

# Western Research

## Western University – Strategic Research Plan Summary

### INTRODUCTION

With annual research expenditures of more than \$230 million, and a proven track record for discovery with impact, Western University – including Robarts Research Institute and the affiliated Lawson Health Research Institute – ranks among Canada’s top research-intensive universities. Since 1878, Western has established a proud tradition that combines excellence in research and teaching, while producing global leaders *and* tangible social, economic, health and cultural benefits for Canada and the world.

Whether aimed at fundamental discovery and generation of new knowledge, or direct application to the public and private sectors, Western’s research strengths are typically defined by the excellence of individual researchers and the research groups with which they are associated. Firmly rooted in the University’s most recent institutional plan, [Achieving Excellence on the World Stage](#), the *Strategic Research Plan* seeks to:

- identify specific areas of existing and emerging research strength at Western;
- guide the recruitment, training and retention of highly qualified faculty, students and postdoctoral fellows, and staff;
- encourage the propagation of collaborative and interdisciplinary models required to tackle increasingly sophisticated global research issues;
- provide direction to facilitate the development of infrastructure and services required to promote excellence in research, and to meet specified targets for research performance as compared to other research-intensive universities in Canada;
- promote opportunities for researchers to transfer the knowledge they have generated to the benefit of Canadians and citizens around the world; and
- cultivate broader research partnerships in London and Southern Ontario, the province, the nation and internationally.

### CORE PRIORITIES

The University’s research mandate is based largely on **five core priorities** that serve as pillars for fostering research excellence and impact at Western, and for further nurturing the culture of advanced innovation at one of Canada’s top research institutions. From fundamental discovery and publications in top-tier journals, to community-based knowledge mobilization and commercialization initiatives, these priorities encompass an overarching desire to be the destination of choice for leading researchers, students and trainees, while producing research with local, national and global impact. The University identifies the following core priorities that guide its research enterprise:

#### 1. **Going Global.**

Knowledge generation and mobilization are increasingly global endeavours, particularly in terms of talent recruitment, collaboration and outcomes. Building upon a proud tradition of more than 135 years of leadership in the international research community, the University seeks to reinforce its standing on the world stage, and to produce results with global impact – notably in signature research areas identified below. Western’s efforts to internationalize research include:

- research and advanced training undertaken in collaboration with co-investigators and institutions in other countries;
- research that makes direct and indirect contributions to life, health, culture, civil society, economy and government around the world;
- student and trainee experience enhanced through structured opportunities to travel, study and

- conduct research abroad; and
- teaching efforts undertaken with a global context in mind, and in an environment welcoming of students, postdoctoral fellows and trainees from other countries.

Western leads collaborative research programs on every continent and has made particular inroads in strategic regions. It should be noted, however, that the identification of specific regions of strength is not to the exclusion of other critically important research being carried out in countries around the world. The University has established clusters of strength in, for example:

- China:** Home to the Hong Kong Campus of the Richard Ivey School of Business; the first Canadian technology transfer office, established by WORLDDiscoveries; and the Western-Soochow Synchrotron Radiation Research Centre;
- Germany:** Attracted international research and development centres (e.g., LANXESS Inc. and Fraunhofer Gessellschaft) to London;
- East Africa:** Established a long-term, community-based HIV-alleviation strategy (*Western Heads East*), the *Ecosystem Health – Africa Initiative* and the *Rebuilding Healthcare in Rwanda* program as part of the mission carried out by the newly established *Africa Institute*; and
- other regions, including: the **United Kingdom** and the **United States**.

## 2. Mobilizing Knowledge.

Knowledge transfer and knowledge mobilization activities provide global impact by allowing for the translation and transmission of new knowledge, strategies, policies and technologies for the greater good of society. Western holds as one of its core priorities to help researchers maximize the impact of their work by supporting the dissemination and translation of knowledge for practical public, government, civil society and industrial benefit.

As an example, the University and its affiliated research institutes established WORLDDiscoveries in 2008 to serve as the region's business development arm for researchers and their inventions. Since that time, collaborative efforts at Western, Robarts and Lawson have resulted in more than \$5 million in annual licensing income administered through WORLDDiscoveries, representing the third-highest total in Canada and nearly doubling any other school in Ontario. *WORLDDiscoveries Asia* – established in Nanjing in 2011 – is also successfully licensing technology developed by collaborators in China.

Knowledge transfer initiatives are not, however, limited to the domain of technology. Policy- and process-based research provide tremendous benefits for communities, culture and business practices, and for government and civil society development efforts. To further the University's goals with respect to knowledge transfer and knowledge mobilization in the service of our city, our region, our province and our country, Western continues to:

- be proactive in encouraging and supporting faculty engagement in collaborative research with community groups, industry and government agencies, while protecting academic freedom and the integrity of the research process;
- actively seek external funding to support knowledge and technology transfer activities undertaken by faculty members; and
- support and nurture the growth of faculty-based start-up companies based at Western.

## 3. Preparing Global-Ready Graduates.

Western is an institution of higher learning, responsible for providing unique, advanced education programs that produce global leaders. To support such efforts, the University provides state-of-the-art infrastructure, laboratories, libraries and facilities, and pairs them with leading teachers, researchers and groups to foster a culture in which innovation thrives and trainees are provided with the best possible environment in which to learn.

Co-op, industry- and government-sponsored programs, including at the *Southern Ontario Water Consortium* and the Research Park – which is home to the *Stiller Centre for Biotechnology* and the *Bioindustrial Innovation Centre* – allow Western to develop a culture of advanced thought and entrepreneurship, while training job-ready graduates with the skills necessary to excel anywhere in the world. To enhance the quality of research training for undergraduates, graduate students and postdoctoral fellows, and to ensure their continued contributions to the University's research enterprise, Western is committed to:

- widespread promotion of access to external funding opportunities (e.g., *NSERC Undergraduate Student Research Awards*) and broadening eligibility for internal funding programs that provide undergraduates with opportunities to participate in research on campus;
- developing new graduate programs in areas of research strength, including by building upon *CIHR STIHR*, *NSERC CREATE* and *MITACS* programs;
- enhancing the profile and visibility of postdoctoral fellows on campus, and ensuring the conditions under which they are contracted are commensurate with other Canadian universities;
- maintaining competitive financial support for graduate students, including guaranteed minimum support for PhD Students; and
- supporting research in teaching and education to ensure the most advanced methods are employed in Western's training efforts.

#### **4. Partnerships with Impact.**

Western is committed to building upon its strong record of leadership with key partners – universities, governments, businesses and communities – and to establishing new models for local, national and international research cooperation that address some of this – and the next – generation's most pressing challenges. The University must continue to bring the world to Western *and* take Western to the world.

The University has established new models for successful industrial partnerships, including collocating a Germany-based LANXESS Inc. global research and development centre with *Surface Science Western*. A facility-centred model was successful for establishing the *Fraunhofer Project Centre @ Western* and, to partner with a number of other Ontario universities, IBM and the federal and provincial governments, Western followed a distributed cluster model, forming the *Southern Ontario Smart Computing and Innovation Platform*. To further promote and enhance the benefits of the partnership process, Western continues to:

- review and strengthen agreements between the University and its affiliated research institutions, and to encourage collaborations across institutions and with industry partners and the community;
- establish stronger working relations at the institutional level with federal laboratories in London, including both the National Research Council, and Agriculture Canada's *Southern Crop Protection and Food Research Centre*; and
- establish closer relationships with local, provincial, and national economic development bodies.

As an example, partnerships are essential to our researchers' efforts to generate important new knowledge about future space travel and other planetary bodies, like Mars. Working with the Canadian Space Agency, NASA and MDA Space missions, while forging strong ties with the robotics, mining and petroleum industries, researchers in the *Planetary Science and Exploration* area apply knowledge gained about Earth to space, and vice versa. A Western-led SSHRC Cluster program, too, has established a powerful and growing network of international academic experts and business leaders who are producing authoritative resources on important sustainability issues – with the goal of shaping management practice and research.

#### **5. Leadership Through Interdisciplinary Research.**

In an effort to find solutions to progressively complex questions, researchers are expanding their networks throughout and beyond their fields of study, and establishing interdisciplinary research groups, centres and institutes. This has been no different at Western, where researchers are increasingly engaged in a wide variety of collaborative – and interdisciplinary – research projects and programs.

Western's world-renowned *Brain and Mind Institute*, for example, is comprised of, among others, researchers from psychology, business, philosophy, music, science, medicine and medical imaging – all of whom are advancing understandings of cognitive neuroscience from a variety of diverse perspectives. Further, the *National Centre for Audiology* is an international leader in hearing health care – from teaching and basic science to applied research that is integrated into clinical trials that produce effective new products and protocols. Most of these efforts are interdisciplinary in nature, involving partnerships not only with industry and government, but audiologists, computer scientists, engineers, experimental psychologists, neuroscientists and speech science specialists, among others.

Such efforts place Canada at the forefront of discovery and enable researchers to provide answers to real-world problems. Western's strengths in wind engineering, too, combine expertise not only in various fields of engineering, but earth science, social science, neuroscience, biology, business and applied mathematics. These initiatives have made Western a world leader in experimental techniques for modelling the behaviour of structures in response to wind loading, and lay the groundwork for anticipated studies related to sustainable cities. In an increasingly competitive environment that emphasizes and rewards collaborative approaches to research, Western continues to offer strong support for interdisciplinary research by:

- supporting the continued selective allocation of resources that assist and promote key interdisciplinary and collaborative research and teaching strengths; and
- facilitating access to highly sophisticated electronic collaborative tools, including high performance and cloud computing, and other vehicles for web-based videoconferencing.

#### DEFINING AND PROMOTING WESTERN'S RESEARCH STRENGTHS

Based upon faculty academic plans submitted during annual planning exercises, and using an iterative process that involves Deans, Associate Deans (Research) and the offices of the Provost and Vice-President (Research), Western identifies areas of established and emerging research excellence. These areas have achieved a critical mass of personnel, funding, infrastructure and training opportunities, and established a strong record of innovation, while espousing the core priorities listed above. These areas include:

- **Imaging.** Recognized by broadly acknowledged global leadership at Western, Robarts and Lawson in the use and development of imaging technologies and techniques across the disciplinary spectrum, including sophisticated tools used in medical diagnostics and advanced analysis of materials and paleontological and anthropological artefacts. Imaging research at Western is largely administered under the banner of the *Biomedical Imaging Research Centre*, which is comprised of a substantial cluster of personnel and imaging infrastructure housed at Western and its affiliates, and which translates discoveries through its National Centre of Excellence, *ClmTec*.
- **Neuroscience and Brain and Mind.** Recognized by internationally respected research undertaken in a variety of disciplinary areas pivotal to understandings of the brain, its function and health, including links to cell biology, brain imaging and psychology. This area builds upon the ongoing legacy of leadership at Western's *Clinical Neurological Sciences* and the global renown of the *Brain and Mind Institute*, which is home to a cluster of excellence that includes six *Canada Research Chairs* and a *Canada Excellence Research Chair*.
- **Materials and Biomaterials.** Demonstrated by the University's pioneering work in the development and application of synchrotron radiation to materials science – which led to the establishment of the *Canadian Light Source* – and broadly recognized leadership in the synthesis, characterization and application of materials – particularly lightweight materials – as well as emerging work in chemical biology and proteins. More than 50 researchers – including six *Canada Research Chairs* and two *Industrial Research Chairs* – are currently affiliated with the *Centre for Advanced Materials and Biomaterials*.

- **Wind Engineering and Natural Disaster Mitigation.** Established by more than 45 years of pioneering leadership at the *Boundary Layer Wind Tunnel Laboratory*, and the subsequent establishment of three additional world-unique wind facilities: the *Advanced Facility for Avian Research*, the *Insurance Research Lab for Better Homes* and the *WindEEE Dome*. Western has assumed a position of global leadership in the wind tunnel testing of buildings, bridges and structures, and in related work in the sciences and social sciences in hazard assessment, simulated structural testing and the development of policies and programs that help mitigate the devastating effects of natural disasters. More recently, this expertise has been employed to harness the power of wind and the environment to develop alternative energy platforms and sustainable cities.
- **Environmental Sustainability and Green Energy.** Recognized by the accomplishments of a large number of faculty working collectively through an Interdisciplinary Initiative (IDI) and the *Centre for Environmental Sustainability*, and at leading facilities related to climate change and green energy production (e.g., the *Institute for Chemicals and Fuels from Alternative Resources* and the *Bioindustrial Innovation Centre*), including world-leading work in alternate energy and biomass conversion to bio-oil.
- **Planetary Science and Exploration.** Exciting imagination and building upon Canada's reputation in the space community, Western has established a cluster of excellence focused on research and graduate education in planetary science. The *Centre for Planetary Science and Exploration (CPSX)* is focused on the collection and analysis of extraterrestrial materials, and on planning for the procurement of specialized equipment and facilities that will allow for the characterization of materials brought back to Earth from future missions to the Moon, Mars and other planets. Members of the CPSX work closely with the CSA, NASA and companies like MDA to understand the formation of Earth, explore planets like Mars and apply technologies and techniques to mining, robotics and healthcare industries.
- **Philosophy of Science.** Demonstrated by Western's position as one of the world's acknowledged leaders in research on conceptual issues concerning the origins and nature of scientific theories, relations among theories and between theories and the world, and the impact of scientific theories on contemporary society. More than 30 researchers from five faculties are currently associated with the *Rotman Institute of Philosophy*, including two *Canada Research Chairs*.
- **Musculoskeletal Health.** Western's work in musculoskeletal health is significant to Canada's leadership role in addressing global concerns about the mobility of aging populations, and is recognized as a rapidly emerging area of research strength. Defined as a health science- and technology-based cluster of excellence that builds on multi-faculty excellence in skeletal biology, bioengineering, medical devices and clinical applications, researchers in this area take a trans-disciplinary approach to improving understandings of, and developing novel therapies for, debilitating bone and joint disorders – with the goal of maintaining lifelong mobility.

## **BUILDING SUPPORT FOR EXCELLENCE**

### ***The Canada Research Chairs Program.***

The *Canada Research Chairs (CRC)* program is a vital tool employed for faculty recruitment, retention and the development of research strengths. Western has been awarded 66 Chairs in accordance with the proportion of funding the University receives annually from each of the Tri-Council agencies. To date, 61 have been filled, with five appointments to be made. In accordance with the review process at Western, all CRC nominations are forwarded by faculties and approved by both the Vice-President (Research) and the Provost. Each nomination places a particular emphasis on the proposed Chair's fit with departmental, school and faculty academic plans, and with the University's *Strategic Research Plan*. In many cases, an additional emphasis has been placed on making interdisciplinary appointments that serve the needs of more than one faculty. Overall, however, Western's goal is to optimize the strategic impact of the CRC program by creating the best possible avenue for fostering and developing internationally competitive research programs in key areas, as defined in this document.

### ***Core Facilities and Physical Infrastructure.***

The University continues to invest significant funding in the construction and maintenance of world-unique infrastructure. Researchers and research groups have worked diligently with staff at Western to seek external funding that has established an impressive inventory of research space, facilities and equipment that is now heavily utilized not only by faculty, students and postdoctoral fellows on campus, but by researchers across Ontario and Canada – and, in many cases, around the world. *Canada Excellence Research Chair*, Adrian Owen, for example, was attracted to Western from the University of Cambridge in large part because of federal and provincial investments in the *Brain and Mind Institute*, and specifically in the University’s world-leading biomedical imaging facilities.

With funding from the *Canada Foundation for Innovation* (CFI), the *Ontario Research Fund* (ORF), industry partners, internal and other sources, the total value of these infrastructure projects has now exceeded \$400 million, placing Western in the very top tier of Canadian universities in terms of availability of leading-edge research space and equipment in a broad variety of fields. To ensure Western’s researchers are well equipped to continue their work – within the context of their discipline and through collaborative and interdisciplinary manners – the University continues to:

- work in collaboration with Deans to ensure the financial viability, functionality of, and broad access to our current network of core research facilities in key areas of strength; and
- identify existing external programs providing support for infrastructure development and renewal, and provide support to researchers through all phases of the project development process – from application, to implementation and project management; and
- remain committed to an aggressive matching strategy for endowed research chairs to recruit the best and brightest minds to Western, while helping provide tools essential to their success.

### **MEASURING AND PROMOTING SUCCESS**

Western has a long history of making significant research contributions on Canada’s behalf, and for the world’s benefit – including major recent findings in neuroscience, robotic surgery, vaccine development and economic policy. The University will continue to attract and develop talent, chart milestones and deliver results that place Canada at the forefront of discovery – while ensuring it communicates these stories of excellence. To measure and more effectively monitor our successes within and beyond our areas of strength, we must develop additional indicators and find means to disseminate information more broadly. We must:

- closely track our research performance in the publication of books, journal publications, awards and distinctions, and our success in meeting targets in research funding and commercialization;
- seek ways to better understand and quantify the contribution of research to the economic, social and cultural development of the local region, the province and the country, particularly in areas where such contributions may be less well known; and
- work with Communications & Public Affairs to develop a quantitative and qualitative database of our research accomplishments through publication or other activities.

In short, Western continues to foster a culture of research excellence – from undergraduates, graduates, postdoctoral fellows, researchers and staff – that produces results in Canada, but for the benefit of the global community.