

Queen's Strategic Research Plan Summary

Introduction

Queen's distinguishes itself as one of Canada's leading research-intensive institutions. Our mission is to advance research excellence, leadership and innovation at a national and international level. We are dedicated through our research and scholarly work to enriching the academic environment, transforming the student learning and post-doctoral experience, and contributing to the cultural and economic growth of our country.

Planning and approval process

Renewal of the Queen's SRP, which sets forth our vision for the next five years, was undertaken in parallel with the process for development of a new Academic Plan and regular consultation throughout the process has ensured that the two plans are integrally connected. The SRP, approved by Queen's Senate May 22, 2012, is a result of broad internal and external consultation with Departments, Schools and Faculties, as well as industry and government. The Plan has been established to support and cultivate the research and academic environment and to provide a roadmap for maintaining and advancing Queen's position as a top ten research-intensive institution. Growing and supporting excellence in research is at the core of the University's SRP.

We will continue to use the Canada Research Chairs (CRC), the Canada Foundation for Innovation (CFI) and the Ministry of Economic Development and Innovation (MEDI) programs to enhance areas of research strength and ensure that we have the critical mass of researchers and the associated infrastructure in strategic areas.

Strategic Research Objectives

Our strategic research objectives are to:

1. Foster and enhance internationally recognized research programs and emerging research strengths.
2. Promote and enhance our research and scholarly activities that provide transformative experiences for undergraduates, graduate students and post-doctoral trainees.
3. Promote and enhance opportunities for collaborative and interdisciplinary initiatives between faculty across the University and with other universities and institutions.
4. Promote and enhance research partnerships that expand on our research strengths, increase the support for research, and enhance the delivery of research to stakeholders and partners locally, regionally, nationally and globally.
5. Advance diversity and inclusivity through research that leads to increased understanding of cultures and communities within Canada and abroad, and research that enables connections to people and the quality of their lives.
6. Encourage and support the translation and transfer of research outcomes, new knowledge and innovation for the betterment of society.

Through the SRP renewal process, Queen's has identified four major research themes. Within each theme, clusters have been identified which reflect emerging and core strengths as demonstrated by research leadership and international reputation, Research Centres and Institutes, and significant investments from competitive funding programs.

Signature programs (Appendix A) are those particular areas of research and scholarly activity distinguished by specific investments (e.g., named, endowed and sponsored chairs; Canada Research Chairs; Research Centres

and Institutes) and research opportunities (e.g., centres of excellence; major research platforms) where Queen's global leadership is expected to develop or has been established.

Theme 1: Exploring Human Dimensions

Exploring human dimensions cuts across several Faculties, Schools and Departments, where the nature of human creativity is explored through the examination and analysis of texts, the restoration of works of art, the critical evaluation of elements of modern culture, the theory-informed study of past human activity, and the creation of new knowledge and art, and its performance. The study of the dynamics of human behaviour and the human mind provide a foundation for exploring the social dimensions of populations and communities and the study of learned systems of understanding.

Cluster: Society, Culture, and Human Behaviour

Research areas: (1) Creation, Interpretation and Preservation of the Arts (2) Contemporary Culture (3) Composition (4) Mind, Language, Cognition, Knowledge, Ways of Knowing, and World Views (5) Theory, Regulation and Modification of Human Activity and Behaviour (6) Social, Cultural and Historical Change (7) Teaching and Learning in Social Contexts (8) Texts, Literatures and Contexts (9) Science, Technology and Culture (10) Cinema (11) Religion and Modernity (12) Economics (13) Geography (14) Globalization Studies.

Cluster: Human Health and Wellness

Foundational research strengths are structural biology, molecular medicine, research methodology, and knowledge translation. Established, emerging and new research strategic strengths within this cluster include: (1) Neuroscience (2) Primary Health (3) Gastrointestinal Disease (4) Cancer (5) Musculoskeletal (6) Cardiovascular and Respiratory Diseases (7) Critical Care (8) Drug Development and Human Toxicology (9) Reproductive and Developmental Origin of Health, Disability and Disease (10) Chronic Disease Management (11) Disease Prevention and Wellness Promotion (12) Vulnerable Populations and Aging Populations (13) Mental Health (14) Military and Veteran Health (15) Pain (16) Rehabilitation.

Theme 2: Understanding and Sustaining the Environment and Energy Systems

Our priorities in this area include: (1) Developing and enhancing the human aspect of healthy environments (2) Increasing depth in our understanding of ecology and the natural environment, particularly related to the 15 ecosystems of Canada (3) Developing sustainable energy systems and quantifying the performance of new systems, and (4) Supporting development of science-based energy and environment policy relevant to Canada's broad policy goals.

Cluster: Human aspects of Healthy Environments

Queen's has established a strong foundation in environment and sustainability research involving multidisciplinary activity related to the human aspect of developing and enhancing healthy environments. This encompasses the workplace environment and occupational health, as well as the socio-cultural, legal and economic aspects of healthy environments.

Cluster: Ecology and the Natural Environment

Researchers are addressing the impacts of natural-resource utilization (water, energy and minerals) on the environment and society, by bringing scientific and engineering knowledge of natural resources to bear on issues of social relevance nationally and internationally. Researchers are working on environmental

assessment, remediation, biotechnology and analysis, and understanding sustainable water supply and regional groundwater flow in complex fractured rock environments and groundwater-lake interactions.

Cluster: Energy Systems

Queen's research encompasses all aspects of energy research from the conventional, oil and gas, to carbon capture and storage, to the alternative, from solar, wind and nuclear technologies to smart grid applications and electric vehicles. Areas of research in conventional energy include: operations management, design optimization through energy and environmental process engineering, pipelines, biorefining, combustion, and contamination and clean-up. Carbon-capture and storage research includes homogeneous catalysis, carbon and nitrogen cycling, systems modelling: life cycle and GHG impact analysis.

Areas of research and developing areas of strength in alternative energy include: thermal systems, photovoltaic, turbulence, power, instrumentation, controls and modelling, design optimization of hybrid drive trains, grid systems and energy storage. With an NSERC Research Chair in Nuclear Materials and with the Nuclear Materials group, world-leading research is being carried out in the area of structural materials for nuclear power applications.

Cluster: Energy and Environmental Policy

Research areas in support of Environment and Sustainability have been identified as follows: (1) Ecology, Evolution and Conservation of Biodiversity (2) Environmental Measurement, Monitoring and Modelling (3) Environmental Chemistry and Toxicology (4) Environmental Change and Planning (5) Environmentally Sustainable Technologies (6) Northern Environments, Resources and Policy (7) Society, Culture and Economic Sustainability (8) Remediation and Protection of Soil and Groundwater (9) Water and the Environment (10) Integrated Environmental and Energy Policy.

Theme 3: Creating, Discovering and Innovating

Priorities in this theme include (1) Creating and producing nationally and internationally recognized performances, including music compositions, theatre productions, shows and screenings (2) Supporting foundational research and inquiry through exploration and discovery in the areas of the natural and physical sciences (3) Developing advanced materials, with improved physical, social or environmental properties over conventional alternatives, and in particular, green chemicals and polymers and nuclear materials (4) Creating advanced technologies, which can create new products or make existing processes "greener," thereby improving the lives of global citizens and their environments.

Cluster: Creative Production and Expression

Research areas within this cluster include: (1) Drama (2) Cinema (3) Music and Composition (4) Art (5) Conservation of Art, Textiles and Artifacts (6) Performance (7) Contemporary and Historical Creativity (8) Research Creation in the Arts.

Cluster: Natural and Physical Sciences

Research areas within this cluster include: (1) Cognitive Science (2) Interdisciplinary Chemical Sciences (biological-medicinal, materials, computational-theoretical and environmental-analytical chemistry) (3) Earth System Science (4) Evolutionary Science and Genetics (5) Nanoscale Structures and Interactions (6) Origins and Structure of the Universe (7) Theoretical Science and Mathematics.

Cluster: Materials

Advanced materials expertise is associated with CRCs in Mechanical and Materials Engineering, Engineering Physics, Chemical Engineering, Civil Engineering, an NSERC Chair in Nuclear Materials, and the Polymers Research Group. Research areas within this theme include: (1) Innovative Materials (2) Materials Science.

Cluster: Advanced Technologies

Research areas within this cluster include: (1) Applications of Computational Science (2) Biomedical Applications (3) Biotechnology (4) Design and Rehabilitation of Infrastructure (5) Modelling and Control of Processes (6) Green Chemistry (7) Advanced Manufacturing Processes (8) Mechatronics and Robotics.

Theme 4: Securing Safe and Successful Societies

Our priorities in this area include (1) Supporting democratic, economically viable systems of governance through active engagement in public policy (2) Improving the quality of information as well as the effectiveness, including the security, of communications tools, with particular focus on networks and telecommunications (3) Contributing to the secure design of infrastructure, with a focus on security of water and large resource extraction processes.

Cluster: Democracy, Economy, and Public Policy

Research areas within this cluster include: (1) Communities, Conflict and Negotiation (2) Democracy, Identity and Citizenship (3) Health Policy and Law (4) International Relations and Development (5) Knowledge-Based Enterprises (6) Organizational Behaviour and Change (7) Social and Economic Development, Regulation and Policy (8) Values, Laws and Policies (9) International and Defence Policy (10) Labour and Employment Law (11) Surveillance.

Cluster: Information and Communications

Research areas within this theme includes: (1) Computer Architectures and Interconnection Networks (2) Computational Science (3) Management Information Systems (4) Technological Innovation and Society (5) Wireless Technologies and Telecommunications (6) High Performance Computing (7) Media studies and Mobile Learning.

Cluster: Infrastructure

Security of infrastructure and water resources has been gaining heightened awareness within the public domain and Queen's researchers are undertaking important research to solve these security problems. Research strengths include: modeling, simulation and control of mining systems, blasting and mineral processing, structural engineering with a focus on various materials, such as concrete, steel, wood and other composites pertaining to the design, construction, maintenance and rehabilitation of structures such as bridges, building breakwaters and guideways.

Landfill design, landslide investigation and modeling, long-term degradation of dams, design of surface and underground works for mining and tunnelling, studies on shallow and deep foundations, including pipes, culverts and other buried infrastructure, as well as earthquake engineering are just a few of the areas of specialization undertaken by the researchers in Civil, Mining and Geological Engineering.

Appendix A: Signature Programs

Signature programs are those particular areas of research and scholarly activity distinguished by specific investments (e.g., named, endowed and sponsored chairs; university based centres and institutes) and research opportunities (e.g., centres of excellence; major research platforms).

1) Named, Endowed and Sponsored Chairs:

- Alfred Bader Chair in Organic Chemistry
- Alfred and Isabel Bader Chair in Northern Baroque Art
- Alfred and Isabel Bader Chair in Southern Baroque Art
- Baillie Family Chair in Conservation Biology
- Bell Canada Mental Health and Anti-Stigma Research Chair
- Bracken Chair in Genetics and Molecular Medicine
- Cancer Care Ontario Research Chairs: Health Services Research, Medical Imaging and Experimental Therapeutics
- Chair in Mine Design, Government of Ontario
- David Chadwick Smith Chair in Economics
- Donald and Joan McGeachy Chair in Biomedical Engineering
- DuPont Canada Chair in Engineering Education Research and Development
- Edith and Carla Eisenhower Chair in Clinical Cancer Research
- Gordon and Patricia Gray Chair in Particle Astrophysics
- Hannah Chair in the History of Medicine
- James H. Day Chair in Allergic Diseases and Allergy Research
- Jarislowsky-Deutsch Chair in Economic and Financial Policy
- Mining/Mechanical Engineering Chair
- Noranda-Falconbridge Chair in Mine Mechanical Engineering
- NSERC Chair in Design Engineering
- NSERC Chair in Nuclear Materials
- NSERC Chair in Minerals and Metals Processing Engineering
- NSERC/RIM Industrial Research Chair in Software Engineering
- Ontario Research Chair in Bioethics
- Ontario Research Chair in Green Chemistry and Engineering
- Sir John A. Macdonald Chair of Political and Economic Science
- Stauffer Dunning Research Chair
- Stauffer Chair Cancer Research
- UNESCO Chair in Arts and Learning

2) Networks of Centres of Excellence:

- Promoting Relationships and Eliminating Violence (PREVNet)
- Tech Value Net

3) Research Centres and Institutes:

- Canadian Institute for Military and Veteran Health Research (CIMVHR)
- Cancer Research Institute (CRI)
- Centre for Energy and Power Electronics (ePOWER)
- Centre for Health Services and Policy Research (CHSPR)
- Centre for International and Defence Policy (CIDP)
- Centre for Law in Contemporary Workplace (CLCW)
- Centre for Neuroscience Studies (CNS)
- Centre for Studies in Primary Care (CSPC)
- Centre for Studies on Democracy and Diversity (CSDD)
- Fuel Cell Research Centre (FCRC)
- GeoEngineering Centre at Queen's-RMC (GeoEng)
- High Performance Computing Virtual Laboratory (HPCVL)
- Human Mobility Research Centre (HMRC)
- Institute for Intergovernmental Relations (IIR)
- John Deutsche Institute for the Study of Economic Policy
- Queen's Institute for Energy and Environmental Policy (QIEEP)
- Southern African Research Centre (SARC)
- Sudbury Neutrino Observatory Laboratory (SNOLAB)
- Surveillance Studies Centre (SSC)
- The Monieson Centre

4) Platforms:

- High Performance Computing Virtual Laboratory (HPCVL)
- Queen's University Biology Station (QUBS)