researchers in computing science, electrical engineering, computer engineering, physics, and mathematics, with recent expansion into interdisciplinary areas that employ advanced computing (systems biology, bioinformatics, and environmental modeling). CRC, CFI, and these provincial chair programs are synergistic mechanisms for creating environments of talented people with operating and infrastructure support. New strategic directions align this area of expertise with initiatives in metabolomics, health informatics and environmental monitoring. The University of Alberta leads the CFI-funded WestGrid high performance project and serves as a major node of the Compute Canada high-performance computing platform.

Life Sciences

Key theme areas: membrane molecular biology/transport/lipids; cross-disciplinary research on chronic diseases, especially obesity and diabetes (including islet transplantation); cardiovascular health; imaging sciences; infectious diseases and virology; solid organ transplantation; public health; rehabilitation medicine; neuroscience and neuroendocrinology; nutrition and metabolism; protein structure and function (including genomics, metabolomics and proteomics); carbohydrate sciences.

Strategic Institutional Support. The University of Alberta has long-established strengths in linking molecular research to health. Recent investments and partnerships include: the Alberta Cancer Diagnostics Consortium for nanotechnology platform development; the Health Research Innovation Facility; the Mazankowski Alberta Heart Institute; and the Katz Group-Rexall Centre for Pharmacy and Health Research. The Alberta Diabetes Institute and the new Edmonton Clinic are specifically focused on integrated patient-centered clinical care, education, and research. This research is supported by 65,000 sq meter of new space devoted to bench-to-bedside health innovation. The access to clinical research applications happens in partnership with Alberta Health Services on initiatives such as the Pediatric Centre for Weight and Health, the Northern Alberta Clinical Trials and Research Centre, the Women and Children's Health Research Institute, the Biomedical Engineering Research and Results Initiative, and

the Institute for Reconstructive Sciences in Medicine. The University supports the *Alberta Innovates* Centre for Carbohydrate Sciences, establishing glycomics and bioglycomics as areas of institutional and provincial priority. Chemical biology and proteomics is one of the five interdisciplinary science areas selected for facilities within the new Centennial Center for Interdisciplinary Sciences building. The University's Centre for Prions and Protein Folding Diseases (CPPFD), established in 2006, has over 20 core and affiliated researchers from three faculties.

Materials and Interfaces

Key theme areas: nanoscience and nanotechnology, with emphasis on nanomaterials for biomedical and natural resource applications; alternative energy sources; nanoscale molecular devices.

Strategic Institutional Support: This area has been targeted for growth and investment via several CFI awards and proposals, as well as a number of CRC positions. The Alberta Centre for Surface Engineering and Science (ACSES) focuses on characterization and modification of surfaces such as those of relevance to catalysis, resource extraction, and electronics. The Centre for Nanoscale Physics and the Ultrafast Nanotools and Microscopy Laboratory are crucial complementary elements to the materials and nanoscale materials research facilities provided by the National Institute for Nanotechnology (NINT), located on the University of Alberta campus. Eighteen staff from physics, engineering, chemistry, business, and law are cross-appointed with NINT. The new \$400M Centennial Centre for Interdisciplinary Sciences houses interdisciplinary facilities and teams for nanostructures and nanomaterials.

Natural Resources

Key theme areas: resource geosciences, including seismic modeling and analysis; geophysics of mining and mineral processing; catalytic, interfacial and transport engineering, geotechnical and geo-environmental engineering; clean coal, oil sands and natural gas exploration, recovery, processing, with emphasis on mitigating environment impact; carbon capture; forestry management; economics of energy, natural resources, and environmental management and policy; biofuels and nano-enabled bioproducts.

Strategic Institutional Support: The University conducts world-leading engineering, physics, and natural resource science research on the extraction of bitumen and creation of synthetic crude oil; the reduction, sequestration, and/or effective use of carbon dioxide; improved land restoration processes, and understanding the impact of natural resource recovery on animal and plant life. This work is supported by the Natural Resources Engineering Facility and the Centre for Oil Sands Innovation, a University partnership with *Alberta Innovates* and Imperial Oil. Privately endowed research chairs and the highest number of NSERC Industrial Research Chairs in Canada complement the University's CRC and CFI investments in energy and geosciences. Fundamental geosciences research was targeted for advancement through the successful 2006 CFI NIF to establish the Canadian Centre for Isotopic Microanalysis (CCIM), which joined the De Beers Laboratory of Diamond Research as an additional geoscience facility. Resource geosciences is another of the five interdisciplinary science areas targeted for facilities and space within the Centennial Center for Interdisciplinary Sciences.

Agricultural and Environmental Sciences

Key theme areas: ecology and environment; conservation biology and biodiversity; water quality and land management; bioremediation; northern ecology, climate change and arctic studies; biomaterials; sustainability.

Strategic Institutional Support: The University has made sustained investment in biological and agricultural sciences related to water quality and water resources, environmental toxins, natural resource utilization, climate change, plant genetics and genomics, and species evolution and protection. This has established an international reputation in ecosystem management, plant biology, biodiversity monitoring, paleobiology, conservation sciences, and ecology. Integrated Earth and Landscape Management is

another of the five interdisciplinary research areas targeted for the newly built Centennial Centre for Interdisciplinary Sciences. In 2006, the University opened the \$25M Agri-Food Discovery Place as dedicated facility for research on food safety and agriculture product development, nutritionally enhanced food, and crop use for biodegradable fuel sources, bio-plastics, and other industrial products. Land reclamation, bioremediation, and nanotoxicology are targeted areas of additional expansion. Three NSERC Industrial Research Chairs in environmental sciences have significant industry support, one of two prestigious Killam Memorial Research Chairs is allocated to ecology, and a fully endowed chair in wildlife biology has been established. The University is a cornerstone partner and funder of the Alberta Biodiversity Monitoring Institute, an industry-government consortium that operates a 10-year assessment of biodiversity at 400 sites throughout Alberta. The Centre for Earth Observation Sciences links expertise in advanced computing, hyperspectral imaging, and wireless sensor networks and engineering to environmental geoscience research as well as to agricultural and mining applications.

Pure Sciences

Key Theme Areas: all areas of chemistry, particularly carbohydrate sciences, analytical chemistry, physical chemistry; pure mathematics; space physics and plasma sciences; subatomic and particle physics; theoretical physics and nanoscience.

Strategic Institutional Support. The University is a founding member of the Pacific Institute for Mathematical Sciences (PIMS). Through PIMS, the University of Alberta played a lead role in establishing the Banff International Research Station (BIRS) for Mathematical Research, also supported by NSERC, the U.S. National Science Foundation (NSF), and the Government of Alberta. The University's Centre for Mathematical Biology continues to expand its research and international graduate training programs with university and federal funding. Theoretical physics has been an institutional priority since the founding of the Theoretical Physics Institute in 1960. Current areas of strength span cosmology to particle physics, with strong interdisciplinary collaboration in space physics. Planetary dynamics and space sciences is also one of the five research themes selected for the Centennial Centre for Interdisciplinary Sciences. Quantum condensed matter physics is a special area of growth, particularly in collaboration with the theoretical and experimental physicists at the National Institute for Nanotechnology. As a founding member of TRIUMF, the University has made significant investment in the ATLAS-Canada computing and in WestGrid and Compute Canada high-performance computing infrastructure that supports compute-intensive pure science.

New Initiatives

The University of Alberta has formally adopted an institution-wide *Northern Strategy* that builds on its cross discipline base of excellence in northern ecology, arctic studies, and environmental monitoring. Several CRCs provide leadership in this area and the University's Canadian Circumpolar Institute anchors our interdisciplinary research and outreach activities in northern science, anthropology, cultural studies, and global climate change. The Northern Strategy has four core themes that span these areas: environment (especially glacial studies, ecosystems, and water); resource and economic development (particularly in sustainable forest management, minerals and mining); social and cultural resilience; and health and wellness. The first two areas exploit interdisciplinary activities in advanced sensing technologies. The University's *School of Energy and Environment* was established to unite traditional science and engineering strength in energy and environment with social sciences expertise on the social, cultural, ethical, economic and political aspects of natural resource development and environmental policy. The University recently partnered with the Helmholtz Research Association of Germany and the Government of Alberta to create the Alberta-Helmholtz Initiative for research on sustainable energy and environment. A new initiative is underway to leverage and expand the University's position in metabolomics and its related clinical, agricultural, and commercial applications.

Summary of CRC allocations – March 2010

	Male	Female	All
Occupied/submitted/in preparation Tier 1s	34	9	43
Occupied/submitted/in preparation Tier 2s	38	17	55
Total occupied/submitted/in preparation	72	26	98
Planned Tier 1s			10
Planned Tier 2s			3

26.5% of the occupied/submitted/in preparation chairs are held by females (compares to 25% CRCs across Canada).

Major research theme of occupied/submitted/in preparation CRCs

Social Sciences, Humanities, and Fine Arts	18
Informational and Communications Technologies	11
Life Sciences	49
Materials and Interfaces	14
Natural Resources	17
Agricultural, Environmental and Earth Sciences	18
Pure Sciences	24

Note that a number of research programs span more than one theme area.

Planning and Approval Process for the Full Strategic Research Plan

The University of Alberta's *Strategic Research Plan for CFI and CRC* is now a derivative of *Dare to Discover, Dare to Deliver*, and related planning processes. Individual Faculty plans, detailed external unit reviews, and consultation with Faculty representatives are key sources of information and consultation. The strategic plans of our affiliated institutions are also reviewed and their leadership consulted on the development of this document. The *Strategic Research Plan for CFI and CRC* is reviewed and approved by the University's Academic Planning Committee, following review by the Faculties' Associate Deans (Research) via the University Research Policy Committee (URPC). The Strategic Research Plan is also a basis for CRC proposals, which are submitted by Deans for review and adjudication by a Senior Executive Committee, consisting of the President, Provost and Vice-President (Academic), Vice-President (Research), and senior researchers.

Metrics for Success

The University of Alberta has adopted a number of quantitative and qualitative metrics, by which it measures its progress in achieving the *Dare to Discover* vision (see www.president.ualberta.ca/daretodiscover.cfm). The success of the institution's strategic research plan, in partnership with the CFI, CRC and CERC programs, is evaluated in the context of those metrics.