

THE UNIVERSITY OF MANITOBA
STRATEGIC RESEARCH PLAN – December, 2011

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: 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 including undergraduate students, where appropriate. This Strategic Research Plan outlines the University's major research thrusts, and details how the Canada Research Chair (CRC) and Canada Foundation for Innovation (CFI) programs have been and will be used to enhance our research capabilities in these areas and thereby meet these objectives.

FIT WITH THE STRATEGIC PLANNING FRAMEWORK

In 2009, the University adopted a five-year Strategic Planning Framework intended to guide major institutional decisions in order to best take advantage of opportunities for the University to focus specific attention on areas of particular relevance in today's world. The Strategic Planning Framework (accessible at http://umanitoba.ca/admin/president/strategic_plan/) includes a number of focus areas for enhancement in academic and research programs, which have been chosen based on their uniqueness, their potential to draw on strengths from across the University and to combine teaching, research, and public service activities, as well as their relevance to Provincial priorities. This Strategic Research Plan is based on the priorities set for research enhancement in the Strategic Planning Framework and other institutional and unit-based research planning initiatives.

RESEARCH AND RESEARCH TRAINING THRUSTS

Eight major thrusts for research and research training are identified in which to develop or maintain excellence: 1) healthy, safe food and novel bioproducts; 2) sustainable prairie and northern communities; 3) human rights and social justice; 4) innovations in public and population health; 5) innovative materials and technologies; 6) culture and creativity; 7) indigenous people's health, culture and governance; and 8) biomedical sciences. These thrusts represent 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, as well as emerging areas where the University is building institutional capacity and encouraging exciting new collaborative efforts. Following is a brief description of these research thrusts and the key sub-areas of institutional focus, as well as the current allocation of Canada Research Chairs (CRCs) and Canada Excellence Research Chairs (CERCs), and Canada Foundation for Innovation (CFI) support. Significant institutional support beyond CRC, CERC,

and CFI allocations exists for each of these research thrusts, including strategic recruitment of faculty members, support for research institutes and centres, and the establishment of other research chairs, some of which are detailed below.

1. Healthy, Safe Food and Novel Bioproducts

A safe, healthy and nutritious food supply benefits both Canada and the world. Much of the world's population struggles with severe famine and malnutrition. Canada and other developed countries have faced recent outbreaks of food-borne illnesses that resulted in death and suffering. Working collaboratively with colleagues from the faculties of Agricultural and Food Sciences, Medicine, Human Ecology, Pharmacy and Science, researchers in this emerging field will work to improve food safety for Canada and the world.

Key areas of institutional strength include: nutrition and functional foods; nutrigenomics; food and feed safety; sustainable agriculture systems; post-harvest systems.

In the area of applied nutritional sciences, the University allocated a Tier 1 NSERC CRC to the area of Nutrition and Functional Foods to recruit a research leader in the study of cholesterol, fat, and energy metabolism. The allocation of 2 Tier 2 NSERC CRCs has allowed for the recruitment of a Nutrigenomics researcher, as well as the retention of a researcher in the area of Food Processing for Grain-Based Functional Foods. Research in this area is supported by the Richardson Centre for Functional Foods and Nutraceuticals, a state-of-the-art research centre located in the University's SmartPark that enables research on development of functional foods and nutraceuticals with a focus on the crops of the Canadian Prairies. The Canadian Centre for Agri-food Research in Health and Medicine (CCARM) at Saint Boniface General Hospital, enhances this area of research through clinical research studies of functional and health food products and nutraceuticals. To support research into food safety issues, the University has allocated a Tier 1 NSERC CRC for the recruitment of a researcher in the field of Food and Feed Safety Systems. Existing research infrastructure to support this area includes a new CFI-funded gut microbiome laboratory which will enable research into links between livestock and human disease. Additional chairs in this area includes a Senior and Associate NSERC Industrial Research Chair in High Erucic Acid Rapeseed (HEAR) research and an endowed Agribusiness Chair in Cooperatives and Marketing which supports research into grain marketing and cooperative governance.

The National Centre for Livestock and the Environment supports this research thrust through the investigation of long term economic and environmental sustainability of integrated livestock and crop production systems. Other University investments include the Canadian Wheat Board Centre for Grain Storage Research, which enhances this research area by providing an innovative facility to develop processes and technologies to preserve what has been produced for food security and sustainability.

2. Sustainable Prairie and Northern Communities

Not only is Manitoba the only western province with an Arctic sea coast and as such has a unique connection to the North of Canada, but it is also considered a gateway to the West. The protection and preservation of the environment in both regions is a major scientific challenge, and requires understanding of a range of issues including climate change and global warming, water stewardship, ecological diversity, and the acquisition and use of natural, mineral, and

energy resources. The sustainability of prairie and northern communities is a concern that cuts across multiple disciplines and requires collaboration from researchers with diverse areas of expertise. The University's established strengths in this area continue to grow as greater attention is turned to this issue by both the scientific community and the public. University researchers continue to build collaborations that will work towards solving some of the most pressing environmental problems facing Canadian communities.

Key areas of institutional strength include: arctic system science; arctic geomicrobiology and climate change, resource and environmental sustainability; ecosystem dynamics and metabolism.

University of Manitoba researchers have established internationally renowned programs of research in Arctic systems science, climate change and its effects on Arctic sea ice. The recent awarding to the University of Manitoba of a Canada Excellence Research Chair in Arctic Geomicrobiology and Climate Change will greatly augment the University's Arctic research efforts already made by its Tier 1 NSERC CRC in Arctic System Science. The research vessel and icebreaker, the Amundsen, and the Sea Ice Environmental Research Facility, the second such facility of its kind in North America, are only two examples of the many CFI-funded facilities that promote collaborative research at all levels, in Arctic climate research. This research area is additionally supported by an NSERC Northern Studies Research Chair in Aquatic Northern Ecosystems and a Department of Fisheries and Oceans Chair that supports research into environmental pathways of contaminants in Arctic marine and freshwater aquatic ecosystems.

The University's long tradition of agriculture and agri-food research is exemplified by the core research group and facilities for the study of sustainable animal production and sustainable cropping systems. A Tier 2 NSERC CRC has been allocated to the study of Applied Soil Ecology that includes an aim to reducing greenhouse gas emissions from soil. The University's commitment to resource and environmental sustainability research is demonstrated by the dedication of a Tier 1 SSHRC CRC in Community-Based Resource Management, who is also co-chair of the International Development Research Chair in Community-Based Resource Management to develop community-based adaptive management to increase food security and improve livelihoods of fisher communities in Rio de Janeiro. An NSERC Industrial Research Chair in Alternative Energy further supports research that promotes the sustainability of prairie and northern communities.

Ecosystem dynamics and metabolism is an area of research priority being supported by the allocation of a Tier 2 NSERC CRC, whose work examines how large-scale environmental stressors affect animals at the cellular-level. Other investments in this area include an NSERC Industrial Research Chair in Alternative Energy and a recent provincially supported Watershed Systems Research Chair, aimed at improving the water quality, water policy and protection of Manitoba's vast waterways.

3. Human Rights and Social Justice

While many Canadians may take our rights and privileges as citizens for granted, there is much political debate globally surrounding the differing definitions of human rights and the concept of social justice. Recently, public attention in Canada has been focused on the efforts to establish the Canadian Museum for Human Rights, which will be located in Winnipeg and will serve as a

unique centre for international education and research collaboration dedicated to the promotion and respect of human rights and diversity. With more than 150 researchers from faculties including Arts, Education, Law, and Social Work focusing on human rights related issues, the University of Manitoba has identified this thrust as an emerging area of research strength and is committed to becoming a world-class leader in this field.

Key areas of institutional strength include: human rights and law, human rights and social justice, peace and conflict studies.

The University of Manitoba has a dedicated source of expertise and research focus in human rights research through the Arthur Mauro Centre for Peace and Conflict Studies, which promotes the advancement of human rights, conflict resolution, global citizenship, peace, and social justice through research, education, and outreach. This capacity has been enhanced by the recent creation of the Centre for Human Rights Research Initiative, which will facilitate research-driven knowledge, public policy and intellectual debate on issues related to human rights and social justice. The new Canadian Journal of Human Rights, created by the Faculty of Law, leads the way in the dissemination of this important research. In support of this growing area of research strength, the University has allocated a Tier 2 SSHRC CRC to recruit a researcher in the field of human rights and social justice.

4. Innovations in Public, Population Health and Health Services Research

Population and public health, including global public health, and evidence-based health policy are long-standing areas of strength at the University of Manitoba. The university's contributions to public health include local, national and international collaborations ranging from Manitoba Aboriginal and aging communities to applied public health interventions for controlling the AIDS epidemic in Kenya and India.

Key areas of institutional strength include: individual, population, and global health; healthy living and aging.

In the area of individual, population, and global health, the University allocated a Tier 2 CIHR CRC to recruit a researcher in the field of Epidemiology and Global Public Health who is examining the prevention of HIV and other STIs and factors determining susceptibility to non-communicable diseases. This researcher is also the director of the Centre for Global Public Health, which engages in the design and implementation of international health and development projects in several countries, primarily in the areas of HIV and STI prevention. A further Tier 2 CIHR CRC was allocated to recruit a researcher in the field of Environment and Health Risk Communication, whose work includes analyses of perception of risk of drinking contaminated water and public health communication associated with the H1N1 virus. CFI funding associated with this chair has supported the acquisition of videoconferencing and recording equipment allowing for communication with remote Northern and Aboriginal communities. The Manitoba Centre for Health Policy is an internationally-recognized research unit that houses sixty researchers, graduate students, systems analysts and support staff. They work on six major studies annually on health and social issues, which involve policy-makers, planners and clinicians. The Centre has received significant CFI investments in the use of health information databases to identify determinants of health and recommend policy changes. Research into the effects of knowledge translation on nursing practice is supported by the CHSRF/CIHR Chair in Cancer Psychosocial Oncology and Cancer Nursing Research. Further

support for research in the area of individual, population, and global health includes a CIHR Chair in Gender and Health for research into prenatal health and care, and two MHRC Research Chairs in Caregiver Communication and Child Youth Health and Illness.

In the area of healthy living and aging, a Tier 1 CIHR CRC was allocated to recruit a leader Physical Activity and Health Studies whose research examines the effects of regular physical activity on the health of the human nervous system. Multi-disciplinary research in this area, including student research training, is supported by the Health, Leisure and Human Performance Research Institute. The Centre on Aging provides a focus for the interdisciplinary study of aging at the University of Manitoba and promotes the public dissemination of this research. The Director of the Centre on Aging is a Tier 2 CIHR CRC in Healthy Aging who is also leading the Manitoba data collection for the CFI-funded Canadian Longitudinal Study on Aging, a national, long-term study of aging that will follow approximately 50,000 Canadians for at least 20 years, one of the most comprehensive studies to date in the world. Additional CFI investments in this area include support for a laboratory to examine neurobiological factors that control food intake and metabolism, contributing to obesity. The Robert Wallace Cameron Chair in Evidence-Based Medicine provides additional support for research into the role of physical activity in the prevention and management of type 2 diabetes in youth.

5. Innovative Materials and Technologies

Materials science is an established, multi-disciplinary research area at the University of Manitoba. From characterization of minerals in the crystallography and mineralogy research facilities of the Clayton H. Riddell Faculty of Environment, Earth, and Resources to materials physics, nanomaterials and microelectronics, to medical textiles, researchers are collaborating with local, national and international colleagues, industries and governments to improve materials used in aerospace, medicine and manufacturing.

Key areas of institutional strength include: earth and composite materials; civil structures; IT and telecommunications; astronomy and astrophysics; biomedical engineering.

The University of Manitoba is particularly strong in the area of earth and composite materials, with the allocation of three Tier 1 NSERC CRCs in Crystallography and Mineralogy, Advanced Materials, and Nanoscale Physics, and two Tier 2 CRCs in Conducting Polymers and Electronic Materials, and Isotope and Environmental Geochemistry. Research is supported by the CFI-funded Crystallography and Mineralogy Research Facility which allows for the examination of mineral structure and complex chemical reactions at a molecular level. The Composites Innovation Centre provides the infrastructure for research and development of materials and technologies used in the manufacturing industry. Similarly, the Manitoba Regional Materials and Surface Characterization Facility provides the infrastructure for research surrounding the chemical, structural and morphological nature of surfaces and bulk materials. This Facility and the newly established Manitoba Institute for Materials, a research node to increase collaboration within the University and with other academic institutions and industry, are both directed by a Tier 2 NSERC CRC. In the emerging field of high energy astrophysics, an NSERC Tier 2 CRC is making important discoveries in the area of neutron stars and their interactions with the surrounding medium. Civil structure research is supported through the allocation of two Tier 2 NSERC CRCs in Solid Mechanics, and Advanced Composite Materials and Monitoring of Civil

Infrastructure. Additionally, the CFI-funded Centre for Architectural Structure and Technology aims to extend the boundaries of design and building technology, and is a leading centre for fabric-formed concrete casting. Creating further strength in this area, the Civil Engineering Department is home to both ISIS Canada Resource Centre that is performing leading-edge research on the use of advanced materials in civil structures, and the W.R. McQuade Structures Laboratory which manufactures and tests materials in various field conditions. IT and telecommunications research is supported by the allocation of a Tier 1 NSERC CRC in Electromagnetics, who is a world leader in antenna design and oversees research in the CFI-funded Applied Electromagnetics Laboratory, and a Tier 2 NSERC CRC in Microelectronic Materials. CFI-funded facilities include a High Performance Computer Centre, which allows University researchers to perform rapid complex calculations and perform simulations. Further support for research in this area includes two NSERC Industrial Research Chairs, one in Teletraffic Analysis and another in Power Systems Simulation.

The growing research area of biomedical engineering has been supported by the allocation of two Tier 2 NSERC CRCs; one, who will develop, among other things, an integrated system for acoustic sleep apnea syndrome diagnosis and innovative methods for early diagnosis and rehabilitation of patients with Alzheimer's disease; the other in Biomedical Engineering Materials to investigate a new therapeutic strategy in bone tissue engineering, overcoming limitations in current bone grafts. Additional CFI investments include support for infrastructure to develop new medical textiles, which can incorporate functions such as antibacterial activity and drug delivery. Planned CFI investments include a Nanomedicine and Tissue Engineering Laboratory for the development of novel biopolymers.

6. Culture and Creativity

The cultivation of creativity permeates the work of the university. With increasing globalization, culture is being recognized as an increasingly important component in sustaining vibrant local and national communities and securing peace and prosperity. Effective trade within a global economic system requires the development of cross-cultural competencies. Within the new knowledge and information economy, understanding and negotiating cultural differences become valued skills and creative contributions may engender competitive advantage. The University of Manitoba has a long-standing interest and research strength in this area and is positioning itself to take a leadership role in understanding the changing roles of culture within the evolving global system, advancing citizen learning for effective participation in facing the challenges ahead and nurturing creativity within traditional and new media of cultural expression.

Key areas of institutional strength include: archaeology; Canadian history and culture; globalization and cultural studies; business innovation and entrepreneurship.

In the area of archaeology, the University has allocated two Tier 2 SSHRC CRCs to retain strong researchers in the areas of Skeletal Biology and Roman Archaeology. Archaeological research at the University is supported by the CFI-funded Bioanthropology Digital Image Analysis Laboratory, which provides 3D modeling and printing capabilities for analysis of skeletal remains, as well as by CFI-funded infrastructure for remote study and preservation of Northern Canadian heritage resources. The research area of Canadian history and culture is supported by the CFI-funded Centre for Creative Writing and Oral Culture, led by a Tier 2 SSHRC CRC in Narrative,

Community and Indigenous Cultures. The Centre supports research into oral and literate cultures as well as creative works. The study of Canadian History and Culture at the University is further enabled 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 in the area of Western Canadian Social History. The field of Globalization and cultural studies has been identified as a priority area for further development for the University, and is linked to the major strategic thrusts of Human Rights and Aboriginal Health, Culture, and Governance. Research in this area is supported at the University through the CFI-funded Centre for Globalization and Cultural Studies. The Director of this Centre, a Tier I SSHRC CRC, is leading inquiries into the potential contribution of research into globalization and the analysis of cultural practices to furthering trans-cultural understanding and interdisciplinary collaboration. The Institute for the Humanities, established more than 20 years ago, promotes cross-disciplinary research in humanities areas of study and assists in public outreach activities. An endowed Chair in Icelandic Language and Literature provides support for research into the culture of this historically significant Canadian immigrant group. In the growing research area of business innovation and entrepreneurship, the Asper School of Business brings together University researchers with the private sector and will support the research of a newly recruited Tier II SSHRC CRC in Entrepreneurship and Innovation. A unique CFI-funded facility in support of Culture and Creativity includes Studio FLAT, which advances research into computer aided musical composition to complement traditional concepts in instrumental and voice music composition.

7. Indigenous Peoples' Health, Culture and Governance

Canada's Indigenous peoples are a significant and important part of Canada and Canadian culture. Manitoba has a large and growing Aboriginal population and recognizes that increased educational success of Aboriginal people is critical to the social, cultural and economic development of Manitoba and of Canada. To that end, the University has strengthened its Departments of Native Studies, Political Studies and History by recruiting in these areas. The University of Manitoba has a long history in interdisciplinary research on a range of Aboriginal issues from researching linguistic structures in Algonquian language, to studying the historical position of Aboriginal peoples in Western Canada, to researching land claims. Further, the University has a specific concentration and strength in researching Indigenous peoples' health, culture and governance and is home to centres for the study of Aboriginal health and Indigenous Governance and community-based research governance.

Key areas of institutional strength include: indigenous politics and governance; indigenous knowledge and social work; aboriginal health.

The allocation of a Tier 2 SSHRC CRC has allowed for the recruitment of a research leader in Indigenous Politics and Governance who, with CFI support, has created Mamawipawin, a space for community-based research into issues of indigenous governance. An additional Tier 2 SSHRC CRC has been allocated to retain a researcher in the field of Indigenous Knowledge and Social Work. In the area of Indigenous Peoples' Health, the Manitoba First Nations Centre for Aboriginal Health Research is a centre of research excellence. Researchers affiliated with the Centre are working collaboratively on projects related to the health of indigenous peoples in Manitoba, Canada and internationally. The University is additionally home to the CIHR-funded Swampy Cree Suicide Prevention Team, which brings together representatives from Swampy

Cree communities with University and international experts in psychiatry and Aboriginal health. CFI funding support in this area includes the creation of a population-based studies laboratory with a partial focus on Aboriginal suicide prevention.

8. Biomedical Sciences

Modern medicine is becoming increasingly complex. As greater understanding of the molecular bases of both normal development and disease are achieved, it is important to integrate these findings into cellular, tissue and whole animal models of disease in order to further our understanding of disease processes, their diagnosis, treatment and prevention. University of Manitoba researchers excel in a wide spectrum of biomedical research. Biomedical researchers are a cornerstone of Manitoba's health care system and are working towards discoveries that will improve the health of Manitobans, Canadians and global citizens.

Key areas of institutional strength include: neuroscience and mental health; regenerative and molecular medicine; cardiovascular sciences; applied pharmaceuticals and rational drug design; immunology and infectious disease; systems biology.

In the area of neuroscience and mental health, two Tier 1 CIHR CRCs have been allocated to retain leaders in the fields of Developmental Neuropathology and Palliative Care. An additional Tier 2 NSERC CRC was allocated to recruit an emerging leader in Comparative Cognition, who is using avian models to examine the effects of aging on spatial cognition. The strategic importance of this area is demonstrated by the recent allocation of six new tenure-track faculty positions in neuroscience within the Faculty of Medicine. Research groups including the Mood and Anxiety Disorders Research Group and the Psychiatric Neuroimaging Research Group facilitate collaborative investigation into neurosciences research topics. The Spinal Cord Research Centre provides technical facilities and promotes collaborative research and training into mechanisms controlling movement, bowel and bladder function, and the effects of training on the nervous system. University of Manitoba researchers in this area also have access to the Health Sciences Centre's newly constructed Kleysen Institute for Advanced Medicine, a clinical research facility with state-of-the-art technology for the study of neurosciences, infectious diseases, advanced imaging and medical informatics. Recent CFI-funded facilities in this research area include a population-based studies laboratory focused on mental health issues and a sophisticated imaging system to investigate how electrical synapses operate and deliver information through brain circuits, important for a wide range of brain functions and neurological disorders such as epilepsy.

Regenerative and molecular medicine research at the University is supported by the allocation of two Tier 2 CIHR CRCs in the areas of Genetic Modeling and Neuro-oncology and Human Stem Cells. Research in this area has been enhanced by the creation of the Regenerative Medicine Program, the first of its kind in Western Canada, and the \$5 million newly constructed state-of-the-art research space on a dedicated floor of the Basic Medical Sciences building. Five new tenure-track faculty positions have been created in the Regenerative Medicine Program, two of which are Tier 2 CRC positions. Recent CFI funding has been received in support of this research, including a gene transduction and analysis laboratory for developing novel therapeutic approaches for neurological disorders such as Rett Syndrome and autism and a translational research center for stem cell-based spinal cord injury repair.

The allocation of a Tier 1 CIHR CRC has enabled the retention of an international leader in Chromatin Dynamics, who also holds the Margaret Sellers Chair in Cell Biology, and has also allowed for the acquisition of a leading-edge genome analysis facility, supported with CFI funding. Research in this area is further enabled through the Manitoba Institute of Cell Biology (MICB), a partnership between the University and CancerCare Manitoba which supports fundamental research in biology and health, with a primary emphasis on cancer and related diseases. Within MICB, the CFI has funded the Great West Life Manitoba Breast Cancer Research and Diagnosis Centre, which supports research into experimental methods of breast cancer detection and a new 3D nano-biomedical imaging node to enhance existing expertise in 3D molecular imaging and analysis. This equipment allows cutting-edge basic, clinical and translational health research. Expertise in this area has allowed for the creation of an Innovative Technologies in Multidisciplinary Health Research Training program, providing research training in innovative molecular imaging technologies and 3D imaging of cells and tissues.

Cardiovascular science is an established area of research excellence at the University. A CIHR CRC has been recently advanced to a Tier 1 chair in Molecular Cardiology and is among a team of more than fifteen University of Manitoba researchers in the Institute of Cardiovascular Sciences (ICS), a partnership between the University and the Saint Boniface General Hospital Research Institute. The Institute has in excess of one hundred research staff and is considered the leading research centre in cardiovascular sciences, both nationally and internationally. An additional Tier 1 CIHR CRC was allocated to retain a leader in the field of Molecular Cardiolipin Metabolism. He is also the Director of the Centre for Research and Treatment of Atherosclerosis, which provides a core facility, devoted to the study of the pathogenesis and prevention of atherosclerosis and related lipid disorders and is involved in direct patient care. This area has received significant CFI funding. More recently, an advanced small animal cardiovascular imaging laboratory located at ICS will assist in the development of novel dietary and pharmaceutical strategies to limit cardiovascular failure and its associated morbidity and mortality. As well, a live cell fluorescence imaging platform will enhance previous investments made into viral and cell culture facilities for molecular cardiology research. The Henry G. Friesen Chair in Endocrine and Metabolic Disorders has additionally provided support for research into cardiovascular endocrinology.

In the area of applied pharmaceuticals and rational drug design, the University has three formally-recognized research groups working in the areas of drug disposition and discovery, antibiotic resistance, and drug use and effectiveness. CFI support in this area has included funding for a transdermal research facility which allows for investigation into the transdermal absorptive properties of sunscreens and insect repellants. The recently constructed Apotex Centre has provided the Faculty of Pharmacy with state-of-the-art research space and equipment. In support of this research area, a Tier 1 CIHR CRC has been allocated to retain an internationally-recognized leader in Drug Development. Planned CFI investments include a nanotechnology laboratory for the creation of nanomedicines to prevent and treat HIV infection. The University has recently launched an NSERC research network entitled MabNet, for the development of a large-scale manufacture of monoclonal antibodies ('Mabs'), a new generation of biopharmaceuticals to treat cancer and other potentially deadly disorders, which will enhance research in this area.

The University is an international leader in the field of immunology and infectious disease.

In the area of immunology, a Tier 1 CIHR CRC in Immune Regulation supports the area of Immunology, along with two Tier 2 CIHR CRCs in the area of Molecular Immunology and Airway Cell and Molecular Biology, and an MHRC Research Chair in Immunology. CFI New Initiatives support has recently contributed to the creation of the Manitoba Integrated Cell Purification and Analysis Unit, which provides state-of-the-art fluorescent cell purification, imaging and analysis tools to support this area. The University has built upon the CIHR-Sponsored National Training Program in Allergy and Asthma by creating the National Training Program in Inflammation and Allergy, a multidisciplinary training and collaborative research group to enhance the capacity and strengths of biomedical research and research training within Manitoba and Canada. The Flynn Family Chair in Renal Transplant provides further support to this research area.

In the area of infectious diseases, research is supported by the allocation of one Tier 1 CIHR CRC in the areas of Resistance and Susceptibility to infections and one Tier 2 CIHR CRC in the area Infection and Immunity. This research area has received significant CFI funding, including an International Access Fund award which allowed for the creation of the Canada-Kenya International Collaboration on Infectious Diseases Research. The University also hosts the CIHR-funded International Centre for Infectious Diseases training program, which provides trainees with multidisciplinary training in infectious diseases and seeks to facilitate domestic and international application of Canada's infectious diseases expertise. The H.E. Sellers Research Chair in Infectious Diseases provides research support in this area, and a new endowed research Chair in the Immunobiology of Infectious Diseases will allow for the recruitment of a world-renowned researcher in the field and support the University's position on the leading edge of this field.

The area of Systems Biology is a major research strength at the University, with expertise shared between the departments of Chemistry, Physics and Astronomy, Microbiology and Biological Sciences, as well as departments within the Faculty of Medicine. A Tier 1 NSERC CRC is allocated to this area to retain a leader in the field of Protein Chemistry who will answer key questions about bacterial and viral infection mechanisms, and drug resistance and oxidative stress. A Tier 2 NSERC CRC allowed for the recruitment of a promising researcher in Structural Biology. CFI support has allowed for the acquisition of a significant base of research technology in this area, including a protein x-ray crystallography laboratory. CFI funding was also a significant part of the \$7M to support the Manitoba Centre for Proteomics and Systems Biology, a facility which has placed the University in a leadership position in the field. The Centre provides the high-quality training in instrument design, laboratory practice and bioinformatics, which allows this discipline to flourish in the province. Cross-disciplinary collaboration with the CFI-funded Time-of-Flight Mass Spectrometry Laboratory in the Department of Chemistry supplements this facility with state-of-the-art mass spectrometry capability. An additional Tier 2 NSERC CRC has recently allowed for the recruitment of a researcher in the field of Phylogenomics, whose CFI-funded research lab investigates the understanding of the relationship of gene mutation to factors in human diseases, including cancer and environmental toxicology.

Summary of Allocation by Research Theme

Research Thrust	Council	Tier I	Tier II	Total
Healthy, Safe Food and Novel Bioproducts	NSERC	<ul style="list-style-type: none"> Recruited – 1 (Jones) To be recruited – 1 	<ul style="list-style-type: none"> Retention – 1 (Beta) Recruitment – 1 (Eck) 	4
Sustainable Prairie and Northern Communities	NSERC	<ul style="list-style-type: none"> Retention – 1 (Barber) 	<ul style="list-style-type: none"> Retention – 1 (Tenuta) Recruitment – 1 (Treberg) 	4
	SSHRC	<ul style="list-style-type: none"> Retention – 1 (Berkes) 		
Human Rights and Social Justice	SSHRC		<ul style="list-style-type: none"> To be recruited – 1 	1
Innovations in Public and Population Health	CIHR	<ul style="list-style-type: none"> Retention – 1 (Chochinov) 	<ul style="list-style-type: none"> Retention – 1 (Menec) Recruitment – 2 (Blanchard, Driedger) 	4
Innovative Materials and Technology	NSERC	<ul style="list-style-type: none"> Retention – 2 (Shafai, Hawthorne) Recruitment – 2 (Chakraborty, Cadogan) 	<ul style="list-style-type: none"> Retention – 2 (Freund, Kazem-Moussavi) Recruitment – 5 (Buchanan, El-Salakawy, Wang, Stetefeld, Fayek) Retention – 1 (Safi-Harb) 	12
Culture and Creativity	SSHRC	<ul style="list-style-type: none"> Recruitment – 1 (Brydon) 	<ul style="list-style-type: none"> Retention – 4 (Hoppa, Stirling, Perry and Cariou) To be recruited – 1 	6
Indigenous People's Health, Culture and Governance	SSHRC		<ul style="list-style-type: none"> Recruited – 1 (Ladner) To be retained – 1 	2
Biomedical Sciences	CIHR	<ul style="list-style-type: none"> Retention – 7 (Hasinoff, Plummer, HayGlass, Del Bigio, Davie, Hatch, Kirshenbaum) Recruitment – 1 (Gardiner) 	<ul style="list-style-type: none"> Retention – 2 (Yang, Marshall) Recruitment – 2 (Ding, Halayko) To be recruited – 2 Unallocated – 1 	19
	NSERC	<ul style="list-style-type: none"> Retention – 1 (Loewen) 	<ul style="list-style-type: none"> Recruited – 2 (Marcus, Kelly) To be retained - 1 	
Total		19	33	52

SUMMARY OF CHAIR ALLOCATION PLAN Note: RC - recruited; RT- retention; TRC - to be recruited)

Council	Type		Total
	Tier I	Tier II	
CIHR	<ul style="list-style-type: none"> Neuroscience and Mental Health – RT (2) (Chochinov, Del Bigio) Regenerative and Molecular Medicine – RT (2) (Davie, Hatch) Immunology and Infectious Disease – RT (2) (Plummer, HayGlass) Cardiovascular Sciences – RT (1) Kirshenbaum Applied Pharmaceuticals – RT (1) (Hasinoff) Healthy Living and Aging – RC (1) (Gardiner) 	<ul style="list-style-type: none"> Regenerative and Molecular Medicine – RC (2) (Ding, Halayko), TRC (1) (Ogilvie, search underway) Immunology and Infectious Disease – RT (2) – (Yang, Marshall) RC(1) Individual, population and global health – RC (2) (Blanchard, Driedger) Healthy Living and Aging – RT (1) (Menec) Unallocated Chair (1) 	19
NSERC	<ul style="list-style-type: none"> Earth and Composite Materials – RT (1) (Hawthorne) RC (2) (Cadogan, Chakraborty) IT and Telecommunications – RT(1) (Shafai) Systems Biology – RT (1) (Loewen) Arctic System Science – RT (1) (Barber) Nutrition and Functional Foods – RC (1) (Jones) Food and food safety systems – TRC (1) 	<ul style="list-style-type: none"> Systems Biology – RC (3) (Freund, Stetefeld, Marcus) Earth and Composite Materials – RT (1) (Fayek) Civil Structures – RC (2) (EI-Salakawy, Wang) IT and Telecommunications – RC (1) (Buchanan) Biomedical Engineering – RT (1) (Kazem-Moussavi), TRC (1) (Xing) Astronomy and Astrophysics – RT (1) (Safi-Harb) Ecosystem Dynamics and Metabolism – RC (1) (Treberg) Sustainable Agriculture Systems – RT (1) (Tenuta) Nutrition and Functional Foods – RC (1) (Beta) Nutrigenomics – RC (1), (Eck) Neuroscience and Mental Health – RC (1) (Kelly) 	23
SSHRC	<ul style="list-style-type: none"> Globalization and Cultural Studies - RC (1) (Brydon) Resource & Environmental Sustainability - RT(1) (Berkes) 	<ul style="list-style-type: none"> Archaeology - RT(2) (Hoppa, Stirling) Canadian History and Culture - RT (2) (Perry, Cariou) Indigenous Peoples' Culture and Governance – RC (1) (Ladner) Indigenous Knowledges and Social Work – TBR (1) (Hart) Human Rights and Social Justice – TRC (1) Business Innovation and Entrepreneurship – RC (1) (Wu) 	10

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.