



## **Strategic Research Plan 2018-2023**

*Excellence in Research through Diversity of Thought and Understanding*

*Research brings Queen's to the World and the World to Queen's*

**2018**

## **Introduction**

Queen's University has 175+ years of shaping Canada's future – through innovation and impact as a leader in higher education, research and knowledge mobilization. We are a leading research-focused academic institution with a profound sense of community and purpose. At the core of our



research and learning and the relationship to race and diversity. The Queen's community is actively pursuing a path designed to achieve tangible and lasting change with respect to anti-racism, diversity and inclusion. These goals emerge from a larger framework of institutional cultural norms at Queen's as foundational to the mission of the university. Queen's faculty and students, many with racialized social identities and international origins, are committed to scholarly and practice-based inquiry on critical race, histories of anti-Black violence, and institutional inequities that perpetuate systemic racial discrimination. Anti-racism, anti-oppression, and social justice are inextricably linked in PICRDI report. Scholarship that explores anti-oppression and social justice recognizes power imbalances; knowledge and skills are core to the elimination of racism. Queen's research growth embraces the principles and goals of the [PICRDI report](#) and is partnered with the broader interdisciplinary research community in dialogue and action.

### **Canada Research Chairs**

Canada Research Chairs (CRCs) represent an important investment by the federal government to attract and retain some of the world's most accomplished and promising minds. CRCs allow Queen's to advance established and emerging institutional research strengths, improve global engagement and reputation, and distinguish itself through excellence in research and scholarship. CRCs contribute to the world's most pressing issues. Their work leads to deep discovery and innovation for societal benefit – in disciplines ranging from health to philosophy to engineering. Moreover, they help train the next generation of skilled professionals who will improve Canada's competitiveness and reputation in research and scholarship.

Queen's recently posted [The Queen's CRC Equity Action Plan](#) – a plan for the recruitment, hiring and retention of CRCs. Importantly, issues of equity, diversity and inclusion were also addressed in the plan, with the goal of ensuring and sustaining the participation of members of the four designated equity-seeking groups (women, Aboriginal peoples, persons with disabilities and visible minorities). On November 28, 2017, Queen's University Senate pledged its commitment to these goals through explicit advocacy for inclusive excellence in the CRC Program:

*The research community at Queen's is committed to and recognizes that building a culture of diversity is a socially responsible approach that actively removes discrimination and barriers to inclusion to provide benefits that reach beyond Queen's University. At Queen's, we recognize that diversity advances research for the greater good by valuing alternate perspectives, thereby unlo-6 (ver)-5 (ver)-5 (ver)-5 (v5*



at Queen's in anticipation of the emergence of a national policy for open access to data. Together, research platforms and faculty, coupled with innovative services and supports







in the formation of a research centre to promote the study of anti-racism, anti-oppression, and equity. Focusing on topics core to the research and academic mission, a virtual interdisciplinary centre will embrace current departmental strengths, while recognizing the need for participation of scholars from multiple faculties. As part of this initiative, the university will invest in the Queen's University Research Opportunities Fund (QROF) to provide awards to be used as a stimulus over the next five years to enhance the growth of anti-racism scholarship for established and new faculty members.

o Sub-Theme: *Democracy, Justice and Equality*

The philosophy of law, political philosophy, applied ethics, business and gender equality are a preface to democratic governance and policy and represent a strength at Queen's. Peaceful coexistence rests on legal and social commitment as foundations to building communities and strengthening relationships between people. This commitment is rooted in our understanding of the need for -a  
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Research Excellence Fund (CFREF) established CPARC with an award of \$63M. CPARC is led by Queen's whose faculty include many of the scientists that developed the Sudbury Neutrino Observatory (SNO). Measurements at SNO solved a long-standing puzzle in particle astrophysics known as the Solar Neutrino Problem, leading to a [2015 Nobel Prize for Queen's Professor Emeritus Arthur McDonald](#). Queen's faculty, students, postdoctoral fellows and research associates continue to play key roles in SNOLAB experiments, which aim to unravel the dark matter mystery and to reveal the fundamental properties of neutrinos. CPARC is integrated with the Astrophysics Group Queen's, where many of the same questions that drive research at CPARC, such as the nature of dark matter and the origin of structure in the Universe, are addressed through theoretical, computational, and observational astrophysics. Astroparticle physics at Queen's relies on the state-of-the-art, multi-institutionally managed and highly internationally-collaborative [SNOLAB facilities](#). A major goal of Queen's University is to develop new state-of-the-art facilities on the Queen's campus for discovery, education, outreach and knowledge translation in physics.

Understanding the fundamental underpinnings of life itself is very much an area of strength at Queen's. Scholars examine the general principles of cell and molecular biology, physiology, evolution and behaviour. These studies embrace the diversity of nature from ancient life forms such as archaebacteria to plants to mammals, terrestrial and aquatic, on both the small scale and large scale. Our scholars use powerful molecular genetic methodology and tools, mathematical modeling, and sophisticated techniques in the lab and field to answer some of the most pressing fundamental questions about cellular function, climate change, human behavior and the evolution of the Earth; where significant expertise is devoted to understanding the complexity of geologic processes that have shaped the planet.

o Sub-Theme: *Ecology, Biodiversity and the Natural Environment*

Aquatic and terrestrial ecosystems are sentinels of environmental change that reflect the unprecedented influence of human activities on landscapes. The interaction between climate change, nutrient pollution/loading, and resource use represent a challenge to the levels of biodiversity in Canadian and international watersheds. These and other factors negatively impact ecosystem services that benefit global societies. Queen's is at the forefront of research investigating the impact of these and other emerging stressors on freshwater and other ecosystems at levels ranging from individual species to entire ecosystems in the past and present, using various tools such as mathematical modelling and pattern recognition.

Our researchers are also acknowledged internationally for their discoveries, innovative methodologies and creative monitoring protocols that guide public policy on issues related to climate change, water pollution and the protection of the environment. Major research infrastructure for the study of lake and land ecosystems



Global cultures reflect a diverse and rich display of constructs and conventions that influence behaviour. Value systems and religions impact social order, which are in turn reflected in law, literature, social justice, leadership, politics or governance, as well as through trade, marketing, media and business. One of the primary objectives of historical research is to better understand changing social and cultural norms and to shed critical light on the distinct power relations, economic systems and forms of exchange, and modes of thinking that help produce these norms and that in turn are shaped by them. The tension between the understanding of global histories, including Canadian multiculturalism and its own emerging modern history, and the

and remediation of diverse collections of audio-visual products created by First Nations and Inuit artists, women and collectives. Preservation of a media history, routinely marginalized, allows scholars to explore and facilitate discussion of cultural heritage. Faculty collaborate with the Agnes Etherington Arts Centre to realize innovative exhibitions and knowledge mobilization events such as the annual Conversations in Indigenous Arts Series. Community-based participatory approaches that embrace, explore and respect the needs of the community and Indigenous ways of knowing are also routinely employed in the research fields of Education, Health and Business, and at the Centre for Social Impact.

#### **4. Health, Wellness and the Determinants of Human Health**

The generation of foundational biomedical knowledge and its translation to novel therapies, health practice and policy is a cornerstone of Queen's health research strengths, encompassing fundamental chemistry, psychology, biomedical and translational medicine, clinical trials, patient-oriented research, data analytics and bioinformatics. The health and wellness theme unites faculties at Queen's, while embracing novel research partnerships with the Kingston Health Sciences Centre and Providence Care. This reflects a deep commitment to join with affiliated hospitals to advance health research, in Kingston and Southeastern Ontario through the novel model of a partnered research institute focused on patient-oriented outcomes that are relevant regionally, nationally and internationally. Mental health represents a significant focus for Queen's and its hospital partners and is one that relies on scholars from diverse backgrounds in order to understand the complex neurobiology and psychology that provide insight into behavior and the basis of cognition and emotion. Health and the human fabric emerge through scholars from the arts and humanities as they address questions of equity, inclusion, and diversity through interdisciplinary contributions ranging from aging and dying to the positive impact of the creative arts. These scholars explore the social issues of equity, power, social justice and the cultural politics of illness and medical humanities linked to health justice. They represent research facets that balance and intersect fundamental and applied medical sciences.

The extent of interdisciplinary research permeating this theme is reflected by the cross-cutting expertise threading through subthemes outlined below. For example, transformative work linking fundamental mechanisms of disease, patient-oriented research and clinical practice, and population health is occurring in the areas of cancer, cardiovascular and respiratory diseases, mental health, gastrointestinal disorders, and neuroscience.

##### **o Sub-Theme: *Patient-Oriented Research, Transformative Health Care and Health Promotion***

Patient-oriented research, as defined by the Tri-Council Agencies, refers to “*a continuum of research that engages patients as partners, focusses on patient-identified priorities and improves patient outcomes.*” The related field of precision medicine identifies approaches that will be effective for patients based on genetic, environmental, and lifestyle factors. Both approaches embrace a recognition that health relies on multiple factors that may be influenced by lifestyle, culture, and Indigenous ways of knowing.

Cancer research has a rich history of discovery, accomplishment and leadership in these areas, and the [Queen's Cancer Research Institute](#) comprises a cohort of international leaders within cancer biology, epidemiology and clinical trials. The [Canadian Cancer Trials Group](#), a signature research strength at Queen's within the Faculty of Health Sciences, has global scope and impact, and is an international leader in the design and execution of national and international multi-centre clinical trials.

Health research at Queen's far exceeds its regional foundation, with a national and international impact and presence that ranges from the [Canadian Institute for Military and Veteran Health Research](#) and the [International Centre for the Advancement of Community Based Rehabilitation](#), to networked health analytics within the [Canadian Frailty Network](#), the [Canadian Primary Care Sentinel Surveillance Network](#) (see *Analytics* subtheme below) or the [Canadian Biomarker Integrated Network in Depression](#). Queen's researchers have partnered seamlessly with our academic hospital partners across several sites and facilities. A bold new facility, focused on patient-oriented research, provides new opportunities via the WJ Henderson Centre housed within the Kingston Health Sciences Centre.

Queen's houses several multi-disciplinary centres and institutes that address fundamental discovery, translational research and therapeutics. [The Centre for Neuroscience Studies](#) explores the mysteries of the brain, from cellular function to psychology to neurosurgery to guide new methods to understand, diagnose, restore health and to preserve quality of life for those facing the challenge of disease and neurological disorders. The [Human Mobility Research Centre](#) facilitates cross-faculty collaboration to develop innovative and effective treatment strategies for bone and joint disorders such as those caused by arthritis, osteoporosis or injury. Health promotion and evidence-based strategies cross faculty-based boundaries to elucidate the foundations of active living across generations and cultures. The [Queen's Cardiopulmonary Unit](#) integrates fundamental and clinical investigators with a common goal of developing novel therapies for the treatment of cardiorespiratory disorders. A similar cross-cutting approach characterizes the [Gastrointestinal Disease Research Unit](#)

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communities, as well as several innovative programs in Africa. The latter embraces a novel research strength through Queen's University's Ethiopian partner, the University of Gondar, to pursue [community-based rehabilitation for those living with disabilities](#). Significant and long-standing health research programs are also well established in Tanzania and Rwanda.

Queen's and its academic hospital partners serve as a leading hub of networks directing population and patient-oriented research, as well as optimizing health care. A community of researchers, data experts and clinical experts apply epidemiological and big data approaches using multiple health and medical record databases to improve health sciences research, health policy and health promotion. The [Institute for Clinical Evaluative Sciences](#) (ICES) established its first satellite centre at Queen's, which provides access to data from the Ontario Ministry of Health and Long-Term Care. More recently, additional databases have emerged from the Queen's-based [Canadian Primary Care Sentinel Surveillance Network](#) (CPCSSN), the [Canadian Institute of Military Veteran Health Research](#) (CIMVHR) with a mandate to enhance the health and well-being military personnel and their families, and the [Canadian Frailty Network](#), which is pan-Canadian initiative focused on optimizing care of the frail elderly. Health analytics is a prominent focus that crosses multiple faculties and disciplines.

## **5. Sustainability, Environment and Resources**

Interactions within the research domain of *Sustainability, Environment and Resources* represent an institutional strength at Queen's. Researchers focus on challenges related to the sustainability



dedicated to preserving the physical materials that comprise a nuclear reactor, and provides important links between fundamental research, industry, policy, and government. Queen's solar energy, nuclear, hydro and other energy solutions parallel research on water management/preservation through multiple research groups, including the [Beaty Water Research Centre](#)

Merging discovery and knowledge translation with the inherent talent of the Queen's human capital impacts across multiple sectors of society and embedded economies.

o Sub-Theme: *Materials Discovery and Molecular Design*

Fundamental understanding of the structure and behaviour of materials gives us the ability to control and manipulate their shape, size, function, and stability. Queen's researchers design and create novel materials such as new energy storage materials, photonic materials, machinery fluids, pharmaceuticals, artificial tissues, smart materials and stimuli-response materials. Queen's researchers are discovering methods to identify and predict the molecular-2 (he)a7lu (i)-6 (n)-14 (g)66 of both biological and synthetic c7 leading to more effective and less expensive health care solutions. Future smart materials and coatings are destined to have economic impa2 (he)at in the aut(i)-6 (ot)-2 (i)-2 (ve)4 (, pe)4 (t)-2 (r)3 (oc)4 (he)-6 (m)-2 (i)-2 (c)4 (a)4 (l)-2 (, )TJ [(a)4 (nd )]TJ 0 very small scale.

