

# BUILDING ON STRENGTH

York University's Strategic Research Plan 2013- 2018



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## EXECUTIVE SUMMARY

Over the past 10 years, research at York has flourished, with one of the highest rates of growth in the intensity of publication of research and scholarship in Canada and a near doubling of research income accompanied by recognition of the impact of York's research as being within the top 10 of Canadian universities. With internationally leading Faculties of Business, Law and Fine Arts, and world class departments and programs throughout the University, and particularly in the social sciences and humanities, we are proud of our accomplishments, but much remains to be done.

Supporting the University's Academic Plan, this new research plan "Building on Strength" provides a vision for accelerating the growth and development of research, scholarship and creative activity at York over the next five years. It articulates the unique character of research at York, in which the quest for discovery and innovation is guided by commitments to critically engaged scholarship, advancing social justice and providing a lasting legacy of benefits to cultures and societies.

York University is a leader in research that crosses disciplinary boundaries, and this is reflected in the narration of our research across six intersecting themes:

*Advancing Fundamental Discovery and Critical Knowledge*  
*Analyzing Cultures and Mobilizing Creativity*  
*Building Healthy Lives and Communities*  
*Exploring the Frontiers of Science and Technology*  
*Forging a Just and Sustainable World*  
*Integrating Entrepreneurial Innovation and the Public Good*

We are committed to ongoing investment in the growth and development of our research strengths and to the overall enhancement of our academic reputation. Our innovative research environment informs our teaching and is one of the key factors that make York an exciting and attractive place for our students at all levels and that attracts our internationally renowned faculty.

Within the breadth of outstanding research at York, there are some more focused areas, where past accomplishments, new developments, momentum and timing provide particular opportunities for building research success. For the next five years we see opportunities to significantly advance research of our six themes as well as particular opportunities in five areas:

*Digital Cultures*  
*Engineering Research that Matters*  
*Healthy Individuals, Healthy Communities and Global Health*  
*Public Engagement for a Just and Sustainable World*  
*Scholarship of Socially Engaged Research*

Each of these areas of opportunity transects one or more of our research themes. Through this strategic combination of broadly based and focused investments over the course of the next five years, York will continue

its impressive development as a leading Canadian research University whose scholarship enhances our culture and improves our society.

Supports to advance this agenda will be implemented at individual, Faculty and Institutional levels.

## RESEARCH VISION

York University is committed to excellence in research and scholarship in all its forms. Informed by a strong commitment to shared values, including the promotion of social justice and the public good, we aspire through our research to better understand the human condition and the world around us and to employ the knowledge we gain in the service of society. Intensive engagement in research is a core institutional value that permeates the fabric of the University, and it is this foundation on which York's vibrant and exciting academic environment is built.

## INTRODUCTION

### A PROUD TRADITION OF CRITICALLY ENGAGED SCHOLARSHIP

York University is Canada's third largest university and is strategically located on the border of York Region in the Greater Toronto Area. Over the past 50 years, York University has developed a proud tradition of scholarship that has been defined by engagement in a critical discourse in which the pursuit of discovery and innovation is achieved with a focus on social responsibility and justice. From its beginnings in 1959 as a small liberal arts college to its present standing as a diverse and comprehensive research and teaching institution, York University has focused not only on new discoveries and the creation of knowledge but also on how this knowledge can be used to benefit cultures and societies as broadly as possible.

Research at York is research that delivers results. In areas as diverse as the fine arts, social sciences humanities, French/English bilingual education, health, business, law, environmental studies and science and engineering, York is recognized for the quality of its work. For example, York is consistently ranked internationally in the top 15 universities for business research, the top 40 for history and the top 100 for English language and literature, modern languages, linguistics and geography. In addition, our faculty is replete with scholars and artists who are nationally and internationally recognized. When measured by impact, research in both social sciences and humanities and science and engineering have ranked within the top 10 universities in Canada and within the top five in the Province of Ontario.

York researchers have played key roles in many of the most important scholarship and discoveries of the past half century. Among these accomplishments are the discovery of the Higgs boson and the exploration of Mars; changing the way we think about bullying, aggression and violence, especially among marginalized people and children at risk; developing novel approaches to health care delivery; developing insight into social and political history of Canada and understanding the environmental changes brought about by colonial expansion on indigenous societies; making advancements in cognitive neuroscience and vision and probing the impacts of digital gameplay; exploring how slavery and the colonization process affected societies and shifted geographical contexts across the globe; studying the formation and development of language policy in Canada; generating new insights into brain development in

children with autism and understanding how bilingualism can delay the onset of Alzheimer's disease; encouraging civic dialogue through performance and public art; examining social inclusivity and urban development; exploring the global plight of refugees; questioning the ways in which European political and environmental cultures translate in the Canadian context; mapping the spread of infectious diseases through mathematical modelling; and examining whether bird behaviour can help species adapt to the drastic changes humans are making to the environment. York researchers and scholars are undertaking outstanding visionary research that has local, national and international significance.

New faculty members at York follow in the tradition of our many accomplished scholars - including Royal Society Fellows, Killam Professors, Humboldt Fellows, Fulbright Scholars, Steacie Medalists, Molson Prize winners, 3M winners, Queen Elizabeth Diamond Jubilee Medalists, Trudeau Fellows, Governor General Award winners, Canada Research Chairs and Distinguished Research Professors - in their dedicated pursuit of new ideas, new innovation and solutions to the most challenging problems facing society today. The work of our scholars enriches the teaching, research and overall learning environment for our students - our brightest minds and our next generation of leaders and thinkers.

York graduates with advanced research degrees have gained national and international acclaim in the exploration of space, the pursuit of justice, public service, the advancement of science, historical research, literature, film and performance studies. Other York graduates have become pillars of the business, legal, political, philanthropic and arts communities and have assumed positions of high visibility in the media and the public sphere.

Through York's integrated approach to teaching and research, undergraduate and graduate students, as well as postdoctoral fellows, enjoy the active mentorship of internationally recognized scholars, access to cutting-edge research infrastructure and an exciting and engaged environment for the pursuit of discovery. York hosts one of the largest cohorts of graduate students in the country, and York's graduate students and postdoctoral fellows are key drivers of the University's research and scholarly success. Students and fellows come to York from around the globe and are supported through prestigious national and international research scholarships and fellowships. York is committed to enabling our students to acquire, advance and apply their skills and knowledge and to providing exceptional supervision, engagement and instruction that supports a high quality educational experience.

As York builds for the future, we will advance this proud tradition of critically engaged scholarship. We will achieve our objectives of national research leadership and increased international recognition by building on our strengths, broadening our base of research and increasing our intensity of engagement. Over the next five years, this will be reflected by increased recognition of our research, scholarly and creative work through enhancement of our ranking in national and international surveys, increased attraction of high quality undergraduate and graduate students and postdoctoral fellows, continued growth in our research income and publication quality and intensity, and further broadening of our external partnerships and engagement.

## PURPOSE OF THE PLAN

This plan tells the story of research, scholarship and creative activity at York for both internal and external audiences, highlights our strengths and aspirations, and identifies broad opportunities for building research at York across the disciplines.

The overall directions for academic development for York University are set out in the University's Academic Plan "Enhancing Academic Quality in a Globalized World 2010-2015", in the 2010 Provostial White Paper "Building a More Engaged University 2010-2020" and in our 2012 provincial strategic mandate agreement submission. These plans speak to the University's crucial nature of research, and to the institutional goal to enhance its reputation of quality scholarship and to be recognized for its accomplishments. Underlining both documents, and as expressed in the 2010 Academic Plan, is the commitment to

*highlight primary goals of research intensification and recognition driven through international standards of peer review, with an emphasis on research cultures, and the advancement of partnerships locally, regionally and internationally.*

The purpose of this Strategic Research Plan is to support the University's Academic Plan by providing a high-level framework that articulates our core values and aspirations for research and scholarship. It offers overall context and direction for the development of York's research enterprise over the next five years. This plan is built upon and informs Faculty and Unit-level plans, providing a platform upon which researchers across the University are empowered to achieve their objectives.

## A BROADLY BASED PROCESS OF ENGAGEMENT

The success of academic plans depends on the engagement of the academic community in the planning process. From the announcement of the strategic research planning process in the spring of 2012 through the presentation of the plan for Senate approval in the spring of 2013, the York community has undergone an intensively open and attentive discussion about the role of research, our valuation of research and our aspirations for the future of research at York. Guided throughout the process by an active and dedicated advisory committee with representatives from the University and the broader community, the Office of the Vice-President of Research and Innovation has actively reached out to solicit input from the York community, emphasizing the broadest possible level of consultation in keeping with York's practice of collegial governance. The input from faculty members, students and staff was invited through a series of open fora, workshops and visits on campus and through an active web portal that invited engagement in the planning process, including a web-based survey, posting summaries of what was said at all events, as well as a page for comments and suggestions. Essential inputs into the plan's development were provided directly by the Faculties through their councils and decanal representatives, as well as through the Academic Policy, Planning and Research Committee of the Senate and other research leadership bodies.

With over 2,800 points of contact through the consultation process, the York community has shown an enthusiastic response to the planning process that has highlighted our valuation of and aspirations for research at York in the context of the overall academic mandate of the University. This plan takes up those aspirations in providing guidance for the growth and development of research at York for the next five years.

## **A COMMITMENT TO QUALITY, ACADEMIC FREEDOM AND SOCIAL JUSTICE**

York strives for the highest academic standards and its strong commitments to academic freedom and social justice and responsibility are woven into the University's fabric. It is the unwavering support of these values by every member of the York community from which the institution derives its strength. The support for these values is a foundational principle of the Strategic Research Plan. It is critical to York's overall success that faculty continue to enjoy maximal liberty in the choice and pursuit of their scholarly work. By holding research and advancement of knowledge across the full spectrum of disciplinary and interdisciplinary activities as essential and integral to our academic mission, York contributes to critical inquiry, scientific discovery and the social and economic development of Canada and beyond. Informed and supported by the consultation process, the values and core principles shared by our research community serve to strengthen and underpin our research priorities.

York is intensifying and building on our research strengths across traditional and non-traditional areas of research, scholarship and creative activity, as reflected by international standards of peer review. We recognize as a community that individual research and scholarship is the foundation upon which the research enterprise at York is built. Only with this solid foundation can we expect to successfully expand our reputation for research excellence. As a community, we acknowledge the importance of graduate students and postdoctoral fellows to the success of our research and scholarship and we are providing them with the best possible supports as they pursue their training.

At the same time, the York community understands the value of collaborative research and the need to translate discovery into action. We value innovation in all its forms and recognize the importance of leveraging the results of our scholarly activities into outputs that can provide tangible benefits to society and the world around us.

Collaborative research at York is special. York has seized on the opportunities provided within a comprehensive institution to make long-term investments in supporting participatory and collaborative research and scholarship that cross the boundaries of traditional disciplines and that reach out into York Region, Canada and the world. York's emphasis on interdisciplinarity in its strategic research development provides national and international leadership in the promotion of new approaches to research and scholarship. Paired with York's engagement in developing partnerships with the public, private and non-profit sectors and outreach to external communities as partners in research, York provides a unique environment in which research that is sensitive to its partners' needs can be translated into cultural, environmental and economic benefits.

## **COMPREHENSIVE RESEARCH EXCELLENCE ACROSS THE INSTITUTION**

As an institution with a broad academic mandate, research, creative and critical scholarship flourish across all of the disciplines expected from a comprehensive institution with a strong grounding in the liberal arts and sciences, and particularly strong research-oriented professional schools. In providing broadly based training, even the largest universities gravitate towards focusing their research and creative activities in areas where their history, setting and other aspects of their situation provide them with specific opportunities and advantages in developing scholarship in areas of need, and which offer them a range of opportunities for future research and growth.

At York University, our research has developed with a strong engagement in interdisciplinarity and a dedication to critical scholarship that advances social justice. When examined through a lens that cuts across disciplines, research at York clusters around six broad themes:

*Advancing Fundamental Discovery and Critical Knowledge*  
*Analyzing Cultures and Mobilizing Creativity*  
*Building Healthy Lives and Communities*  
*Exploring the Frontiers of Science and Technology*  
*Forging a Just and Sustainable World*  
*Integrating Entrepreneurial Innovation and the Public Good*

The scholarship and research within each of these themes are both informed by disciplines and are inherently interdisciplinary and transdisciplinary in their development and application. These themes capture areas of research in which York University is demonstrating national and international leadership.

Each theme includes a broad segment of scholarship and is built upon a number of research strengths. York is fully committed to fostering the continuing development of research and scholarship across the breadth of these themes and to supporting these in the long term. In particular, we will continue to support our recognized areas of research strength as we invest in areas of emerging activity where national leadership and international recognition can be achieved.

#### **ADVANCING FUNDAMENTAL DISCOVERY AND CRITICAL KNOWLEDGE**

- » Whether in the humanities, social sciences, fine arts, natural sciences or beyond, pure research is emphasized across a large sector of York's research enterprise.
- » Many of the greatest advances in the arts, humanities, social, natural and medical sciences are due to exemplary individual contributions. University-based research must provide ample space for scholars to explore uncharted territory in their areas of expertise.
- » The advancement of knowledge entails the examination and critique of existing structures and thinking, as well as the creation of new forms and expressions. Universities must nurture the drivers of innovative and critical ideas.

Research at York begins with appreciating the importance of fundamental inquiry and creative scholarship. Throughout the University, scholars are investigating the world around us. From the study of moral, political and legal philosophy to pure mathematics; from the study of molecular and subatomic interactions to understanding the human brain; from poetic representations of data and generative systems in light and sound installations to the novel use of artificial agents in interactive environments; from the study of the formations of cultures and languages and the origins of government to historical analysis of the development of political institutions and social formations; from the study of chromosomes to the understanding of the cosmos. The basic discovery of our world provides valuable insights into our potential as human beings.



As a publicly funded institution, York emphasizes the benefits and application of the research we conduct. We also recognize that pure scholarship and the development of creative works remain essential to the research mandate of a university and a country and that these need to be strongly encouraged and supported. The success of fundamental inquiry requires a long-term approach. We also need to accept that the road to success and fruitful applications will not be linear, but will likely meander and be full of surprises. Much of this scholarship is pursued by individuals or small groups, with a degree of immediate focus that seems without immediate application or impact.

The engagement in pure, discovery-oriented research is a particular privilege for and responsibility of the University's faculty and students. York expects national and international leadership as a result of such engagement. The quality and recognition of this foundational research is validated through international standards of peer review, prizes and awards that recognize the University's work and that provide funding for this work. At York, the advancement of fundamental discovery research is sought through the formulation and exploration of critical questions that push the boundaries of traditional modes of inquiry and scholarship. A primary function of universities is to train critical minds, to inspire new generations who are trained to think of the impossible as the not yet possible and to encourage questioning of the fundamental values and assumptions of our world. The promotion of critical scholarship that challenges our assumptions and that questions our values helps us to understand the world as we see it today, and it helps us to transform it into the better place we envision for tomorrow. Critical scholarship at York is a hallmark of the institution and is apparent in the research conducted in the sciences, humanities and social sciences. York also enjoys a proud tradition of achievement in law, education, fine arts, business and administrative studies and libraries. This tradition includes strong scholarship in moral, political and legal philosophy, in the study of ethics and in the cognitive sciences.

In the social sciences and humanities, a critical approach to research embraces reflective assessments of society, cultural change and ways of knowing. To advance critical social and cultural theory, researchers in these fields are exploring historical change; political activism; the social and economic transformations of societies around the world; and how culture has been and continues to be a crucial means of expression and avenue for creative problem solving. York researchers explore a range of moral, political, feminist and legal philosophies and ethics, and are expanding the critical analyses of gender, sexuality, age and ability. Across disciplines, the profound dedication to equity is reflected in a broad range of research devoted to understanding and transforming attitudes towards constructs of race, class, gender and power differentials in a range of social, political and economic formations. Researchers are exploring language acquisition and theories of linguistic variation and change so that we can understand more clearly the role and impact of language in multicultural societies. By pushing the boundaries of innovative form and expression in the visual and performing arts, researchers probe cultural attitudes towards race, sexual identity and marginalized groups. Through a critical lens, researchers at York are exploring the impacts and effects of the global movement of people, by displacement or through growing diasporas. They are at the forefront in the study of the effects on society of political, social and cultural inequities, injustices and human rights violations. When we enhance our understanding of world religions, ancient and current cultural practices, and the exigencies of political and economic powers, we can make better sense of a complex world. At the same time, research into the

role of archivization in knowledge dissemination and preservation informs the communication of new knowledge. Critical inquiry allows us to hear voices otherwise silenced by historical or contemporary injustice or marginalization.

York displays strong research leadership in discovery science across physics, chemistry, mathematics and biology, psychology and other disciplines. For example, the astrophysics group uses observations and theory to study the origin of the Universe and how galaxies like our own Milky Way take shape. The quantum optics group has cooled atoms to near absolute zero and in doing so has created Canada's first Bose Einstein Condensate. Novel precision laser spectroscopic techniques are used to measure fundamental constants and precise isotope shifts. York's researchers are collaborating on large-scale international initiatives as part of our membership in TRIUMF, Canada's National Laboratory for Particle and Nuclear Physics. More recently, York researchers have been involved in an international collaboration led by Canadians at the European Centre for Nuclear Research (CERN) to manipulate antihydrogen.

Biological research at York extends from molecules to cells, organisms, populations and ecosystems. Researchers are pioneering the use of light-logging geolocators to track the migration of birds and explore how weather conditions influence migratory behaviour. York researchers are pushing the boundaries of genomics and proteomics to more fully understand how the expression of genes is regulated and to determine the structure and function of proteins and other factors encoded by the genome. Researchers have developed innovative approaches to investigate the diversity and functionality of the proteome resulting from alternative splicing and post-translation modifications. Physiological, metabolic, behavioural, biochemical and genetic processes are being investigated in different model systems, including yeast, filamentous fungi, insects, fish and mice. Researchers in chemistry and biology are elucidating the structure of molecules and proteins by nuclear magnetic resonance spectroscopy X-ray crystallography and mass spectrometry, and are making seminal contributions to chemical biology, organic, inorganic and physical chemistry.

Pure mathematics is another example of a field where a researcher often proceeds into new territory only driven by the desire to probe fundamental theory. Innovative and critical advances in pure mathematics often find application only decades after their conception and in ways never anticipated by their originators.

## **ANALYZING CULTURES AND MOBILIZING CREATIVITY**

- » This theme explores culture and creativity at the intersections of social innovation and tradition.
- » It addresses directly York's diverse and strong expertise in the fine arts, including dance, design, film, music, theatre, creative writing, visual arts and digital arts, as well as a broad spectrum of research in liberal-arts based disciplines that include literature, languages, linguistics, humanities and social sciences.
- » As well, it encompasses scholarship from education and environmental studies and a range of other disciplines.

York University is widely recognized as a major contributor to the advancement of creative work and scholarship in arts and culture in Canada. The vitality and diversity of our innovative research and creative scholarship places us as

an emerging global leader in cultural production and creative research. This dynamic creativity is complemented by critical analysis of both culture and cultural production.

The University community is drawn together by the breadth and scope of scholarship in communications and cultural studies, fine arts, digital arts and arts-based education, philosophy and environmental studies, languages, literature and linguistics, technical and creative writing, and translation. Through this research, leading arts and humanities scholars, librarians and practitioners cut across traditional disciplinary boundaries to facilitate dynamic collaborations. Within this thematic area, critical and creative features are mutually informative and often interwoven, whether in the publications of scholars in our research programs, the practice-based production of artists, designers and performers in York's studio programs or in areas that traverse the two.

York's research in the areas of culture and creativity spans an extensive spectrum of disciplines and influences a range of social, cultural and technological development in the public, private and non-profit sectors. This diverse and interdisciplinary research draws on internationally leading expertise that can be found at the intersection of arts and digital technologies, including digital humanities and education, digital culture and digital arts. In digital arts, York's researchers are investigating the future of narrative, emerging forms of cultural expression, interactive storytelling and interactive cinema. As part of York's Future Cinema Lab in the Faculty of Fine Arts, the Augmented Reality Lab offers artists and designers the opportunity to explore new screen technologies, approaches and techniques through production and theoretical study of augmented reality as an emerging medium. This work increasingly deals with large repositories of data and data-driven research methodologies to investigate interactive and immersive visualizations. The York-led Centre for Innovation in Information Visualization and Data-Driven Design (CIV-DDD), the preeminent research hub for innovation and training in information and scientific visualization in Ontario, facilitates the development of the next generation of data discovery, design and visualization techniques. Other researchers in physics and engineering are pushing the boundaries of quantum computing, setting the foundation for the future of computing, while York's legal scholars are exploring IP law and policy issues predicted from the next generation of digital technologies. York's research librarians are active stewards of the University's research assets and advance our research culture and reputation by providing important leadership and infrastructure for evolving data-driven research methodologies, such as those seen in the emerging digital humanities.

At York, creative cultural production is complemented by the critical study of cultural traditions, cultural production and performance practices. Scholars in English, French studies, Spanish studies, humanities, and languages, literatures and linguistics, as well as throughout the fine arts, excel in all genres of their studies, from the earliest expressions to today's global spectrum of voices. In anthropology, researchers critically analyze our place in the world. Their work explores how people are subjected to, participate in and contest the processes of living in a world that is interconnected by powerful economic, cultural and technological forces. Scholars in history examine the forces and thinking that shaped cultures in the past as a starting point for acting and thinking in the present. In communications studies and political science, researchers explore the politics of contemporary, popular and more traditional forms of cultural expression. Linguists at Glendon College have been assisting in the development of

language policy as it affects public education in Nunavut and are providing insight on its impact and the threats experienced by francophone cultures in Ontario and Quebec, and internationally.

Researchers are exploring art, digital media and globalization to better understand how artists in different cities contribute to the development of new cultural and information landscapes. Scholars in this area are documenting new cultural formations (that is, practices and public art installations using technologies to create new cultural experiences that engage audiences) and community-based cultures (that is, the ways the new diasporic communities are making an impact on the cultural landscape of Canada today) - from urban parks to transitory performances in neighbourhoods to virtual spaces on the Internet. Research outcomes include exhibitions, curatorial interventions, performances and publications. Design researchers imagine new user interfaces for the future that inform our understanding of communications technology in the world today. Dance researchers are focusing on dance science, particularly injury prevention, motor learning and motor control, conditioning for dancers and psychological aspects of injury. Additional scholarship focuses on dance history and criticism. York's music scholars are engaging in highly recognized investigations, integrating academic studies and studio training across a wide range of musical cultures and traditions. For example, ethnomusicological research is exploring the lived experience and the ongoing significance of music in defining self and community within a context of global destabilization.

In theatre, York researchers have traced the genealogical development of performance studies in Canada and forged important connections with scholars using performance studies frameworks in other disciplines. They are providing leadership in major international research projects from Bali to South Africa, which include the history of theatrical design and understanding the traditional narrative of theatre development through tracing the transnational flow of theatrical objects and ideas. In cinema and media studies, researchers are exploring the intersections of cinema and media with technology, art and photography in the fields of architecture and art history, spectatorship and politics. Researchers are concentrating on new forms of digital media that include gallery installations and mobile media, as well as video scholarship in European art cinema, Canadian cinema, mid-century Hollywood cinema and contemporary Chinese and Japanese cinema.

The crucial intersections between science, technology and the arts are other key areas of research in this theme. The Interactive Systems Research Group (ISRG) facilitates research on human-computer interaction, computer-supported collaborative design systems and multimodal communications for persons with disabilities. Research also integrates scholarship in education and emerging trends in lifelong learning technologies, digital media and information literacy. As well, researchers exploring the design and development of play-based multimedia learning tools, simulations and environments are transforming learning by integrating art and technology with new models of pedagogy.

## **BUILDING HEALTHY LIVES AND COMMUNITIES**

- » This theme encompasses the study of health, from age-related ailments and disease prevention, through cognitive and physical health, to the influence of income inequality, the social determinants of health as well as the health of communities and global health.

- » It includes but is not limited to needed changes in health policy, services and systems, as well as research in the biomedical and clinical sciences and population health.
- » It speaks to the nature of well-being and the study of how to achieve high-quality, lifelong well-being for individuals and for society, including physical, mental and social well-being.
- » Contributing disciplines include but are not limited to biology, psychology, law, sociology, political science, anthropology, education, economics, environmental and mathematical science, kinesiology, nursing and health policy, management and eHealth.
- » This theme provides a foundation of research and scholarship that will support the completion of the next phase of York's academic development through the building of an academic health network with diverse health organizations in York region. This initiative supports the ongoing development of the Faculty of Health and sets the stage for a medical school that focuses on integrative clinical and preventive medicine, interdisciplinary service delivery and health promotion.

York supports an impressive range of health research and associated expertise that is focusing on improving health outcomes and bridging new knowledge and applications to improve the understanding, prevention and treatment of disease and injuries. These initiatives include biomedical exploration; the study of the social determinants of health and age-related ailments; the promotion of mental, creative and physical health; critical examinations of disabilities; analyses of global health and health policy; health data mining and management; exploring bullying behaviours; and situating wellness in the contexts of history and culture. This interdisciplinary approach to health research is making a significant contribution towards improving the overall health and well-being of individuals and communities. Researchers at the University are exploring the effectiveness of strategies that address health-related inequalities for all people, including those who are marginalized and face increased health risks. As well, they are exploring new directions in health policy and community action, healthcare diagnosis, intervention and services.

A sampling of York's integrative health research extends from the laboratory to the community. For example, our cognitive neuroscience researchers are advancing our understanding of how the brain works in linking vision with behaviour thereby making connections to improved rehabilitation for stroke patients and patients with head injuries. As well, our researchers are offering new routes of investigation and insight into the genetic, molecular and cellular neurobiology and environmental effects on brain development in children with autism. Interdisciplinary teams, including health and dance researchers, are generating new insights into diabetes and its prevention through physical activity and diet. York's biologists and chemists are advancing discoveries in cancer research, developing new therapies and enhancing quality of life for cancer patients. Our faculty members are working to address discrimination by monitoring the human rights of persons with disabilities worldwide. Others are exploring critical questions involving muscle health and its contribution to metabolism, mobility and the quality of life and healthy aging. York scholars are partnering with public organizations and private sector industries to advance people-centred health and healthcare through integrated electronic health records and mobile technology, as well as creating training programs and professional standards for the new health coach profession being developed at the University. This initiative is a first in Canada to combine multiple skill sets in health promotion, disease and injury prevention, and behaviour change. Nursing faculty members are exploring ways to improve safety through enhancing patient-centred care. Researchers working with the internationally recognized Centre for Vision Research

(CVR) are tackling a variety of health concerns and are engaging in research ranging from brain disorders to visual deficits in Canada's aging population.

The health and well-being of individuals and communities reflects a complex interaction among social, biological, political, behavioural, environmental, economic, cultural and historical factors. York researchers in the social sciences, social work, creative arts and education are studying the health implications of homelessness, youth culture and community development within urban settings, as well as examining criminal victimization and innovative approaches to addressing youth health. Historians are studying how concepts of health have changed over time and how humans have responded at various moments to epidemics and other health challenges in a variety of geographical settings. Researchers in education are focusing on enhancing literacy and educational involvement and well-being among marginalized populations, including Aboriginal peoples. Sociology researchers are providing a critical voice in the debate over health care reform in Canada. They are addressing privatization, healthy aging, the erosion of universal health care, nursing shortages and inequities in health care. York has several national-leading programs in health studies, social work, disaster and emergency management. Our innovative work in human resources management on lifelong well-being and work/life balance highlights our comprehensive approach to the study of health that places an emphasis on community engagement, social justice and critical theory. Another area of key research focuses on the contribution of the creative arts to health and social well-being and the balance of health care equity for different groups such as Aboriginal people, women, rural populations, persons with disabilities, economically disadvantaged groups, immigrants and ethnic and cultural minorities. Anthropologists are exploring key issues in global women's health and Aboriginal health as part of a larger critical exploration of biomedical knowledge in cultural, social and historic contexts.

York houses a number of research centres, laboratories and facilities that coordinate and focus research in health-related areas. For example, the Sherman Health Sciences Research Centre, a hub of vision and neuroscience research excellence, brings together researchers in York's Centre for Vision Research (CVR), kinesiology and psychology in state-of-the-art facilities that include functional magnetic resonance imaging (fMRI). York's new Life Sciences Building was opened in 2012 and provides top-notch learning and research facilities with leading-edge technologies for advanced imaging. Its two multi-user research hubs - the Biomedical Imaging Facility and the Bioanalytical Facility - are among the most innovative in Canada. York houses one of Canada's most advanced spectrometry laboratories and offers premier technology in proteomics. A rich concentration of health research within York Institute for Health Research (YIHR) brings together faculty from interdisciplinary teams and cross-sectorial networks encompassing a range of social, environmental, biomedical and behavioural scientists, as well as faculty members undertaking related research in disease modelling, business, law, education and the physical sciences. Glendon College houses state-of-the-art neuropsychological testing facilities that are used to research the detection and management of cognitive disorders in the elderly francophone population. York's focus on child and youth research produces leading scholarship on health, education, relationships and development of infants, children, adolescents and families. Other areas of health-related research include skeletal muscle health; the influences of air and water quality and atmospheric particulate matter on human health; the association of

sustainable growth on individual and population health; the use of biomolecular interactions to diagnose and treat diseases; and women's health, sexuality education, and LGBT activism and human rights.

External partnerships are integral to York's health-focused research. We have local partnerships with industry leaders, regional hospitals, family health teams, public health and the Central LHIN (Local Health Integration Network). Internationally, we have partnerships with organizations in the United States and Western Europe, India, the Middle East, Eastern Europe, China, South America and Africa, sharing with each the mutual goal of helping people live healthier lives and co-creating rejuvenated health systems.

York's faculty contribute to the development of cutting-edge health research that is changing the dynamics of health issues, health care services and health systems both in Canada and globally. These research projects cover a breadth of topics and make invaluable contributions to health improvement for Canadians and people around the world. The topics on which they focus include citizenship and human rights; political, economic, gender and equity issues; applied mathematics; health and the environment; health governance; law and policy.

### EXPLORING THE FRONTIERS OF SCIENCE AND TECHNOLOGY

- » This theme explores the complexity of science and engineering, technological innovation and the fundamental challenges arising in our global ecosystem.
- » The projects in this theme focus on research and development in biology, psychology, chemistry, physics, computer science and engineering and often include industrially relevant discoveries and innovations.
- » Disciplines included in this theme are mathematical and information sciences, humanities and social sciences, health sciences, law, environmental studies, and science and technology studies.

York's interdisciplinary and collaborative research programs encompass a full range of pure and applied science research, including life sciences and biology, physical, earth and space sciences, computing, mathematics, chemistry and engineering. Our researchers work at the forefront of discovery and application with projects ranging from subatomic particles to the exploration of Mars and beyond, from the molecular level to complex ecosystems, from the theoretical to the practical. Our strength in research allows us to be at the cutting-edge of innovation, expanding what is known and contributing to solutions for local and global issues. While this research area highlights research strengths in the Faculty of Science and the Lassonde School of Engineering, it also emphasizes strong alignments with and contributions from the fine arts, humanities, social science, law, health sciences, environmental studies, and science and technology studies.

York's researchers in science and engineering conduct a broad range of cutting-edge studies in physics, biology, chemistry and engineering, in keeping with York's tradition of successfully carrying out research that cuts across the disciplines. York's Centre for Vision Research (CVR) is on the leading edge of developing and applying technology in the areas of computational vision and robotics. Researchers are integrating the fields of visual psychology, computer vision, robotics and visual neuroscience as they investigate new models of human visual mechanisms and the ways these could lead to intelligent machines. Examples of recent research success in this area are the Selective

Tuning Model for visual attention and an intelligent, visually guided wheelchair intended for children with physical disabilities. Additionally, York's Electrical Engineering and Computer Science Department is a core partner with the Faculty of Fine Arts' interdisciplinary Digital Media Program. This is the only program in the Greater Toronto Area that combines a rich blend of technology, media and communication that is drawn from the strengths of the computer science, fine arts, cultural studies and social sciences.

Stereoscopic and 3D film innovation is another example of how York's ground-breaking research is offering new routes of investigation and insight. Bringing together a uniquely interdisciplinary team of scientists, filmmakers and industry leaders, the York-led project 3D FLIC (3D Film Innovation Consortium) is bridging fundamental research in stereoscopic perception with the development of stereoscopic 3D (S3D) film language and production, while building the capacity of the S3D production clusters in the Greater Toronto Area. York's strength in stereoscopic 3D research is further enhanced by the Stereoscopic 3D Lab @ York (S3DL), the first dedicated facility of its kind in Canada. The lab melds art and science in the best tradition of interdisciplinary research, joining researchers in the sciences and engineering with researchers in the fine arts.

York is an international leader in space science and engineering research, which relies on collaboration with Canadian, American and European space agencies. York's Centre for Research in Earth and Space Science (CRESS) houses laboratories where concepts for space flight instruments are developed and tested. CRESS has a track record of contributing instruments for international space exploration missions. One such recent contribution was the laser remote sensing instrument that was operated from the surface of Mars on the NASA Phoenix spacecraft that led to the discovery of snow in Mars' atmosphere. Current projects include leading the development of a laser terrain mapping instrument that will be used for the NASA ORIRIS -REx asteroid sample return mission scheduled for launch in 2016. CRESS has a significant research capacity in climate science, including atmosphere and sea ice, which complements the University's broad range of environmental monitoring research in air, water, biodiversity, bioanalytical and atmospheric chemistry and geomatics.

Scholars in the humanities and social sciences expand our critical understanding of science and technology by exploring their social, cultural, political, philosophical and material dimensions. This research offers unique interdisciplinary perspectives on both the historical development and contemporary challenges of scientific and technological practices and discourses. Researchers from across the university are collaborating on projects in the development of new technologies in the digital arts, computing and engineering. Further, with the development of new technologies come new legal issues and rapidly evolving legal and social norms. York's legal scholars are exploring the complex legal and governance issues surrounding intellectual property and technology law and interacting with their colleagues in sciences and engineering.

York's mathematics and statistics researchers are undertaking leading-edge studies that focus on applications for the sciences and health sciences. For example, they are developing new mathematical models for the prediction of disease transmission and the geo-stimulation of how a disease spreads, and they are coordinating a number of academic-industrial collaborations in data mining, neural networks and pattern recognition. Significant contributions to this research are being made by researchers in the life sciences, with particular emphasis on biochemistry and



molecular biology, cell biology, ecology and population biology, genetics and animal and plant science. Researchers in chemical and physical sciences are pushing the boundaries of nanotechnology and advancing the fields of synthetic chemistry, proteomics and materials science.

York University's newly formed Lassonde School of Engineering is poised to make an enormous impression on the field of engineering in Canada and beyond. It reflects a modern view of engineering that takes a new approach to teaching in the discipline by forming strong academic partnerships with the Schulich School of Business and Osgoode Hall Law School that will offer students definitive interdisciplinary integration. Research developments within the Lassonde School will focus on transformative initiatives with a clear emphasis on technological development, societal advancement, innovation and commercialization. Researchers will specifically address the advancement of energy and smart technologies, connective media, technologies for healthier living, and intelligent public safety and security services.

### **FORGING A JUST AND SUSTAINABLE WORLD**

- » Research in this theme extends from understanding the global and international environment to exploring identity, human rights, citizenship and the movement of peoples.
- » Research projects focus on challenges posed by the social, economic and environmental transitions shaping human activity, focusing on local and international policy making with particular emphasis on environmental sustainability and climate change, urbanization, socio-political systems, the international political economy, history, security, governance and law.
- » This theme explores public and international affairs and a broader examination of Canadian public institutions and the international environments in which they function, with particular emphasis on Canada's bilingual heritage, emerging multilingual contexts and Aboriginal and Indigenous peoples.

This theme brings together renowned scholars from a wide range of disciplines to support York's leading political, environmental and sustainability research programs. Researchers in this area are asking critical questions, developing new knowledge and awareness, and challenging existing solutions and technologies. Their findings support the development of equitable public policy and socio-economic advancement. They are engaged in collaborative international research spanning political science, history, law, business, geography, science, philosophy, equity studies, fine arts and other areas of the social sciences and humanities. Their research focuses on transnational issues such as globalization, post-colonial criticism, security, gender, human rights and refugees. Their studies also incorporate research related to Aboriginal and Indigenous peoples and nations, Indigenous thought, legal scholarship, and language, and highlights York's strength in Canadian and international affairs. Many researchers in this area are actively pursuing interdisciplinary scholarship that bridges disciplines concerned with the natural and built environments and social justice.

Forging a just and sustainable world features scholarship that offers new insights into areas cutting across borders and populations and effectively responding to the challenges shaping human activity and changing the way we live. A sampling of this integrative research highlights the collaborative approach that produces vital research synergies

and brings new insights to how we understand the pressing global, regional and local issues facing us today. For example, York has a significant capacity in environmental monitoring research, including oil and gas sector impacts, and a broad spectrum of expertise in air, water and biodiversity monitoring. York researchers are exploring climatic and environmental change in Europe and North America across various historical periods and showing how this has had a profound social, economic and political effect over time. In the area of atmospheric monitoring and modelling, York is conducting cutting-edge research in areas ranging from understanding chemical and climate simulations, to air pollution forecasting, to probing the changes occurring in the atmosphere of the Arctic and Northern regions and the global stratosphere. York researchers are leaders in environmental and sustainability research, applying experimental methods and simulations as they investigate air composition, climate change and Arctic sea ice, including taking measurements from aircraft and space.

Further, York researchers are investigating threats to natural resources and habitats: studying water quality monitoring in Canadian lakes and beyond; examining the health impact of climate on vector-borne and waterborne diseases; making predictions of climate change by way of insect sub-fossils; monitoring migratory patterns and health of forest songbirds; studying invasive insects; examining the molecular biology of plants; and studying bee biodiversity vital to the pollination of wild plants and crops. Ecologists study the effects of multiple environmental stressors on different ecosystems and develop computer models to predict these effects. These studies advance our understanding of the impact of climate change, acid rain, mineral levels and invading species on the North American landscape and on the biodiversity that is essential to our existence. Researchers are at the forefront of what is known as "restoration ecology", a field of study that uses various indicators to monitor the environment and to develop intervention strategies that promote the recovery of damaged ecosystems.

Current examination of issues related to urban sprawl and political ecology are bridging ecological research and public policy. The City Institute at York University (CITY) engages in critical analyses of the sustainable city, in all its parts and all its manifestations. CITY researchers are closely examining how non-human agents affect urban societies both in the past and in contemporary global suburban areas. As well, they are conducting studies into worldwide suburban development to examine governance models, land use, infrastructure and daily life. Research in the fine arts explores issues of cultural citizenship, community and the environment through a range of experimental and creative practices that emphasize public art installations and scholarly publications that examine urban development, Inuit culture and climate change. Ultimately, this research will promote improved understanding of the state of the environment and enhance our knowledge of how to counter the cumulative effects of environmental changes, including the future effects of multiple stressors.

The nature and scale of our societal and environmental problems require the application of a broad spectrum of approaches in seeking solutions. York's Faculty of Environmental Studies broke ground as the first Canadian environmental studies program, and continues to produce collaborative, integrative and solution-oriented research on environmental issues, broadly defined. FES conducts important sustainability research at York's Las Nubes Biological Reserve in Costa Rica where issues of tropical deforestation, sustainable development and biodiversity, conservation and human well-being are studied and explored. Also through its Sustainability Energy Initiative (SEI),

York is fostering research projects that explore sustainable energy and develop policy applications that advance sustainable energy solutions.

York's Institute for Research and Innovation in Sustainability (IRIS) is a focal point of the sustainability research being pursued across the University. The Institute encourages interdisciplinary collaboration and supports research activities that address real-world sustainability challenges. In the Ecological Design for Performance Program, research projects are transforming global design for stage and screen through an integration of new technologies designed to reduce the carbon footprint of stage and film productions.

There is considerable scholarship intersecting law and the environment involving York's legal scholars at Osgoode Hall Law School. This research touches on many important environmental and equity and human rights issues as reflected in Canadian and global environmental law, including those related to Aboriginal and Indigenous peoples and the environment. Other emphases include natural resources law, the impact of resource development on Aboriginal treaty rights, ethical investment, governance for sustainability and sustainable finance. Questions of security, sovereignty and jurisdiction are central to equality and the politics of the environment, which are especially relevant to York's Northern and Arctic research projects. Along with issues of Arctic sovereignty and territorial claims, York is conducting research and applying knowledge to other world regions that are experiencing similar pressures and entitlement issues, which include culture, ethnicity, gender, sexuality, subnational divisions, civil society, and migration and borders.

York has established itself as a world leader of research into the origins, nature and consequences of inequalities and oppressions, both individually and at their intersections. These include economic policies of the developed world; the social structures of race, gender and colonialism; and varied physical, intellectual and emotional abilities. In building on our commitments to social and societal justice, York strives for the transformation of inequality and oppression. Recognizing the pressures often associated with displacement, migration and the movements of refugees, our researchers are examining the multifaceted dynamics of global migration. The Centre for Refugee Studies (CRS), the first such centre in North America and only the second in the world, conducts leading-edge investigations into the complex issues surrounding all levels of refugee experiences. These studies focus on the displacement of populations and individuals across and within borders for reasons of persecution; expulsion; violence; violation of fundamental human rights; and the loss of essential human security and livelihood. York's refugee research is highly collaborative. The Centre has strong ties to research centres and organizations around the globe, and plays a strong role in informing public policy development and practice by international, governmental, advocacy and service organizations. York's feminist researchers examine transnational issues and apply a highly interdisciplinary approach to exploring issues of gender, sexuality, employment and labour; health and spirituality; human rights; and equity in education. Furthermore, York's legal scholars are examining the many aspects of international, comparative and transnational law, including the intersection of globalization's various forces and the forces of domestic law.

International research at York brings together renowned scholars from a wide range of disciplines who are providing answers to questions on some of the most important and intractable issues around the globe. Further, York has

one of the largest concentrations of Canadian specialists in the world conducting research that is pertinent to understanding Canada and its place on the global stage. The work of these specialists spans a diverse range of topics, including Canadian environmental history and culture; Canada in the North American and global political economy; the past and present of Canadian labour; the policies and politics of language and French Canada; and the Canadian and international implications of key challenges. In the field of public and international affairs, York's research focuses on analyzing the key challenges in Canadian public life and how Canada's public institutions function within domestic and international systems and contexts. This research is housed at York's School of Public Affairs, the first bilingual school of its kind in Canada.

### **INTEGRATING ENTREPRENEURIAL INNOVATION AND THE PUBLIC GOOD**

- » Innovation relies on the entrepreneurial spirit and courage, but at York its practice and study is animated and framed by principles of social justice and the public good. York is uniquely positioned to meet this multifaceted challenge and bridge these two pursuits.
- » Research under this theme involves disciplines such as business, engineering, ethics and law, corporate social responsibility, corporate governance, sustainable economic development and human rights.
- » This theme is closely linked to "Forging a Just and Sustainable World." The development of knowledge and good practices must be tested from the perspective of sustainability.

York offers a unique professional school environment where research in business and engineering, along with science and fine arts, emphasizes technological development and market alignment. This exists within a broader community setting that emphasizes social justice and critical discourse, evidenced by York's research strengths in education, law, political science, economics and other disciplines within liberal arts. In particular, our exploration of capitalism, corporatization and business management is balanced by research that questions presumptions of market capitalism, political models, Eurocentrism and bourgeois culture. A number of the world's leading critics of contemporary capitalist society are exploring the violence of capitalist, colonial and patriarchal states, societies and economic systems, and the nature of the structures of governance from the local to the global that instantiate and sustain these violent inequities. While these two areas may seem more oppositional than compatible, the result is a critical discourse that offers a unique perspective on the development and implementation of innovation that promotes social consciousness and sustainability.

Entrepreneurship has clear ties to a business model for knowledge transfer. Entrepreneurial innovation moves beyond goals driven only by profit motives to the search for ethical ways to conduct business in ways that engage the university: knowledge production. Bringing considerations of the public good to the forefront of entrepreneurial innovation is a challenge that is being taken up in a range of sites across the disciplines. Scholars are researching the reasons that underlie successful entrepreneurship and long-term management, and are seeking deeper insights into the dynamics between consumer behaviour and government policy. At the same time, York is recognized as a world leader for our research into corporate social responsibility, and for our thought leadership in responsible business models as reflected in the Canadian Business Ethics Research Network (CBERN) that brings together partners from

industry and academe. The goal of the network is to foster ethical approaches in those spaces where communities and industry coexist. This same spirit informs our leading research into extractive industry practices, international intellectual property regulation, trade and investment agreements, and corporate governance. Still other initiatives examine labour standards and labour relations and probe how public policy can promote social justice for workers both in Canada and abroad. Research in venture capital, private equity and business finance is complemented by research into the moral, social and economic challenges of human migration and diasporas.

Within engineering, there is major emphasis on the development of the “renaissance” engineer, who brings a sense of the public interest and corporate responsibility to professional practice. This essence is reflected in the development of research programs that explore transportation networks, energy solutions and development of new devices and technologies, while at the same time emphasizing sustainability and a green economy.

York researchers are known for putting critical insight to practical use through dynamic interactions with decision makers in the public and private sectors. From economic policy consultations to gender analysis of budgets, to assessing intellectual property protections and creating informed dialogue on urban transit, we serve as entrepreneurs and catalysts for more intelligent public policy. For example, York researchers are helping to frame intellectual property law and related technology discussions in Canada, and they are introducing useful policy options aimed at providing balance in policy- and law-making processes. Our hosting of the Law Commission of Canada is a further example of our hands-on policy engagement, as is our leadership of the Canadian Homelessness Research Network and the Refugee Research Network. Our contributions to policy and economics of renewable energy through the Sustainable Energy Initiative are another strong example. A common thread through all of York's initiatives is our collaborative approach to knowledge creation and social innovation, in which academic researchers work with community partners and policy makers to advance and promote social consciousness and enhance sustainability. York researchers exhibit leadership that fosters innovation and enhances society's capacity building for sustainable livelihoods and supporting the public good.

## **BUILDING ON EXISTING STRENGTHS IN RESEARCH, SCHOLARSHIP AND CREATIVE PRODUCTION**

York is committed to the ongoing development of its recognized areas of strength in research, scholarship and creative expression. Indeed, the majority of resources supporting research at York will continue to be devoted to the broadly based support of excellence in research and scholarship that forms the basis for the University's recognition as a leading Canadian research institution. Through the recruitment of outstanding new researchers and students, the development of cutting-edge infrastructure, and the promotion of engaged collegial and collaborative research, we will provide a strong impetus for the continued advancement of York's research profile in global university rankings.

## COMPELLING OPPORTUNITIES FOR THE STRATEGIC DEVELOPMENT OF RESEARCH

Within the breadth and diversity of cutting-edge scholarship at York are a number of areas where scholars have coalesced to provide enhanced opportunities for leadership and recognition through strategic investment. These are complemented by emerging areas of research that are underpinned by a strong vision of the York community achieving new levels of research leadership. Development of these opportunities brings together varied perspectives, disciplines and understandings that deliver innovative achievements and address emerging challenges. Strategically, by committing to supporting and building these areas of opportunity, we are positioning ourselves to further enhance the profile and recognition of York for its ground-breaking scholarship that informs our academic programming.

### DIGITAL CULTURES

This is an inherently integrative and diverse research area, drawing on researchers from across York to work at the intersection of arts and science, to push technological boundaries while critically investigating the social and cultural impacts of new digital media technologies and the ways in which they are shaping and changing human activity and interaction. Research in this area supports new applications, interfaces and content creation, scientific inquiry, design, policy development and critical discourse in digital media. Among the opportunities in this area is mastering the rapidly expanding capacity in high-performance computing that is associated with the challenges of “big-data” applications and literacy facing our society today. This area of opportunity advances an existing range of cross-disciplinary research from the Fine Arts, Computer Science and Engineering, Education, Liberal Arts and Professional Studies, Health, Law, Environmental Studies, the Libraries and other areas from across the University.

Building on substantial investments over the past few years, York has been developing a national and international profile for its accomplishments in critically exploring the development of digital cultures. Through broad coordinated investments across the disciplines, we are extending and expanding our recognized leadership at the interface of an expanding cluster of creative industries in film, television, informatics, data visualization games and apps development. As well, we continue to develop York's participation in major arts organizations and festivals for which we have become well known. Coordinating investment will propel research in these areas and strengthen industry-academic collaboration. In doing so, we will build on our leading-edge digital arts and technology research and existing collaborations with some of Canada's largest digital media hardware and software companies. Support in this area will leverage York's current success in digital media and encourage continued innovation to drive our leadership forward.

### ENGINEERING RESEARCH THAT MATTERS

Building on existing strengths in applied sciences, business management, law and engineering, York University's newly formed Lassonde School of Engineering is implementing a new approach to engineering that leverages the specific strengths of the broader York community. Representing over \$100 million in new investment and the hiring of over 60 new engineering professors, the Lassonde School will realize a long-standing aspiration of the University. The development of engineering will cultivate entrepreneurial leadership combined with business development and management skills to enable successful and competitive future innovators. This will be fostered through

relationships with the Schulich School of Business, Osgoode Hall Law School, Faculty of Environmental Studies, Liberal Arts and Professional Studies, and depend on an ongoing relationship with the Faculty of Science in shaping future directions. Over the next five years engineering research at York will be guided by our commitments to social justice and interdisciplinarity.

Existing research areas will be complemented by new and expanded research programs in electrical, mechanical, civil and chemical engineering that push forward explorations of smart technologies for a green environment and healthier lives, and for enhanced public safety and security. Samples of the creative, dynamic and ground-breaking research development this will generate include the following: resource and environmental management and urban planning; power systems engineering and energy systems with emphasis on sustainability and renewable resources; next generation microprocessors, aircraft control systems and telecommunications; thermofluids, industrial systems and micro-systems; advanced manufacturing and materials, catalysts, biosystems, nanotechnology and medical devices; new materials and fuels for a greener and more sustainable environment; intelligent and sustainable infrastructure; and biomedical and biochemical systems and process engineering. This research opportunity is not merely to expand research but also to facilitate the scientific and technological breakthroughs for the 21st century to meet the challenges of environmental sustainability, the prevention and treatment of disease and the development of new materials and devices to make Canadian products competitive in the global marketplace.

Within five years, our expansion of engineering and applied science research will see York reach the first tier for innovation in engineering and applied and basic science research. Our vision is to foster dynamic, innovative, leading-edge research and collaboration that captivates, engages, empowers and shapes the world at large. Our aspiration is to offer leadership in the generation of ideas, new technologies, innovation and creativity and to realize the potential for practical translation of results into commercial opportunities, while providing a truly multidisciplinary educational and research environment where students and faculty grow and excel.

### **HEALTHY INDIVIDUALS, HEALTHY COMMUNITIES AND GLOBAL HEALTH**

Researchers at York are exploring the boundaries of innovation and scholarship as they seek to improve the health of individuals, communities and societies both nationally and internationally. This area of opportunity aligns with York's traditional values of social justice and aims to improve the lives of individuals through their lifespan and cultures across local, national and international contexts. York's research in these areas will build on our established strengths in cognitive science, mental, creative and physical health, critical disabilities, nursing and critical health studies. Broadly defined, health research at York begins with a focus on the individual, with the benefits of this scholarship being extended to the global community; an application that transcends national boundaries. This process is always mindful of underlying cultural, social, legal, environmental and economic perspectives. These areas of inquiry will be supported by basic research and applied theoretical approaches to address health through the lifespan and to apply the benefits of this scholarship broadly. In this work, the disciplines of public health (biostatistics, epidemiology, environment, social-behavioural science, health policy and management) intersect with the social sciences (demography, political economy, law and human rights, and sociology) to address problems that can arise locally but have interconnected global implications affecting health and health equity.

We will continue to expand research programs that focus on health and health outcomes. These, in turn, will align with the needs and opportunities that emerge as we put into place plans for a medical school at York. A medical school at York would address Ontario's evolving and unmet clinical and community health needs by focusing on integrated interdisciplinary care, family medicine, community health and wellness through the lifespan. Demographics, healthcare gaps and the evolution of medicine are the drivers behind building a new kind of medical school that places emphasis on the generalist and on the integration of the physician within the context of the broader healthcare and health promotion teams. We are evolving our existing relationships with our regional clinical partners, community health and regional health authorities so that we can build on existing research linkages and partnerships to allow for a smooth integration of clinical and population health-based research into the broader York research landscape. Implementation of a medical school and associated research program at York will benefit from the tremendous wealth offered by the surrounding disciplines at the University which can provide unique perspectives and innovative approaches to solving some of the most pressing questions in health promotion, disease and injury prevention, and the delivery of healthcare.

By leveraging existing expertise and accomplishments, York will foster development of research and scholarship that promotes human health in a global context. In turn, this context will be developed through the application of local solutions in a global context and through a global perspective that encompasses both individual and societal well-being.

#### **PUBLIC ENGAGEMENT FOR A JUST AND SUSTAINABLE WORLD**

York has established itself as a world leader in the research of the origins, nature and consequences of inequalities and oppressions, both individually and at their intersections. These include but are by no means limited to the economic policies of the developed world and the social structures of race, gender and colonialism within local and international contexts, and the varied physical, intellectual and emotional abilities that shape and define oppression. In building on our commitments to social and societal justice, we will continue to enhance our research efforts that inform critical discussions of the sources and nature of inequalities and oppressions; in turn, these initiatives will better inform actions that can change and transform these inequalities.

Today, ever-increasing human activity is putting ever-greater pressure on the future of our environment and societies. At this critical time, scholars across York are exploring ways to meet these challenges in a socially responsible manner. Across the disciplines, researchers are developing fundamental understanding of key issues from disease migration and climate change to environmental challenges related to population growth, industrialization and war and developing workable solutions that will ensure a secure and sustainable future. In addition, York researchers are building an international reputation for ground-breaking critical and collaborative research through their broad focus on urban environments and public policy. Through this research, they are providing new knowledge and innovative approaches to understanding and addressing the complexity of the urban environment in all its parts and manifestations.

Building on our rich history of research and our remarkable range and depth of expertise, York is developing even stronger research programming that informs and addresses a range of challenges in urban environments that



includes governance, planning, land use, infrastructure, economy, security, educational engagement, transportation energy and quality of life. As we focus additional emphases on these strengths and on our growing external relationships and collaborations, we will enhance our reputation as a leader in developing forward-looking solutions towards achieving a sustainable future.

### **SCHOLARSHIP OF SOCIALLY ENGAGED RESEARCH**

Canada has slowly been awakening to a challenging innovation paradox: investments in innovation are being primarily driven by the technology sector while the opportunities and needs for innovation are expanding quickly in the social and service sectors. Social innovation offers the potential of improving life for individuals, communities and societies. With our long tradition in the social sciences and humanities, York is ideally positioned to show universities how they can use academic research to fuel social innovation. In addition to leadership in community-engaged research, York is acknowledged as a leader in knowledge mobilization. York a founding member of Research Impact, Canada's university knowledge mobilization network, and our leadership in this organization enhances the two-way connection between university researchers and community research partners so that grounded evidence can inform decisions about public policy and professional practice. The multiple effects of socially engaged research is appreciated broadly across our institution's disciplines, from the social sciences and humanities, to business and law, environmental studies, education, and sciences and engineering.

York is working to maximize the opportunities and returns of socially engaged research across all the disciplines. Our established leadership and reputation forms the basis for continuing investments in this area so as to advance York's achievements and strengthen our expertise on the scholarship of engagement. We are committed to increasing the critical mass of scholarship at York that focuses on socially engaged research and on understanding how we can maximize the benefits of this research. As well, we are committed to fostering a stronger appreciation for the academic importance of both the traditional and non-traditional outputs of this research and its benefits to society. York's ongoing investment in this area will enhance our reputation as a leader in an area of research that is relevant to real world problems and enables social innovations that address society's persistent challenges.

### **COMMITMENTS TO THE SUPPORT OF RESEARCH**

We believe that an active, engaged research culture is integral to the fabric of our world-class University and fundamental to the success of our faculty and students. York is committed to prioritizing the development and intensification of internationally leading research across our institution as a means of enhancing the vibrancy of academic life and generating an exciting atmosphere for learning. This begins through a commitment to faculty complement, Chairs, infrastructure and the alignment of our planning processes. Support of research originates in our academic departments and units, where scholarship and creative activities are integrated into graduate and undergraduate teaching. This occurs through both highly successful and recognized individual scholarship and collaborative research activities and programs. Units also play a key role in the dissemination of scholarship in traditional and emerging forms, including new media such as the Internet and networked digital devices. Moreover, York is committed to making research accessible to all faculty, students and staff, and to making appropriate accommodation for those who require it.

## BY THE INSTITUTION

Excellence in research is achievable only if researchers can rely on the best possible infrastructure and support mechanisms that aid their scholarly work. Despite continuing fiscal constraints faced by Canadian universities, York continues to prioritize its resources in support of the development of its research and scholarship. Further, York is committed to applying available resources efficiently and prudently. Smart use of new technologies and removal or simplification of cumbersome administrative hurdles becomes imperative in this environment in order to facilitate our researchers' success.

York has several initiatives underway that will continue to improve the institutional support of exploration and study. Our initiative on Process Re-engineering and Service Enhancement (PRASE) is specifically charged with finding efficiencies in current research administrative procedures through the reduction of bureaucracy and the introduction of paperless processes. The Office of Research Services is acquiring and implementing a state-of-the-art grant management system to allow optimal tracking of grant applications, external contracts and ethics protocols. Freed-up administrators' time will be concentrated on assisting students with research grants and award applications. The simplification of pre-award processes will occur concurrently with the introduction of dramatic changes in post-award processes to streamline procedures that previously were cumbersome and time consuming. For example, York's newly acquired Sm@rtBuy system allows for the paperless procurement of goods at competitive prices. Researchers can now use this system to initiate purchases and securely track them over the Internet. It is expected that this system will soon be complemented by a new electronic travel and expense claim system that will greatly simplify the planning of research-related travel and claiming of expenses.

Innovative research is enabled by innovative infrastructure. We want to ensure that York's researchers and graduate students have access to appropriate state-of-the-art research space, cutting-edge equipment and technology, and comprehensive library collections and services, including unique archives and special collections. This access is fundamental to our success as a research-intensive university and to the successful recruitment and retention of world-class faculty members and students. Over the past few years, York has made important progress in responding to the infrastructure needs of its expanding population of researchers. This has been accomplished with the completion of several new buildings and the installation of new up-to-date equipment and other infrastructure. Our new Life Sciences Building features modern and fully equipped laboratories and research facilities designed to support researchers and trainees in meeting the growing demand in science and the health-related disciplines of biology, chemistry, biochemistry and kinesiology. The Sherman Health Sciences Research Centre supports leading-edge research as a regional facility for vision science, kinesiology and psychology, housing some of the most significant and technologically advanced research platforms and specialized laboratories. Further, our York Research Tower has added 84,000 square feet to York's research centres and institutes in the liberal arts and humanities. As part of the expansion of York's engineering program into the newly formed Lassonde School of Engineering, we are planning the construction of a new engineering building to enhance innovation and interdisciplinary collaboration as well as increase the school's student capacity. This past year, we added significant new research space with the expansion of Osgoode Hall Law School and the opening of Glendon's Centre of Excellence for French-Language and Bilingual Postsecondary Education.

York strongly supports the development of research and scholarship and does so through a number of programs that are accessible to all researchers, for both individual and collaborative projects. These include the availability of seed funds for research, travel, project development support and enhancing the time available for faculty to develop and complete research projects. We are building a base of collegially engaged mentorship and support that will assist researchers in identifying and benefiting from new research opportunities. We will continue to strengthen our highly successful research director and research officer support network, as well as the strategic programs directorate in the Office of Research Services.

As well, York is supporting the recognition of our research and scholarly accomplishments through proactive assistance in the nomination of our scholars, students and postdoctoral fellows and visitors for prizes and awards, scholarships and fellowships and through the continuing development of externally funded research chairs, professorships, scholarships and fellowships. It is important that we continue to enhance familiarity with our research and scholarship within and beyond the York community and to create new opportunities for interaction between York researchers and external partners. Research and scholarly events recognize our successful faculty and students for their scholarly achievements and publicize the depth and breadth of research across the University.

As a research-intensive institution, York derives an ongoing benefit from the Canada Research Chairs (CRC) Program. CRCs provide recognition and supports to many of our most accomplished researchers and emerging research leaders. At York we are committed to using the CRC program to build our research capacity and leadership in areas of research opportunity. We recognize that research excellence across the institution far exceeds the number of available CRCs and privately funded chairs and research professorships. Thus York is working to develop an internal research chairs to provide recognition and support for more of our leading researchers on the merits of their accomplishments. In developing these supports, we recognize the importance of research in informing teaching and contributing to the overall excitement in the classroom. Thus York is working to ensure that all of our faculty, which includes our most successful researchers, have the opportunity to participate actively in teaching at the undergraduate and graduate levels.

One way in which York strategically promotes the development of interdisciplinary research is through our network of Research Centres and Institutes (ORUs). These ORUs advance research and research collaboration across the University by providing a home for research development beyond traditional academic units. Steeped in York's tradition of collegial interdisciplinarity, ORUs serve as synergistic hubs for participatory research programs that bring together expertise from across disciplines. York's recently enhanced ORU policy opens up new possibilities for maximizing ORUs research potential and provides a support structure that promotes broader research interactions. Opportunities arising from the new policy include establishing comprehensive partnerships in support of ORUs and their active growth and development; increasing the resource base committed in support of ORUs; and bringing likeminded groups together into broader and higher-impact initiatives that advance our recognition as a research-intensive University. At the institutional level, ORUs are expected to align with the demonstrated strengths of York research and our strategic growth opportunities. Similarly, at the faculty level, ORUs are an overt expression of investment in a particular research area. Thus institutional and faculty research plans are expected to serve as

practical guides for the University's aspirations, encouraging the expansion of research engagement broadly and in the context of ORUs. Building on strengths and opportunities will play an important role in recognizing creative synergies and interdisciplinarity among current ORUs as well as clarifying opportunities for new initiatives in newly emerging research fields.

We will continue to invest in the development and support of our Organized Research Units in ways that will increase their grounding in the institution and their engagement with the external community. With targeted investments to raise their recognition and profile, ORUs will continue to be an important component of our efforts to grow internationally as a leading research institution and to increase the brand recognition of research at York.

### **BY THE YORK COMMUNITY**

During the consultation process, the York community has consistently expressed its commitment to and support for research at the University. Involvement in research, scholarship and creative activity is highly valued, and it is recognized as an essential component of academic life that is crucial to both the development of our academic programming and student success and our academic hiring and career progression. For faculty, staff and students, research at York focuses on excellence, intensification, critical scholarship, a continually enhanced reputation, and provides students access to research opportunities at all stages of their education. This includes enhancing participation rates to take advantage of external research funding opportunities, promoting and nominating colleagues for external recognition and awards, and maximizing dissemination of the research accomplished through presentation, publication and other means such that all full-time faculty are actively engaged scholars.

While much of the research activity at York is accomplished through individual scholarship, the success of all our research projects depends on a collegial environment where scholars have access to engaged discussion, mentorship, support expertise and cutting-edge facilities promoting the development and exchange of knowledge. There is a broad commitment across the University community to engage in and support collegial initiatives that are aimed at improving access to research opportunities at all levels within the institution and to creating new opportunities on an ongoing basis.

### **INTEGRATION OF RESEARCH IN EDUCATION**

The engagement of the University in a diverse range of research projects provides an environment that exposes our students to pioneering scholarship first-hand. This creates excitement and provides graduates with experiences at the cutting edge of their fields of study. York is committed to making research accessible to all of its students and to providing full opportunities for students with disabilities to participate in and benefit from research programming.

Exposure of undergraduates to research is promoted at York first by bringing research into the classroom, integrating the latest findings in the curriculum and engaging students. Thus all York professors, including our most active researchers, are expected to be in contact with students at all levels and to bring the lessons of their research into their classrooms. Additionally, York is committed to exposing undergraduate students to the practice of research and creation by involving them in research projects and the production of artistic works as part of their curriculum, and by going beyond the curriculum to offer internships and other opportunities to participate in and

develop research projects over longer periods of time, especially for students considering higher research-intensive degrees.

York provides a vigorous environment for its graduate students and postdoctoral fellows. We have one of the largest cohorts of graduate students in Canada and a significant number of postdoctoral trainees. Our graduate students and postdoctoral fellows come from around the world to participate in cutting-edge research projects and world-leading MA and PhD programs. The ongoing expansion and quality of our graduate student and postdoctoral fellow population, including increasing our number of international students, is an important objective for York and an important part of our strategy to enhance our international standing. This strategy includes a strong focus on thesis-based graduate students and postdoctoral fellows holding nationally and internationally recognized scholarships and awards, as we build towards our long-term goal of having 15 per cent of the York student population at the graduate level and doubling the numbers of our postdoctoral fellows.

An exciting and comprehensive experience for graduate students at York will be ensured by a strong research infrastructure that includes active, accessible and engaged supervision and mentorship; places an emphasis on quality and timely completion of programs; offers access to an array of research and professional development opportunities; provides comprehensive and unique research library collections and promotes information literacy; and offers competitive financial supports. Graduate supervision is an important expectation of York's faculty and must be appropriately encouraged and recognized by the units and the institution. Flexibility and accessibility in our research infrastructure will encourage students from all backgrounds and situations to access our graduate and research programming.

## **SUPPORTING THE TRANSLATION OF THE RESULTS OF OUR RESEARCH INTO ACTION**

Much of the scholarship at York is pursued by individuals and small groups, and requires a long-term focus. Validation of this research is disseminated through traditional forms of communication such as peer-reviewed publications and in faculty meetings, but increasingly, it is being disseminated through new communication tools, both physical and web-based.

At the same time, collaboration is a hallmark of scholarship and research at York. York scholars working in all six of the strategic research themes collaborate with partners locally and globally. These research collaborations produce graduates with new skills and perspectives whose work and knowledge will have a positive effect on the lives of citizens, the environment and the economy. York research helps to inform public policy, social services, professional practice and the development of consumer and business products and services through both collaborative and individual scholarship. Each of these is concerned with strengthening the relationship between research, policy and practice. Through individual and conjoint collaboration with partners from the non-profit, public and private sectors, York turns its research into action to benefit local and global citizens. We accomplish and will continue to accomplish this by supporting knowledge mobilization, research commercialization and social entrepreneurship across the University.

## **PROMOTING EQUITABLE ACCESS TO RESEARCH**

In order to promote the most equitable access to research, York's research programs must be made available with the fewest possible restrictions. To this end, York University libraries are an active site of research, advocacy, education, service and infrastructure support in the areas of scholarly communications and publishing, rights management and knowledge dissemination. Many York researchers become involved in the editing and production of nationally and internationally renowned scholarly journals. Thirty of these journals are supported through York's libraries whose commitment to the dissemination of research is manifested through their online hosting of a wide number of these publications, the vast majority of which are freely available.

## **WORLD LEADING KNOWLEDGE MOBILIZATION CONTRIBUTING TO SOCIAL INNOVATION**

York is Canada's leading knowledge mobilization university garnering extensive national and international recognition and numerous awards for its work in moving knowledge generated in the Social Sciences, Humanities, Art and Design (SSHAD) into the community and the economy. Industries that rely primarily on the SSHAD disciplines account for almost two-thirds of the Canadian economy. These industries are major agents of positive change within our communities, both in the mainstream and marginalized sectors.

Knowledge has greater value when it is mobilized and shared by faculty and graduate students with communities and organizations that contribute to and benefit from York's research. The key to developing robust research partnerships lies in both sustainable relationship building and carefully matching our research strengths and critical analysis with the complementary needs of innovators, entrepreneurs, policy makers and community groups. Ranked the top knowledge intermediary in Canada, York's pan-university knowledge mobilization infrastructure supports multidirectional connections between researchers and research partners, encouraging the development of knowledge and evidence that informs decisions about public policy and professional practice. Knowledge mobilization advances social innovation through engaged scholarship and assists our partners in the community, government and industry to address society's most persistent social, environmental and economic challenges.

York's Knowledge Mobilization Unit's mandate is to foster research collaborations; build capacity and develop tools for knowledge mobilization; support a culture of knowledge mobilization; and make research and research expertise accessible to stakeholders.

Working closely with partners in the community, from NGOs to the United Way York Region to local and international partners in government, York's Knowledge Mobilization Unit has been one of the key supports of York's success in community and socially engaged research. York is home to a large cohort of scholars who collaborate in their research and teaching with partners from the public, private and non-profit sectors. York is the national leader in large-scale, collaborative SSHRC grants, which provide funding for faculty and students to work in collaboration with partners, thus maximizing the social, environmental and economic benefits of our research. Engaged scholarship provides the evidence base for knowledge mobilization, enabling social innovation, which in turn maximizes the impacts of University research. York will invest institutional and strategic resources to support scholarship in this area, further complementing York's leadership in knowledge mobilization by creating a center of expertise in

engaged scholarship that will be an intellectual home for scholars. In this manner, York will continue to move beyond engagement to true partnership with organizations from the public, private and voluntary sectors.

Over the next five years, York intends to expand our national leadership and international profile in knowledge mobilization and socially engaged research. As well, we will continue to promote our success and recognition in engaged scholarship (research and learning) by encouraging our students and faculty to maximize the benefits of their research in the SSHAD disciplines. Ongoing development of knowledge mobilization at York is a constant effort, one we maintain through promoting the scholarship of socially engaged research.

### **RESEARCH COMMERCIALIZATION AND INDUSTRIAL LIAISON THROUGH INNOVATION YORK**

To support our drive to research intensification, we have recently re-engineered York's support network for technology transfer and research. Under the brand of Innovation York (IY), we have renewed our commitment to providing state-of-the-art research commercialization services to faculty members, trainees and industry within four service streams: agreements, industry liaison, commercialization and entrepreneurship, and startup acceleration. IY provides an integrated suite of services to the York research community that facilitates research, realizes the commercial, economic and social potential of research outcomes, and creates a culture of industry-engaged scholarship and entrepreneurship. IY works with faculty inventors across the University in the sciences, engineering, arts, business and health, as well as inviting scholarly inputs from business administration and law. IY has joined with a number of key external partners to ensure that our suite of services is robust and effective, including MaRS Innovation, and ventureLAB, our regional innovation centre. IY operates services on campus and has facilities in the Markham Convergence Centre in York Region to incubate and accelerate startup companies and support them with business mentorship.

Support of these strategic relationships highlights significant new investments by York that will assist in effectively achieving knowledge and technology transfer and commercialization in collaboration with our industry, government and community research partners. IY is building on existing partnerships and commercialization activities to develop opportunities for faculty members and trainees to obtain regional, national and global industry support for their own research and commercialization opportunities.

### **ENABLING THE SOCIAL ENTREPRENEUR**

By merging our success in technology commercialization with our leadership in knowledge mobilization, our strength in social sciences and humanities with the Lassonde School of Engineering, York will create a hybrid space where innovation in technology and management combines social innovation to facilitate the creation of social enterprises. A social enterprise applies the discipline of business to a persistent unmet social need. A social enterprise can be a non-profit or a for-profit organization, or a blended corporation. In this hybrid space, York will support social entrepreneurs such as those who for example: are likely to develop an app that enables food bank workers to more efficiently and accurately assemble a basket of food for people with food restrictions such as Celiac disease or diabetes; create an online platform for sharing underused community assets; or invent and commercialize technology that enables persons with disabilities to more easily access the Internet.

Products and services like these can be lucrative, yet the social benefits are put before profits and the profits are used to further social benefits. Social entrepreneurs derive their inputs from students and faculty working across the University in fields such as computer science, engineering, business, administration, critical disability studies, fine arts and design, mental health services, education and communications and culture.

York will help accelerate social innovations by providing social entrepreneurs with a home at Innovation York in the Markham Convergence Centre in York Region. We will build on our deep relationship with United Way York Region to ground our social enterprise in the needs of our communities and the lived experience of their citizens. We will work with business mentors and seasoned entrepreneurs at ventureLAB, York Region's Regional Innovation Centre and part of the Ontario Network of Excellence, to provide social entrepreneurs with all the supports afforded to traditional entrepreneurs so they can test their businesses and develop them on a scale that can meet local and global needs.

It is in these hybrid spaces that York will pioneer novel entrepreneurial approaches as a way to maximize the economic, social and environmental benefits of our research.

## SUMMARY AND EXPECTATIONS

Research, scholarship and creative activity are integral to the fabric of York. Their growth and development are amongst the highest priorities for the University. With a strong commitment to quality, academic freedom, social justice and responsibility, York delivers research that advances critical inquiry and scientific discovery, challenges our beliefs and perceptions, and affects the social, cultural and economic development of our country and beyond. "Building on Strength" reflects York's commitment to research excellence and to the development of new knowledge and creative activities.

In moving us closer to achieving our research ambitions, implementation will be established through collegial discussion with our units and faculties as well as our external research partners as we develop and align research priorities. Researchers, faculties and units will be empowered to pursue successful research intensification through broad-based support opportunities and programs that are accessible to all researchers.

The success of "Building on Strength" will be measured by growing the national and international recognition of our faculty and their scholarship and creative activities, advancing our position within the top 10 universities for research impact and further acceleration of the strong pace of growth of our research funding and outputs. In five years, we expect that the progress made under "Building on Strength" will have positioned York as a national leader in research, scholarship and creative activity in Canada. Across the University sector, we will have enhanced the excitement that research brings to the education of our students.