



STRATEGIC RESEARCH PLAN SUMMARY (Updated: September 14, 2009)

INTRODUCTION AND OBJECTIVES

The University of Manitoba is the Province's leading research institution. Its vision is to be recognized as a leader among Canadian research-intensive universities and a key player in building Manitoba's social and economic future. The overall objective of the University's strategic research plan is to assist the University in realizing this vision. The specific objectives of the plan are to: maintain and enhance research capacity in existing areas of research strength; build research capacity in emerging areas of research strength; foster networking, partnerships and collaborations between disciplines and across sectors; and provide unique research training opportunities for graduate students and other trainees.

RESEARCH AND RESEARCH TRAINING THRUSTS

Based on institution-wide and unit-based research planning initiatives, the University has identified a number of major thrusts for research and research training. These thrusts represent those areas in which the University has a critical mass of internationally recognized and/or exceptionally promising researchers who interact at various levels and share interests over a fairly broad discipline/field. What follows is a brief description of those thrusts in which the University has currently allocated Canada Research Chairs (CRCs), has strategically recruited faculty members, and/or in which it has or intends on deploying Canada Foundation for Innovation (CFI) support and recruit Canada Excellence Research Chairs (CERCs).

Applied Nutritional Sciences. Expertise in this emerging area of research excellence is concentrated in the Faculties of Agricultural and Food Sciences, Human Ecology, Medicine and Pharmacy. With the support from the federal and provincial governments and industry partners, the University has established a new Richardson Centre for Functional Foods and Nutraceuticals and a Canadian Centre for Agri-Food Research in Health and Medicine also has been established at the St. Boniface General Hospital (SBGH) Research Centre. To build on these initiatives and enhance research strength at the University, three NSERC CRCs (one at Tier 1 level for recruitment, two at Tier 2 level for retention and recruitment), have been allocated to the **functional foods and nutraceuticals** area, including nutrigenomics.

Archaeology. The University is a key player in the sub-fields of classical archaeology, zooarchaeology and bioarchaeology on both the local and international stages. Currently, there is no Canadian university of any size or rank with a more vigorous archaeological research program. In order to solidify its leadership position in this field, the University has allocated two Tier 2 SSHRC CRCs to retain emerging research leaders, one in each of **classical archaeology** and **bioarchaeology**. With CFI support, a new digital analysis laboratory has also been established.

Astronomy. High-Energy Astrophysics (HEA) was identified in the 2000 Mid-Term Review of Canada's Long Range Plan as an exciting and fast growing research area where Canada is expected

to make significant contributions and play a leading role. Around the same time, the University of Manitoba identified a need to strengthen its research in Astronomy and recruited two experts in observational astronomy. The University has recruited a third new person with expertise in **theoretical astrophysics** and has plans to recruit a fourth person with similar expertise. To further strengthen the development of astronomy research, the University has allocated an NSERC Tier 2 CRC to retain an excellent researcher with expertise in high energy observations relating to neutron stars, supernova remnants and associated phenomena.

Biomedical Sciences. Within this broad thrust, the University's research activities are currently organized around eight general fields as follows.

Cardiovascular sciences are established areas of research excellence at the University. The Institute of Cardiovascular Sciences, a partnership between the University and SBGH, houses over 80 researchers, is home to a CIHR-funded group in experimental cardiology and, with ongoing support by its founding partners, has received significant CFI funding in recent years. Two Tier 2 CIHR CRCs have been allocated to retain promising cardiovascular scientists at the Institute. The University has also allocated a Tier 1 CIHR CRC in regulation of cardiolipin and phospholipid metabolism in mammalian cells to retain an excellent researcher.

Neuroscience and mental health research at the University is comprised of several formally-recognized research groups, which focus on spinal cord injuries, mental health, and neurodegenerative diseases, the latter in close collaboration with the SBGH Research Centre. The University has received several New Opportunities awards and has allocated three CIHR CRCs to this broad area: two Tier 1 CRCs to retain internationally-recognized leaders in palliative care and in developmental neuropathology; and a Tier 2 CRC to retain an emerging research leader in the field of mood and anxiety disorders. An additional Tier 2 NSERC CRC has also been allocated to recruit a researcher in the area of brain and cognitive science.

Cell biology and gene technology is also an established area of research excellence at the University. Researchers in the Faculty of Medicine and in the Manitoba Institute of Cell Biology focus their research efforts on cancer cell biology. With the support of the University and CancerCare Manitoba, the Institute has received CFI New Opportunities and major Innovation Fund awards that have augmented newly constructed cancer research facilities.

The University has allocated a Tier 1 CIHR CRC to retain an international leader in gene expression in cancer cell progression, a Tier 2 CIHR CRC to retain an exceptional functional genomics/stem cell biology researcher, and has recruited a Tier 2 CIHR CRC whose research is focused on neuro-oncology. To strengthen its internationally recognized research programs in cardiovascular disease, cancer and spinal cord injury, with focus on processes related to tissue restoration, the University has allocated one Tier 1 CRC and five tenure-track faculty positions for recruitment in regenerative medicine. With CFI and University support, a new genetic models facility was also recently established and significant funding was recently announced for functional genomics by Genome Canada.

The University has a long history in excellence in the field of endocrinology and metabolism. In partnership with the Health Sciences Centre, the University supports the Diabetes Research and Treatment Centre, which fosters research collaborations between basic and clinical scientists. A multi-disciplinary research centre on atherosclerosis has been established by the University. Research and treatment of hepatitis is the focus of the University's liver diseases research group.

In the established research field of **immunology**, University scientists have distinguished themselves throughout the world. The University has supported applications to and received funding from CFI's Innovation Funds and New Opportunities programs in support of the Immune Regulation of Allergy research group. The group hosts nationally funded, transdisciplinary strategic training program grant. A Tier 2 CIHR CRC has been allocated to recruit an outstanding scientist in respiratory sciences with expertise in the biology of breathing in the Department of Physiology and the Manitoba Institute of Child Health. The University has also allocated one Tier 1 CIHR CRC to retain a leading immunologist in the allergy research group, as well as one Tier 2 CIHR CRC to retain an accomplished scientist with expertise in molecular immunology.

The University has a well established, globally competitive, and world renowned research program in **infectious diseases**. The excellence of the program has been built through strategic investments by the University in people and infrastructure over 30 years and by developing a strong partnership with the Public Health Agency of Canada's National Microbiology Lab. University scientists have distinguished themselves throughout the world. The University has supported applications to and received funding from CFI's International, Innovation and New Opportunities Fund programs in support of the Resistance and Susceptibility to Infectious Diseases research group. The group hosts a nationally funded, transdisciplinary strategic training program grant. The University has allocated a Tier 1 CIHR CRC to retain an internationally-recognized HIV/AIDS clinician-scientist and a Tier 2 CIHR CRC to recruit a leading immunologist working on Chlamydial infection and treatment. To further support this area, the University has recruited a Tier 2 CIHR CRC in **epidemiology and international health**, who leads the recently established Centre for Global Public Health, which focuses on knowledge translation in emerging infectious diseases. To support the further development of this Centre, the University has allocated three new tenure-track positions to this initiative. Finally, the University is currently establishing an endowed research chair in immunobiology of infectious diseases.

In **applied pharmaceutical sciences**, the University has three formally-recognized research groups working in the areas of drug disposition, drug use and effectiveness in the elderly, and antibiotic resistance. Several new recruits recently have joined the University, and CFI New Opportunities support has been received in this area. The University has achieved recognition in the growing area of novel drug delivery systems and targeted drug delivery, and has allocated a Tier 1 CIHR CRC to retain an internationally-recognized leader in drug delivery science.

The Faculties of Medicine and Engineering have identified **Biomedical Engineering** as an emerging area of research. Several new faculty members have been hired to strengthen this area. In addition, the University has allocated a Tier 2 NSERC CRC to retain an emerging researcher in biomedical engineering and currently an NSERC Industrial Research Chair (IRC) is being recruited in this area.

Engineering and Information Technology/Sciences. The University has a long tradition of research excellence in the fields of engineering and information technology/sciences. Research expertise, which spans the Faculties of Engineering and Science, currently is concentrated in several organized areas: advanced manufacturing; biomedical engineering; civil infrastructure; electrical power systems; information technology/sciences, which includes IT/communications and advanced data networking and expert systems; and thermal fluids.

The University is a recognized leader in the general area of **civil infrastructure**. It is the administrative headquarters of *ISIS Canada*, the Network of Centres of Excellence which is pioneering the use of advanced materials in both the construction and rehabilitation of civil structures. Five recent academic appointments have been made in this area or in infrastructure-related fields, several of whom have received CFI New Opportunities Fund program support. The capabilities of the University's state-

of-the-art Structures Laboratory have recently been expanded, which includes enhanced technical support. The University has allocated three Tier 2 NSERC CRCs to the general area of structures and structural health monitoring: one to retain an emerging leader in the area of neural computation and structural health monitoring techniques, one to recruit an emerging researcher in civil infrastructure, one to recruit an emerging leader in applied mechanics and structural health monitoring. To complement the innovative capacity in the structural health monitoring area, the University has developed significant strength in microfluidics, bio-sensing, and MEMS. Several researchers in the fields of biosystems, computer, and electrical engineering; and physics, chemistry, and medicine have been retained and recruited to develop applications in bio-diagnostics, bio-monitoring, lab-on-chip, and bedside technologies.

In both academic and industrial circles, the University has been long recognized as an international leader in **electrical power systems**, including simulation and modeling, distribution, tower design, power electronics and instrumentation, and the electrical power area is a sector of strategic priority for Manitoba. This research area is actively and broadly supported by local industry and government; such support includes funding for an NSERC IRC in electrical power systems. The University has also recruited new academic staff to this area.

The organized area of **IT/communications** includes an internationally-recognized research program in applied electromagnetics and antenna design. Virtually all satellite ground stations in North America and well over 1,000 base stations in South America are based on designs emanating from this groundbreaking research program. The research program is supported by the University's unique \$4.0M Antenna and Microwave laboratory, considered the best of its kind in North America and which has recently been enhanced through CFI support. In addition, the research program is enhanced through the University's Electromagnetic Compatibility and Microwave Imaging Laboratory, Nano-Systems Laboratories, Advanced Radio Frequency Systems Laboratory and the Manitoba Regional Materials and Surface Characterization Facility. A new facility for micromachining software adaptive antennas has also recently been established. This globally recognized research program is led by a Tier 1 NSERC CRC who is a world leader in applied electromagnetics and antenna design. This research team works closely with the University's well established materials research group including a Tier 2 NSERC CRC in microelectronic materials.

The University of Manitoba is enhancing its research capacity in related areas of application which include machine intelligence and vision, computational mathematics, expert systems, and biomedical engineering.

Canadian History. The University is internationally recognized for its expertise in history, which spans different periods and different civilizations. It is a global leader in Canadian history, particularly, in the history of Western Canada, where its human resources are matched by incomparable archival collections in Winnipeg of world-wide renown. The University has allocated a Tier 2 SSHRC CRC to retain a researcher who has distinguished herself as one of Canada's leading young historians.

Environmental and Resource Sciences. While the University's new Clayton H. Riddell Faculty of the Environment, Earth, and Resources serves as the 'hub' for this broad, inter- and multi-disciplinary thrust, researchers in a variety of faculties/schools and research centres/institutes conduct research in organized areas such as applied geography; sustainable environments/natural resource management; biodiversity/bioremediation; and environmental adaptation.

Within this general thrust, **Arctic system science** is an established area of University research excellence. The University has recently made several new academic appointments in this area, who have been assisted by CFI New Opportunities program support, and the University also supports a

Centre for Earth Observation Sciences which serves as focal point for activity and interaction. In addition, the University has made significant CFI investments in globally unique sea-ice environmental research facility (SERF), the Canadian Research Icebreaker, NGCC Amundsen, and instrumental analytical capabilities. This internationally recognized research program is led by a Tier 1 NSERC CRC. To build on its existing research strengths in Arctic system science, the University is proposing to recruit a CERC in Arctic Geomicrobiology and Climate Change. The focus of this CERC program is to develop models capable of predicting change in both physical and biological components of the system, and cold adapted bioremediation technologies as a means of managing Arctic sustainable development.

The University has identified **Resource and Environmental Sustainability** as an area of strategic importance. Alternative energy production is an important component of the strategy to achieve this goal. This area is also a key priority for the province of Manitoba and the federal government as is evident by the commitment of significant funding for new research and industry initiatives in alternative energy initiatives in Manitoba. The University of Manitoba has established research excellence in the areas of biological and thermal conversion of biomass feedstocks, biotechnology and thermal-fluid science. The University wishes to develop expertise in alternative energy technologies and to attract significant provincial and federal funding to enable further world-class collaborative research in this emerging and globally important area. In support of this initiative, the University has committed new academic staff positions in Plant Science, Mechanical and Manufacturing Engineering, and Biosystems Engineering. Currently, the University has an NSERC IRC in Alternative Energy in partnership with Manitoba Hydro and a collaborative research development grant from NSERC, in partnership with Husky Energy, in bio-fuel feedstock production and processing.

The University's Natural Resources Institute (NRI) is a national and international research leader in the area of **resource and environmental sustainability**. It has a strong and well-recognized record of graduate training in this area, and has recently introduced a new doctoral degree program in this field along with the recruitment of additional academic staff. The University has allocated a Tier 1 SSHRC CRC to retain an international leader in community-based resource management, a priority area for research and training of the NRI. Research programs in **biodiversity/bioremediation** have also been strengthened through CFI New Opportunities program support.

Globalization and Cultural Studies. Through a number of its humanities and social sciences departments and units, the University has a long-standing interest and research strength in globalization and cultural studies as well as human rights issues. Newly developed educational program and research initiatives in this area, combined with the recent hiring of a number of promising young faculty, have led the University to identify globalization and cultural studies as a priority area for further development. A Tier 1 SSHRC CRC has been allocated to recruit an established research leader in this area.

One of the goals of the University of Manitoba is to become the University of first choice for Aboriginal students in Manitoba and across Canada. To achieve this goal, the University has strengthened its Departments of Native Studies, Political Studies and History by recruiting several academics with research interests in **Canadian Aboriginal issues**. To further strengthen this area, the University has allocated two Tier 2 SSHRC CRCs, one to recruit an emerging leader in indigenous governance, reconciliation and decolonization and another to retain a researcher in narrative, community and indigenous cultures.

Materials Science. This established area of research excellence at the University is diverse, encompassing work in the University's Clayton H. Riddell Faculty of Environment, Earth, and Resources; and Faculties of Engineering, Science, and Human Ecology. Current organized areas of

research expertise include: aerospace materials engineering, rare earth materials, materials chemistry, materials physics, and microelectronic and nanomaterials and medical textiles. The University maintains an extensive inventory of instrumentation that enables cutting-edge science in this area, including a highly sophisticated crystallography laboratory, a modern microbeam analytical facility and state-of-the-art materials testing and nanofabrication facilities. These laboratories, several of which have been recently enhanced with CFI support, are hubs of significant and sustained local, national and international collaborations involving academic, government and private sectors. The University has allocated a total of seven NSERC CRCs to this general area of research excellence: four Tier 1 CRCs to retain and recruit world leaders in mineralogy and crystallography, aerospace materials, rare earth materials, and nanomaterials, and three Tier 2 CRCs to retain and recruit emerging research leaders in materials chemistry, microelectronic materials, and fluid-solid interactions and surface science.

Subatomic Physics. The University has a diverse experimental program in subatomic particle physics. Our researchers have played a pivotal role in the project to measure the weak charge of the proton. A recent recruitment ensures Manitoba's continuing strong intellectual contribution to international projects at such major facilities as TRIUMF, Argonne and Jefferson Lab.

Population and Community Health. University researchers excel in the broad-based, inter- and multi-disciplinary field of population and community health. Expertise in this research thrust is organized around the following areas: Aboriginal health; aging; child health; international health; disabilities studies; population genetics; social, psychological and population determinants of health; and environmental health.

Aboriginal health is an area of strategic importance to Manitoba and, in turn, the University. The University is an identified leader in the area of Aboriginal health research, and the University's flagship department of Community Health Sciences serves as the hub of this broad-based area of research strength. The department and University support the CFI-funded Manitoba First Nations Centre for Aboriginal Health Research, which plays a national leadership role in this field and is the recipient of numerous significant research partnership awards from CIHR. The University has allocated a Tier 2 CIHR CRC to recruit an emerging research leader in **social and environmental determinants of health**.

University health researchers have pioneered the use of health information databases to identify population and social determinants of health and to recommend **health policy** changes and directions. The University's Manitoba Centre for Health Policy is an internationally recognized centre of excellence in this field. To further support this area, the University has allocated one Tier 2 CIHR CRC, to retain an emerging research leader in the area of **aging**.

The University's Health, Leisure and Human Performance Research Institute (HLHPRI) acts as a hub for research examining physical, psychosocial and functional factors affecting health. This highly productive, multi-disciplinary research unit plays a pivotal role in ensuring the University's broad-based participation in the institutes and programs of CIHR. The University has used a Tier 1 CIHR CRC to recruit a research leader in **physical activity and health** and director of this institute.

Sustainable Agriculture. The University has a long tradition of research excellence in the fields of agricultural and food sciences. Current research expertise is concentrated in the following organized areas: sustainable cropping systems; sustainable animal production systems; value-added processing; and post-harvest technology, particularly as it relates to grain storage.

Within **sustainable cropping systems**, the University's plant breeding and pathology programs are internationally-recognized. More recently, this traditional research strength has been enhanced to

include an emphasis on sustainable cropping systems research, including such areas as pesticide free production and innovative tillage practices. The University maintains excellent laboratory and field facilities in this area that have recently been significantly enhanced through two major CFI awards.

Nutrition/nutritional biochemistry, and monogastric and ruminant production systems are the foci of the University's **sustainable animal production systems** area of research expertise. Excellent laboratories, research units and field facilities support collaborative, basic and applied sciences animal production research within and outside the University. With a major CFI Innovation Fund grant, the University has initiated a large-scale enhancement of its research infrastructure to support multi-disciplinary, agro-ecological studies on livestock production systems. The university has allocated a Tier 2 NSERC CRC to recruit an emerging leader in the field of animal systems research.

Focus of research in the field of agricultural and food sciences, has been to conduct multi-disciplinary research for **environmental and economic sustainability of agricultural systems**. The university has allocated a Tier 2 NSERC CRC to recruit an emerging leader in this field.

The University supports a unique, multi-disciplinary research program and is an international leader in grain storage research. With CFI support, research capabilities in this area have recently been significantly enhanced by the construction of a state-of-the-art \$5M grain storage and handling research facility. The multi-disciplinary focus of this program, combined with its world class facilities, provide the strongest environment in the world for research on grain storage, grain drying and automation of grain handling operations.

Systems Biology. The University has a unique amalgam of expertise in systems biology, with expertise concentrated in and active collaboration between and among the University's departments of chemistry, physics, microbiology and biological sciences, as well as several departments within the University's Faculty of Medicine. Expertise in protein chemistry has been expanded with the recent recruitment of several new faculty members, and a Tier 1 NSERC CRC has been allocated to retain an international leader in protein chemistry. The University is an international leader in mass spectrometry and home to the most sophisticated and advanced mass spectrometers in the world. Several recent CFI awards are providing enhanced capabilities for research in mass spectrometer prototype design, proteomics, glycomics, structural biology and genomics. Three Tier 2 NSERC CRCs have been allocated: one to retain a promising researcher with expertise in the application of mass spectrometry to complex biological macromolecules, and two others to recruit emerging stars, one with expertise in structural biology and the other in phylogenomics.

MEASURING THE PLAN'S SUCCESS

Given the plan objectives previously enumerated, measures of the plan's success include indicators of: (a) research capacity-building [i.e., critical mass/faculty and graduate student retention and recruitment; discipline-appropriate measures of research productivity (e.g., publications, grants/contracts, awards and honours, etc.); development/acquisition of specialized research facilities/equipment; national rankings of research performance]; (b) networking, partnership and collaboration (local, national, international, within and between disciplines/sectors); and, (c) training opportunities for graduate students and other trainees (both extent and nature).

DESCRIPTION OF THE PLANNING AND APPROVAL PROCESS

In terms of the development of the University's strategic research plan and the associated CRC allocation plan, the process began with a call for chair proposals by the Vice-Presidents (Academic) and (Research) to deans and directors of faculties and schools. Based on the submissions received as

well as other institution-wide planning initiatives, a draft plan and chair allocation strategy was developed by the University's senior executive committee. Both the University's Senate Planning and Priorities Committee and the Senate Committee on University Research provided commentary on this plan and associated strategy, which were endorsed by the Senate Committee on University Research. The plan and associated chair allocation strategy were subsequently approved by the University's President who, as stipulated in the CRC Program Guide, is accountable for the strategic research plan.

GENDER REPRESENTATION IN RELATION TO CRC NOMINATIONS

As the current focus of the University is to use the CRC program to *recruit* leading researchers to the University, the issue of gender representation will be addressed by ensuring that recruitment processes are not only free of barriers to nominating women to CRC positions but, indeed, are proactive with respect to the nomination of female candidates, particularly in disciplines/fields where they are under-represented in terms of these positions. This includes: ensuring appropriate gender balance on all search committees; including a statement in CRC advertisements that particularly encourages women to apply; mandatory training of all search committee chairs on process and issues related to equity and diversity, including providing information on the placement of advertisements specifically directed at women; the appointment of the associate vice-president (research) to all search committees and the review, by the Office of the Vice-President (Academic), of all search processes to ensure that each has adopted a proactive approach to the identification of qualified females for CRC positions.

SUMMARY OF CHAIR ALLOCATION PLAN

The following table summarizes the University of Manitoba's Canada Research Chair allocation plan.

COUNCIL	TYPE		TOTAL
	Tier 1	Tier 2	
CIHR	<ul style="list-style-type: none"> • Applied Pharmaceutical Sciences - RT(1) • Cardiovascular & Respiratory Sciences - RT(1) • Cell Biology - RT(1) • Immunology & Infectious Diseases - RT(2) • Neuroscience & Mental Health - RT(2) • Physical Activity & Health - RC'd (1) 	<ul style="list-style-type: none"> • Aging - RT(1) • Cardiovascular & Respiratory Sciences - RT(2); RC'd(1) • Cell Biology & Gene Technology - RT(1); RC'd(2) • Community Health Sciences - RC'd(1) • Immunology & Infectious Diseases - RT(1) • International Health - RC'd(1) • Neuroscience & Mental Health - RT(1) • Regenerative Medicine – RC(1) 	20
NSERC	<ul style="list-style-type: none"> • Materials Science -RT(2);RC'd(1); • Functional Foods/Nutraceuticals - RC'd(1) • IT/Communications - RT(1) • Protein Chemistry - RT(1) • Applied Geography – RT(1) • Unallocated Chairs (2) 	<ul style="list-style-type: none"> • Materials Science - RT(1); RC'd(1) • Surface Science - RC'd(1) • Functional Foods & Nutraceuticals - RC'd (1) • Civil Infrastructure - RC'd (1) • Neural Computation & Structural Health Monitoring - RT(1) • Applied Mechanics & Structural Health Monitoring - RC'd (1) • Mass Spectrometry - RT(1) • Sustainable Agricultural Systems - RT(1) • Sustainable Intensive Livestock Production – RC'd(1) • Structural Biology – RC'd(1) • Phylogenomics- RC'd(1) • Observational Astronomy – RT(1) • Nutrigenomics – RC'd(1) • Biomedical Engineering – RC'd(1) • Brain and Cognitive Science – RC'd(1) 	25
SSHRC	<ul style="list-style-type: none"> • Globalization & Cultural Studies - RC'd (1) • Resource & Environmental Sustainability - RT(1) • Unallocated Chair(1) 	<ul style="list-style-type: none"> • Bioarchaeology - RT(1) • Canadian History - RT(1) • Classical Archaeology - RT(1) • Indigenous Politics & Governance - RC'd (1) • Narrative, Community and Indigenous Cultures – RT(1) • Unallocated Chair(1) 	9
TOTAL	20	34	54

Note: RC'd - recruited; RT- retention; RC - to be recruited