

UNIVERSITY OF SASKATCHEWAN

Strategic Research Plan

Canada Research Chairs Program, Canada Excellence Research Chairs Program, and Canada Foundation for Innovation Program
October, 2010

Introduction

The University of Saskatchewan continues to embrace ongoing strategic renewal in its commitment to the people of the province of Saskatchewan, in its academic programs and the quality of the learning environment, and in the pursuit of research excellence. In the context of an extraordinary academic breadth, the University of Saskatchewan has established an international reputation for achievement in a diversity of disciplines. The University's "*Strategic Directions*"¹, first articulated a vision for achieving the goals of enhancing academic pre-eminence in scholarship and program creativity with adherence to international standards.

In the spirit of this vision, the "*Second Integrated Plan: Toward an Engaged University (2008/09 – 2011/12)*"² articulated the commitment to select a definitive set of existing foci of exceptional research and scholarship that have achieved pre-eminence regionally, nationally, or internationally, or are on the cusp of doing so, and promote these widely as the University's areas of pre-eminence or '*signature areas*'. This commitment follows upon the earlier investment in identifying broad areas of strength and promise, or research themes as expressed in the document *Extending Horizons: University of Saskatchewan Research, Scholarly and Artistic Landscape (2006)*.

The *research themes* within the University's Canada Research Chairs Strategic Research Plan arise from the *Extending Horizons* document and represent areas of strength in the University's collective research and scholarly activity. The '*signature areas*,' enabled by the university's capacity, investments, history, and sense of place, distinguish the University as leaders in Canada and internationally, with recognition based on output and achievement. Importantly, the University's signature areas also reflect relevance to issues of national and international priority, contributions to innovation, and broad and inclusive collaboration and engagement. The significance of the signature areas and their ability to define the U of S in conjunction with these areas of exceptional research and scholarship will become apparent as the signature areas are promoted widely over time.

The Canada Research Chairs Program and the Canada Foundation for Innovation have provided opportunities for enhancement of research and training capacity in key areas of institutional priority, which will contribute substantively to achievement of our institutional goals. The Strategic Research Plan provides the framework within which these resources may be allocated, in order that the University may build on its strengths, and pursue its initiatives as expressed in the *research themes* and *signature areas* described in the plan.

¹ http://www.usask.ca/ip/inst_planning/strategic_directions/index.php

² http://www.usask.ca/ip/inst_planning/second_intplan/index.php

Objectives of the CRC and CFI Programs

The University of Saskatchewan Strategic Research Plan identifies objectives that will serve the national agenda for increased competitiveness in research and development and for improving the lives of Canadians. Key objectives of the Strategic Research Plan are:

- Build on areas of existing research pre-eminence, including signature areas. Areas of existing strength can benefit significantly through strategic enhancement of research capacity. Of particular importance are those areas of strength that serve to define our sense of place, and serve to contribute to provincial and national agendas for growth and innovation.
- Enhance emerging areas of research excellence. Areas recognized as of emerging pre-eminence will benefit greatly through the academic leadership provided by Canada Research Chairs. Chairs will be deployed to contribute to establishment of 'critical mass', to sharpen academic focus, and to help to define academic direction and innovation.
- Create opportunities to pursue new initiatives identified as of strategic importance to the University, Saskatchewan, and Canada. In order to consolidate institutional capacity in new areas of research, it is important that academic leadership be embraced, and that this leadership serve as a hub about which critical mass may evolve.
- Expand opportunities for partnerships and interdisciplinary research. Chairs deployed strategically will contribute to linkages among researchers within the University, and between researchers at the University and external to the institution, including the many private and publicly funded research organizations situated on the campus of the University of Saskatchewan.
- Attract and retain outstanding faculty by providing an environment in which chairs can be successful. Enhanced research capacity and international profile will directly affect the University's ability to recruit and retain faculty in an increasingly competitive market.
- Build the infrastructure to support leading-edge research through investment in new and emerging areas of technology, enhancement of research facilities and investment in major facilities to enable researchers to excel at the forefront of their fields.
- Train highly qualified personnel. Chairs, and the research clusters that are associated with them, will create research environments attractive to post-graduate and postdoctoral trainees. Expanding research programs, a growing body of post-graduate trainees, and an outstanding faculty will contribute directly to innovation in undergraduate programming and enhancement of opportunities for engagement of undergraduate students in research.
- Enhance opportunities for external funding and establishment of outstanding research infrastructure. Chairs, and the teams of collaborators and students associated with them, will increase the competitiveness of researchers at the University of Saskatchewan for external funding.

The University's CFI and CRC Programs

The U of S CRC and CFI Programs are intended to enhance Canada's research capacity and training of highly qualified personnel through the attraction and retention of researchers who are recognized as international leaders, and the provision of a research infrastructure to support chairs' endeavours. The University's CRC Chairs and CFI allocations are deployed within areas of thematic strength intended to build the University's international reputation and develop its research enterprise. The leadership and productive synergies demonstrated by the Chairs, coupled with strategic investments in research infrastructure, creates a research environment conducive to growth in the pursuit of research excellence.

The University of Saskatchewan continues to benefit significantly from resources allocated from the Canada Foundation for Innovation, most notably through the creation of major new facilities. These have included, but are not limited to the Canadian Light Source, the Saskatchewan Structural Sciences Centre, the Ag-Bioprocess Engineering Research Laboratory, the Infrastructure for Applied Biotechnology in Agriculture, and InterVac (International Vaccine Centre), the first Containment Level 3 facility in Western Canada for human and large animal diseases. CFI support has allowed the U of S to strategically align world-class research facilities with areas of research strength. Further, CFI funding has broadened the scope of existing research, and made possible the exploration of new and emerging areas of research. The University has recognized the relevance of these major facilities to the recruitment of outstanding faculty and the attraction of Chairs, and will continue to capitalize on these investments in the strategic deployment of Chairs.

The University also recognizes that the Canada Foundation for Innovation is a key source of funding required to establish the necessary infrastructure essential to the success of our Chairs. Thus, the objectives for the CFI and CRC programs are consistent. The University has been successful in seeking to optimize the funding available through matching funds, in particular the Saskatchewan Innovation and Science Fund, Western Economic Diversification, and from a variety of other local, provincial, and national sources, both private and public.

Allocation of Canada Research Chairs at the University of Saskatchewan as of 2010

Table 1 provides an overview of the distribution of Chairs across the three Councils as initially awarded to the University and as subsequently allocated. Those chairs appointed as of 2009-10 and nominations in progress as of April, 2010 are also identified.

Table 1. Allocation of Chairs, as of 2010

	SSHRC	CIHR	NSERC
Total Chairs initially allocated	3 – T1	4 – T1	11 – T1
	3 – T2	5 – T2	10 – T2
Chairs appointed as of 2009-10	2 – T1	2 – T1	10 – T1
	3 – T2	2 – T2	6 – T2
Nominations in progress as of April 2010			1 – T1
		1 – T2	

Research Themes

As outlined earlier, in 2006 the University of Saskatchewan reviewed its research landscape in order to begin to identify areas of pre-eminence, areas of emerging pre-eminence, and areas of strategic importance to the University, the Province, and the Nation. This exercise resulted in adoption of the major research themes, which capture the areas identified as areas of research strength and priority at the University of Saskatchewan and represent the framework within which Canada Research Chairs will be allocated. As the University evolves and its scholarly activities reflect new synergies, these themes have been recast as appropriate, with the previous theme for *Materials Science* folded into the theme for *Technology and Science*. The university's *research themes* are: ***Culture and Society; Aboriginal Peoples; Environment, Natural Resources and Sustainability; Technology and Science; and Human and Animal Health.***

Within the framework provided by the research themes, the areas of pre-eminence or signature areas augment these major themes and represent areas of depth and focus which distinguish the University's collective research and scholarship. Broadly defined, the University's *signature areas* are:

Aboriginal Peoples: Engagement and Scholarship;
Agriculture: Food and Bioproducts for a Sustainable Future;
Energy and Mineral Resources: Technology and Public Policy for a Sustainable Environment;
One Health: Solutions at the Animal-Human-Environment Interface;
Synchrotron Sciences: Innovation in Health, Environment and Advanced Technologies;
Water Security: Stewardship of the World's Freshwater Resources.

We anticipate that all of our chair nominations will fit into one or more of the research themes and signature areas described below. Our capacity in each of these research themes and signature areas is considerable, in part because of the investments made independently of this program and in part because of the work of numerous faculty members. The Chairs program will strengthen our commitment and bring additional focus. The precise character of the focus will depend, in the first instance, on the work of our nominees and the research programs they have developed.

Culture and Society

Understanding who we are as individuals, societies and nations is a fundamental aspect of scholarly work at the University of Saskatchewan. Current and developing expertise in this research thrust covers four major sub-themes. **Creativity and Innovation in the Arts** includes research, scholarly and artistic activities in art, drama and music with a strong emphasis on faculty members' extensive creative development, performance and outreach activities. Research in **Society in a Global Context** includes inter-cultural discourse, literature and language analysis, race, gender and sexuality. In addition, building on our sense of place, this sub-theme includes interdisciplinary studies of the Great Plains including history, culture, and political and economic systems. Investments in areas of strength in the broader sub-theme of **Institutions and Society** leverage an established tradition of public policy research at the institution. Research addressing policy and culture, democracy in diverse societies, public policy and governance, rural development and the study of co-operatives and producer associations are key foci with emerging emphasis addressing health and social policy, science technology and innovation, leadership, and trade and transnational regulations. The signature areas of *Agriculture, Energy and Mineral Resources*, and *Water Security* also illustrate research strengths in this theme, related to consideration of access to natural resources. Research in **Humanities and Foundations of Knowledge** encompasses early societies, classical, medieval and renaissance studies, the history of science, human reasoning, and indigenous humanities. This base sustains the signature areas of *Aboriginal Peoples*, as it relates to indigenous knowledge systems.

Aboriginal Peoples

Research and scholarly activities pertaining to Aboriginal Peoples is a main focus at the U of S. Under the sub-theme of **Health**, faculty are working to address inequities in health strategies, develop community-generated health research, and investigate how traditional practices can be incorporated into health care education and delivery. International areas of strength in **Administration and Business** include Aboriginal governance, decentralization, and community economic and business development. The area of **Education** focuses on Aboriginal identity and culture. **History and Social Justice** is critical to this cluster, and includes expertise in native-newcomer relations, Indigenous law,

northern plains and boreal forest archaeology, and First Nations and early Canadian literatures. The University continues to foster work in constitutional issues, treaty rights, and linguistic survival. **Aboriginal Peoples** is also identified as an emerging signature area. As home to the highest proportion of Aboriginal peoples of any province in Canada, this area reflects the desire to distinguish ourselves as a national centre of excellence in research directly related to engagement and scholarship of Aboriginal peoples. Research in areas related to social justice, policy, health, education, administration and business is a strong focus. A leader in the conducting of ethical and appropriate research with First Nations and Métis communities, the University is particularly well poised to position itself as a leader in research in partnership with First Nations communities.

Environment, Natural Resources and Sustainability

The U of S undertakes critical fundamental and applied research in the sub-theme of **Resource Management**. Areas of expertise include sustainability of prairie and northern ecosystems, hydrology and water resources, sustainable crop management systems, and processing, infrastructure development, and sustainable beef cattle systems. Under the umbrella of **Earth, Climate and the Atmosphere**, researchers are internationally renowned for their work in solar-terrestrial and atmospheric studies. Emerging areas of strength are molecular environmental science, and high-performance computing in Earth science. **Energy and Mineral Resources** as a signature area underpins the research involved in energy production and conservation, mineral mining, the security of sources of energy and related public policy, and the sustainability of society and its infrastructure. This theme also highlights the emerging signature area in **Water Security**. This focus encompasses sustainable freshwater resource management and assessment on a regional, national and international scale, based on research strengths in the areas of aquatic toxicology, hydrology and aquatic biology. With the award of a Canada Excellence Research Chair (CERC) in Water Security and development of a world-leading research and training institute focused on issues of water quality and water supply domestically and globally, the U of S is well positioned to consider sustainability from the perspective of the world's freshwater resources. As a leader in the emerging area of **Renewable Energy** research, the U of S will look to build on its expertise in the areas of biomass conversion, bio-energy from animal and agricultural wastes, clean coal technology, bio-ethanol, bio-diesel, and energy transport. The research focus of **Sustainable Agriculture Production** captures a breadth of study in plant breeding and genetics, and sustainability in animal and crop systems. **Agriculture**, as a distinguished area of research, reflects the University's leadership in food and bioproducts research and bio-energy sources.

Technology and Science

The University of Saskatchewan has a broad array of research and academic interests in technology. The **Social Contexts for Technology** focuses on issues such as the organization of work, diffusion of innovation, artistic expression, durability of social bonds, distribution of property rights and the new rural economy. Research in advanced learning technologies uses techniques from computer science, human-computer interaction, artificial intelligence, and software-agent technologies to study these effects on humans. The research thrust of **Information and Communication Technologies** has had far-reaching impact and changed profoundly the very nature of many disciplines. These include computer modeling, imaging, geographic information systems, communications and software technology, data mining technology, networks, and digital techniques. Key areas in this research thrust include communications and networks, computer architecture and system engineering, and next-generation groupware. **Biotechnology** involves research that permeates many disciplines at the University of Saskatchewan, including agricultural biotechnology, structural biology, bio-fuels and biomaterials, bioinformatics, and bioethics.

Work in **Materials Science** spans a number of disciplines and its results are found in many familiar products and applications. This research thrust involves the application of the laws and theories of quantum mechanics to explore and enhance atomic structure, uniting research in a wide range of disciplines, particularly chemistry, physics, mathematics and engineering. Areas of focus include material synthesis and modification using a variety of techniques, nano-structures and surface science, and material structures and macro-properties. Characterization of material properties is accomplished using a variety of methods including synchrotron light techniques, most notably the dedicated X-ray lithography facility for micro and nano-scale structure and device research fabrication at the CLS.

Opportunities to explore the boundaries of our understandings and interpretation of the natural world are at the heart of research in Fundamental Sciences. The **Foundations of Science** include work on logical and algebraic reasoning, and complex systems modelling. The home of the Canadian Light Source (CLS), the University of Saskatchewan's research in **Synchrotron Sciences** permeates a staggering number of research areas in the health, pharmaceutical, natural and applied sciences including biomedical imaging, BioXAS and industrial sciences. Researchers in the chemical sciences, engineering, and health sciences are exploring functions, natures and applications at the nano-level; and the University is developing strength in the **Nanosciences**.

The University further recognizes **Synchrotron Sciences** as one of its distinctive areas of pre-eminence, which crosses virtually all research within the broad research thrust of **Science and Technology**, with applications in alternative fuels research, environmental contaminants, drug development, cancer treatment, and crop-resistance research. Novel technologies available through the CLS assist in mining exploration and extraction to better meet environmental standards in the mining, drilling, and refining of petroleum and mineral resources and enhance the signature area of **Energy and Mineral Resources**.

Human and Animal Health

Few other institutions match the broad array of human and animal health research expertise found at the University of Saskatchewan. Research in the area of **Chronic Disease** encompasses work on cancer, obesity, hypertension, the neurosciences, mental health and addiction, and arthritis. Research strength is also found in the companion area of **Infectious Diseases** where the University has firmly established its reputation in immunology and the intersection of animal and human health. Building on the strengths of our institution, University researchers continue to investigate and work toward commercial applications in the area of **Reproductive Health. Public and Community Health and Wellness** represents a huge area of collective strength; researchers in this area explore topics ranging from physical and mental development throughout the human lifespan, health delivery and care of vulnerable populations and public health issues. The **Molecular Design and Drug Development** focus unites researchers in the basic health and pharmaceutical sciences and includes work in drug and vaccine delivery, pharmaceutical nanotechnology and drug development. The health of rural populations and remote northern communities crosses boundaries with the **Aboriginal Peoples** and **Water Security** signature areas, highlighting developing research expertise in the use and control of water on reserve lands and the safe drinking water standards in First Nations communities. The application of **Synchrotron Science** through the BioMedical Imaging and Therapy beamline supports advanced research and development in medical imaging techniques, yielding new tools in cancer detection and treatment and drug design.

Research to advance animal and human health, as a signature area titled **One Health** to reflect the animal-human-environment interface, is based on the work of internationally recognized researchers and an outstanding infrastructure in infectious disease and vaccine research to support research in the life sciences. VIDO-InterVac provides advanced research for vaccinology and immunotherapeutics and is a recognized global leader in the field of vaccine development. The

Academic Health Sciences Complex will integrate teaching and research facilities for unique academic, clinical and scientific collaborations, positioning the U of S as a leader in the health sciences and supporting patient-centred health care.

Allocation of Chairs Planned for 2010-2014

The University of Saskatchewan anticipates modest turnover in Canada Research Chairs over the period of this Strategic Research Plan. Resignations, retirements, and unsuccessful renewal may release Chairs for reallocation. Nationally, institutions are subject to reallocation, as changes in relative success in competition for Tri-Council funding bears on entitlement. The University of Saskatchewan anticipates that a total of 7 Canada Research Chairs (1-T1, 6-T2) may be available for allocation in the period 2010-14.

Table 2. Estimate of Chairs to be Available for Allocation, 2010-14

	Unallocated Chairs^a	New Chairs^b	Potential Resignations^c and Retirements^d	End of Tier 2 Tenure	Total
SSHRC	1 – T1			1 – T2	1 – T1 1 – T2
CIHR	2 – T1 3 – T2			2 – T2	2 – T1 5 – T2
NSERC	1 – T1 4 – T2		1 – T1	3 – T2	2 – T1 7 – T2
Total = 18 (5 – T1; 13 – T2)					

- a. Unallocated Chairs are those currently in process from the preceding allocation.
- b. New Chairs include chairs allocated to the University of Saskatchewan as a result of the reallocation exercise every alternate year.
- c. Potential Resignations include those recently received and those projected over the next five years, as well as projected unsuccessful nominations for renewal.
- d. Anticipated Retirements are projected, as retirement at the University of Saskatchewan has no mandatory retirement age.

Within the last cycle of Chair allocations, targeted investment was deemed essential to take advantage of provincial funding opportunities and to build research leadership and focus within the SSHRC community. As a result, the CRC Oversight Committee elected to increase the University's complement of SSHRC CRCs from five to six. At the present time, further deviation from the current allocation of chairs amongst the council pools is not anticipated, and it is expected that Chairs becoming available through resignation, retirement, or increase in the University's allotment will remain within the pool of origin. Nevertheless, in order to take advantage of strategic opportunities, it is essential that the University retain a degree of flexibility in the allocation of available Chairs.

The University is cognizant of the potential difficulty in retention of its most successful Tier 2 Chairs. The University must also judiciously balance the desirability of recruitment of outstanding young scholars into Chairs in order to provide them with the means to achieve their full potential, against the advantages inherent in appointment of established, senior scholars with a proven record of achievement. The latter may contribute to a more immediate realization of institutional goals.

Table 3. Anticipated Allocation of Chairs by Research Area, Strategic Research Plan 2010-14

	SSHRC	CIHR	NSERC
Culture & Society	1 – T1 1 – T2		
Aboriginal Peoples		2 – T2	
Technology & Science		1 – T1 1 – T2	1 – T1 2 – T2
Human & Animal Health		1 – T1 2 – T2	1 – T2
Environment, Resources & Sustainability			1 – T1 4 – T2

Table 4. Current (as of 2010) and Projected (as of 2014) Allocations of Chairs by Research Area, Strategic Research Plan

	SSHRC		CIHR		NSERC	
	2010	Projected 2014	2010	Projected 2014	2010	Projected 2014
Culture & Society	3 – T2	1 – T1 3 – T2	1 – T2			
Aboriginal Peoples	1 – T1	1 – T1		2 – T2		
Technology & Science			1 – T1	2 – T1 1 – T2	7 – T1 4 – T2	7 – T1 4 – T2
Human & Animal Health	1 – T1	1 – T1	1 – T1 1 – T2	2 – T1 2 – T2		1 – T2
Environment, Resources & Sustainability					3 – T1 2 – T2	4 – T1 5 – T2

Gender Representation

The University of Saskatchewan has been very successful in attracting outstanding female candidates, and has steadily increased the percentage of female Chair holders since the inception of the program. The proportion of women holding Chairs now stands at approximately 30%, which is on par with that of the full-time faculty at the University. The goal is to sustain or increase this proportion of female Chairs through continuation of our efforts to recruit highly qualified female candidates. The appointment of female Chairs as positive and influential role models within the University community expands upon our commitment to both equity and excellence. Providing networking opportunities, creating a culture of equality, and celebrating achievements are critical to attracting and retaining high-caliber female faculty and encouraging women to pursue post-graduate research and academic careers.

Allocation of Chairs to Internal, External Candidates

In accordance with the intent of the CRC Program to increase the number of outstanding scholars at Canadian universities, our intent is to place an emphasis on international searches, and it is expected that the majority of appointments will be to candidates external to the University and from outside Canada. Although there will be Tier 2 chairs available for allocation, the ratio of Tier 1 to Tier 2 chairs presents limited opportunity for promotion of Tier 2 chairs to Tier 1 chairs.

Assessment of Progress

Contributions made by Chairs will be assessed by a number of indicators to determine their success in meeting the objectives of the CRC Program. Specific expectations for Chairs may vary considerably across disciplines, so that indicators will not apply equally to all Chairs. Nevertheless, significant activity is expected to occur within each of the following five categories, and the progress of each Chair will be assessed against appropriate indicators within each category. Indicators for each category may include, but are not limited to:

High Quality People

- Visionary leadership
- Ability to recruit and retain outstanding faculty, maintain critical mass of researchers and students
- National and international awards and recognition
- Invited presentations at national and international conferences and at institutions outside the U of S
- Training of highly qualified personnel (number and quality of graduate students, undergraduates engaged in research programs, post-doctoral fellows, research associates, research assistants, technicians; and their subsequent successful placement)
- Innovative contributions to academic undergraduate and graduate program development and delivery

Significant Regional, National, and International Impact

- Impact on policy (social, business, government, health, education)
- Contributions to Canadian social and cultural life through artistic, performance, cultural and literary work
- Contributions to technological advances; technology and intellectual property transfer
- Relevance to regional and Canadian innovation agendas
- Participation on professional bodies, committees, and boards at the national and international levels
- Outreach and community initiatives and service that benefit the public and private sectors

Ability to Attract Resources

- Success in securing external research funding, including national granting council competitions
- Enhancement of research infrastructure
- Involvement in collaborative initiatives with external institutions, organizations, and the private sector

Significant Collaborative Activity

- Formation and enhancement of cross-unit and cross-college collaborative groups
- Contributions to interdisciplinary and multidisciplinary activities
- Increased and innovative use of existing U of S and local facilities and resources
- Establishment and strengthening of national and international partnerships
- Community and government agency linkages, partnerships and collaborations
- Industry linkages

Significant Activity Output

- Publication quantity and quality; communication of research results
- Performance and exhibition of scholarly and artistic work
- External recognition, citation, and other evidence of impact of research, scholarly and artistic contributions
- Patents and commercialization agreements
- Direct economic impact (e.g. spin-off companies, job creation, impact on tourism)

A comprehensive review of the accomplishments of the Chair, undertaken during the final year of the term, will inform the process for recommendation on renewal or reallocation of the Chair. A Chair Review Committee, a body of senior academics appointed by the CRC Oversight Committee, is assigned the task of review of the renewal documentation, and provides feedback to the Chairs and advice to the Oversight Committee.

Planning and Approval Process

The University of Saskatchewan has built an Integrated Planning Initiative founded upon a collegial and collaborative process that has identified four major planning foci: 1) attracting and retaining outstanding faculty; 2) increasing campus-wide commitment to research, scholarly and artistic work; 3) establishing the University of Saskatchewan as a major presence in graduate education; and 4) recruiting and retaining a diverse and academically promising body of students, and preparing them for success in the knowledge age. The Integrated Planning process is informed by a series of foundational documents that guide the University in its identification of areas and activities of strategic importance to the institution and society.

Final authority and responsibility for the Research Plan, the allocation and nomination of Chairs, and the allocation of internal resources rests with the University President. The President is advised by an Oversight Committee, consisting of the Provost and Vice-President Academic and the Vice-President Research; the Vice-Provost Faculty Relations and Associate Vice-President Research attend all meetings as resource personnel. A CRC Advisory Committee provides a forum for collegial consideration and serves in an advisory capacity to the Oversight Committee. This committee consults widely with members of the University community in terms of allocations to the research themes and signature areas and the selection of appropriate candidates.

The Strategic Research Plan has been developed through an iterative and collaborative planning process undertaken through University Council and committees of Council. CFI applications are developed under the guidance of a CFI Advisory Committee, chaired by the Vice-President Research, who is then responsible for communication of advice to the President.