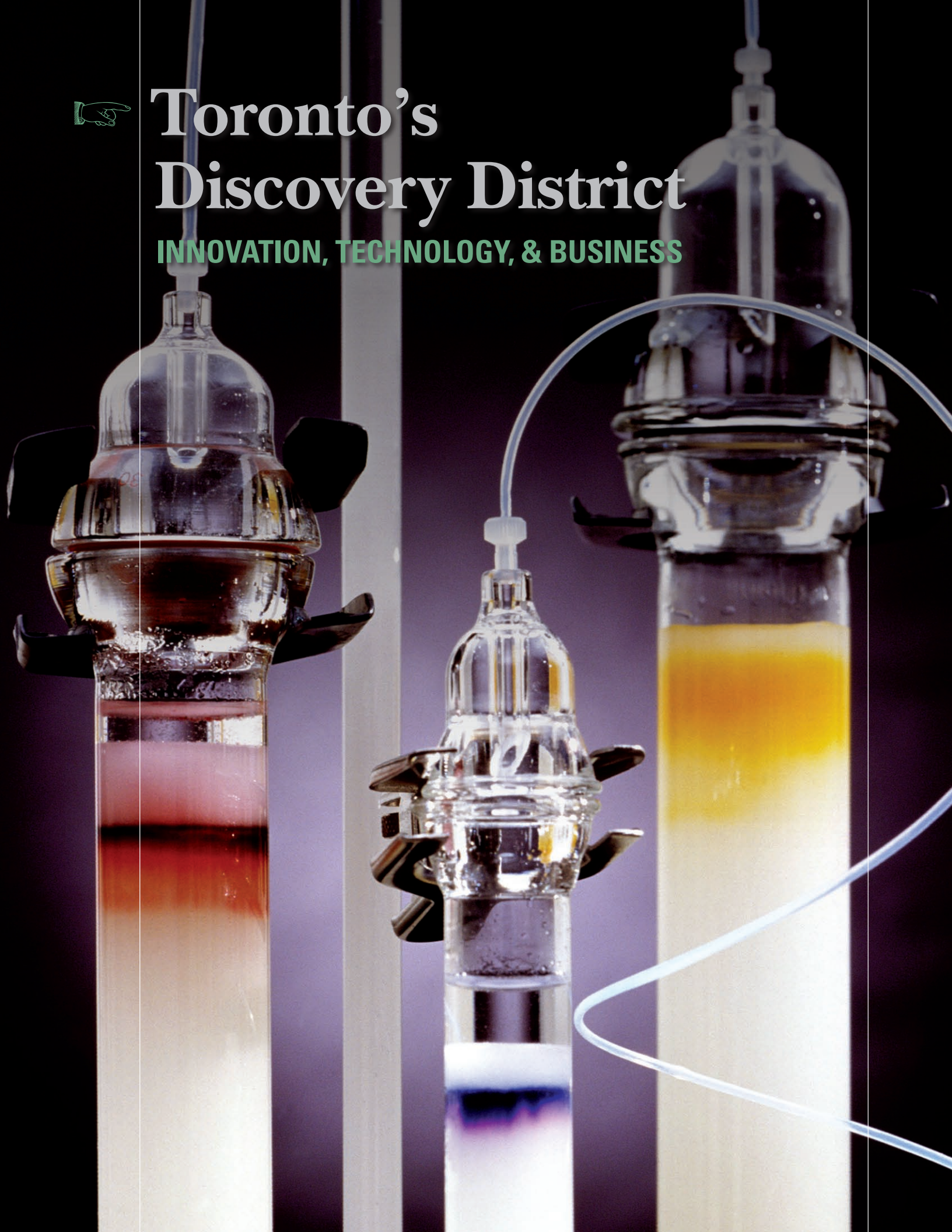




# Toronto's Discovery District

INNOVATION, TECHNOLOGY, & BUSINESS





**City of Toronto, Economic Development provides programs and infrastructure for businesses; creates an investment climate that stimulates growth and positions Toronto in the international marketplace.**

City of Toronto  
Economic Development, Culture & Tourism  
Metro Hall, 8th Floor  
55 John St.  
Toronto, Ontario M5V 3C6  
mbuist@toronto.ca

## ***BioDiscovery Toronto*** BioMedical Research Organizations *Linked For Innovation*

**BioDiscovery Toronto Inc. is a new common storefront for biotechnology, providing one-stop shopping for companies seeking to partner with world-class biomedical research teams.**

**Toronto's universities and research hospitals are partners in this unique approach to medical discovery and commercialization. Our member institutions and hospitals lead the world in research in genomics, proteomics, drug discovery, immunology, bioinformatics and assistive devices.**

**BioDiscovery Toronto receives its core funding from the provincial Ministry of Research and Innovation's RIN and ORCP programs, the federal government's NSERC/CIHR Intellectual Property Mobilization Program, and the City of Toronto.**

BioDiscovery Toronto  
BioMedical Research Organizations Linked for Innovation

BioDiscovery Toronto  
Mars Heritage Building, Suite HL-20  
101 College Street  
Toronto, Ontario  
Canada M5G 1L7  
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# Toronto's Discovery District Where Research and Business Meet

Healthcare is one of the fastest-growing economic sectors in the world. Toronto has one of the largest medical and biotech clusters of any metropolitan area in North America. More than \$1 billion is directed annually to research activities in the city's aptly named "Discovery District," a global centre of groundbreaking research in bioinformatics as well as new diagnostic and therapeutic tools for every imaginable disease. Discovery District researchers have a world-class reputation for breakthroughs ranging from breast cancer and cardiovascular disease to Alzheimer's and cystic fibrosis. The biomedical cluster's growth has been dramatic in recent years, and all indications are that this rapid pace will continue into the future. In total, the biomedical industry in Toronto has over 700 companies providing jobs for more than 80,000 people.

Toronto's Discovery District is a unique 2.5 square kilometre research park that is fully integrated into Toronto's downtown core. The Discovery District is probably the most concentrated mix of research, biomedical companies, finance and business support services anywhere in the world. The centrepiece is the University of Toronto and its affiliated teaching and research hospitals which is ranked in the top three North American institutions for medical publications and citations – a measure of medical science impact. Close by is Canada's financial and business centre – Bay Street, with expert advisors on legal, accounting and venture capital investment. Advisors who are well versed in the special needs of medical and biotechnology matters. One block away is the seat of the Ontario Government.

The Discovery District continues to grow and to attract investment. More than \$500 million has recently been invested in new infrastructure that will support basic research and the commercialization of new scientific discoveries in the Toronto area. The MaRS centre - 750,000 square feet of research labs, business incubator facilities and business services - has emerged as the new biomedical convergence centre and next year is expected to announce an additional one million square feet of research and commercial space for advanced technology research and commercialization. Very close by is the new Donnelly Centre for Cellular and Biomolecular Research, a multi-storey, \$110 million research centre and the new Leslie Dan Faculty of Pharmacy. These are part of a series of major capital investments that will house a new generation of biomedical researchers and continue to keep Toronto at the forefront of biomedical excellence for decades to come.

Toronto's Discovery District is more than just world-class science and discovery. It is working hard to take that new knowledge and create new opportunities for business. Contact Toronto Economic Development or BioDiscovery Toronto for access to any one of the institutions profiled in this brochure and find out how you can benefit commercially from the innovative technologies that can be found in Toronto.

Toronto Economic Development is ready to help. The expert team of specialists can answer all of your questions about business and investment opportunities in our community. Toronto Economic Development also offers an in-depth biomedical cluster profile and liaison with other government agencies and with industry.

For more information contact:

Matt Buist  
Manger, Business Development  
Medical & Biotechnology  
Toronto Economic Development  
416-392-3380  
mbuist@toronto.ca  
www.toronto.ca/business

David B. Shindler, PhD  
Executive Director  
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# Toronto Brings Biotech Ideas To Life



Today, Transition Therapeutics Inc. of Toronto is a thriving, 39-employee biopharmaceutical company. But less than a decade ago it was no more than an idea in the mind of co-founder Dr. Tony Cruz, then a senior scientist at Mount Sinai Hospital. Since founding the company in 1998, Dr. Cruz and his team have built a diverse product pipeline with five products currently in clinical trials for such maladies as diabetes type I and II, hepatitis C, multiple sclerosis and Alzheimer's. After a 2001 initial public offering and a recent \$10 million round of financing, the company's current market capitalization has grown to just under \$100 million. That success

is uniquely attributable to the talent pool and easy access to science-savvy capital that exists in Canada's largest biotech market and Toronto's Discovery District.

Transition Therapeutics is just one firm among a cluster of fast-proliferating companies locating along Toronto's University Avenue between Dundas and College Streets, the area known as the Discovery District. In fact, the neighbourhood harbours more than 100 other science-related firms plus dozens of University of Toronto-affiliated research centres and nine teaching hospitals. In addition, the City is home to more than half

**1994: SickKids provides the first biological proof that second-hand cigarette smoke can affect a fetus.**

– Dr. Gideon Koren

of Canada's pharmaceutical companies, with a combined employment near 160,000, and approximately 40% of the Canadian biotech industry, making Toronto the continent's fourth-ranked magnet for research investment, totaling \$1 billion of private and public-sector funding in 2005.

The ideas begin at places like the Terrence Donnelly Centre for Cellular and Biomolecular Research, opened in spring of 2006, a factory for Nobel-quality basic research that integrates in a communal setting some of the best minds from the University of Toronto's medical, pharmaceutical and engineering faculties. The aim is to foster collaboration between previously disparate academic disciplines at the nexus of information science and biology. Among the 35 principal investigators at the Donnelly are teams using the tools of molecular engineering to attempt new stem cell therapies. Another group uses materials science techniques to discover new coatings for transplanted organs, in an attempt to reduce the frequency of recipient rejection.

Just down the street, the University of Toronto's Leslie Dan Faculty of Pharmacy opened in September 2006, housing Canada's largest pharmacy school as well as basic research that may one day yield drug treatments for cancer, HIV/AIDs and heart disease, among others.

Inevitably, ideas and drug treatments developed in the Dan Faculty and the Donnelly Centre will lead to MaRS. Opened in the fall of 2005, the centre is intended to speed commercialization in the emerging fields of biotech and related sciences by grouping in one location the resources a fledgling start-up requires to grow. In addition to state of the art wet-dry lab facilities, MaRS also houses a 35,000 sq. foot incubator that currently houses 24 young firms working in the life sciences, information technology and materials sectors. But MaRS isn't just for young companies. Currently located in the 700,000

square-foot first phase of the project are 50 tenants that range from comparatively youthful operation, such as NPS Pharmaceuticals, to mid-sized growing operations, such as Transition Therapeutics, to long-established world conglomerates, such as Merck Frosst Canada Ltd. The MaRS initiative has worked out so well the first phase is completely occupied; another 800,000 square feet building will be ready sometime in 2008.

It's all part of Toronto's 175-year-long heritage of life-changing discoveries, a trait begun with Banting and Best's discovery of the insulin effect and continuing through recent innovations such as the isolation of the genes for muscular dystrophy, cystic fibrosis, Alzheimer's and breast cancer. The Discovery District's close proximity to the financial services of Bay Street, Canada's financial capital, home to biomedically experienced legal firms as well as high-tech venture capital creates synergistic opportunities. A geographical mosaic of international neighbourhoods illustrates Toronto's status as one of the world's most multicultural cities, making it an easy place to attract talented minds from other countries; they'll feel at home here. Great public transit, reasonable cost of living and major-league sports and entertainment options also make this city of 2.6 million people an attractive place to live.

"Toronto's government and business leaders understand the district's projected 30% annual growth rate hinges on its ability to commercialize innovations in biotech and related fields," says Matt Buist with the City of Toronto's Economic Development Division. "Thanks to public sector incentive programs, conducting research in the city's Discovery District can reduce your research costs by 66%." For more information, or to request a copy of the BioSource CD call Matt Buist at (416) 392-3380 or via e-mail at [mbuist@toronto.ca](mailto:mbuist@toronto.ca).

**1942: Wilbur Franks, a medical graduate, develops the "anti-black-out" suit. Credited with saving thousands of Allied fighter pilots during WW II, his invention would be worn by every air force pilot in the world and eventually be developed into the space suit worn by astronauts.**



# Toronto Discovery District Quick Facts

- 2 square kilometres concentrated brain power
- More than 50,000 Jobs
- 22,000+ Medical Care and Research Related Jobs

## University of Toronto:

- 67,000 Students
- One of the Largest Faculties of Medicine in North America
- More Medical Faculty and Students/Ph.D.s than Harvard
- Medical Research Spending Ranked 4th in North America

## York University:

- 50,000 Students
- leading interdisciplinary research and teaching university in Canada
- 3rd largest University in the country

## Ryerson University

- 21 000 undergraduate and 700 graduate students
- largest primarily undergraduate university in Canada
- 9 Teaching Hospitals
- 30+ Specialized Medical and Related Sciences Research Centres
- Toronto's Biotechnology Sector ranks 4th in North America and in top 10 in the World
- Biotechnology Cluster is expected to grow by 30% annually
- Specialized Financial and Business Services Supporting the Research Community

## Biotechnology Specialization in:

- Vaccines
- Diagnostics
- Bio-Informatics
- Bio- Pharmaceuticals
- Biotech instrumentation
- Genomics, Proteomics

1997: SickKids invents a powder iron supplement that improves the lives of millions of children suffering from anemia due to iron deficiency.

– Dr. Stanley Zlotkin



# Frequently Asked Questions



## What is the Toronto Discovery District?

The Toronto Discovery District is a partnership of government, academic, and healthcare institutions coming together to form an integrated research environment, serving Canada's and the world's bio-medical discovery community. The Toronto's Discovery District is responsible for over \$1 billion of research annually, taking research and innovation from bench to bedside, from concept to final product.

## How are the technology transfer and commercialization offices of Toronto's Discovery District organized?

Technology arising from the Toronto's Discovery District can be accessed from the technology transfer offices of the member institutions. (Contact information on the individual Discovery District members is available on the profile page.)

**2000 In an international trial on breech delivery, scientists led by Mary Hannah find substantially lower rates of death or serious complications for breech babies delivered by planned caesarean section compared with those delivered by vaginal delivery.**

– Sunnybrook



## **What are some of the success stories of the Discovery District? Start-up ventures? Licenses? Sponsored research with industry?**

Member institutions have worked with industry partners in everything from early-stage and pre-clinical research collaborations, up to and including human Phase III clinical trials. Toronto's research community has a long history of "firsts", including anti-rabies vaccines, the heart pacemaker and "Pablum", the first scientifically designed baby food. More recent breakthroughs include the isolation of T-Cell and Dopamine receptors, and genes for muscular dystrophy, cystic fibrosis, Alzheimer's disease and breast cancer, to name but a few.

## **What are the opportunities and services provided?**

In-licensing/out-licensing and service opportunities abound. Please see the profile page as to the services provided to industry by the member institutions.

## **The federal and Ontario governments have initiated a number of incentive programs (ie. tax credits) to foster the development of a vibrant biotechnology industry. What are these incentive programs and how do they assist industry in reducing the cost of conducting research in Ontario?**

Conducting research within the Toronto Discovery District can reduce your research costs by up to 66%. Speak with any member institution representative and find out how partnering within Toronto's Discovery District can help you.



# Toronto's Discovery District Research Advantages

University of Toronto - One of the Largest Faculties of Medicine in North America

- More Medical Faculty and Students/Ph.D. than Harvard
- Medical Research Spending Ranked 4th in North America
- More than \$1 billion spent annually for Medical Research

## Medical Faculty Overview

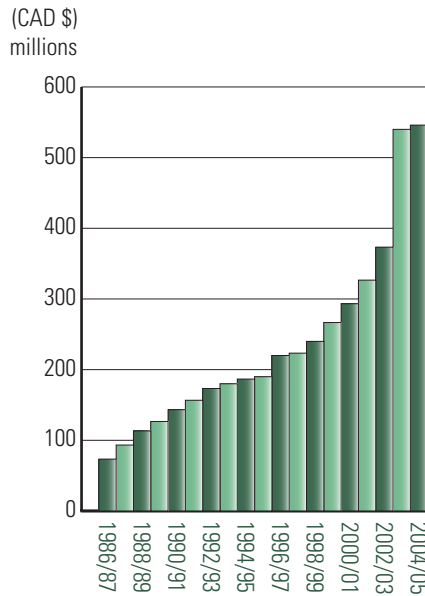
Medical Students: 766

PhD Students: 819

Faculty Members: over 5,000

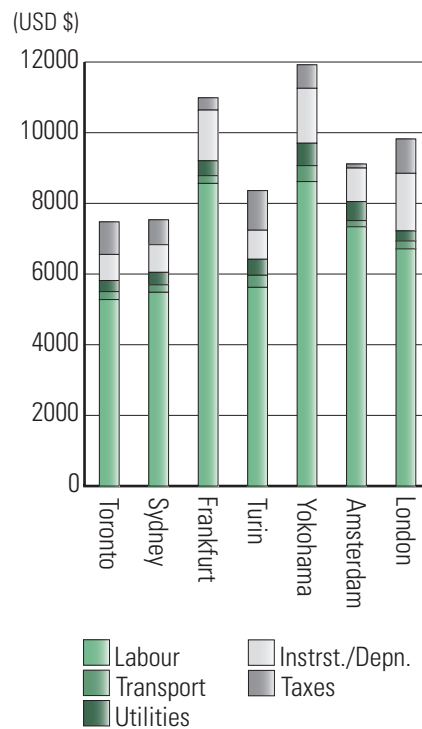
Affiliated Hospitals & Research Centres: 23

University of Toronto Research  
Public Funding Faculty of Medicine  
Affiliated Research Institutes



(source: Synopsis of Research Activities,  
Faculty of Medicine (2004/2005))

10-Year Average Annual Operating  
Costs: All Operations Australian,  
Asian and European Cities



**2002: SickKids discovers that newborns that experience repeated painful procedures in their first days of life become hypersensitive to pain and learn to anticipate it even before it happens. This research results in new ways to decrease/manage pain in infants and children.**

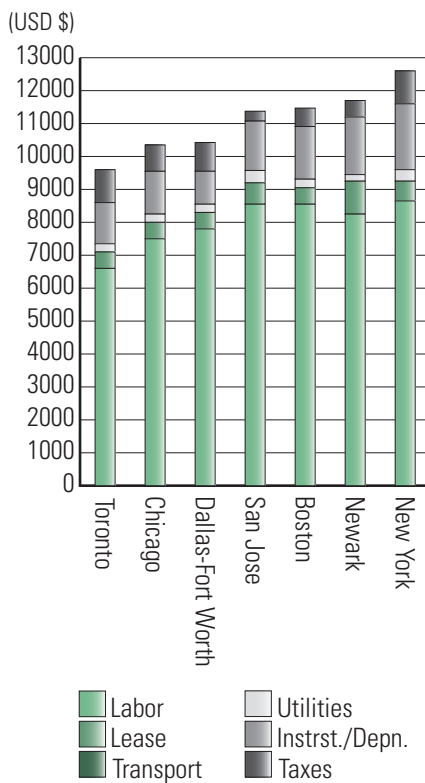
- Dr. Anna Taddio

## Research and Technology Commercialization are supported by significant Financial Incentives

- A company spending \$100 on R&D can earn a tax credit that can reduce costs to \$35.45
- Ontario, in partnership with the Government of Canada, offers a world-leading tax credit system for research and development
- Companies receive 100% deduction of qualifying R&D expenditures plus a 20% investment tax credit on those expenditures to apply against income
- A “superallowance” offers an additional 25 to 52.5% on taxable income

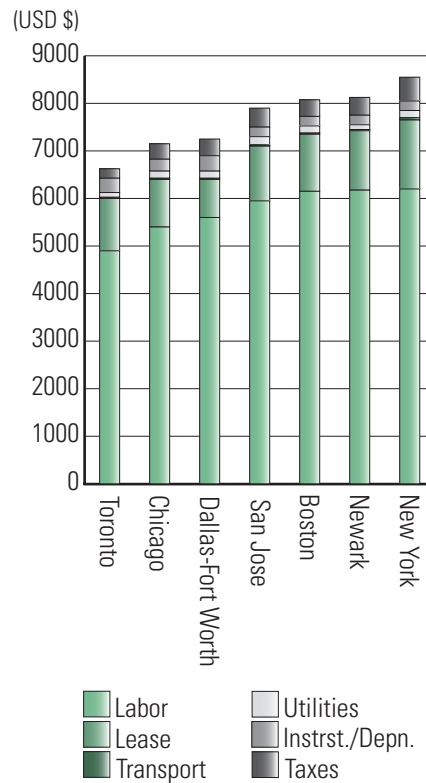
## Toronto Offers a Very Cost Competitive Environment for Research and Investment

10-Year Average Annual Total Location-Sensitive Costs



Competitive Alternatives.com  
Industry: Biotechnology; Operation:  
Pharmaceutical Products

10-Year Average Annual Total Location-Sensitive Costs



Competitive Alternatives.com  
Industry: Biotechnology; Operation:  
Biomedical R&D

2003: Imaging scientists led by Martin Yaffe publish the first results to use digital mammography with a contrast agent (dye) to show tumours that cannot be viewed with current clinical mammography.



# Profiles of Leading Research Facilities

## University of Toronto Affiliated Major Research Institutes

Research Institute	Centre for Addiction and Mental Health (CAMH)	The Hospital for Sick Children Research Institute	St. Michael's Hospital
<b>Research Areas</b>	Neuroscience · Molecular Biology · Biochemistry · Pharmacology · Genetics · Epigenetics & Biobehavioural research  Clinical Research · Schizophrenia · Mood Disorders  Social Prevention and Health Policy Research · Culture · Health systems and Epidemiology Research · Addictions, Psychiatric & Instrument Development · Women's Health · Community & Health	Brain & Behaviour Research; Cancer Research; Cardiovascular Research; Cell Biology; Developmental Biology; Genetics & Genomic Biology; IIR; Integrative Biology; Lung Biology; Metabolism Research; Population Health Sciences; Structural Biology	Clinical Care; Inner City Health; Global Health; Knowledge Translation
<b>No. of Principal Researchers</b>	100	235	150
<b>Research Budget</b>	annual extramural funding \$37,879,456 (2005/06)	annual extramural funding \$139,729,201 (2006/07)	annual extramural funding \$34.3 million (2006/07)
<b>No. of Clinical Trials</b>	350 active clinical protocols	1,971 active clinical protocols	318 submitted in 2005
<b>Special Features</b>	Positron Emission Tomography (PET) Centre  PRIME Clinic (Prevention through Risk Identification, Management and Education)  Epigenetics Laboratory	· Advanced Bioimaging Centre <a href="http://www.sickkids.ca/ABC">www.sickkids.ca/ABC</a> · Advanced Protein Technology Centre <a href="http://www.sickkids.ca/APTC">www.sickkids.ca/APTC</a> · Centre for Computational Biology <a href="http://www.ccb.sickkids.ca">www.ccb.sickkids.ca</a> · Clinical Research Support Unit <a href="http://www.sickkids.ca/CRSU">www.sickkids.ca/CRSU</a> · Flow Cytometry Facility <a href="http://www.sickkids.ca/fcf">www.sickkids.ca/fcf</a> · Imaging Facility <a href="http://imaging.ccb.sickkids.ca">http://imaging.ccb.sickkids.ca</a> · The Centre for Applied Genomics <a href="http://www.tcag.ca">www.tcag.ca</a>	· Biostatistical Consulting · Research Ethics Monitoring · Bioimaging Centre

2006: SickKids researchers determine that humidity is an ineffective therapy for the common childhood ailment croup.

– Dr. Dennis Scolnik

<b>Research Institute</b>	<b>Samuel Lunenfeld Research Institute of Mount Sinai Hospital</b>	<b>Sunnybrook Research Institute</b>
<b>Research Areas</b>	Cancer Genetics; Epidemiology & Biostatistics; Genomic Medicine; Mouse Models of Human Disease; Neurodevelopment; Cognitive Function; Stem Cells/Tissue Engineering; Systems Biology; Women's and Infants' Health	Four Disciplines: Molecular and cellular biology; Clinical integrative biology; Imaging; Clinical epidemiology. Seven Strategic Programs: Aging and population health; Cancer; Heart and circulation; Musculoskeletal; Neurosciences; Perinatal and gynecology; Trauma and critical care.
<b>No. of Principal Researchers</b>	32	171
<b>Research Budget</b>	annual extramural funding \$64.2 million (2006/07)	annual extramural funding \$91 million (2005/06)
<b>No. of Clinical Trials</b>	230 active clinical protocols	N/A
<b>Special Features</b>	<ul style="list-style-type: none"> <li>· Robotics Facility - high throughput screening and genome-wide assays <a href="http://www.mshri.on.ca/robotics/index.html">www.mshri.on.ca/robotics/index.html</a></li> <li>· Centre for Modelling Human Disease - mouse models relevant to human disease &amp; screening tools for in-depth analysis of the major physiological systems in the mouse <a href="http://www.phenogenomics.ca/services/phenotyping.html">www.phenogenomics.ca/services/phenotyping.html</a></li> <li>· Microarray Facility - services and a variety of microarray products including mouse, human, yeast, C. elegans and zebrafish arrays <a href="http://www.mshri.on.ca/microarray/">www.mshri.on.ca/microarray/</a></li> <li>· Contract and Clinical Research Facilities and Services - a wide spectrum of services for basic, translational, and clinical research provided in GLP certified laboratories fully accredited in Canada and the US <a href="http://www.mtsinai.on.ca/Pathology/services/research_services/default.htm">www.mtsinai.on.ca/Pathology/services/research_services/default.htm</a></li> </ul>	<ul style="list-style-type: none"> <li>· Centre for cytometry and scanning microscopy <a href="http://www.sunnybrook.ca/research/services/cyto">www.sunnybrook.ca/research/services/cyto</a></li> <li>· 1.5 Tesla research magnetic resonance imaging facility <a href="http://www.sunnybrook.ca/research/services/15T">www.sunnybrook.ca/research/services/15T</a></li> <li>· 3.0 Tesla research magnetic resonance imaging facility <a href="http://www.sunnybrook.ca/research/services/3T">www.sunnybrook.ca/research/services/3T</a></li> <li>· Antibody core facility <a href="http://www.sunnybrook.ca/research/services/antibody">www.sunnybrook.ca/research/services/antibody</a></li> <li>· Histology laboratory <a href="http://www.sunnybrook.ca/research/services/histology">www.sunnybrook.ca/research/services/histology</a></li> <li>· Genomics core facility <a href="http://www.sunnybrook.ca/research/services/molecular_genetics">www.sunnybrook.ca/research/services/molecular_genetics</a></li> <li>· Proteomics core facility <a href="http://www.sunnybrook.ca/research/services/proteomics">www.sunnybrook.ca/research/services/proteomics</a></li> <li>· Transgenics core facility <a href="http://www.sunnybrook.ca/research/services/transgenics">www.sunnybrook.ca/research/services/transgenics</a></li> </ul>

The identification of a mutation in the colon cancer gene (the APC gene) that is present at a high incidence in Jews of Ashkenazi descent.

		University Health Network	
Research Institute	Ontario Cancer Institute and The Campbell Family Institute for Breast Cancer Research	Toronto General Research Institute	Toronto Western Research Institute
Research Areas	Applied Molecular Oncology; Biophysics and Bioimaging; Cancer Genomics and Proteomics; Epidemiology, Statistics and Behavioural Research; Signaling Biology; Stem Cell and Developmental Biology; Clinical Studies	Behavioural Science and Health; Cell & Molecular Biology; Clinical Decision-Making and Health Care; Clinical Investigation and Human Physiology; Experimental Therapeutics; Genomics Medicine; Clinical Studies	Musculoskeletal Health & Arthritis; Neural & Sensory Science; Applied and Interventional Research; Cell and Molecular Biology; Outcomes & Population Health; Clinical Studies
No. of Principal Researchers	158	194	128
No. of Trainees	317	262	167
No. of Support Staff	432	424	216
Research Budget	Data for all 3 UHN Research Institutes: \$189M for 2005/2006		
No. Clinical Trials	More than \$12M in Clinical Studies		
Special Facilities (Those available for both academic and commercial research use indicated by *)	<ul style="list-style-type: none"> <li>· *Analytical Genetics Technology Centre (AGTC) <a href="http://www.analyticalgenetics.ca/">www.analyticalgenetics.ca/</a></li> <li>· *Microarray Centre (MAC) <a href="http://www.microarrays.ca">www.microarrays.ca</a></li> <li>· *DNA Sequencing Facility <a href="http://www.uhnresearch.ca/facilities/sequencing.htm">www.uhnresearch.ca/facilities/sequencing.htm</a></li> <li>· Proteomics Group <a href="http://www.uhnresearch.ca/proteomics">www.uhnresearch.ca/proteomics</a></li> <li>· Global eHealth <a href="http://www.ehealthinnovation.org">www.ehealthinnovation.org</a></li> <li>· Flowcytometry</li> <li>· *Advanced Optical Microscopy Facility (AOMF) <a href="http://www.uhnresearch.ca/omm/aomf">www.uhnresearch.ca/omm/aomf</a></li> <li>· *Laboratory for Applied Biophotonics <a href="http://www.uhnresearch.ca/facilities/LAB.htm">www.uhnresearch.ca/facilities/LAB.htm</a></li> <li>· *TGRI Light Microscopy Unit <a href="http://www.uhnresearch.ca/resources/tgrilmu/">www.uhnresearch.ca/resources/tgrilmu/</a></li> <li>· *Wright Cell Imaging Facility <a href="http://www.uhnresearch.ca/wcif">www.uhnresearch.ca/wcif</a></li> <li>· Sterilization Services <a href="http://www.uhnresearch.ca/facilities/sterilization.htm">www.uhnresearch.ca/facilities/sterilization.htm</a></li> <li>· Tissue Culture Media Facility <a href="http://www.uhnresearch.ca/facilities/tcmf.htm">www.uhnresearch.ca/facilities/tcmf.htm</a></li> </ul>		

1961: Discovery of blood forming stem cells enabling bone marrow transplants.

– Dr. Ernest McCulloch and Dr James Till

<b>Research Institute</b>	<b>Ryerson University</b>	<b>York University</b>
<b>Research Areas</b>	Bioengineering; Biomechanics; Biomaterials; Bioprocessing; Imaging; Signal Processing; Medical Physics; Trace and Minor Metal Analysis; X-Ray Fluorescence; Metabolic Modelling; Lasers in Medicine; Radiation Therapy; Ultrasound Imaging; Molecular Sciences; Analytical Biochemistry; Biofilms; Environmental Biotechnology; Host-pathogen Interactions; Molecular Microbiology; Protein Biochemistry.	Biotechnology/Medical Devices; Mass Spectrometry/ Proteomics; Vision Science; Infectious/Chronic Diseases; Gender/Child/Youth Health; Health Systems/Policies/Law; Pollution/Atmospheric Science; Ecology/Alternative Energy; Agriculture/ Fishing/Energy; Law and the Environment; Geomatics; International Development; Entertainment Technology; Science/Technology/and Art; Arts/Culture/Society; Education and the Arts; Diasporas/Forced Migration; Security and Peace Building; Refugees; Determinants of Health.
<b>No. of Principal Researchers</b>	202	1,200
<b>Research Budget</b>	\$6 million	annual extramural funding \$60 million (2006/07)
<b>No. of Clinical Trials</b>	N/A	N/A
<b>Special Features</b>	<ul style="list-style-type: none"> <li>· Faculty of Engineering, Architecture and Science <a href="http://www.feas.ryerson.ca">www.feas.ryerson.ca</a></li> <li>· Science <a href="http://www.ryerson.ca/science">www.ryerson.ca/science</a></li> <li>· School of Graduate Studies <a href="http://www.ryerson.ca/graduate">www.ryerson.ca/graduate</a></li> <li>· Department of Physics <a href="http://www.physics.ryerson.ca">www.physics.ryerson.ca</a></li> <li>· Department of Chemical Engineering <a href="http://www.ryerson.ca/chemeng">www.ryerson.ca/chemeng</a></li> <li>· Department of Electrical and Computer Engineering <a href="http://www.ee.ryerson.ca">www.ee.ryerson.ca</a></li> <li>· Department of Mechanical and Industrial Engineering <a href="http://www.mie.ryerson.ca">www.mie.ryerson.ca</a></li> <li>· Department of Chemistry and Biology <a href="http://www.ryerson.ca/cab">www.ryerson.ca/cab</a></li> <li>· Ryerson University Analytical Centre (RUAC) <a href="http://www.ryerson.ca/ruac">www.ryerson.ca/ruac</a></li> <li>· Advanced Microscopy Facility <a href="http://www.ryerson.ca/cab/facilities/facil.html">www.ryerson.ca/cab/facilities/facil.html</a></li> <li>· Office of Research Services <a href="http://www.ryerson.ca/ors">www.ryerson.ca/ors</a></li> </ul>	<ul style="list-style-type: none"> <li>· York Core Molecular Biology and DNA Sequencing Facility <a href="http://www.yorku.ca/biocore/">www.yorku.ca/biocore/</a></li> <li>· Centre for Research in Mass Spectrometry <a href="http://www.chem.yorku.ca/CRMS/">www.chem.yorku.ca/CRMS/</a></li> <li>· Centre for Vision Research <a href="http://cvr.yorku.ca/home/">http://cvr.yorku.ca/home/</a></li> <li>· York Institute for Health Research <a href="http://www.yorku.ca/yihr/">www.yorku.ca/yihr/</a></li> <li>· Centre for Research in Earth and Space Science <a href="http://www.cress.yorku.ca/">www.cress.yorku.ca/</a></li> <li>· Centre for Atmospheric Chemistry <a href="http://www.cac.yorku.ca/">www.cac.yorku.ca/</a></li> <li>· Institute for Research and Innovation in Sustainability <a href="http://www.iris.yorku.ca">www.iris.yorku.ca</a></li> <li>· Las Nubes Centre for Neotropical Conservation and Research <a href="http://www.yorku.ca/lasnubes/index.htm">www.yorku.ca/lasnubes/index.htm</a></li> <li>· Microscopy and Imaging Facility <a href="http://www.biol.yorku.ca/emif/">www.biol.yorku.ca/emif/</a></li> <li>· Laboratory for Computer Systems Research <a href="http://www.cse.yorku.ca/~lcsr/Welcome.html">www.cse.yorku.ca/~lcsr/Welcome.html</a></li> <li>· Laboratory for Industrial and Applied Mathematics <a href="http://www.liam.yorku.ca/index.php">www.liam.yorku.ca/index.php</a></li> <li>· VISion senSOR (VISOR) Laboratory <a href="http://www.cse.yorku.ca/~visor/home.html">www.cse.yorku.ca/~visor/home.html</a></li> <li>· Geospatial Information and Communication Technology Lab (GeoICT) <a href="http://www.geoict.yorku.ca/geoict_main.html">www.geoict.yorku.ca/geoict_main.html</a></li> <li>· Biomolecular Expression and Characterization Facility <a href="http://dryden.biol.yorku.ca/">http://dryden.biol.yorku.ca/</a></li> </ul>

1986: Use of a patch technique to repair ruptures of the heart wall following a heart attack.

– Dr. Tirone David



# MaRS



“The early decades of the 21st Century will be marked by the increased scientific and technological convergence of three fundamental drivers – biotechnology, advanced information technology and nanotechnology [...]. These converging technologies have the promise to achieve tremendous improvements in human capital, innovation, economic performance, and the quality of life.” – OECD



1988: Mapping and surgical correction of cardiac rhythm disorders.

– Dr. Lynda Mickleborough and Dr. Eugene Downar



## About MaRS

MaRS Discovery District ([www.marsdd.com](http://www.marsdd.com)) is a not-for-profit corporation founded by leaders from the business and public sectors, to improve commercial outcomes from Canada's foundation of science and technology innovation. MaRS connects and fosters collaboration between the communities of science, business and capital through co-location in the MaRS Centre and more broadly through catalytic programs, structured networks and the MaRS web portal. MaRS will ensure that made-in-Canada discoveries make a positive difference to the health and quality of life of Canadians and others around the world. The MaRS Centre, located in Toronto's Discovery District, was officially opened in September 2005.

## MaRS Centre

MaRS Centre is a convergence innovation centre in the heart of Toronto's world renowned "Discovery District" that connects the leadership in science, business and capital to create a more efficient commercialization marketplace in Canada. The facility houses leading researchers and technology transfer groups, growth businesses ranging from start-ups to mature companies, venture capital and professional services firms, and community organizations.

The MaRS Centre also houses: the MaRS Incubator, a state-of-the-art incubation facility for young companies; the MaRS Venture Group, providing programs and services for entrepreneurs, technology start-ups and emerging growth companies; and the MaRS Collaboration Centre, a high-tech conference and meeting facility for delivering MaRS Programs and hosting community events. MaRS extends its reach virtually through the MaRS Portal – an online community connecting commercialization stakeholders from across the province and beyond.

Phase Two of the development will see MaRS building out another 800,000 square feet, with a target completion date of 2008. It is anticipated that the momentum of the MaRS project will attract multinational technology businesses and leading research organizations to this development.

## Contact Information

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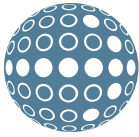
Fax: 416-673-8181

Website: [www.marsdd.com](http://www.marsdd.com)

**1997: Dr. Christopher Feindel developed a new technique for preserving hearts for transplantation by using the shed blood from a donor to provide nutrient blood flow to the heart prior to being transplanted into the recipient. The recycling of donor blood can increase the safe preservation of the heart from 4 to 8 hours in a pig transplant model.**

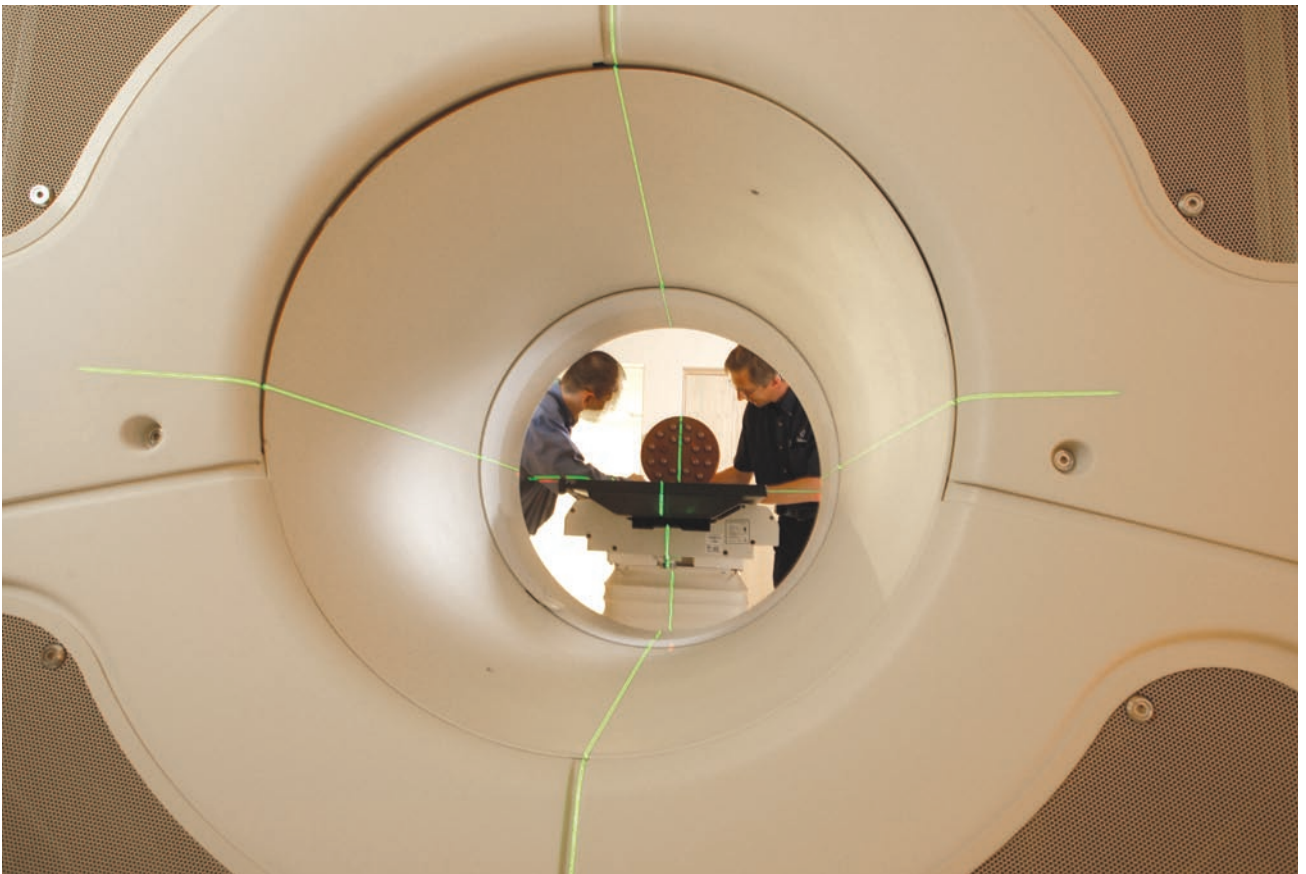


# The Ontario Institute for Cancer Research



Ontario Institute  
for Cancer Research

The Ontario Institute for Cancer Research (OICR) is dedicated to research in prevention, early detection, diagnosis and treatment of cancer. The Institute is an independent, not-for-profit corporation, funded by the Government of Ontario through the Ministry of Research and Innovation.



2005: A team of researchers from SickKids and Université Laval discovered a protein that plays a major role in neuropathic pain. This discovery paves the way for the development of new diagnostics and treatments for chronic pain.

– Dr. Michael Salter.

The Institute brings together multi-disciplinary, multi-institutional collaborations, which will allow research that can overcome the challenges of the complexities of cancers.

Established in December 2005, the Institute will support more than 50 internationally recognized principal investigators; there will be a strong core of scientists at the MaRS Centre with the remainder in nodes of excellence around the province.

The Institute will leverage the current research excellence at universities, research hospitals and health research institutes across Ontario, leading to greater integration of cancer research efforts across institutions. In addition to investigating fundamental aspects of cancer, the Institute will focus on translating research findings into programs, technologies and therapies as well as fostering commercialization and private sector partnerships.

In July 2006 Dr. Thomas Hudson was appointed President and Scientific Director of OICR. He was previously the founder and Director of the McGill University and Genome Quebec Innovation Centre in Montreal, Quebec and prior to that, Assistant Director of the Whitehead/MIT Center for Genome Research in Boston, Massachusetts. Dr. Hudson is internationally renowned for his work in genomics and brings extensive expertise in research and in building large, multi-disciplinary research groups.

OICR offers opportunities to biotechnology and pharmaceutical companies for collaboration on research leading to prevention, early detection, diagnosis and treatment of cancer. OICR can help cancer researchers involved in the early stages of drug development or in testing new therapies by connecting them with the brightest cancer researchers working in a multi-disciplinary, multi-institutional environment.

The Ontario Cancer Research Network, established in 2002, has been incorporated into the Institute. Its initiatives will continue under the umbrella of the Institute and include:

- Cancer Research Fund;
- Clinical Trials Programs;
- Ontario Cancer Research Ethics Board;
- Ontario Tumour Bank

## Cancer Research Fund

The Cancer Research Fund supports translational cancer research projects through bi-annual peer-reviewed grant competitions. To date, eight competitions have been held, awarding a total of \$48 million to 88 projects. The Ontario Cancer Biomarker Network (OCBN), whose core facility is located in the MaRS Centre, was awarded \$6 million in December 2005 to fund biomarker analysis and discovery platforms for clinical studies in Ontario. OCBN also provides management and support for academic and industry-sponsored research. It offers access to the best scientists in biomarker research in Ontario, a well-provisioned biorepository; state-of-the-art facilities, leading-edge technologies and methods, and regulatory-compliant processes and facilities.

## Clinical Trials Programs

OICR is improving the environment for the conduct of cancer clinical trials in Ontario. This is resulting in faster study start-up, increased patient recruitment, more efficient study management and reporting and an overall improvement in quality.

[www.OntarioCancerTrials.ca](http://www.OntarioCancerTrials.ca) maintains a searchable database listing 360 trials in Ontario and provides a simple questionnaire for patients to determine their eligibility. It is a comprehensive site that meets World Health Organization criteria as a registry.

## Clinical Trials Infrastructure Fund

The Clinical Trials Infrastructure Fund awarded \$12.7 million to Ontario cancer centres and hospitals to support clinical trials staff, resulting in increased enrolment into clinical trials and access to novel therapies sooner. To date 28 hospitals, including five paediatric hospitals have received funding and hired more than 100 new personnel. Enrolment has increased from between three and five per cent of cancer patients to 11 per cent in Ontario.

## Clinical Trials Network

The Clinical Trials Network is a partnership between OICR and Ontario cancer centres and community hospitals. Its membership currently includes more than 250 oncology clinical trials professionals from 30 provincial sites. Its Standard Operating Procedures have been adopted by 29 cancer centres and hospitals and other institutions have expressed an interest in adapting them for use in clinical trials for other diseases. Through a series of workshops, more than 200 people have been trained on regulations and guidelines governing cancer clinical trials.

## Ontario Cancer Research Ethics Board

The Ontario Cancer Research Ethics Board (OCREB), [www.ocrn.on.ca/ethics\\_Home.htm](http://www.ocrn.on.ca/ethics_Home.htm), is an oncology-specific provincial resource providing scientific and ethical review and ongoing monitoring of multi-centre research. Launched in 2004, OCREB works with Ontario cancer centres and hospitals to ensure oncology research involving human subjects meets the highest standards of scientific and ethical conduct with the most efficient use of resources. In its second year of operation, there was a

64 per cent increase in the number of new submissions over year one and the volume continues to increase. Eleven of the 30 Ontario hospitals that conduct cancer clinical trials have authorized the use of OCREB.

## Ontario Tumour Bank

The Ontario Tumour Bank (OTB) is a biorepository and data bank that collects human tumour and other tissues across the province and provides real-time access to its inventory to academic and industry-based cancer researchers through its website at [www.OntarioTumourBank.ca](http://www.OntarioTumourBank.ca). Researchers are assured of high quality specimens and associated clinical data derived from more than 35 disease sites, since dedicated OTB-funded staff directly control the banking process including collection, storage and data management. Researchers have access to fresh-frozen tumour and normal adjacent tissues, paraffin-embedded tissues and peripheral blood. Consent is obtained from each patient and comprehensive information is collected including pathology, patient and family history, treatment, toxicity, and outcome data.

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Please e-mail us at [info@oicr.on.ca](mailto:info@oicr.on.ca).

**1992: Developed a novel experimental technique that employs chemical substances to prevent or treat brain damage from stroke or trauma by regulating cell calcium levels.**

– Dr. Chris Wallace



# The Samuel Lunenfeld Research Institute of Mount Sinai Hospital



The Samuel Lunenfeld Research Institute of Mount Sinai Hospital, a University of Toronto affiliated research centre, is one of the world's leading centres in biomedical research. Established in 1985, the Institute is committed to excellence in health research and the training of young investigators. Strong partnerships with industry and the clinical programs of Mount Sinai Hospital ensure that scientific knowledge is used to promote human health.



2000: Identification of the novel immune molecule CD 200 to modify host immune response in transplantation.

– Dr. Reg Gorczynski

Research programs are focussed in a number of cross-disciplinary centres. The goal of these eight interrelated programs is to understand the function of our genes and how genetic pathways and environmental factors lead to the development of human diseases such as cancer, diabetes, hypertension, premature labour, depression and osteoporosis. Our approach at the Lunenfeld allows for the application of biomedical research from molecules to populations.

### **Prosserman Centre for Health Research**

Researchers in the Prosserman Centre for Health Research lead innovative genetic and molecular epidemiological research applying new molecular biology concepts and methods to studies of individuals and human populations. Population, laboratory and clinical studies assess the impact of genetic and environmental determinants of disease on disease risk and evaluation of strategies for treatment and disease control. Primary areas of interest are cancer, heart disease, diabetes and inflammatory bowel disease.

### **Centre for Systems Biology**

The primary focus of research in the Centre for Systems Biology is the mechanisms through which genes and their products interact to organize both regulatory systems within individual cells and more complex, multi-cellular structures. This is being pursued through analysis of protein complexes involved in signal transduction and the cell cycle, quantitative and qualitative analysis of specific protein-protein interactions and protein interaction networks and their regulation by post-translational modifications. Such data is combined with high-throughput, array-based screens designed to identify genetic interactions and gene expression patterns to identify sets of genes functioning in common pathways. Researchers in the centre also employ chemical

libraries to identify compounds with utility in treatment of disease.

### **Centre for Stem Cells & Tissue Engineering**

The focus of the Centre for Stem Cells & Tissue Engineering is two-fold: use of embryonic stem cell lines to create mouse models of human disease through transgenesis, homologous and site-specific recombination embryonic stem (ES) cells and secondly, repair or replacement of degenerating tissues through cell-based therapies with particular emphasis on arthritis-related therapies. With respect to human ES cells, research includes establishment, maintenance and differentiation as well as possible use and safety issues in tissue engineering, regeneration and cell-based therapies.

### **Centre for Modeling Human Disease**

The Centre for Modeling Human Disease applies state-of-the-art genetic approaches to study the function of genes in the context of an intact organism together with in depth phenotypic analysis using approaches drawn from physiology, pathology, behaviour, in-life imaging and cell and molecular biology. The Centre provides a platform for integrative, genome-wide generation and analysis of mouse models related to pregnancy and development, diabetes, neurobehaviour, cancer, cardiovascular disease, bone and connective tissue formation and kidney function.

**2002: Deduction of the structure of a molecular complex in the brain involved in many functions including memory and learning.**

## Auxiliary Centre for Women's & Infants' Health

Research in the Auxiliary Centre for Women's and Infants' Health is focussed on reproductive biology, pregnancy and the transition to the newborn period. Research studies address both normal and pathologic development of embryo, placental and maternal systems during pregnancy and labour defining critical processes during pregnancy with the goal of minimizing fetal, neonatal and maternal death, disability and morbidity. The Centre integrates laboratory based research, clinical research, teaching and clinical practice.

## Fred A. Litwin Centre for Cancer Genetics

The goal of the Fred A. Litwin Centre for Cancer Genetics is to translate the concepts and techniques of molecular oncology into new approaches to the detection, treatment and prevention of cancer. A common interest of members is population-based studies on the molecular genetics of cancer susceptibility genes and identification and analysis of modifier genes in both hereditary and sporadic cancers. Much of the research is a fusion of molecular genetics, molecular pathology, genetic epidemiology and biostatistics, and the use of high-throughput technologies to rapidly and efficiently translate advances in molecular oncology into clinical practice. Areas of particular focus include breast and colorectal cancer.

## Centre for Genomic Medicine

Researchers in the Centre for Genomic Medicine conduct translational research to accelerate the application of advances and knowledge in fundamental science to clinical practice expediting the prevention, diagnosis and treatment of disease. Research in the Centre is carried out by clinician scientists intimately aware of clinical

issues but who are also cognisant of advances in fundamental science and capable of applying them to clinical issues.

## Centre for Neurodevelopment and Cognitive Function

Research within this centre focuses on using both vertebrate and invertebrate animal model systems to study the development and function of the nervous system. Research interests include:

- 1) studying the fundamental signal transduction cascades and other molecular machineries that govern the development of single neurons to the mammalian brain;
- 2) establishing the molecular mechanisms that initiate and regulate the formation of connectivities among the developing neurons;
- 3) analyzing the function of neural circuits in different animal behaviors; and
- 4) establishing animal models to study the cause and cure for human neurological and psychiatric diseases.

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**1996: SickKids identifies a gene that causes colon cancer. Colorectal cancer is the second leading cause of cancer-related death among Canadians.**

– Dr. Liliana Attisano and Dr. Jeff Wrana



# St. Michael's Hospital



Leading with Innovation  
Serving with Compassion

## ST. MICHAEL'S HOSPITAL

*A teaching hospital affiliated with the University of Toronto*

St. Michael's Hospital is a world-renowned academic health science centre. With more than 5,000 staff and 600 physicians, St. Michael's Hospital teaches 1,600 students each year, performs 25,000 day surgeries, treats 600,000 patients in clinics, sees 53,000 patients in the emergency room and provides round-the-clock care to 24,000 inpatients.



1914: John Gerald Fitzgerald of the Faculty of Medicine establishes the anti-toxin laboratories, which subsequently become the Connaught Laboratories.



Fully affiliated with the University of Toronto, St. Michael's Hospital leads the way in clinical care, education and research in: heart disease; trauma and critical care; neurosurgery; arthritis and osteoporosis, laparoscopic surgery, diabetes; cancer care; and care of the homeless and vulnerable populations in the inner city. As the designated adult-trauma centre for downtown Toronto and a major referral centre for Ontario, the Hospital treats the most critically ill and complex patients in the province.

### **The Li Ka Shing Knowledge Institute**

St. Michael's Hospital is building the Li Ka Shing Knowledge Institute, the only institute of its kind in North America. The Knowledge Institute, which is scheduled to open in 2009, will marry research and education in a hospital setting in order to best integrate the tripartite priorities of excellence in patient care, research and education. As a 240,000 square foot state-of-the-art facility, the Knowledge Institute will be comprised of two nine-story centres: the Keenan International Research Centre and the Li Ka Shing International Centre in Health Care Education.

### **The Keenan International Research Centre**

The Research Centre's goal is to improve human health and patient outcomes by generating new medical knowledge. We will attract and motivate creative individuals who work together in a stimulating and collaborative, intellectual environment. SMH's research strengths and priorities lie in several well-established programs including Critical Care, Inner City Health, Global Health and Knowledge Translation.

Critical care research is comprised of a matrix which includes three cross-cutting themes in regenerative medicine, inflammation/injury and molecular and genetic determinants of disease. These themes span clinical specializations in vascular biology, trauma/respiratory failure, diabetes/kidney and blood research, which together form a comprehensive program in basic and clinical research.

The Centre for Research on Inner City Health is the first centre of its kind in Canada whose mission is to improve the health of urban populations through a program of clinical and policy relevant research. Particular emphasis is placed on the needs of socially disadvantaged and economically deprived groups, including the homeless and underhoused, those suffering from mental illness and patients diagnosed with diseases including HIV/AIDS and tuberculosis.

The Centre for Global Health Research is focused on large scale epidemiology (i.e. the cause, distribution and control of disease in populations). At present, the largest cohort study in the world is being conducted at the Centre, encompassing a population of 6 million people in India. Global health researchers are also focused on broader issues including international bioethics, infectious diseases in immigrant populations, HIV/AIDS intervention and prevention in Africa and health systems reform in China.

Research expertise expanded in the fall of 2005 to include Knowledge Translation, as a result of the affiliation of the Knowledge Translation Program at University of Toronto with St. Michael's Hospital. St. Michael's Hospital is forging a unique niche in Knowledge Translation through innovative research and through close collaboration of research and education, by integrating an evaluative component to education and training.

**2003: Yaacov Ben-David and Robert Kerbel discover that TRP-2, a gene involved in melanin synthesis, is responsible for intrinsic drug and irradiation resistance in human melanoma.**

Knowledge translation is the field of research and practice that develops and uses ways to increase the likelihood that patients and clinicians incorporate proven knowledge into clinical practice.

Over the last six years, overall research activity has experienced a significant growth trajectory with more than 60% growth in staff scientists and over 115% growth in external funding. One hundred and fifty physicians and staff scientists currently work out of 7 research sites and lead approximately 400 research staff.

The Keenan International Research Centre will consolidate the Hospital's growing research community into one location. In doing so, the Research Centre will act as a catalyst for the development of synergistic relationships, and promote new methods to address complex health issues from multiple perspectives. As part of the Li Ka Shing Knowledge Institute, the Keenan International Research Centre will enable the marrying of research and education in one setting, providing fertile research and training ground to bring new research to patients at SMH and across the world.

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**1921: Working in a University laboratory, Frederick Banting, Charles Best, J.J.R. Macleod and J.B. Collip are the first to obtain insulin in a form consistently effective for treating diabetes mellitus. In 1923, Banting and Macleod would receive the Nobel Prize.**



# Sunnybrook Research Institute



Sunnybrook Research Institute (SRI) has grown to become one of Canada's largest research institutes in its relatively short 16-year history. Research expenditures have more than tripled in the last five years. In 2004/2005, external funding topped \$85 million, a number that is projected to exceed \$90 million in 2005/2006. As of 2004/2005, SRI is second in external funding among all University of Toronto-affiliated research institutes.



1996: SickKids identifies a human blood cell that regenerates the entire blood system. This discovery enables the development of new treatments for blood diseases such as leukemia, thalassemia and sickle cell anemia.

– Dr. John Dick

The main aims of SRI are to understand and prevent disease, and develop treatments that enhance and extend life. These aims derive from a core vision: to achieve discovery and its translation into the clinic to set best practices.

Research at SRI spans the spectrum of discovery from basic science to translational research to knowledge transfer. A distinguishing feature of SRI is the integration between clinical and scientific activities. There are seven strategic programs: aging and population health, cancer, heart and circulation, neurosciences, musculoskeletal, perinatal and gynaecology, and trauma and critical care; and four scientific disciplines: clinical epidemiology, clinical integrative biology, imaging, and molecular and cellular biology. Each scientist is aligned with a discipline and a strategic program. This enables scientists and clinicians to work with one another in tight-knitted pursuit of the same aims toward the same core vision, one that ultimately will benefit humanity as a whole.

More than 170 scientists and clinician-scientists at SRI are working in the following three priority science areas toward achieving that vision:

### - Genes, proteins and cells

Research in this area, which spans strategic program areas with a particular emphasis on regenerative medicine, aims to discover and explain how molecules and cells work toward preventing disease and improving diagnosis, treatment and prognosis. Main areas of expertise in this area are inflammation, infection and immunity, stem cell biology, cell cycle control, signal transduction, vascular modelling, angiogenesis and antiangiogenesis.

### - Imaging

Research in this area concentrates on the development and refinement of technologies

to visualize cells, tissues and organs. Blending physics, mathematics and engineering, SRI expertise spans multiple imaging modalities: ultrasound, magnetic resonance imaging, digital mammography and tomosynthesis, X-ray, and positron emission tomography / computed tomography. These technologies are clinically relevant to the diagnosis of disease, and the guiding and monitoring of therapies, including minimally invasive surgical techniques, across strategic program areas.

### - Clinical epidemiology

Research in this area explores the causes, consequences and treatment of disease to improve patient care and ensure health care resources are used wisely. SRI's expertise is in applying epidemiologic methods to issues in medicine across strategic program areas. This includes analyzing disease incidence, treatment efficacy and outcomes, as well as policies and the economic impact of diagnostic tools and therapies. Methods are diverse: clinical trials, meta-analyses, surveys and database studies. Sunnybrook scientists work with faculty at the Institute for Clinical Evaluative Sciences and with policy makers to inform decisions about health care.

In a new and exciting initiative, SRI is establishing the Centre for Health Services Sciences, which will be dedicated to integrating knowledge into the health care system. This centre's activity will focus on uncovering the mechanisms of human health and disease with an eye to clinical translation.

Commercialization is also a focus of research efforts at SRI, as is evidenced by several spin-off companies that have emerged from here, including VisualSonics Inc and Sentinelle Medical Inc. In 2004/2005, we had more than \$4 million in industry-sponsored research from

**1929: Davidson Black, a medical graduate, discovers the skull of "Peking Man", an important clue to the nature of humanity's ancestors.**

Apotex Inc., Bristol-Myers, GE Healthcare and sanofi pasteur, and many others. Indeed, the world headquarters of sanofi pasteur's Cancer Vaccine Program is located here. Sanofi pasteur, Canada's largest vaccine company, sponsors cancer vaccine research at SRI through its Cancer Vaccine Network, thereby capitalizing on the acumen of our immunologists. Sanofi pasteur provides the vaccines, and SRI scientists test them in clinical trials, the results of which then inform the creation of new and better vaccines.

## Breakthroughs at Sunnybrook Research Institute

Sunnybrook Research Institute continues to invent the future of health care and achieve breakthrough after breakthrough:

- Immunologists at SRI were the first in the world to create a simple system to generate T cells, a vital component of the immune system, in a Petri dish. This discovery points the way to the eventual development of clinical therapies for people with devastated immune systems, for example, those with acquired immune deficiency syndrome.
- Imaging scientists at SRI developed the world's first method to image blood flow in the microscopic vessels of the heart in real time, a technique now used internationally.
- Cell biologists at SRI showed that lower doses of chemotherapy given with antiangiogenic drugs significantly delays the growth of tumours in preclinical models, a molecular breakthrough that clinical trials teams worldwide are now seeking to validate.
- Neuroscientists at SRI showed that bright artificial light therapy is as effective as antidepressant medication in the treatment of winter depression. They also showed it works

faster, and produces less agitation and sleep disturbance and fewer palpitations.

- Researchers at Toronto Sunnybrook Regional Cancer Centre were the first to show that magnetic resonance imaging detects more breast cancer tumours earlier, compared with mammography, ultrasound or a clinical exam in women with the BRCA1 / BRCA2 gene.
- Heart and circulation researchers at SRI provided compelling evidence to suggest that artery grafts from the forearm should be used in place of vein grafts from the leg for heart bypass surgery, a finding that challenges more than 30 years of surgical practice.

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**2001: SickKids discovers that infant heart transplants can be performed safely and successfully even when the blood types of the donor and recipient don't match.**



# SickKids

## The Hospital for Sick Children Research Institute

**SickKids**<sup>®</sup>  
RESEARCH  
INSTITUTE

The Hospital for Sick Children (SickKids) is the largest paediatric academic health sciences centre in Canada, and one of the largest in the world. Its central mission is to deliver exemplary patient care, to train the next generation of child health leaders, and to develop new interventions and treatments. The synergy between SickKids' Research Institute and its patient care professionals leads to breakthroughs in treatments and ultimately, prevention of childhood disease and injuries.



1990s: Identification of genes responsible for hereditary blindness, Alzheimer's, Lou Gehrig's and Huntington's disease.

The Research Institute at the Hospital for Sick Children undertakes child-centred research across the life continuum from fetal origins to adult outcomes; including fundamental discovery, applied research, and outcomes and impact.

Currently, there are more than 2,200 staff and trainees involved in more than 975 funded projects, including more than 1,900 active clinical protocols. Along with 235 principal investigators and 202 project directors, there are over 900 graduate students, research fellows and visiting scientists from at least 25 countries, as well as laboratory technologists, research assistants and other support staff.

The total research budget for 2005-2006 was more than \$139 million. Funding for research activities and operations comes from two sources. Internal funding from SickKids Foundation, where community and corporate donors contribute to the Foundation's endowments; and external funding from approximately 750 peer-reviewed grants awarded to our researchers. In addition, the SickKids Research Institute has approximately 200 collaborative research projects with pharmaceutical and biotechnology companies.

Research at the SickKids Research Institute is organized into 12 research programs: Brain & Behaviour Research, Cancer Research, Cardiovascular Research, Cell Biology, Developmental Biology, Genetics & Genomic Biology, Infection, Immunity, Injury & Repair Research, Integrative Biology, Lung Biology, Metabolism Research, Population Health Sciences and Structural Biology & Biochemistry.

## **CORE RESEARCH FACILITIES**

### **Advanced Bioimaging Centre**

The Advanced Bioimaging Centre is a joint facility of SickKids and Mount Sinai Hospital. It is located in the Department of Pathology and Laboratory Medicine at Mount Sinai Hospital and provides electron microscopy services

to scientists at both institutions, as well as the University of Toronto and the scientific community at large.

### **Advanced Protein Technology Centre**

The Advanced Protein Technology Centre (APTC) provides protein analysis services to the Canadian research community. APTC services include amino acid analysis, peptide sequencing, peptide synthesis and mass spectrometry.

### **Centre for Computational Biology**

The Centre for Computational Biology (CCB) is the computational support and service group for the SickKids Research Institute. From desktop support and application development to computing resources and bioinformatics consulting, the CCB provides a full range of computational support and services, as well as supercomputing services.

### **Clinical Research Support Unit**

The mandate of the Clinical Research Support Unit (CRSU) is to improve the quality of clinical research at SickKids by providing consultation in the areas of study design and methodology, statistical analysis, and data management.

### **Clinical Research Centre**

The Clinical Research Centre was established to provide safe and accessible facilities for physiological types of patient-based research. Services provided include a cardiopulmonary research exercise laboratory and a clinical investigation unit that offers general patient assessment, specialized metabolic testing and bioelectrical impedance.

### **Transgenic Facility and Mouse Embryonic Stem Cell Facility**

The Transgenic Facility is a resource centre containing a collection of laboratory equipment required for procedures involved in mouse embryo research. The Mouse Embryonic Stem (ES) Cell

**1933: Under the direction of Charles Best, a university – based research team begins work on heparin, an anti – coagulant, which would open the fields of vascular surgery and renal dialysis.**

Facility is a core facility that provides services for gene-targeting experiments, including growing ES cells and feeder cells, electroporation of targeting vectors, and selection and expansion of targeted ES cell clones.

## Flow Cytometry Facility

The Flow Cytometry Facility allows for cell analysis using flow cytometry technology. Flow cytometers detect and quantify a number of cellular parameters as cells are carried in a liquid stream through a nozzle that is illuminated by one or more lasers emitting light of defined wavelengths.

## Imaging Facility

Laser confocal microscopy and deconvolution microscopy are considered optimal systems for detection of fluorescent molecules with high resolution. Multi-photon excitation extends the capabilities of the confocal system by increasing the focal depth and minimizing photodynamic damage to the biological system. The high energy of the tunable laser is also ideal for photo-activation or photo-bleaching experiments. Most of the equipment in the Imaging Facility is not available elsewhere in Toronto, including laser tweezers and scissors that can manipulate individual organelles.

## Monoclonal Antibody Facility

The monoclonal antibody facility provides services for custom hybridoma production and antibody purification to the Canadian research community.

## The Centre for Applied Genomics

The Centre for Applied Genomics (TCAG) is comprised of facilities that provide the resources, technologies and expertise essential for disease gene research and other basic and applied genetic and genomic investigations. Along with DNA sequencing and synthesis, TCAG facilities include:

- The genetic analysis facility, which includes genome-wide scans, fine-mapping genotyping,

marker development and mutation analysis.

- The genome resource facility provides a gene and physical mapping service.
- The gene isolation and expression facility uses state-of-the-art technologies to facilitate the isolation of candidate genes from defined chromosome regions, to facilitate the isolation of full-length genes through library screening, RT-PCR and RACE, and to determine tissue expression profiles of genes of interest.
- The microarray facility performs both gene expression studies and array-based comparative genomic hybridization.

## PROJECT FACILITIES

### The Mouse Imaging Centre

The Mouse Imaging Centre (MICE) combines state-of-the-art digital imaging technologies for the characterization of mouse models of human disease and phenotype discovery.

### SIDNET

SIDNET is a project that aims to express the human proteome and study human function by high throughput screens, thereby allowing the study of cellular proteins. The SIDNET protein archive enables users to access a vast library of protein clone information, as well as allows researchers to search a protein database.

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**The discovery of the SH2 domain, a vital cell signaling ingredient within a cell. This domain has been found to be altered during the process of a normal cell turning into a cancerous cell.**

– Samuel Lunenfeld





# University Health Network (UHN) Research

UHN Research ([www.uhnresearch.ca](http://www.uhnresearch.ca)) is a leading-edge biomedical and healthcare research organization with international stature, and is a teaching partner of the University of Toronto. Our research institutes (Ontario Cancer Institute, Toronto General Research Institute and Toronto Western Research Institute) are home to nearly 500 scientists and clinician scientists, and more than 1,900 staff and trainees.



University Health Network  
Toronto General Hospital Toronto Western Hospital Princess Margaret Hospital



1963: SickKids performs the first widely successful surgery to correct transposition of the great arteries of the heart, the birth defect known as “Blue Babies”. Before this procedure, this condition used to kill 9 out of 10 patients in their first year.

– Dr. William Mustard

In 2005/2006 UHN Research had a research budget of \$189M. Our researchers lead programs in cancer, cardiology, transplantation, immunology and autoimmunity, infectious diseases, tissue injury, diabetes, neural and visual sciences, musculoskeletal disease, and urban and community health. UHN Research brings together the innovation, talent and resources to achieve global impact in basic, translational and clinical research.

## UHN Research 2005-2006 Statistics

- Nearly 500 scientists and clinician scientists
- Research funding more than C\$189 M
- Clinical studies/contracts more than C\$19M
- Total project funding more than C\$152M
- Funding from over 220 Canadian and international research grant agencies, foundations, as well as from companies in pharmaceutical and biotechnology sectors.

## State of the art facilities

- Analytical Genetics Technology Centre  
[www.analyticalgenetics.ca](http://www.analyticalgenetics.ca)
- Microarray Centre  
[www.microarrays.ca](http://www.microarrays.ca)
- DNA Sequencing Facility  
[www.uhnresearch.ca/facilities/sequencing.htm](http://www.uhnresearch.ca/facilities/sequencing.htm)
- Proteomics Group  
[www.uhnresearch.ca/proteomics](http://www.uhnresearch.ca/proteomics)
- Global eHealth  
[www.ehealthinnovation.org](http://www.ehealthinnovation.org)
- Flow cytometry
- Advanced Optical Microscopy Facility  
[www.uhnresearch.ca/omm/aomf](http://www.uhnresearch.ca/omm/aomf)

- Laboratory for Applied Biophotonics  
[www.uhnresearch.ca/facilities/LAB.htm](http://www.uhnresearch.ca/facilities/LAB.htm)
- TGR Light Microscopy Unit  
[www.uhnresearch.ca/resources/tgrilmu](http://www.uhnresearch.ca/resources/tgrilmu)
- Wright Cell Imaging Facility  
[www.uhnresearch.ca/wcif](http://www.uhnresearch.ca/wcif)
- Sterilization Services  
[www.uhnresearch.ca/facilities/sterilization.htm](http://www.uhnresearch.ca/facilities/sterilization.htm)
- Tissue Culture Media Facility  
[www.uhnresearch.ca/facilities/tcmf.htm](http://www.uhnresearch.ca/facilities/tcmf.htm)

## Clinical Trials at UHN

UHN Research capabilities are matched by Canada's largest hospital, encompassing expertise in cancer care (Princess Margaret Hospital); cardiovascular science and transplantation (Toronto General Hospital) and neural and sensory sciences, musculoskeletal health and arthritis, and community and population health (Toronto Western Hospital). The broad base of clinical and research expertise and availability of supporting services makes UHN a centre of choice for conducting clinical trials. Clinical Studies Resource Centres are available at each hospital to facilitate the design and implementation of clinical trials.

## UHN Clinical 2005-2006 Statistics

- 65,288 inpatient weighted cases
- 967,447 clinical visits
- Annual budget more than C\$1.1B

## Partnering with UHN

The UHN Research Business Development Office ([www.uhnresearch.ca/rbdo](http://www.uhnresearch.ca/rbdo)) has been responsible for fostering innovation and technology transfer at UHN since 1998. This office spearheads partnership activity by

**1936: Medical graduate Norman Bethune, later a hero of the People's Republic of China, organizes the world's first mobile blood transfusion unit in Spain.**

assessing and protecting intellectual property (IP) generated at UHN, by commercializing IP through licensing or spin-off companies, and by negotiating contracts and agreements on behalf of our researchers.

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## MORE ABOUT UHN RESEARCH INSTITUTES

### Ontario Cancer Institute (OCI)

Established in 1952, the Ontario Cancer Institute is one of the leading centres for the study of the molecular basis of cancer. OCI researchers employ state-of-the-art tools in genomics, proteomics structural biology, molecular biology, biophysics and the behavioural sciences. With these tools they analyze cancerous cells at the molecular level; test gene and cellular therapies for cancer and other diseases; develop new technologies for diagnosing and treating cancer; determine the effects of diet and behaviour on cancer risks; and develop and test informatics tools for the large-scale analysis of patient populations.

### Toronto General Research Institute (TGRI)

Research at the laboratories and clinics of the TGRI has led to major breakthroughs in organ transplants, cardiac pacemakers, and novel therapies for endocrine and autoimmune disorders. Some of these breakthroughs

include the world's first single and double lung transplantation and the use of insulin to treat diabetes. TGRI's research program includes research in cardiology, transplantation, immunology and autoimmunity, infectious diseases, tissue injury and diabetes.

### Toronto Western Research Institute (TWRI)

TWRI is home to the research programs associated with the neural and sensory sciences, musculoskeletal disease and urban and community health programs at UHN. Neuroscientists here explore the function of the nervous system as they develop treatments for spinal cord injuries, cerebral ischemia, vascular malformations, brain tumours, neurophthalmologic disorders and neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease. Researchers at musculoskeletal research program focus on arthritis and associated degenerative diseases. Their investigations are aimed at revealing the causes of, and generating therapies for, these ailments.

### Toronto Medical Discovery Tower (TMDT)

The Toronto Medical Discovery Tower is part of Phase I of The MaRS Centre. This fifteen-floor, 400,000 sq ft building has been designed with state-of-the-art biomedical research facilities and will house some of Toronto's most advanced programs in genomics, proteomics, integrative biology, infectious disease, image-guided therapy, structural biology, regenerative medicine, stem cell research and drug discovery as part of the research institutes of University Health Network.

**1945: Raymond Parker of U of T's Connaught Medical Research Laboratories discovers a defined chemical nutrient medium in which cells can grow and replicate. His discovery helps Jonas Salk to develop the polio vaccine.**



# Centre for Addiction and Mental Health (CAMH)



Centre for Addiction and Mental Health  
Centre de toxicomanie et de santé mentale

**Mission:** Improving the lives of those affected by addiction and mental health problems and promoting the health of people in Ontario and beyond

**Vision:** Strong and healthy communities, in which people with addiction and mental health problems can access appropriate and effective services and live as full participants



2004: Sick Kids researchers unmask the potential of stem cells found in adult skin.

– Dr. Freda Miller

The Centre for Addiction and Mental Health (CAMH) is the largest mental health and substance use research centre in Canada, and one of the largest in the world, combining research, clinical care, health promotion and education. CAMH is a Pan American Health Organization and World Health Organization Collaboration Centre, and is a teaching hospital fully affiliated with the University of Toronto.

CAMH was created in 1998 through the successful merger of the former Addiction Research Foundation, Clarke Institute of Psychiatry, Donwood Institute and Queen Street Mental Health Centre. This allowed us to develop unrivalled depth and breadth in scientific discovery, and has focused our research efforts on understanding and improving the treatments for mental health and substance use problems.

Research at CAMH brings together internationally recognized scientists, state-of-the-art facilities, a range of professional training and a province-wide network of community program staff. These resources are interlaced across four areas of scientific focus:

- Neuroscience Research
- Clinical Research
- Social, Prevention and Health Policy Research
- PET Centre

Research at CAMH is centred on excellence in science, focus in our efforts, relevance to CAMH mission, and integration across the scientific domains.

We are committed to working together so that our scientists conduct collaborative research across disciplines that catalyses change in how people receive care.

CAMH Profile – We have nearly 100 full-time scientists and approximately 300 staff;

72 graduate and 36 post doctorate fellows obtained research-training placements in 2005-2006; annual extramural funding \$37,879,456 (2005/06).

## AREAS OF RESEARCH

### Neuroscience Research

The Neuroscience Research Department focuses on the mechanisms in the brain that underlie mental illness and addiction, and the mechanisms that are involved in their respective treatments. The department studies all levels of the brain—from molecules, through brain cells, to the whole brain in three areas of research: Molecular Medicine, Psychiatric Genetics, and Clinical & Behavioural Neuroscience.

Neuroscience research is divided into the following sections:

- Biobehavioural Pharmacology / Neurobiology of Alcohol
- Biopsychology
- Clinical Neuroscience
- Human Neurochemical Pathology Laboratory
- Laboratory of Cellular and Molecular Pathophysiology
- Molecular Neuroscience
- Molecular Pharmacology
- Neuroimaging
- Pharmacogenetics
- Psychiatric Neurogenetics

### Clinical Research

The Clinical Research Department is involved in research, treatment and education. This department contributes to these areas through scientific publications, presentations, and the sharing of knowledge with clinicians and the community at large. Clinical Research is divided into five sections:

**2003: Dr. Tom Wolever of the Division of Endocrinology and Metabolism discovers that Acarbose improves the glycemic profile and insulin sensitivity in elderly patients with type 2 diabetes who are inadequately controlled on diet alone.**

- Addictions
- Child, Youth and Family
- Law and Mental Health
- Mood and Anxiety Disorders
- Schizophrenia

## Social, Prevention and Health Policy Research

The Social, Prevention and Health Policy Research Department conducts innovative, topical research using the latest methodological and statistical techniques. This work provides scientific evidence to inform policy decisions, health system redesign and other interventions. This restructured department comprises four integrated sections, each of which collaborates with the other research departments, clinical services and the Policy, Education and Health Promotion department.

The four sections are:

- Health Systems Research & Consulting
- Public Health & Regulatory Policies
- Social and Community Prevention Research
- Social, Equity and Health

## Positron Emission Tomography Centre

Positron Emission Tomography (PET) is a medical imaging technique uniquely suited to study chemical and metabolic disturbances in patients and assess the effects of treatment. PET uses radioactive probes that are selected to target specific aspects of the brain chemistry: for example, the dopamine system in schizophrenia or the serotonin system in depression. After injection of a minute amount of these radioactive probes in a patient, the PET camera can measure their distribution in the brain. By performing PET scans before and after treatment with a

medication, PET can measure the effects of that medication on the brain.

The PET Centre is equipped with two state of the art scanners and a cyclotron. We are the only PET facility in Canada fully dedicated to mental health and addictions research, and one of a few in the world. Our main focus is on studying chemical brain messengers through PET methods, to better understand the neurochemical root of mental illness and addiction. The ultimate goals are to:

- improve the lives of clients and their families by enhancing the effectiveness of existing treatments and reducing side effects
- to encourage innovative approaches to drug development by using PET in the early stages of evaluating new drugs

Currently, research in the PET centre is focused on radiochemistry and PET methodology, schizophrenia, and mood neurochemistry. Moving forward, the PET Centre will expand its core activities and collaborations with clinicians in the fields of substance abuse and geriatrics.

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**1948: W.G. Bigelow begins studies of hypothermia as a means of performing open-heart surgery. Later, he would be part of the team that designs the first electrical cardiac pacemaker.**



# University of Toronto (U of T)



The University of Toronto is Canada's leading research-intensive university and one of the largest in North America. It has over 70,000 students, more than 11,000 faculty and staff, and 400,000 alumni worldwide. U of T's annual operating budget is over C\$1.1 billion and investigators attract research grant and contract support of C\$517 million per year.



1961: James E. Till and Ernest A. McCulloch discover the hemopoietic stem cell. This is the basis for bone marrow transplantation, which is a highly successful clinical story today.

There are three major U of T campuses that cover approximately 3 km<sup>2</sup> of land. The university offers 75 PhD programs and has 14 professional faculties. There are 10 fully affiliated teaching hospitals associated with the University of Toronto. The U of T library has more than 15 million volumes and is ranked third among North American university libraries, behind Harvard and Yale. Innovation has long been a hallmark at U of T.

During its 179-year history, the university has been home to some of the world's most original thinkers. Its graduates include six Nobel Prize winners, two astronauts, four Canadian prime ministers, the first black Canadian doctor, the first Canadian aboriginal medical graduate and the world's first female aircraft designer. As well, U of T innovation has led to the discovery of insulin and the development of the first electronic heart pacemaker, the artificial larynx, the single-lung transplant process, nerve transplants, and the artificial pancreas. Research at U of T has also led to the discovery of the genes responsible for cystic fibrosis and the most severe form of Alzheimer's disease.

## Core Technologies Include

- Neuroscience
- Genomics and Proteomics
- Tissue Engineering/Biomaterials
- Regenerative Medicine
- Biopharmaceutical Discovery and Development
- Molecular Biology
- Computer Science and Bioinformatics

## Research Overview

As the nation's top research university, U of T aims to push the frontiers of knowledge on all fronts.

## Centre for Research in Neurodegenerative Disease (CRND)

Through its Centre for Research in Neurodegenerative Disease (CRND), U of T provides international leadership in research, education and discovery related to neurodegenerative diseases, including Parkinson's and Alzheimer's disease. The CRND is an interdisciplinary research institute that brings together scientific expertise in Genetics, Molecular and Cell Biology, Protein Chemistry, Transgenic Animal Modeling, Neuropathology, Neuronal Function and Neuroimmunology.

## Institute of Biomaterials and Biomedical Engineering (IBBME)

U of T's Institute of Biomaterials and Biomedical Engineering (IBBME) is a unique multi-disciplinary organization where researchers and practitioners from applied science, engineering, medicine, dentistry, and biology collaborate to solve problems in a number of areas including medical and life sciences for the study of living systems, enhancement and replacement of those systems, design and construction of systems to measure basic physiological parameters, development of instruments, materials and techniques for biological and medical practice, and the development of artificial organs and other medical devices.

## Banting and Best Diabetes Centre (BBDC)

The Banting and Best Diabetes Centre (BBDC) has the primary objective of advancing diabetes research, education, and patient care. The BBDC boasts some of the world's most prolific innovators in the field of metabolic and endocrine disorders.

**2005: Scientists led by Yaacov Ben-David produce the first results showing that early surgical removal of the spleen in combination with antiangiogenic therapy that stops the formation of blood vessels that feed tumour growth leads to prolonged survival in a mouse model of leukemia.**

– Sunnybrook



In addition to these elite established programs, the University is currently developing major initiatives that have the potential to revolutionize biotechnology innovation in the coming years.

### **Molecular Design and Information Technology (MDIT)**

Opened early in 2003, the Molecular Design and Information Technology (MDIT) Centre, a high tech supercomputing facility, will form the heart of a new drug discovery and development program. This initiative designed to nurture and strengthen three-dimensional structure-based molecular research, biomolecular computations, and drug/molecular design. Along with the Faculty of Medicine's Institute for Drug Research (IDR), MDIT will cement the U of T community as an international hub for research in biopharmaceutical discovery and development.

### **Terrence Donnelly Centre for Cellular and Biomolecular Research (Donnelly CCBR)**

Opened in the fall of 2005, The Terrence Donnelly Centre for Cellular and Biomolecular Research (Donnelly CCBR) is establishing a unique organization to facilitate the development of novel and exciting technologies in the areas of medicine, arts and science and applied science and engineering. These technologies will have the potential to transform the current marketplace. The Donnelly CCBR will consist of five primary research platforms: (1) Animal Models of Disease, (2) Biomolecular Engineering, (3) Functional Imaging, (4) Protein Structure and (5) Proteomics and Bioinformatics.

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# Faculty of Nursing, University of Toronto



The Faculty of Nursing at the University of Toronto is one of the most respected schools of its kind in Canada, with a long history of educating nurses to the baccalaureate level and beyond. The faculty is renowned nationally and internationally for its educational programs and the quality of research carried out by its faculty members.



2004: Researchers identify a new form of disease gene associated with Rett syndrome.

– Dr. Berge Minassian (SickKids), Dr. John Vincent (CAMH)

University of Toronto is one of the top research-intensive universities in North America, offering a distinctive environment for the pursuit and development of knowledge. Parallel to the university's mission, the Faculty of Nursing endeavours to provide a supportive environment for faculty members and students in building research capacity for the development of evidence-based best practices in nursing, healthcare and the healthcare system. The Faculty of Nursing continues to attract research funding from various sponsors including the federal and provincial government. In 2005-06, a total of \$7 million of research funding was received for various research projects and programs undertaken by faculty researchers.

The diversified interests in the research areas at the Faculty of Nursing have resulted in the development of the following research themes and clusters. Faculty researchers are associated with these clusters that further foster and develop their respective research interests with the necessary space and facilities provided by the new location of the Faculty of Nursing at 155 College St.

## **Nursing Health Services Research**

Nursing health services research involves the application of research methods from social and health sciences, biostatistics and economics to investigate questions relating to nursing and health services resource planning, organization, management, financing and delivery. Research focuses include health human resources, nursing effectiveness, nursing and health outcomes, nurse costing, quality work environments, healthcare teams, nursing leadership and patient safety issues, with a particular emphasis on reformation of organizational culture, building technological tools for safe care, delivering processes of safe care and applying human factors system designs in health care.

## **Diversities & Politics of Health**

This research cluster unites scholars who re-examine conventional ways of conceptualizing nursing, health care and health promotion. By analysing social relations and discourses in these fields, this group of academics explores their assumptive foundations and proposes alternative, hybrid and interdisciplinary ways of thinking and researching. The group recognizes and is informed by political, theoretical and methodological diversities. Particular focuses of research include social inequities in health, illness and nursing, gender as a determinant of health, participatory and action approaches to research, migration and health, aboriginal Canadians' health, HIV/AIDS, redefinitions of traditional boundaries between politics and ethics and theoretical approaches exploring nursing complexities in the 21st century.

## **Nursing Interventions**

The focus of this research cluster is on rigorous evaluations of conventional and innovative forms of nursing care, using randomized controlled trials, theory-driven evaluations and systematic reviews of the evidence. Studies are conducted in formal and informal healthcare settings, addressing a wide variety of health and illness issues, e.g., maternal-newborn health, cancer, cardiovascular disease and acute and chronic pain in adults and children. Many of the studies are multidisciplinary and international in scope.

## **The Clinical Simulation Learning Centre (SIMS Lab)**

In its renovated space the Faculty of Nursing has launched a new era in professional education and research for the benefit of the healthcare system and people of Ontario and Canada.

Simulation education is a proven method of introducing and integrating increasingly complex

**1984: Geneticist Tak Mak helps identify the T-cell receptor gene, a major advance in our understanding of the body's immune system.**

scenarios into the education process. To meet the need for both safe and effective education and professional assessment and retraining, the faculty has created the Clinical Simulation Learning Centre (SIMS Lab) in the Health Sciences Building.

The SIMS Lab includes two distinct learning environments. One replicates a general in-patient unit with 12 beds and a nursing station, while the other replicates a five-bed critical care environment with an isolation room for infectious disease training. Nursing students in our undergraduate, graduate and nurse practitioner programs will use both simulation labs to enhance their psychomotor skills, acquisition and critical thinking skills.

With one of the only simulation learning centres in Canada equipped to replicate a critical care environment with advanced patient simulators (adult and pediatric), the Faculty of Nursing is very excited at the opportunity to be the first to assess the outcome of introducing simulation into nursing education.

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# The Leslie Dan Faculty of Pharmacy



The Leslie Dan Faculty of Pharmacy is committed to improving the health of Canadians through education and research. It is a national leader in the education of pharmacy professionals and in pharmacy practice, social and administrative pharmacy and pharmaceutical sciences research. The faculty is focused on nurturing a culture of innovation and boosting the entrepreneurial spirit of its researchers who endeavour to move drug discovery to commercial viability.



1965: SickKids develops a lab procedure that cuts the time needed to diagnose whooping cough from 5 days to 30 minutes.

With the largest student complement of any pharmacy school in Canada and greater than most U.S. schools, the faculty provides unparalleled pharmacy programs for more than 1,000 undergraduate, post-baccalaureate doctor of pharmacy (PharmD) and internationally trained pharmacy students. The undergraduate program in pharmaceutical chemistry is an ideal training ground for students interested in pursuing a career in the pharmaceutical industry. In addition there are over 130 graduate students pursuing MSc and PhD degrees. Continuous professional development and customized executive programs are offered for practicing pharmacists, pharmaceutical industry professionals and academics. Programs on drug information are presented for members of the general public.

The Leslie L. Dan Pharmacy Building is designed by the internationally renowned British firm of Foster and Partners. The building campaign has galvanized the pharmacy sector – as evidenced by the more than \$65 million in government, university and private sector support. Many corporations and hundreds of other individuals who make their living through pharmacy have supported the building project at other giving levels. Feature articles describing the building have appeared in *Building Magazine*, *Canadian Architect*, *Azure*, the U.S. publication *Architectural Record*, the British publication *Wallpaper* as well as the *Toronto Star* and the *Globe and Mail*.

## Drug Discovery: From the bench to bedside

Research conducted by faculty principal investigators encompasses all aspects of the discovery, development, administration and utilization of therapeutic drugs. A pharmacy-led drug design/medicinal chemistry platform is being developed and is intended to be a catalyst for interdisciplinary research and collaboration,

both pharmacy-initiated and partner-initiated. The research clusters of the faculty are organized among the following three divisions:

## Pharmaceutical Sciences

The main clusters within this division are pharmaceuticals and drug delivery, pharmacokinetics, pharmacology and toxicology. Research endeavours within the division range from fundamental drug discovery at the molecular level to clinical trials. The research activities can impact therapeutic uses including treatments for cancer, HIV/AIDS, neural injuries and diseases, substance abuse, autoimmune diseases, heart diseases and birth defects.

**Pharmaceutics:** In the area of pharmaceuticals there is research focused on the rational design and development of polymer-based drug delivery systems, enhanced and modulated drug delivery, the discovery and development of novel radiopharmaceuticals for diagnostic imaging or targeted radiotherapy of cancer and the development of new targeted and controlled release drug delivery systems that take into account the short biological half-life and strong systemic side effects associated with many drugs, including old drugs and the new generation of drugs such as proteins, peptide and immunomodulators. Researchers within this group hold a number of patents including one for molecular dispersion composition with enhanced bioavailability.

**Pharmacokinetics:** Faculty members within this cluster are focused on understanding what happens to a drug once it is introduced to the body. Among other topics, research is aimed towards an understanding of the handling of drugs and their metabolites within eliminating organs, the molecular regulation of drug transport proteins and drug transport processes across cell membranes.

**1988: Surgeons Alan Hudson and Susan MacKinnon perform the world's first nerve transplant on a nine-year-old boy.**

**Pharmacology and Toxicology:** Research projects among this group range from the study of idiosyncratic drug reactions to forensic toxicology studies related to substance abuse. Unexpected adverse reactions occur in a small percentage of patients that take a drug and represent a serious medical problem. Since such reactions often lead to withdrawal or severe restrictions on the use of a drug, which in turn significantly adds to the uncertainty of drug development, knowledge gained in these studies facilitates the identification of toxicologically predisposed humans, the development of strategies to minimize unwarranted drug toxicity and an understanding of disease mechanisms, risk factors and novel treatments.

**Social & Administrative Pharmacy:** Activities in this division range from pharmacoeconomic studies to developing lifelong educational models for healthcare -- in particular pharmacy -- professionals through to patients' use of complementary/alternative medicine. Research findings impact health and clinical policy, medicine regulations and reimbursement and professional education.

**Pharmacy Practice:** This is an emerging specialty area for the faculty. It is intended that this newly created division will unite educators and researchers who have an emphasis in the area of clinical pharmacy that is focused on patient-oriented drug therapy. The faculty is currently drawing together members who are engaged in pharmacy education and research who for the most part also maintain clinical practices to ensure continued awareness of clinical problems and clinical relevance. Many of these researchers are being drawn from our affiliated teaching hospitals.

Faculty members hold a number chairs and professorships co-funded by the government, professional and industry partners, the university and the faculty.

They include:

Canada Research Chair in Adverse Drug Reactions – Jack Uetrecht

Canada Research Chair in Chemical Genetics – Guri Giaever

GlaxoSmithKline Chair in Pharmaceutics and Drug Delivery – Prof. Ping Lee

F. Norman Hughes Chair in Pharmacoeconomics – Dr. Murray Krahn

Ontario College of Pharmacists Professorship in Pharmacy Practice – Prof. Zubin Austin

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**1999: SickKids concludes that occupational exposure to organic solvents during pregnancy increases the chances of major birth defects.**



# The Terrence Donnelly Centre for Cellular and Biomolecular Research (Donnelly CCBR)



Terrence  
Donnelly  
Centre for  
Cellular &  
Biomolecular  
Research  
University  
of Toronto

The Terrence Donnelly Centre for Cellular and Biomolecular Research (Donnelly CCBR) creates a unique organization at the University of Toronto where investigators from the Faculty of Medicine, the Leslie Dan Faculty of Pharmacy, the Faculty of Applied Science and Engineering and the Faculty of Arts & Science are brought together. Donnelly CCBR is an open, fluid environment that encourages new ways of approaching biological problems by stimulating unconventional interactions among disciplines.



1989: Lap-Chee Tsui and Manuel Buchwald of the Department of Medical Genetics and Jack Riordan of the Department of Biochemistry & Clinical Biochemistry isolate the gene that causes cystic fibrosis.



The essence of the Donnelly CCBR lies in three programs that span the leading areas of biomedical research: bioengineering and functional imaging; integrative biology; and models of disease. The Donnelly CCBR premise is that each program - and the entire centre - will thrive best if it includes biological, physical, computer and engineering scientists working together in a communal setting at the University of Toronto to shape and define the "New Biology."

When fully realized, the Donnelly CCBR will include more than 35 principal investigators and their teams. More than 25 investigators have moved into the Donnelly CCBR, and recruitment of new scientists will continue for several years. By creating an ideal interdisciplinary research environment in physically stunning space, the Donnelly CCBR will encourage outstanding minds to come to and stay in Canada. In fact, several new faculty members have already been recruited to the Donnelly CCBR from universities in the United States and Europe. This cadre of new investigators includes the first joint recruits representing the Departments of Computer Science and Chemistry, and Faculties of Pharmacy and Medicine.

Here are some of the key research programs currently underway at the Donnelly CCBR:

A team of geneticists, led by Donnelly CCBR Director Brenda Andrews and fellow professors Charlie Boone and Timothy Hughes, have established a state-of-the-art functional genomics laboratory on the top floor of the centre. The lab aims to use the astounding techniques of post-genome biology to systematically explore the function of all genes in the cell. CCBR scientists, led by Professors Andrew Emili and Jack Greenblatt, are also exploring the far more complex set of all the proteins that those genes can generate: the proteome.

Understanding and cataloguing the proteome is a massive computing task, requiring cutting-edge information technology and mass spectrometry equipment. The overall goal is to produce the first glimpse of the complex wiring diagram of the cell, and to use this diagram as a template for predicting how to manipulate the cell's circuitry with small molecules or drugs. This goal will be greatly facilitated by the establishment of a new chemical genetics program that will explore how small molecules such as drugs affect cells and organisms. The program is led by Guri Giaever, a new recruit to the Donnelly CCBR from the Stanford Genome Centre, who is internationally recognized as a leader in the nascent field of 'chemical genomics'.

In another lab in the building, Donnelly CCBR colleagues Professors Peter Zandstra and Cindi Morshead are engaged in exploring what may well be the most fascinating cells in the human body: stem cells. Zandstra's team is using engineering-based approaches such as modelling, molecular engineering and bioreactor design, to enable new stem cell based therapies. Morshead is investigating whether it is possible to activate the stem cells in a stroke victim's brain to promote self-repair of the sustained neural damage. Interactions between the stem cell and genetics teams are likely to produce completely unanticipated new insights into understanding how stem cells work.

In complementary projects, Professors Molly Shoichet and Michael Sefton are using techniques of tissue engineering to discover new ways to encourage nerve cells to repair and grow. Materials science approaches are geared towards discovering new coatings for transplanted material to prevent immune rejection in patients. The CCBR aims to create an environment that will allow immediate 'transfer' of discoveries in one discipline to another – in this way, interesting questions can be quickly

identified and the results applied to important biomedical problems. One can only imagine how interactions among tissue engineers, cell biologists, geneticists and others will promote advances to gene therapy, among other advances.

The Donnelly CCBR has also devoted an entire floor – more than 20,000 square feet – to the growing field of ‘bioinformatics’ and computational biology: the nexus of information science and biology. The large-scale biology projects in the Centre, some of which are outlined above, create massive amounts of data that are essentially meaningless unless analysed using innovative computer algorithms that help scientists discern important patterns. These patterns reveal new and important information about cell and organism function. In the past year, five new junior investigators have been recruited to the Donnelly CCBR, through collaborations involving the departments of Computer Science and the Faculty of Medicine: Gary Bader (from Sloan Kettering), Michael Brudno (from UC Berkeley), Zhaolei Zhang (from Yale University), Quaid Morris (from University of Toronto), and Brendan Frey (from the Beckman Institute).

In addition to housing cutting-edge research, the Donnelly CCBR will be a collaborative classroom, providing hands-on training for hundreds for undergraduate, graduate students and postdoctoral fellows.

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**2004: Neuroscientists use wireless handheld technology to collect data from patients with bipolar disorder – more than 40,000 responses – and thereby build the largest database of its kind in Canada. This allows the analysis of mood dynamics with unprecedented detail.**



# Women's College Hospital



Women's  
College  
Hospital

Women's College Hospital is well established as a leader in women's health — our remarkable history goes back more than a century in Ontario. We have gone through many changes in the past several years — the most recent being regaining our independent governance on April 1, 2006. This is a very exciting time for us, as we explore new and better ways to provide care to women and their families throughout every phase of their lives.



1991: Dr. Philip Seeman identifies two new dopamine receptor proteins, D4 and D5, clearing the way to finding more effective and safer medicines for treating psychosis, schizophrenia and possibly cocaine addiction.

The New Women's College Hospital is a community dedicated to achieving leadership in women's health in an ambulatory care setting.

We are the first and only independent ambulatory care hospital in Ontario, and the only hospital in Ontario with a primary focus on women's health. As a teaching hospital fully affiliated with the University of Toronto, we support research in women's health and will lead the way in training health-care providers within an ambulatory setting.

The Women's College Research Institute (WCRI) works with all of the researchers based at Women's College Hospital to conduct research that improves women's lives. WCRI includes a diverse, interdisciplinary faculty active in eight established research programs and in a number of clinical research initiatives across the hospital. Visit the WCRI web site at [www.womensresearch.ca](http://www.womensresearch.ca).

Women's College Research Institute (WCRI) is leading the way towards a new, more comprehensive understanding of women's health. Our investigators explore women's health concerns from cell to society. They work across disciplines to generate relevant and holistic solutions. WCRI is dedicated to integrating research into clinical practice at Women's College Hospital to produce outstanding clinical services for women and their families.

### **WCRI strives to**

- Create new research knowledge by supporting research programs in key women's health areas and by working with clinicians to develop and evaluate innovative services.
- Facilitate advances in women's health by connecting researchers, students and clinicians across research disciplines.
- Share research knowledge with clinicians, policy makers and the public to insure that research knowledge improves women's lives.

WCRI is comprised of eight established research programs. It also encompasses and supports a number of clinical research initiatives within Women's College Hospital.

- Familial Breast Cancer Research Unit
- Maternal Infant and Reproductive Health Research Unit
- Canadian Osteoarthritis Research Program
- Obstetrical Anesthesia Research Unit
- Ontario Breast Cancer Community Research Initiatives
- Osteoporosis Research Program
- Violence and Health Program
- Women and HIV Program

Women's College Research Institute makes clinical researchers part of its Faculty and will be a testing ground for ambulatory care services that can help people maintain their health and live independently. We will strive to ensure that all of our care programs are based on research evidence - and that this evidence is clear and compelling enough to justify improving health services for women and their families at other institutions.

Enhancing the capacity of our clinical research programs to evaluate the quality of clinical care models is one important element of our current strategic planning process. Here are some examples of clinical research initiatives now active at Women's College Hospital.

- The Bay Centre for Birth Control
- The Family Practice Health Centre
- The Gender, Asthma and COPD Program
- The Henrietta Banting Breast Cancer Centre
- The Women's Cardiovascular Health Initiative
- Women's Mental Health Clinical Programs

**1962: Dr. Harold E. John establishes Canada's first Department of Medical Biophysics and develops cobalt therapy units which revolutionize radiation treatment of cancer around the world.**



# Ryerson University

RYERSON  
UNIVERSITY

Ryerson's growing research activities have a strong applied focus. With approximately 700 full time faculty members, 21,000 undergraduate and 700 graduate students, Ryerson University is the largest primarily undergraduate university in Canada, offering more than 80 degree programs, including 18 graduate degrees.



1995: A research team led by Peter St. George-Hyslop, Director of the Centre for Research in Neurodegenerative Diseases, discovers two genes responsible for early-onset Alzheimer's.

## Bioengineering

The Faculty of Engineering, Architecture and Science is developing specializations at the undergraduate and graduate level in Bioengineering. A multidisciplinary initiative involving engineering (Chemical, Electrical and Computer, and Mechanical Engineering) and science (Chemistry and Biology, Computer Science, Mathematics and Physics) departments forms the basis of unique collaborations in bioengineering. Research includes research in signal processing in the development of new medical devices, biomedical physics, advances in human factors research, imaging, bioinformatics, bioprocess engineering, biosensors, biomechanics and biomaterials, and computational modeling within medical device engineering.

## Medical Physics

Research in medical physics focuses on the rapid development of innovative techniques for disease detection, imaging and treatment and for the improved understanding of disease etiology and progression. Concentrated in the Department of Physics faculty are engaged in the development of science and applications of the new technologies that can advance Canada to the forefront of the biomedical technology sector, and to educate the future scientists and clinicians who will use these new systems. The Department is home to the Canada Research Chair in Biomedical Applications of Ultrasound. Other research areas include the development of minimally invasive thermal therapeutics, in vivo measurement of strontium and other trace elements in human bone and tissue using X-ray fluorescence, treatment of tumors using intensity modulated radiating therapy, and computational modeling for improving cancer treatment methods.

## Molecular Sciences

Faculty in the Departments of Chemistry and Biology, Physics, Nutrition, and Chemical Engineering contribute to research and graduate studies in molecular sciences. The varied research program integrates the composition, structure, function, expression, interaction and imaging of molecules using concepts and methods in the chemical and biological sciences. The Department of Chemistry and Biology is home to the Canada Research Chair in Biofilms. Faculty research includes the development of analytical tools in environmental chemistry, proteomics and biomarker discovery, biochemistry of microbial extracellular polymeric materials, and the development of novel polymer systems for use in sensors. Advances in understanding cellular responses to thermal and ultrasound therapies, microbial-host interactions, and bioorganic and medicinal chemistry are being made.

## Facilities

The Ryerson University Analytical Centre houses the latest PerkinElmer instrumentation: HPLC with uv, refractive index, conductance, and fluorescence detection; GC-MS with autosampler; GC with headspace and purge-and-trap autosamplers; molecular luminescence, uv-vis, and FTIR spectroscopies. Access to ESI/MALDI-Qq-TOF-MS and ESI-Ion Trap-MS is also available within the Department as are opportunities to access PCR (Roche Lightcycler) and DNA sequencing.

The Ryerson Clean Room Facility is a specially designed laboratory for work involving the measurement of metals at trace and ultratrace levels in environmental samples. The dust-free room is outfitted with laminar flow hoods for sample preparation and a graphite furnace atomic absorption spectrometer for detection and quantitation of metals in water.

**1996: Brenda Gallie and co-workers develop a new therapy for retinoblastoma, a cancer of the eye that leads to blindness. It represents the first major change in the management of this disease in 35 years.**

The Advanced Microscopy Facility includes a two-photon confocal laser scanning microscope (CLSM), a Raman confocal microscope (RCM), and an atomic force microscope (AFM). A Scanning Electron Microscopy with energy dispersive x-ray spectroscopy and coating facility is based in the Department of Mechanical and Industrial Engineering. The Department of Chemistry and Biology houses an inverted laser-confocal microscope suitable for live-cell imaging and an epifluorescence microscope.

Facilities in Physics include the Minimally Invasive Thermal Therapy Laboratory, Human Trace Element Detection Laboratory, Ultrasound Biomicroscopy Laboratory, Optoacoustic Imaging Laboratory, and the Wavelength Dispersive X-ray Fluorescence Laboratory.

## Contact Information

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Web site: [www.ryerson.ca/ors](http://www.ryerson.ca/ors)

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Professor and Associate Dean (Research,  
Development and New Science Programs)

Dept. of Chemistry & Biology  
Faculty of Engineering, Architecture and Science

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Fax: 416-979-5368

E-mail: [sliss@ryerson.ca](mailto:sliss@ryerson.ca)

Web site: [www.ryerson.ca](http://www.ryerson.ca)

**2002: Identifying gene clusters using microarray technology that are involved in lung cancer.**

– Drs. Denis Wigle, Igor Jurisica, Jim Woodgett, Shaf Keshavjee,  
Gail Darling, Frances Shepherd and Ming Tsao



# York University



redefine THE POSSIBLE.

York University is the leading interdisciplinary research and teaching university in Canada. The third largest university in the country, York is host to a dynamic academic community of 50,000 students and 5,000 faculty and staff, as well as 190,000 alumni worldwide. York's 11 faculties and 23 research centres and institutes conduct ambitious, groundbreaking research, often cutting across traditional academic boundaries.



The discovery of a genetic maker for Wiskott-Aldrich syndrome (a fatal immune deficiency disorder) that resulted in genetic counselors from across North America contacting MSH for help in prenatal diagnosis.



## YORK'S STRATEGIC RESEARCH FOCUS

York researchers are undertaking visionary research of local, national and international significance. York is a leading force in the development of new knowledge that provides insight into the scientific, economic, social and cultural issues affecting our world. Building on our historic strengths we are expanding our interdisciplinary and collaborative research in four strategic thematic areas – health, the environment and sustainability, culture and entertainment, and international studies. To explore the issues that impact our world in the most strategic and effective way, York Research is committed to the following hallmarks within each of its thematic areas of research:

**Interdisciplinary:** To see with fresh eyes and new perspectives. The vision to break down traditional academic boundaries and pursue truly interdisciplinary research projects, with a particular emphasis on collaborative projects between scientists and social scientists.

**Collaboration:** To develop research in a collaborative way by engaging colleagues from other institutions, industry, NGOs and community groups locally, nationally and internationally

**Impact:** To ensure that research has an impact on and relevance to the world in which we live and to ensure that researchers are engaged outside the institution through knowledge exchange, technology transfer, and community-university partnerships and clusters.

## KEY RESEARCH THEMES AT YORK UNIVERSITY

### Health Research

York University has a history of excellence in health research. From the biomedical to social determinants of health, from health policy and management to bullying behaviours, York's

interdisciplinary approach to health research is improving the overall health and well-being of individuals and communities. York is home to over 250 faculty members working on health research across the full spectrum (for example, from the biomedical, social, environmental, and life sciences to nursing, law, mathematics, business, psychology, policy and informatics) and to a number of research centres and labs engaged in health research at York. York's unique approach to health research pulls together strategic partners from diverse sectors of society, forging vital new collaborations – often across different disciplines. In the process, York facilitates research and knowledge exchange with community hospitals, government agencies, social service organizations, and other academic institutions to address the most urgent health issues of our time.

A sample of areas of health research strengths at York include:

- Biotechnology, Mass Spectrometry, and Proteomics
- Vision Science
- Determinants of Health
- Infectious and Chronic Diseases
- Gender, Child, and Youth Health
- Health Systems, Policies, and Law

### Environmental and Sustainability Research

Since its inception, York University has been a leader in environmental and sustainability research, bringing together renowned researchers from many diverse disciplines to address the most urgent issues facing our world. As we move into the 21st century, environmental and sustainability research continues to be a top priority for York. By stressing the importance of prevention, long-term thinking, sound decision-making, and respect for the environment, sustainability strives to meet the needs of the present without compromising those of the future. The interdisciplinary Faculty of

1993: The International Digital Mammography Development Group, led by scientists at SWRI, is formed. This collaboration of leaders in breast imaging has made dramatic breakthroughs in developing new technologies to detect breast cancer.

Environmental Studies is York's largest research-based graduate program, and the Schulich School of Business is ranked among the top three business schools worldwide for its integration of management and sustainability. York's environmental researchers are active participants in the sustainability of communities, advising governments on pressing environmental issues and helping to formulate policy that matters.

A sample of areas of environmental and sustainability research strengths at York include:

- Air Quality, Atmospheric Science, and Pollution
- Ecology and Protection of Natural Resources and Habitats
- Sustainable Agricultural, Fishing and Energy Industries
- Law and the Environment
- International Development and Sustainability
- Geomatics

## Culture and Entertainment Research

Drawing on the breadth and scope of expertise in areas such as communications and cultural studies, fine arts, education, philosophy, computer science, engineering, applied mathematics, law, and business, York is emerging as a global leader in culture and entertainment research. York University is home to the largest university-based fine arts program in Canada, and one of the largest in the world. In addition, York offers degrees in design, communications and culture, computer science, engineering, applied mathematics, and a number of social science and humanities programs with direct connection to culture and entertainment, while York's Schulich School of Business offers Canada's only MBA with a specialization in arts and media administration. York's culture and entertainment researchers have a direct and immediate impact on social, cultural, and technological development in the public, private, and non-profit sectors and researchers maintain close ties to theatre, music

and dance companies, galleries and museums, and the film, broadcast, and new media industries.

A sample of areas of culture and entertainment research strengths at York include:

- The Arts, Culture and Society
- Science, Technology, and the Arts
- Education and the Arts
- Entertainment Technology

## International Studies Research

Bringing together renowned scholars from a wide range of disciplines, including political science, law, business, geography, science, and the humanities, York facilitates important research on both geographic regions, like Africa, Europe, Asia, and Latin America, and transnational issues, like globalization, security, gender, human rights, and refugees. While offering new insights into nations and the pressing concerns that cut across borders, York is also providing more effective responses to challenges that are changing the way we live. York's international studies researchers work with governments, business, and NGOs across the globe, and ensure the transfer of new knowledge. They are actively shaping policy and addressing real-world issues and challenges. In addition, York University is home to leading research centres and institutes across a broad range of international areas.

A sample of areas of international studies research strengths at York include:

- Diasporas, Forced Migration, and Refugees
- International Political Economy
- Development and the Global South
- Security and Peace Building
- Research in and on regions throughout the world
- Research that is reshaping international legal thought

## YORK UNIVERSITY RESEARCH AND OUR LOCAL COMMUNITIES

**1998: Dr. John Dick, Department of Molecular and Medical Genetics, identifies a class of human hematopoietic cells with SCID-repopulating activity. The identification demonstrates complexity of the organization of the human stem cell compartment and has important implications for clinical applications involving stem cell transplantation.**

York's research also serves as a driver of economic growth and innovation in the GTA. York's strategic research plan is designed to help tear down the ivory tower and engage with the local community directly through technology and knowledge transfer, clusters, regional innovation, and partnerships. York's historically strong international linkages are matched by strong collaborations with local communities, which include key projects in the Greater Toronto Area, such as the Innovation Synergy Centre in Markham; the York Region Human Services Planning Coalition; the Consortium on New Media, Culture, and Entertainment R&D in the Toronto Region; and YORKbiotech. Additionally, York University has been an active partner with The Town of Markham and a number of industry partners to establish a National Research Council of Canada (NRC) facility within the Greater Toronto Area, the only major urban centre in the country without such a facility.

## YORK UNIVERSITY FACTS

- With 5,000 graduate students, York has the second-largest graduate Faculty in Ontario
- York is home to the world-renowned Schulich School of Business and Osgoode Hall Law School
- Since 1999 York has graduated 600+ Doctoral, 6,500+ Master and 45,000+ Bachelor students
- York has been ranked as Canada's third most internationally collaborative university in scientific research
- York University's total impact on the GTA economy is conservatively estimated at over \$3.5 billion in 2004

## YORK'S S&T-RELATED FACULTIES

- Faculty of Health
- Faculty of Science & Engineering
- Faculty of Environmental Studies
- Faculty of Graduate Studies
- Osgoode Hall Law School
- Schulich School of Business

## YORK'S S&T-RELATED RESEARCH CENTRES & INSTITUTES

### York Core Molecular Biology & DNA Sequencing Facility

The York Core Molecular Biology and DNA Sequencing Facility provides extensive service to the academic, biomedical, and biotechnology communities throughout Canada and the USA, offering DNA sequencing and proteomics science.

**Director:** Ron Pearlman

**Address:** Farquharson Building

**Telephone:** 416-736-2100 ext.70121

**Fax:** 416-736-5698

**Email:** corfac@yorku.ca

**Website:** www.yorku.ca/biocore/

### Centre for Research in Mass Spectrometry

The Centre for Research in Mass Spectrometry promotes mutually beneficial research collaboration in mass spectrometry both within and outside York University. Mass spectrometry is a very powerful analytical process that is used to identify unknown compounds, to quantify known compounds, and to elucidate the structure and chemical properties of molecules.

**Director:** K.W. Michael Siu

**Address:** 238 Chemistry Building

**Telephone:** 416.736.2100 Extension 77860

**Fax:** 416.736.5936

**Email:** kwmsiu@yorku.ca

**Website:** www.chem.yorku.ca/CRMS/

### Centre for Vision Research

The Centre for Vision Research is an international leader in interdisciplinary studies of vision, ranging from clinical applications, studies of human perception, brain sciences, visual biometrics, and computational vision, to helpful tools for the visually impaired, visually guided computer

**2003: SickKids identifies, for the first time, a cancer stem cell responsible for brain tumours. This discovery may change how this deadly condition is studied and treated in the future.**

– Dr. Peter Dirks

interfaces for the hearing impaired, and visually guided robots for the physically disabled.

**Director:** John Tsotsos  
**Address:** 0009 Computer Science Building  
**Telephone:** 416.736.5659  
**Fax:** 416.736.5857  
**Email:** cvr@yorku.ca  
**Website:** <http://cvr.yorku.ca/home/>

## York Institute for Health Research

The York Institute for Health Research promotes interdisciplinary health research. Comprised of faculty from law and the social, health and environmental sciences, YIHR is based upon the assumption that health depends upon many interacting variables - social, political, economic, cultural and historical – and that without attention to these variables, efforts at intervention are likely to fail.

**Director:** Marcia Rioux  
**Address:** 019 Health, Nursing and Environmental Studies Building (HNES)  
**Telephone:** 416.736.5941  
**Fax:** 416.736.5986  
**Email:** yihr@yorku.ca  
**Website:** [www.yorku.ca/yihr/](http://www.yorku.ca/yihr/)

## Centre for Research in Earth and Space Science

The Centre for Research in Earth and Space Science serves to enhance and facilitate collaborative, interdisciplinary research on topics including astronomy and astrophysics, atmospheric dynamics, chemical physics, geodynamics, remote sensing, the space environment and robotics. It draws its members from the Departments of Earth and Atmospheric Science, Physics and Astronomy, Chemistry, Computer Science, and Mathematics and Statistics.

**Director:** Gordon Shepherd  
**Address:** 249 Petrie Science Building  
**Telephone:** 416.736.5247  
**Fax:** 416.736.5626  
**Email:** gordon@yorku.ca  
**Website:** [www.cress.yorku.ca/](http://www.cress.yorku.ca/)

## Centre for Atmospheric Chemistry

The Centre for Atmospheric Chemistry is comprised of York scientists, working within the Departments of Chemistry and Earth and Atmospheric Science is concerned with relevant issues related to the environment, including: urban and regional oxidant formation, stratospheric ozone depletion, the greenhouse effect, acid precipitation, airborne toxic chemicals, global atmospheric change and arctic pollution.

**Director:** Geoff Harris  
**Address:** 006A Steacie Science Building  
**Telephone:** 416.736.5410  
**Fax:** 416.736.5411  
**Email:** cac@yorku.ca  
**Website:** [www.cac.yorku.ca/](http://www.cac.yorku.ca/)

## Institute for Research and Innovation in Sustainability

The Institute for Research and Innovation in Sustainability is an interdisciplinary university-wide institute that is the focal point for sustainability-related research activities by all ten faculties. IRIS brings together and supports York academics and researchers to work across disciplines and collaborate with partners in Canada and internationally.

**Director:** Dawn Bazely  
**Address:** 349 York Lanes  
**Telephone:** 416.736.5784  
**Fax:** 416.736.5195  
**Email:** irisinfo@yorku.ca  
**Website:** [www.iris.yorku.ca](http://www.iris.yorku.ca)

2000: Dr. Peter St. George-Hyslop, director of the Centre for Research in Neurodegenerative Diseases in U of T's Faculty of Medicine and a neurologist at the University Health Network, announces that a new vaccine that may help prevent and treat Alzheimer's disease is ready to be tested on human subjects.

**Photos courtesy of:**

- MaRS
- The Ontario Institute for Cancer Research
- The Samuel Lunenfeld Research Institute of Mount Sinai Hospital
- St. Michael's Hospital (SMH)
- Sunnybrook Research Institute (SRI)
- SickKids – The Hospital for Sick Children Research Institute
- University Health Network (UHN) Research
- Centre for Addiction and Mental Health (CAMH)
- University of Toronto (U of T)
- Faculty of Nursing, University of Toronto
- The Leslie Dan Faculty of Pharmacy
- The Donnelly Centre for Cellular and Biomolecular Research (Donnelly CCBR)
- Women's College Hospital
- Ryerson University
- York University

# Toronto At A Glance

	Toronto	Region
Population	2.6 million	5.4 million
Per cent age 39 years or under	55.7%	57.1%
Languages spoken by 25,000 +	19	22
Labour Force	1.4 million	2.9 million
% with university degree	36%	31%
% with some post-secondary	70%	68%
Unemployment (annual average)	7.9%	6.9%
Universities and Colleges	9	12
Full-time students	185,000	210,000
Number of businesses	76,000	139,500
Office space	119 million square feet	162 million feet square
Industrial space	283 million square feet	746 million square feet
GDP	\$127 billion (USD \$113 billion)	\$262 billion (USD \$233 billion)
Average Household income	\$69,125 (USD \$61,553)	\$76,454 (USD \$68,082)
Retail Sales	n/a	\$54 billion (USD \$47.8 billion)
Visitors	18 million	29 million

Sources: Statistics Canada; City of Toronto

## North American Sector Ranking (by employment)

Business Services	3 <sup>rd</sup>
Design	3 <sup>rd</sup>
Entertainment	3 <sup>rd</sup>
Film and Television	3 <sup>rd</sup>
Financial Services	3 <sup>rd</sup>
Food and Beverage	3 <sup>rd</sup>
Information and Communication Technology	3 <sup>rd</sup>
Medical, Pharma and Biotech	3 <sup>rd</sup>

Sources: Institute for Competitiveness & Prosperity 2002; E & B Data 2004



 **TORONTO** Economic Development

**BioDiscovery Toronto**  
BioMedical Research Organizations  
*Linked For Innovation*