University – Industry – Government Partnerships

A Key Element of McMaster’s Model for Global Engagement

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McMaster University

- Established in 1887
- 28,000+ full-time undergraduate and graduate students
- 955 full-time faculty (36% female; 94% hold PhDs)
- 6 Faculties – Business, Engineering, Health Sciences, Humanities, Science, Social Sciences
- ranked 66th in the Shanghai Jiao Tong Ranking of World Universities 2017 – one of only four Canadian universities in the Top 100
- ranked 78th in the Times Higher Education World University Rankings 2017 – one of only four Canadian universities in the Top 100
- ranked 140th in the QS World University Rankings 2017 – one of only six Canadian universities in the Top 150
- ranked 74th in the THE Global Employability Rankings 2017 – one of only five Canadian universities in the Top 100
A Platform for Innovation

Our U15 research-intensive universities:

• Educate over **597,475** people annually

• Perform about **$8.5B** research annually (~27% of all research in Canada)

• Employ over **56,555** faculty (excluding clinicians)

• Are centered in communities where **62%** of Canadians live

• Offer English, French and bilingual campuses

• Exist coast-to-coast
Research at McMaster University

• ranked 8th among Canada’s top research universities with a research income of more than $354 million (Research Infosource Inc. 2017)

• ranked 1st in Canada in research intensity, attracting $405,000 per full-time faculty member (Research Infosource Inc., 2017)
McMaster and Its International Flavour

- Full-time faculty represents **55 countries**. The largest representation of countries, other than Canada, includes the United States, the United Kingdom, India and China.

- International undergraduate students represent **7.7%** of the student population (2016/17).

- International graduate students represent **22%** of the graduate student body (2016/17).

- McMaster’s international students represent **107 countries** (2016/17).

- Over 10,000 active alumni reside outside of Canada, representing **139 countries** (2016/17).

Source: McMaster Fact Book 2016-2017
The Transformational Model

- Cooperation for peaceful coexistence and mutual benefit
- International demand for the University’s expertise in research, education, and learning
- The civic mission of the University, embodying and enabling global citizenship
## International Partnerships in R&D: The Usefulness of Networks

| **Research talent** needs to be the central focus of efforts to enhance international R&D | **People-centered model of innovation** supports and encourages the mobility of students and researchers among universities worldwide | **Knowledge and information** is the new global currency innovation through R&D partnerships will hinge on how information is shared, utilized and leveraged | **Capacity-building** is a key component of the Transformational Model of Global Engagement | **Private sector engagement** is a integral part of partnership and networking structures |
Models for Collaboration: Academia-Industry Partnerships

McMaster-Jiangsu International Technology Development and Translation Centre

Condition Monitoring of Powertrain Components in Electrified Vehicles
Biomedical Engineering – An Equal Partnership of Engineering and Health Sciences

McMASTER SCHOOL OF BIOMEDICAL ENGINEERING

RESEARCH

EDUCATION

BIOMATERIALS

MEDICAL IMAGING

BIOPHOTONICS

INTEGRATED SYSTEMS

MEDICAL ROBOTICS

MEDICAL DEVICES

BIOMECHANICS

GRADUATE

UNDERGRAD

Masters

PhD

CHEMICAL AND BIOENGINEERING

ELECTRICAL AND BIOMEDICAL ENG

MECHANICAL AND BIOMEDICAL ENG

FACULTY OF HEALTH SCIENCES

FRAUNHOFER PROJECT CENTRE for BIOMEDICAL ENGINEERING & ADVANCED MANUFACTURING (BEAM)
The Fraunhofer Project Centre BEAM Organization

- Combination of expertise
- Capitalizing on synergies
- Utilizing national research networks and funding instruments

FPC BEAM

- Cell engineering
- Immunology
- Diagnostics
- Lab-on-a-chip

- Cell therapy
- Diagnostics
- Biomaterials

- Innovative cell therapies
- ATMP manufacturing solutions
- New diagnostics, biosensors and biomaterials

Cell therapy
- Automation
- Biosensors
- Microfluidics
The Fraunhofer Project Centre BEAM
Business Model

Value creation for partners through BEAM:
- Manufacturing leadership
  - Novel therapeutics
  - Novel devices and equipment

Partner success drives BEAM by growing:
- Expertise
- Capabilities
- Income
- IP portfolio

Exclusive and non-exclusive IP
- Contract research
- Academic collaboration
- Joint ventures
- Spin out company
A premier 37 acre research park, offering collaborative space for researchers and entrepreneurs to “co-locate, connect and commercialize”; a place to transform ideas from vision to commercial opportunity

Home to a federal research lab (CanmetMATERIALS), the 80,000 ft², state-of-the-art McMaster Automotive Resource Centre (MARC), and the Fraunhofer Project Centre for Biomedical Engineering and Advanced Manufacturing (BEAM)
Transportation Electrification Research

- 100+ researchers and $150+ million in programs and infrastructure
- Collaboration with more than 30 private and public sector organizations including unique relationships with major automotive OEMs
- McMaster Automotive Resource Centre (MARC) – $26 million investment

Social Cost and Benefits of Electric Mobility in Canada

... to develop a clear understanding of the wide range of costs and benefits that will emerge in Canada as electric mobility develops and to help prepare the automotive sector, electric utilities, government and other stakeholders for the future before it unfolds.
Supporting the Transformation of Ideas into Economic Impact

- DemoCamp
- ChangeCamp
- HackingHealth
- Hack The City
- DeGroote Business Case Competition
- Startup Career Fair
- Mac Career Fair
- Jobs and growth
- $25,000 pitch competition
- Investor events
- Lion’s Lair
- OCE seed funding
Engineering design collaborations

- Organized by PACE (Partners for the Advancement in Collaborative Engineering Education)
- Industry involvement:
  - 5 partners: General Motors, Siemens, Oracle, Autodesk, HP
  - 21 contributors including Altair, ANSYS, dSPACE, MathWorks
- University involvement:
  - 42 universities from Brazil, Canada, China, Germany, India, Italy, Mexico, South Korea, Sweden and United States
- Student engineering cooperation
  - Student teams include 5-7 university from 2 op 3 continents
  - Each team designs one mobility vehicle
  - Every university design one components of their team’s device
  - Students meet every week in video conferences
  - The groups meet each July to compete
International Student Competitions

EcoCAR 3
- Sponsored by industry (General Motors, Siemens, etc) and government (U.S. Department of Energy, NSERC)
- Purpose: convert a standard vehicle into a hybrid electric vehicle
- 16 universities from USA and Canada involved in a 4 year competition
- Each team includes students from one university
- McMaster’s team has about 80 students from several faculties
- SEPT has student members and a faculty advisor

PACE
- Sponsored by industry (General Motors, Siemens, etc)
- Purpose: design and build a small mobility device
- 6 teams from 42 universities in 10 countries; 2 year competition
- A team included students from multiple university
- McMaster’s team has about 6 students from SEPT and two faculty advisors

Capstone Projects
- Agreement with ITESM Mexico to develop common capstone projects
DeGroote researchers collaborate with international colleagues to explore business related challenges through an international lens

- Examination of employee attitudes and behaviours (C. Connelly with researchers in Norway and Slovenia)
- Examination of group structures and their impact on firm innovation (G. Calic with colleagues in Germany)
- Experience-based Co-Design approaches to improving public services for vulnerable and disadvantaged populations (G. Mulvale with colleagues in Sweden and the UK)

Enhancement of teaching contributes to future-ready graduates at all levels while enhancing the internationally focused expertise of PhD students supporting these initiatives
DeGroote researchers work to address international issues and challenges

- Examination of how applied data analytics and operational perspectives and expertise contribute to the efficient and effective transfer of humanitarian aid (K. Huang with World Vision Canada)
- Assessment of how data can assist in refinement of services by local settlement agencies to best meet the needs of new residents such as those from Syria (B. Honig)
- Exploration of the differences in how recently arrived refugees access social services and healthcare across multiple programs including Canada’s government sponsored, privately sponsored and blended visa programs (B. Honig with colleagues in Sweden)
The MSc Global Health program was launched in 2010 as a joint offering with Maastricht University in the Netherlands to address emerging challenges in globalization and health and prepare future professionals for careers in a globalized world. Since then, enrolment has tripled, with partnerships expanding to include universities in India (Manipal University), Norway (University College of Southeast Norway), Thailand (Thammasat University) and Colombia (Universidad del Rosario).
Potential Areas for Collaboration

- Water and Health
  - Water quality; sensor development
- Biomedical Engineering
  - Biomedical Engineering and Advanced Manufacturing Centre (BEAM); medical devices
- Healthy Development & Aging
  - Microbes in Health and Disease; Creative Treatments for Complex Disorders
- Neuro/Behavioural Sciences
  - Cognitive and sensory neuroscience
- Automotive R&D
  - Hybrid and Electrification Technology
  - Light-weighting
- Advanced, High-Value Manufacturing
  - Digital/additive manufacturing; product life-cycle management; smart sensors
- Advanced Software Technologies
  - Cyber-physical systems; cloud computing; safety-critical software
- Renewable Energy
  - Solar PV; waste heat recovery
Supporting Links

- https://www.eng.mcmaster.ca/sept/
- https://www.degroote.mcmaster.ca
- https://oia.mcmaster.ca/
- https://globalhealth.mcmaster.ca/
- https://mcmasterinnovationpark.ca/
- https://theforge.mcmaster.ca/