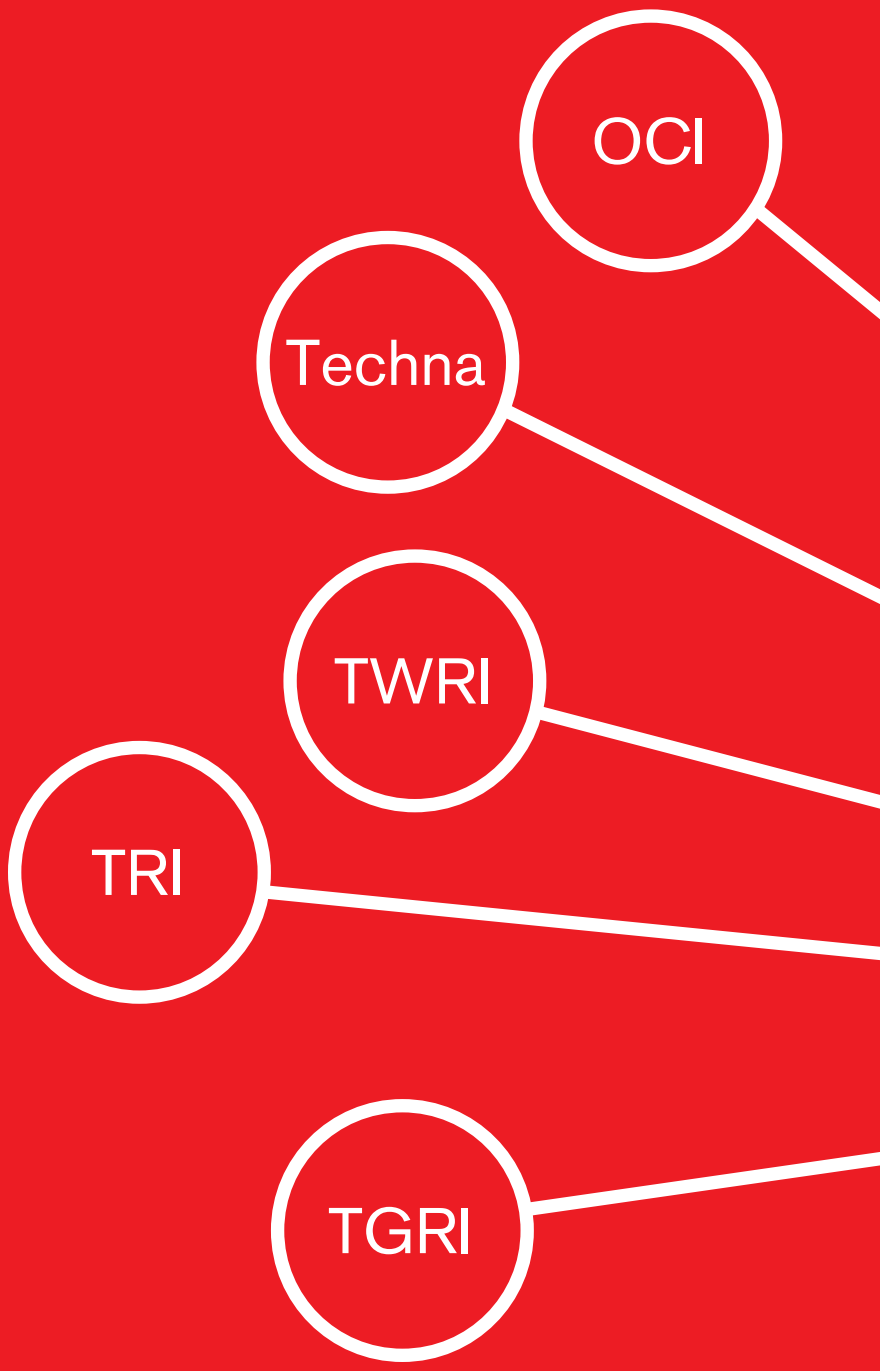
CONNECTED...

UHN Research Report 2012

UHN Research Snapshot

Total Researchers	**688**
Fellows	580
Graduate Students	573
Total Trainees	**1153**
Support Staff	1486
Research Space	809,090 sq. ft.
Publications	2303
Total Funding	$302,304,068

University Health Network (UHN) consists of Toronto General Hospital (TGH), Toronto Western Hospital (TWH), Princess Margaret Cancer Centre and Toronto Rehab (TR). The scope of research and complexity of cases at UHN have made it a national and international source for discovery, education and patient care. It has the largest hospital-based research program in Canada, with major research in transplantation, rehabilitation, cardiology, neurosciences, oncology, surgical innovation, infectious diseases and genomic medicine. UHN is a research hospital affiliated with the University of Toronto (UT) and is a member of the Toronto Academic Health Science Network (TAHSN).



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Welcome Message

Making Connections

Robert S. Bell *MDCM, MSc, FACS, FRCSC*
President and Chief Executive Officer, UHN

Christopher J. Paige *PhD, FCAHS*
Vice President, Research, UHN

At UHN we think a lot about connections. Without them we could not fulfill our mandates in patient care, education and research. Connections are fundamental to our life as a research hospital.

In fact, connections are fundamental to life. Isolated brain cells cannot think but connect one hundred billion of them correctly with the right cellular partners and the Mona Lisa, War and Peace, and the Double Helix appear. Isolated heart cells can contract but if you organize five or ten billion correctly with the right partners you create an extraordinarily efficient pump. An isolated skin epithelial cell offers little protection but layer billions together with the right partners and architecture and you build a most powerful defense system in a world of hostile microbes.

Of course even those single brain cells and heart cells depend on connections to survive. The inside of a cell is a hotbed of structured activity including enzyme pathways that provide energy to power cellular functions and proteins connecting to proteins at defined docking sites to activate or suppress other pathways, to name a few.

The cells that make up those hearts and brains and other organs are all essential features of what allows us to be human—and thereby to connect to other humans. In a research hospital, this means patient care teams can be formed, molding individual expertise into powerful healing units that are able to meet the needs of patients and families. This connectivity is particularly important at UHN where our health professionals care for some of the sickest patients in Canada with multiple co-morbidities.

Connectivity between teachers and learners is another hallmark of the research hospital and is essential for the passage of clinical knowledge to future generations of health professionals. Our biomedical researchers provide opportunities for learners to develop skills in state-of-the-art research to drive the acquisition of new knowledge, knowledge that is essential for continued progress in maintaining health and detecting, understanding and treating disease. UHN is able to achieve connections between learners and teachers in part because it itself is connected to UT and the affiliated research hospitals that comprise TAHSN.

UHN understands that by studying its own processes, innovation will emerge that will improve the health care system. To accomplish this, connections between clinical experts, based inside and outside of the hospitals, health systems researchers, administrators and patients are essential. By promoting such connections, UHN becomes a living laboratory for improving not only the health of Canadians but the efficacy of the health care system.

UHN has also embraced the wisdom of hospital-to-hospital as well as hospital-to-community connections to improve patient care. As a member of the Cardiac Care Network, the UT Transplant Institute, the Joint Department of Medical Imaging and Cancer Care Ontario—to name just a few—UHN is able to deliver care that is faster, better and more efficient. Underlying these networked approaches is the essential component of connections to governments and other funders of health care and health research. Such connections are essential to promote evidence-based financial decisions by government and to help philanthropists to effectively achieve their goals.

As rich in knowledge as the local TAHSN hospitals are, UHN understands that there is valuable knowledge beyond our immediate environment. UHN is committed to playing an important role internationally—this is grounded in our mission of global impact. A connected international community of clinical practitioners and researchers form a network of scholarship unprecedented in human history which, if it can be harnessed, will be able to solve the most complex health problems.

The consequences of failed connections are severe. When the connection between a tumour suppressor gene and its target is broken, malignant cells emerge; when brain cell networks break down dementia sets in; when research and clinical teams fail to communicate, therapeutic approaches stagnate and important discoveries remain in notebooks.

At UHN we are committed to enhancing connectivity to propel expanding networks of knowledge to understand, prevent and treat disease. We invite you to read further, learn more about what we do and discover how you can join our mission and connect with us.

Techna: Advancing Health through Technology

On November 9th 2012, Toronto-area philanthropist Carlo Fidani, alongside Drs. Christopher Paige and David Jaffray, cut the ribbon in the Banting Building to officially launch the Techna Institute for the Advancement of Technology for Health (Techna)– UHN's newest research institute. Recognizing the need for more applied innovation to improve care for patients, Mr. Fidani's $5M donation to The Princess Margaret Cancer Foundation kicked off the quest to create a unique environment that would serve as the front line for the development and deployment of new health technologies.

Techna is designed to shorten the time interval from technology discovery and development to application for the benefit of patients and the health care system. The Institute works towards these goals by focusing on translational research and establishing partnerships with industry. An important metric of success for Techna will be the impact of these newly translated technologies on health outcomes.

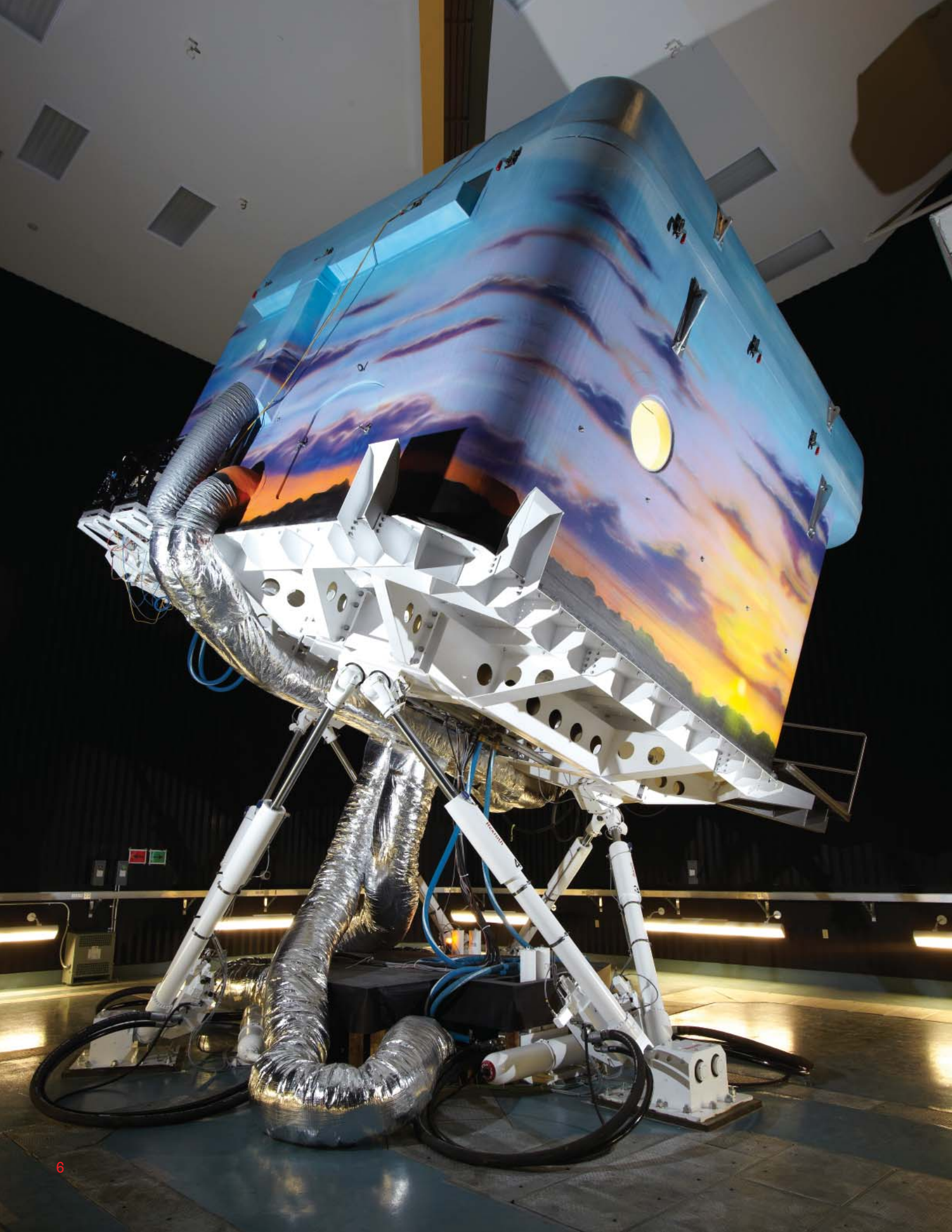
Techna activities are focused into five Cores: Photonics, Nanotechnology & Radiochemistry, Design & Engineering for Health, Guided Therapeutics and Informatics & Communication Technology. Each Core features the dual leadership of a clinical representative and a physical sciences or engineering faculty member. This unique structure ensures the melding of expertise from multiple disciplines.

Techna researchers have access to the world-class resources and facilities across UHN, MaRS and the UT campus, including: hardware and software laboratories, medical imaging facilities, machine shops, microfabrication facilities, a human factors testing lab, as well as access to clinical expertise. Collectively, over $100M in infrastructure is available to Techna.

In addition to uniting these facilities, Techna provides researchers with the expertise and human capital needed for project management, knowledge transfer and commercialization. A centralized project management approach ensures that the experience and skills gained through each project remain within Techna and UHN, as the core of experts moves from project to project within the Institute, strengthening the system. Commenting on this, Dr. Robert Bell, CEO of UHN emphasizes that "The success of Techna is going to be driven by its soft skills." Dr. Jaffray continues, stating that "Techna is leveraging the best science, engineering and clinical know-how to advance the performance of health care at UHN with far-reaching gains for patients in Canada and across the globe."

Image: Close-up of an inverted microscope in Techna's cleanroom facility.

> "Techna has the expertise to drive innovation in medical technology through to clinical impact."
>
> *Dr. David Jaffray, Director, Techna*



iDAPT: The Future of Rehabilitation Science

During their lifetime, it is estimated that one in two Canadians will experience a disability that requires rehabilitation. Integrating advanced technologies into rehabilitation research to help people get back on their feet is a central aim of the research institute at UHN's Toronto Rehab. In November 2011, this goal became a reality when TRI launched a new facility called iDAPT–Intelligent Design for Adaptation, Participation and Technology. In collaboration with UT, iDAPT houses 13 laboratories that together represent one of the most advanced rehabilitation research centres in the world. The 65,000 sq. ft. space allows researchers to cultivate ideas in a real-life environment. Dr. Geoff Fernie, TRI Director, explains, "iDAPT is completely unique–nothing comes close to it in the world. These facilities allow Toronto Rehab researchers to study problems that no one else can, so that we can find practical and affordable solutions to big problems that are experienced by older people, people with disabilities and caregivers."

The centerpiece of iDAPT is the Challenging Environment Assessment Lab (CEAL), which currently houses three special laboratories–StairLab, StreetLab and WinterLab–that can be lifted on and off a motion simulator to mimic environmental challenges. Participants are fitted with motion-tracking systems and monitored for changes in brain activity, eye and muscle movements, heart rate and temperature so that researchers can design rehabilitation solutions to help people cope in everyday situations. "The idea is to bring elements of the real world inside so we can test all of these research questions in a safe environment," says Dr. Jennifer Campos, Chief CEAL Scientist.

In StairLab, researchers observe how harnessed participants recover from stair falls, an injury that affects one in three senior citizens in Canada. StreetLab consists of a curved projection screen and walking treadmill as part of a high-tech three-dimensional cityscape simulator to study how people with brain injury, vision or sensory loss cope with complex environments. WinterLab creates an environment with real ice, sub-zero temperatures and 30 km/h winds, where researchers hope to create better footwear and clothing that will help reduce falls and sudden changes in blood pressure. Additional iDAPT research initiatives aim to fight hospital-acquired infections, diagnose sleep apnea, create intelligent home monitoring systems and increase mobility and movement for those with paralyzed limbs.

While iDAPT provides scientists with a technological quantum leap, TRI researchers continue to value simple solutions aimed not only at improving rehabilitation, but also at preventing injuries before they happen. This vision has already attracted the attention of over 500 researchers from over ten countries as well as industry partners eager to bring their expertise to UHN.

Image: iDAPT's Challenging Environment Assessment Lab (CEAL).

"iDAPT recreates real-life conditions, advancing rehabilitation breakthroughs with everyday applications."

Dr. Geoff Fernie, Director, TRI

Bringing Research Innovation to the Marketplace

While advances in medical science often involve abstract ideas, "Ultimately, people need to benefit from research," says Dr. Brian Barber, the Director of UHN's Office of Technology Development and Commercialization. "By commercializing research discoveries and technological advances, UHN can bring these breakthroughs to the public; creating tangible gains for society from research successes, both in terms of patient impact and economic return on investments." The past year has seen a number of success stories that highlight how licensing UHN technologies to companies and creating new start-ups can help realize the true potential of research.

For the first time in the past decade, a new drug discovered at UHN (by Dr. Daniel Drucker), is about to reach the marketplace. The drug, a glucagon-like peptide 2 analog (teduglutide), has just received regulatory approval in Europe and the U.S. for patients with short bowel syndrome. In the U.S. alone, 15,000 patients will soon have the potential to improve their quality of life with this new therapeutic. Marketed by NPS Pharmaceuticals, it has projected sales of $350M per year. With intellectual property protection first filed in the 1990s, it has taken 15 years of subsequent development for this drug to reach the marketplace. This example emphasizes the long-term commitment needed for successful biomedical research commercialization.

A further example of achieving patient impact is illustrated by the recent licensing of UHN-developed technology to RaySearch, a Swedish company specializing in advanced radiation cancer therapy of cancer. This technology, developed by Drs. David Jaffray and Michael Sharpe at the Princess Margaret Cancer Centre, allows for the reduction of required treatment planning time from many hours to minutes, for breast cancer patients undergoing intensity modulated radiation therapy for their disease. Through this licensing arrangement with RaySearch, these important benefits developed for patients at the Princess Margaret Cancer Centre will now be shared with others throughout the world.

Another UHN commercialization success story has led to the development of a new treatment that promotes the restoration of voluntary movements in individuals paralyzed by stroke or injury. The therapy, known as RECLAIM, was developed by Simple System Inc., a UHN spin-out company founded by TRI's Dr. Milos Popovic. The innovative treatment was named the winner of TiEQuest's 2012 Business Venture and the 2012 Best Intellectual Property competitions. As the first therapy to significantly improve the independence of those suffering from severe stroke and spinal cord injuries, RECLAIM is expected to launch in 2013 with sales of $40M projected by 2015.

Finally, TWRI's Dr. Michael Tymianski has just reported phase 2 clinical trial results on 180 patients for the new neuroprotective drug NA-1, developed with another UHN spin-out company, NoNO Inc. The demonstrated reduction of approximately 50% of brain damage resulting from surgical procedures to repair brain aneurysms is an important step towards the successful development of a stroke prevention drug.

Image (L-R): Drs. Michael Sharpe and David Jaffray.

"By 'transforming innovation into impact' UHN is redefining patient care."

Brian Barber, Director, UHN's Office of Technology Development and Commercialization

News and Events

2012 Research Highlights

"2012 was an exceptional year for research at UHN. New funding announcements, research achievements and large-scale collaborations were front and center."

Christopher Paige, VP, UHN Research

Canada Research Chairs Awarded to UHN Researchers

This past year UHN celebrated the appointment of two new Canada Research Chairs (CRCs)–OCI's Dr. Igor Jurisica, who was awarded a Tier I Chair in Integrative Cancer Informatics, and TWRI's Dr. Antonio Strafella, who was awarded a Tier 2 Chair in Movement Disorders and Neuroimaging. Two Chairs were also successfully renewed, including OCI's Dr. Thomas Kislinger's Tier 2 Chair in Proteomics in Cancer Research, and TWRI's Dr. Andres Lozano's Tier 1 Chair in Neuroscience. The CRC program, established by the Government of Canada, invests $300M per year to help attract and retain some of the world's most accomplished and promising minds in research, engineering, natural sciences and health sciences.

Image (above, right): Dr. Antonio Strafella, Tier 2 CRC in Movement Disorders and Neuroimaging.

New Funding for Advancing Neurotechnologies

On June 8, the Federal Economic Development Agency for Southern Ontario announced an investment of nearly $11M from the Government of Canada towards accelerating the commercialization of neurotechnologies, in partnership with the Ontario Brain Institute, universities and private sector companies. UHN researchers will lead three of the 14 funded projects–these include projects focused on evaluating the efficacy of deep brain stimulation in treating Alzheimer's disease (Dr. Andres Lozano, TWRI), a home diagnostic tool for sleep apnea (Dr. Geoff Fernie, TRI) and a portable device for the detection of hydrocephalus (Dr. Kieran Murphy, TWRI).

Image (above, centre): Dr. Geoff Fernie speaks about the capabilities of TRI's iDAPT facility at the Technology Development Program funding announcement on June 8, 2012.

UHN Smartphone App Wins Award

bant–an application for smartphones designed to help patients with diabetes–recently won the People's Choice award at the inaugural World Congress mobile Health Innovation Exchange Conference in Boston, MA. The app was designed by a team led by Dr. Joseph Cafazzo, co-leader of the Techna Design & Engineering for Health Core and head of UHN's Centre for Global eHealth Innovation. bant helps type 1 diabetics record and track their blood sugar levels, interfacing seamlessly with glucometers for easy self-reporting. Trends in data are analyzed instantly and can be integrated between the smartphone and the patient's health record. The bant app is an example of the use of new technology to help reduce the burden of chronic conditions on patients, caregivers and health care providers.

UHN Inventor of the Year Announced

UHN's 2011 Inventor of the Year Award was presented to OCI's Dr. Aaron Schimmer at the 2012 Annual General Meeting. This award, sponsored through UHN's Technology Development and Commercialization Office, recognizes a top scientific innovator for outstanding contributions to patient-oriented biomedical research. Dr. Schimmer was acknowledged for his efforts in advancing therapeutics from the lab to the clinic. Known drugs are screened by his research team to identify compounds that impact molecular targets responsible for cancer. Not only do these drugs have previously unrecognized anti-cancer activity, they also help to increase our understanding of how cancer develops. Through this approach, current drugs can be 'repurposed' and moved into clinical trials at a fraction of the time and resources typically needed for new cancer therapeutics.

Image (above, centre): Dr. Christopher Paige announcing UHN's Inventor of the Year at the Annual General Meeting at MaRS on June 20, 2012. (above, left): Dr. Aaron Schimmer with his award.

Global Collaboration in Neurodegeneration Research

TWRI's Drs. Antonio Strafella, Connie Marras and Anthony Lang were awarded an operating grant entitled "Immune subtype in Parkinson disease" for a research project in collaboration with Dr. Thomas Gasser at the Deutsche Zentrum für Neurodegenerative Erkrankungen (DZNE) in Germany. The initiative was funded by the Centres of Excellence in Neurodegeneration Research (CoEN), which brings together leading international laboratories to undertake innovative research that will increase our understanding of how neurodegenerative diseases are triggered and progress thereby accelerating the development of new approaches to treatment. The CoEN organization represents a world-wide initiative involving Canada (Canadian Institutes of Health Research), Germany (DZNE), the United Kingdom (Medical Research Council), Belgium (Vlaams Instituut voor Biotechnologie), Ireland (Health Research Board and Science Foundation) and Italy (Ministero della Salute).

Image (above, right): Dr. Anthony Lang, Senior Scientist at TWRI.

Achievements

Research Awards and Distinctions

Dr. Michael Baker
Queen's Diamond Jubilee Medal

Dr. Angela Colantonio
Fellow of the American Congress of Rehabilitation Medicine

Dr. Robert Bristow
John Ferguson Memorial Award for Prostate Cancer, Prostate Cancer Canada

Drs. Charles Tator and Michael Fehlings
Reeve-Irvine Research Medal for Spinal Cord Injury Research

Dr. Geoff Fernie
Morris (Mickey) Milner Award, Health Technology Exchange

Dr. Eleanor Fish
2012 Investigator Award, Canadian Society for Immunology

Dr. Jason Fish
Early Researcher Award, Ministry of Economic Development and Innovation

Dr. Susan Jaglal
President of the Canadian Society of Epidemiology and Biostatistics

Dr. Andres Lozano
Pioneer in Medicine Award, Society of Brain Mapping and Therapeutics

Dr. Benjamin Neel
Member of Board of Directors, American Association for Cancer Research

Drs. Dante Morra and Peter Rossos
2012 Bronze Edison Award (Science/ Medical Category)

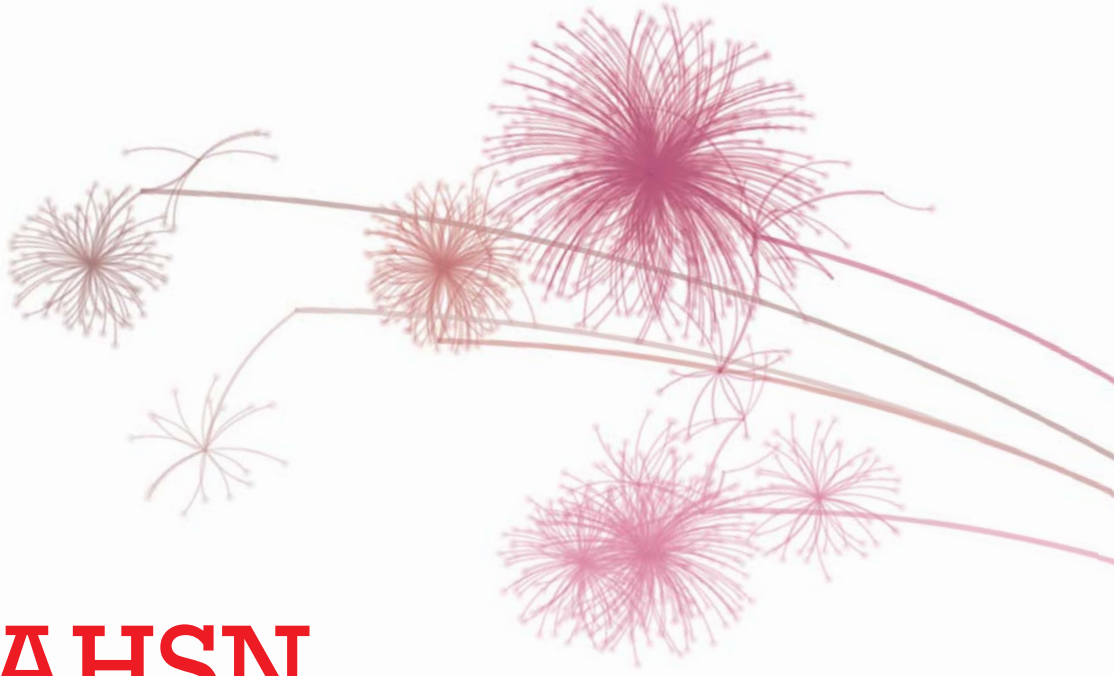
Dr. Gary Rodin
Life Time Achievement Award, Canadian Association of Psychosocial Oncology

Dr. Frances Shepherd
Queen's Diamond Jubilee Medal

Dr. Ming-Sound Tsao
Warwick Award, Canadian Cancer Society

Dr. I. Alex Vitkin
Fellow of the Optical Society of America

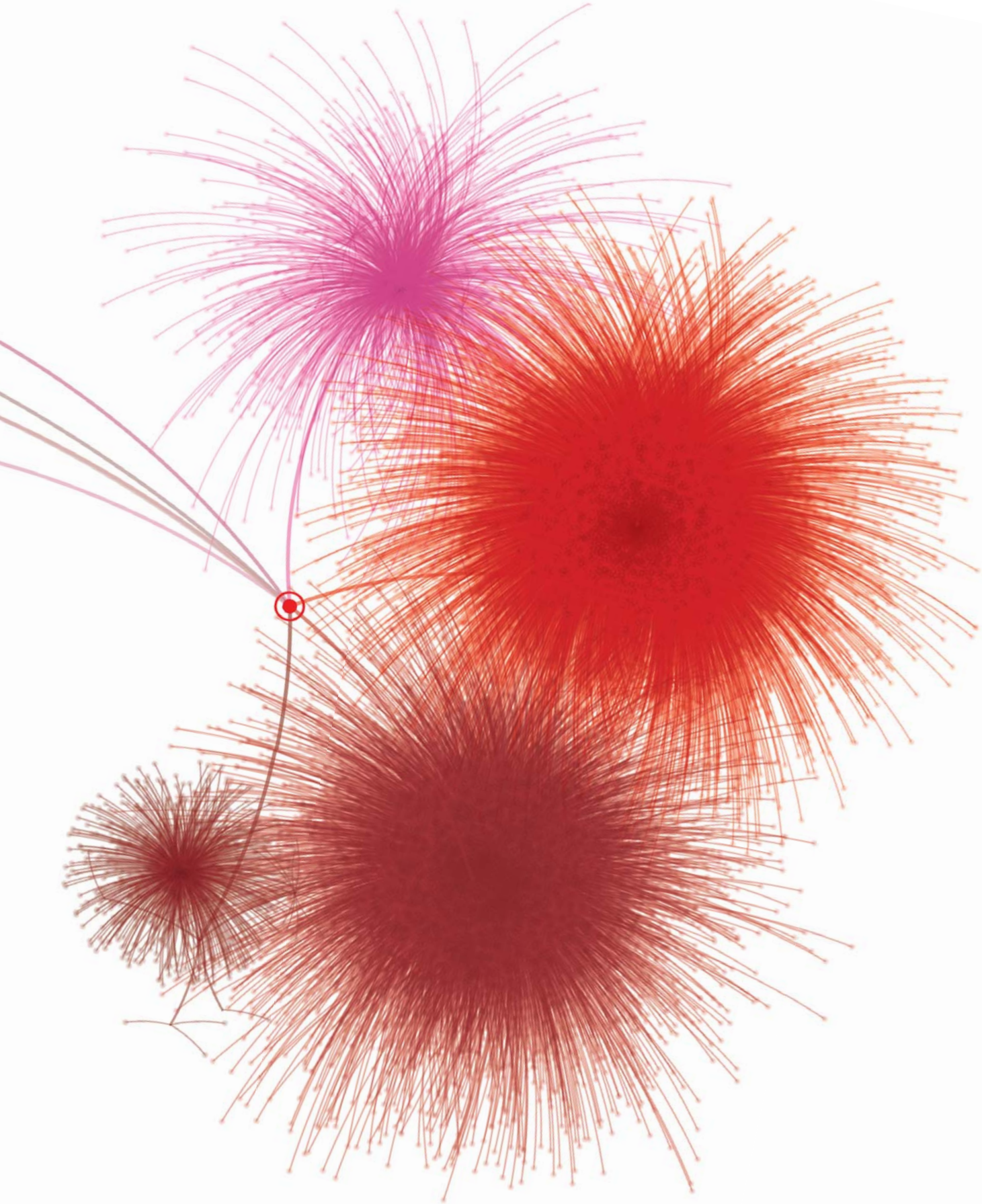
Dr. Daniel Winer
Benjamin Castleman Award, Massachusetts General Hospital and the United States and Canadian Academy of Pathology



...to TAHSN

18,899 collaborations
14 partners

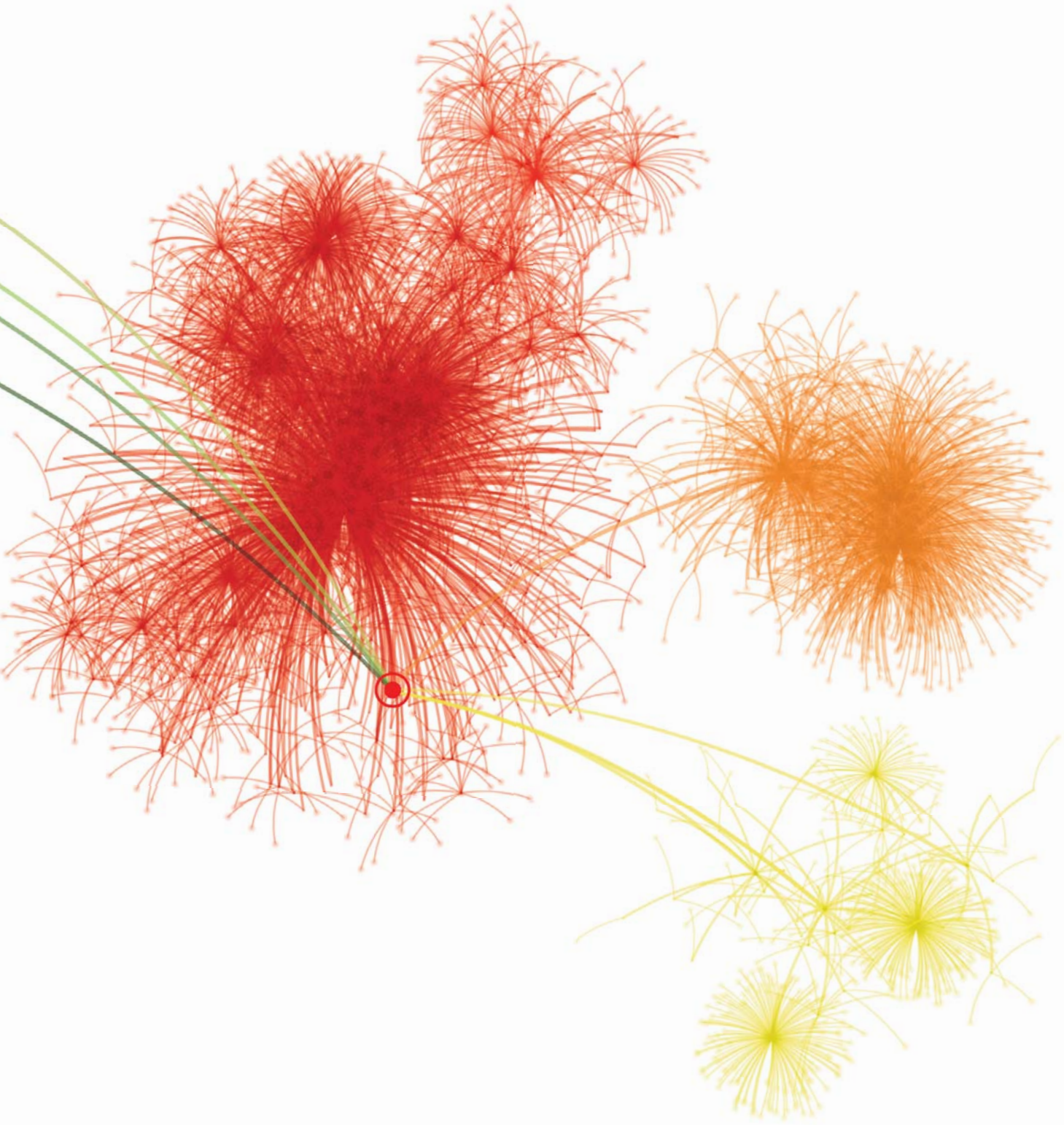
UHN is a member of the Toronto Academic Health Science Network (TAHSN). This connectivity map depicts the breadth of UHN's collaborations within TAHSN.



...to CANADA

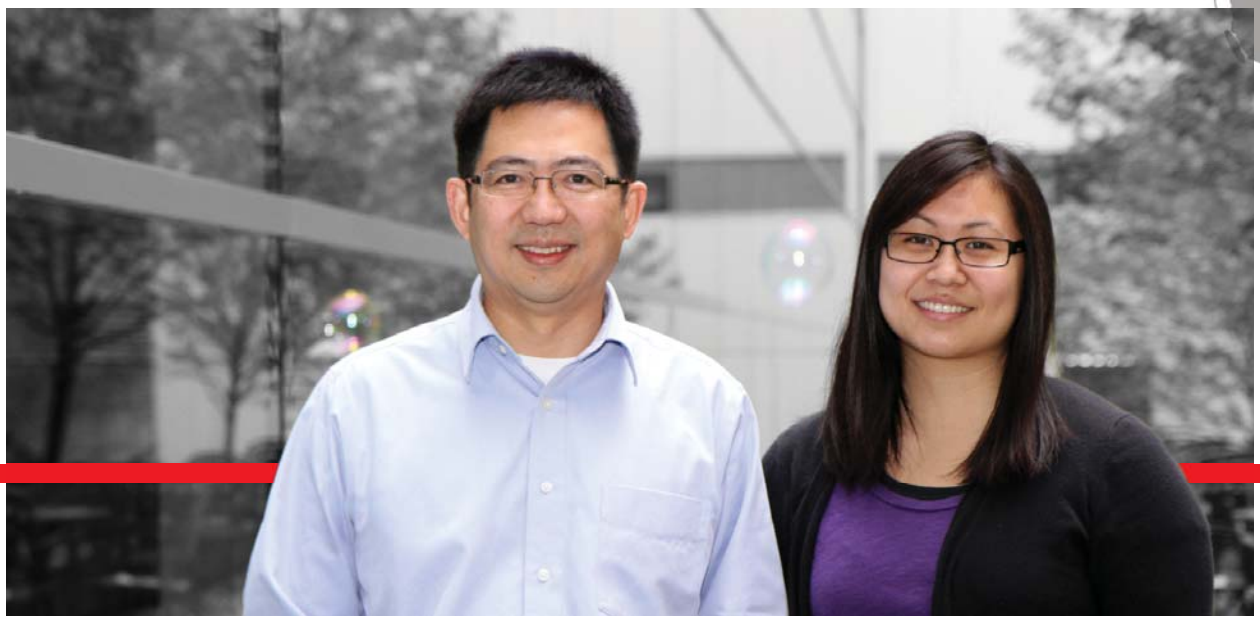
5048 collaborations
398 partners

UHN researchers collaborate with various public and private sector partners throughout Canada. This connectivity map depicts the breadth of these Canadian partnerships (British Columbia, Alberta, Saskatchewan, Manitoba shown in green; Ontario, excluding TAHSN partners, shown in red; Quebec shown in orange; and Prince Edward Island, Newfoundland, New Brunswick and Nova Scotia shown in yellow).



Research Breakthroughs

Local and Canadian Collaborations



Porshe Microbubble Driving Greater Resolution Real-time images of the body's structure and blood flow can be captured using portable ultrasound (US) devices. However, greater imaging detail can be obtained with photoacoustic (PA) tomography, which uses a US detector to detect tiny pressure waves created by a laser pulse when absorbed by an imaging agent in the body. Combining these two technologies allows clinicians to obtain extremely detailed images while using only a handheld portable device. Current imaging agents compatible with US and PA are difficult to manufacture and have had low stability, limiting the clinical application of this technology.

OCI and Techna's Drs. Gang Zheng and Brian Wilson, together with graduate student Elizabeth Huyhn, have recently developed the first inherently dual US/PA imaging agent. The agent–also known as the 'porshe microbubble'–is made up of microbubbles that are non-toxic, easily synthesized and highly stable. Because of its unique properties it also has potential uses in other applications including drug and gene delivery.

"Porshe microbubbles allow for the creation of high-resolution three-dimensional images of living tissue and could be used to target drugs to specific locations within the body–a valuable tool with the potential to improve both diagnoses and treatments for a range of diseases." *Dr. Gang Zheng*

Reflecting the importance of these findings, Dr. Zheng's research paper was selected as the cover and spotlight article for the *Journal of the American Chemical Society*'s October issue.

Image (above, L-R): Dr. Gang Zheng and Elizabeth Huyhn.

Huynh E et al. J Am Chem Soc. 2012 Aug. Supported by The Princess Margaret Cancer Foundation, the Ministry of Knowledge Economy of South Korea, the Natural Sciences & Engineering Council of Canada, the Canadian Institutes of Health Research, the Canada Foundation for Innovation and the Joey and Toby Tanenbaum/Brazilian Ball Chair in Prostate Cancer Research.

Novel Drug Protects Against Stroke

Stroke is one of the leading causes of death and disability. Despite intensive research aimed at improving stroke outcomes, current treatments are ineffective at preventing stroke-related brain damage and are limited to a narrow window of administration after stroke to show benefits. A breakthrough study led by TWRI's Dr. Michael Tymianski has assessed the effectiveness of a new drug that shows promise at preventing the damage caused by stroke.

The new drug inhibits a protein called postsynaptic density protein 95 (PSD-95), which is known to serve as a scaffold for other proteins present in the brain. The studies show that the PSD-95 inhibitor reduces the severity of tissue damage induced by stroke and preserves brain function. These beneficial effects were observed even when the drug was administered several hours after stroke.

Dr. Tymianski comments, "We are closer to having a treatment for stroke than ever before. We now have a way to dramatically reduce its damaging effects and our next step is to confirm these results in a clinical trial."

Cook, DJ et al. Nature. 2012 Feb. Supported by the Canadian Stroke Network, the Heart & Stroke Foundation of Ontario and M. Tymianski's Tier 1 Canada Research Chair in Translational Stroke Research.

Extending Care for Osteoporosis

Despite the availability of effective treatments for osteoporosis, those at risk for fractures remain under-treated. Patients admitted with mild fractures often skip follow-up procedures that could help to prevent further injury. For this reason, many hospitals now assign a screening coordinator to follow up with patients on an individual basis.

While effective, these strategies are not fiscally feasible in small community hospitals, where a third of all fracture patients are treated. TRI's Dr. Susan Jaglal, with collaborators in Edmonton, Calgary, Hamilton, Toronto and London, tested whether a centralized coordinator acting via phone and email could promote osteoporosis treatment.

As the first randomized trial restricted to small or rural communities, the study involved patients from 36 small hospitals across Ontario. When assigned a coordinator, patients were five times more likely to receive bone mineral density testing and twice as likely to seek appropriate treatment. Dr. Jaglal emphasizes, "A centralized coordinator represents a cost-effective way to improve care for osteoporosis in rural communities across Canada."

Jaglal, SB et al. Osteoporos Int. 2012 Jan. Research supported by the Ontario Ministry of Health and Long-Term Care Osteoporosis Strategy.

Decision Support Tool for Heart Failure

Diagnosis of heart failure (HF) by an emergency care physician who may not have access to the full range of prognostic tools could result in costly hospitalization of low-risk patients and potential discharge of high-risk patients. To assist decision-making for emergency care physicians, TGRI's Dr. Douglas Lee and collaborators from Sunnybrook and Mount Sinai Hospital have developed and validated an evidence-based risk scoring tool for HF.

In a multicentre study of 86 Ontario hospitals, the medical charts of 12,591 patients presenting with symptoms of HF were examined, including those admitted and discharged after assessment. A number of health indicators were compared to mortality at seven days and results were used to create the Emergency Care Heart Failure Mortality Risk Grade (EHMRG). Measures comprising the EHMRG include risk factors such as age, blood pressure, oxygen saturation and potassium concentration in the blood. This risk model is an easy-to-use objective tool that may help physicians better diagnose and prioritize heart failure patients in the often demanding emergency room environment.

Lee, DS et al. Ann Int Med. 2012 Jun. Supported by the Ontario Ministry of Health and Long-Term Care, the Canadian Institutes of Health Research, the Heart & Stroke Foundation of Ontario and J.V. Tu's Tier 1 Canada Research Chair in Health Services Research.

Linking Salt and Sleep Apnea

Sleep apnea–characterized by difficulty in breathing due to collapse of the throat–afflicts approximately 50 percent of heart failure patients and worsens prognosis. TRI and TGRI's Dr. T. Douglas Bradley, in collaboration with Dr. Gary Newton at the Peter Munk Cardiac Centre, conducted a study suggesting that salt intake may be a key factor in whether heart failure patients experience sleep apnea.

The study assessed salt intake and sleep apnea in heart failure patients, and found that patients with higher salt intake had an increased risk for sleep apnea. The researchers hypothesized that consuming salt, which promotes fluid retention, may worsen sleep apnea by contributing to fluid accumulation in the legs during the day when upright. At night when lying down, some of this fluid shifts into the neck where it causes congestion around the throat which increases its tendency to collapse and cause sleep apnea.

"Our study reveals that heart failure patients may benefit from decreasing their salt intake as it may help alleviate their sleep apnea," says Dr. Bradley.

Kasai et al. J Am Coll Cardiol. 2011 Jun. Supported by the Canadian Institutes of Health Research and the Heart & Stroke Foundation of Ontario.

Identifying Longevity Mimicking Drugs

Caloric restriction is known to extend life span in mammals and delay the onset of age-related diseases, including cancer and diabetes. Drugs that can mimic the effects of caloric restriction may have enormous therapeutic potential for treating these diseases. By comparing changes in gene expression in a caloric restriction experimental liver model with a database containing gene responses to over 1,000 different drug treatments, OCI and Techna's Dr. Igor Jurisica identified 14 drugs that have the potential to mimic the effects of caloric restriction. One such drug has an effect similar to resveratrol–a well-known longevity additive found in red wine.

To date, only a few of these drugs have been discovered because identifying them is both costly and time consuming. Dr. Jurisica's approach represents a rapid and cost-effective method of drug screening that will accelerate the identification and development of new longevity therapeutics.

Fortney, K et al. Rejuvenation Res. 2012 Apr. Supported by the Ministry of Economic Development & Innovation, the Canadian Institutes of Health Research, the Canada Foundation for Innovation, IBM, the Ontario Ministry of Health and Long-Term Care and I. Jurisica's Tier 1 Canada Research Chair in Integrative Cancer Informatics.

Gut Feelings in Diabetes

Diabetes is a chronic disease that is characterized by high levels of sugar (glucose) in the blood. An experimental surgery called duodenal-jejunal bypass surgery (DJB) improves type 2 diabetes by lowering glucose levels, yet how this happens is not known.

TGRI's Dr. Tony Lam and a collaborator in London, Ontario shed light on this mystery by exploring the use of DJB surgery in experimental models of uncontrolled diabetes. The DJB procedure creates a pathway that connects the stomach directly to the jejunum–the middle portion of the intestine. The researchers found that the jejunum inhibits glucose production in response to nutrient intake under normal conditions. This jejunal sensing mechanism is required for the benefits of DJB surgery, which occur independently of changes in insulin levels, food intake and body weight.

Dr. Lam says, "These findings further support the emerging use of bariatric surgery and unveil the sensing mechanisms in the jejunum as potential therapeutic targets for uncontrolled diabetes."

Breen, DM et al. Nat Med. 2012 Jun. Supported by the Canadian Institutes of Health Research, T. Lam's John Kitson McIvor Endowed Chair in Diabetes Research and T. Lam's Tier 2 Canada Research Chair in Obesity Research.

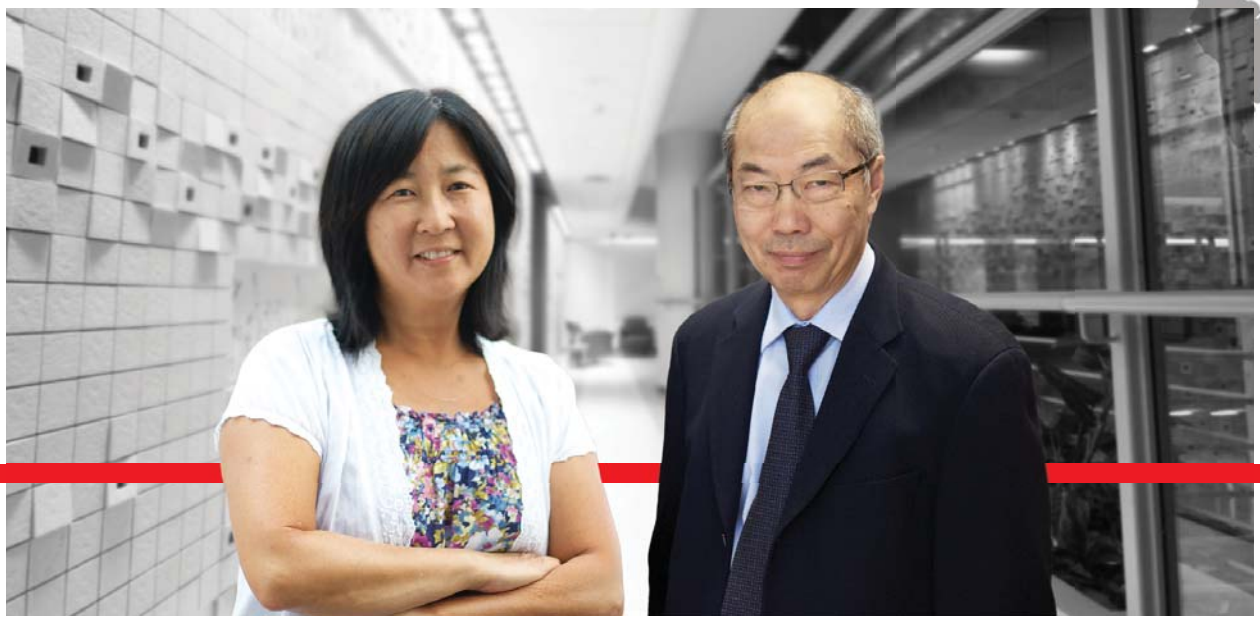
...to the WORLD

26,778 collaborations
5017 partners
95 countries

Research at UHN involves connections to public and private sector partners around the world. This connectivity map is a visual representation of these collaborations by continent (North America, excluding Canada, shown in red; South America in yellow; Europe in blue; Africa in green; Asia in teal; and Oceania in purple).

Research Breakthroughs

International Collaborations



Adding Insult to Injury: Mutation Further Modifies DNA In cancer, genes are often mutated. This is true for acute myeloid leukemia (AML), for which a mutation in the IDH1 gene is frequently found. Knowing that the mutation exists and is associated with a disease is only part of the puzzle: scientists must also determine how the mutation leads to the disease. In this case, it is unclear how the IDH1 mutation affects the abnormal cell development that causes cancer. One hypothesis is that the mutated protein increases reactive oxygen species (ROS) within cells, which reduces stem cell longevity and the production of normal blood cells.

OCI's Drs. Tak Mak and Pamela Ohashi, with global collaborators from the U.S. and Germany, investigated the properties of this mutation in an experimental model. They found that while the mutation caused enlarged spleens and decreased blood-producing cells in bone marrow—as would be expected in AML—there was no change in the levels of ROS. Instead, increased incorporation of methyl groups to the DNA structure was found across all chromosomes, known as epigenetic modification. These changes could affect blood-forming cell division and differentiation.

"We have shown that ROS alterations are not responsible for leukemia in our IDH1 mutation model, thereby providing greater understanding of the links between certain mutations and leukemia."

Dr. Tak Mak

Image (L-R): Drs. Pamela Ohashi and Tak Mak.

Sasaki, M et al. Nature. 2012 Aug. Supported by the Alexander von Humboldt Foundation, the German Research Foundation, the National Institutes of Health, the Damon Runyon Cancer Research Foundation, the Leukemia & Lymphoma Society, Harvard Medical School, the Burroughs Wellcome Fund, the Starr Cancer Consortium, the Canadian Institutes of Health Research, the Ontario Ministry of Health and Long-Term Care, the Terry Fox Foundation, The Princess Margaret Cancer Foundation, P. Ohashi's Tier 1 Canada Research Chair in Autoimmunity and Tumour Immunity, J-C. Zuniga-Pflucker's Tier 1 Canada Research Chair in Developmental Immunology and T. Mak's Tier 1 Canada Research Chair in Inflammation Responses and Traumatic Injury.

Targeting Cancer's Nutrient Supply

For solid tumours to grow, they must be able to promote the growth of new blood vessels—a process known as angiogenesis. These new vessels supply cancer cells with nutrients and a route through which they can spread across the body. The first clinically available drug to inhibit angiogenesis, a compound called bevacizumab, has been shown to be effective in treating colorectal and lung cancers. This drug was assessed by OCI's Dr. Amit Oza in the treatment of ovarian cancer—a disease with the worst prognosis of all gynaecological cancers.

Dr. Oza's ambitious research project spanned 11 countries, with collaborators in the United Kingdom Germany, Finland, Australia, Norway and France. The study showed that bevacizumab improves progression free survival and may have an effect on overall survival in high-risk patients. The drug halts worsening of the disease, especially in patients who are at high risk of disease progression. Side effects, including increased hypertension, were experienced for some patients. Dr. Oza comments, "For patients with poor prognosis, the benefits of bevacizumab to overall survival may outweigh the risks; these are encouraging results."

Perren, TG et al. N Engl J Med. 2011 Dec. Supported by the Medical Research Council UK, Roche, the National Institutes of Health, the National Cancer Research Network and The Princess Margaret Cancer Foundation.

Gender Affects Immune Function in MS

Multiple sclerosis (MS) is an autoimmune disease that affects women more than men, and one possible reason for this may be that cells of the immune system in each gender have different activities. Alongside collaborators across Canada, the U.S. and Germany, TGRI's Dr. Shannon Dunn explored $CD4^+$ T cell differences between women and men.

An effective immune system requires the proper functioning of signaling molecules; elevated levels could suggest disease development. Dr. Dunn found that $CD4^+$ T cells from females produced higher levels of interferon γ (INFγ), while those from males produced relatively more interleukin-17A (IL-17A). This gender difference was dependent on the levels of peroxisome proliferator activated receptors (PPAR)α and γ. By changing the expression of the two PPAR receptor types, Dr. Dunn reversed the influence of gender on T cell INFγ and IL-17A production.

Dr. Dunn notes, "These findings raise the prospect of providing customized MS treatments that take into consideration the sex differences that exist between women and men."

Zhang, MA et al. PNAS. 2012 Jun. Supported by the Canadian Institutes of Health Research and the Multiple Sclerosis Society of Canada.

Gene Signatures for Leukemia OCI's Dr. John Dick collaborated with researchers in Canada, Japan, Germany and the U.S. to examine the genetic profiles of hematopoietic stem cells (HSCs) and leukemia stem cells (LSCs). HSCs are capable of developing into multiple cell types comprising a functional blood system while LSCs are responsible for the development of leukemia. The findings have led to the identification of a number of genes–a gene signature–that is able to predict the clinical outcome of the most common form of leukemia in adults, acute myeloid leukemia (AML).

The group performed an analysis to compare the genes expressed in these different cell types and found a list of genes specifically expressed in stem cells. From this, they identified a gene signature associated with the ability of stem cells to continually grow and function long term. When comparing these gene signatures against a database of 160 AML patients where patient survival was known, they correlated increased stem cell-like properties with poor prognosis.

This report also suggests that the gene signatures determined for LSCs could be used to identify new therapeutic targets specific for cancer stem cells.

"Determining the LSC and HSC gene signatures is of great clinical importance. By predicting how aggressive AML is on a patient-by-patient basis, these signatures open the door to more effective and customized cancer therapies."

Dr. John Dick

Image (L-R): Drs. Kolja Eppert and John Dick.

Eppert, K et al. Nat Med. 2011 Aug. Supported by the Ministry of Economic Development & Innovation, the Leukemia & Lymphoma Society, the Stem Cell Network of Canadian National Centres of Excellence, the Canadian Cancer Society Research Institute, The Princess Margaret Cancer Foundation, the Ministry of Education, Culture, Sports, Science and Technology in Japan, the Terry Fox Foundation, Genome Canada, the Ontario Institute for Cancer Research, the Canadian Institutes of Health Research, Canada Foundation for Innovation, IBM, the Ontario Ministry of Health and Long-Term Care and J. Dick's Tier 1 Canada Research Chair in Stem Cell Biology.

Locating Silent Genes Human cells contain two copies of each gene: one maternal copy and one paternal copy. While classical genetics tells us that both copies should be expressed in the body, for a small fraction of genes, one copy is silenced in a process known as 'imprinting'. Imprinting errors can lead to developmental and chronic diseases when a 'good' gene is silenced; or conversely, when a harmful gene that is normally dormant becomes active.

In order to identify regions within the genome that are imprinted, TWRI's Drs. Cathy Barr, James Eubanks and collaborators in the U.S. and the United Kingdom carried out a systematic genetic survey. Researchers identified 55 regions–23 of which were previously unknown to geneticists. They also found a pattern in the genetic code that predisposes genes to silencing. This pattern may help researchers further identify imprinted genes to guide the development of treatments that correct imprinting errors involved in disease.

Image (L-R): Drs. James Eubanks and Cathy Barr.

Xie, W et al. Cell. 2012 Feb. This work was supported by the Krembil Seed Development Fund, Applied Biosystems 10K Genome Award, the Ludwig Institute for Cancer Research, the National Institutes of Health Epigenomics Roadmap Project and the National Human Genome Research Institute.

Effectiveness of Parkinson Disease Surgery after Ten Years Deep brain stimulation (DBS)–the delivery of electrical impulses to the brain via a surgically implanted device–has been shown to be an effective medical treatment for controlling motor complications in Parkinson's disease patients. The beneficial effects of DBS have been reported to last up to eight years; however its longer-term effects are largely unknown.

A study led by TWRI's Dr. Elena Moro, in collaboration with researchers in Italy, followed patients with Parkinson's disease undergoing subthalamic nucleus DBS treatment over a ten-year period. Dr. Moro found that benefits, specifically improved motor control with decreased tremor, were sustained over time. DBS combined with Parkinson's medication resulted in similar beneficial outcomes.

Dr. Moro states, "These findings show that DBS provides lasting, improved motor control to parkinsonian patients. For patients with advanced Parkinson's disease, the benefit from surgery was greater than that provided by commonly prescribed medications."

Castrioto, A et al. Arch Neurol. 2011 Dec. Supported by the Canadian Institutes of Health Research, CurePSP and St. Jude Medical.

...to YOU

UHN Foundations

Princess Margaret Cancer Foundation
Toronto General & Western Hospital Foundation
Arthritis Research Foundation
Toronto Rehab Foundation

Believe it! Campaign

Princess Margaret Cancer Foundation

The creation and delivery of Personalized Cancer Medicine will provide the new gold standard of cancer care.

In April, The Princess Margaret Cancer Foundation (PMCF) announced an ambitious new five-year fundraising campaign aimed at raising $1 billion dollars in research funding for Personalized Cancer Medicine at the Princess Margaret Cancer Centre. The *Believe It!* campaign aims to revolutionize cancer care in Canada and around the world by changing the paradigm of how treatment is delivered to cancer patients. Personalized Cancer Medicine uses advancements in genetics to more precisely diagnose a patient's cancer and determine its prognosis, which will help to select the treatment that is most likely to be of specific benefit to the individual.

"The ability to decode cancer genes is leading us towards a more customized approach," explains Dr. Benjamin Neel, Director of The Campbell Family Institute for Cancer Research and the Ontario Cancer Institute at The Princess Margaret. "Our goal is to bring full genetic molecular profiling to all patients in order to truly deliver personalized cancer treatment."

The *Believe It!* campaign hopes to raise funds through engagement with the donor community and researcher grant funding—these funds will help to recruit world-class physicians, scientists and staff, creating multidisciplinary teams that will develop new technologies to help patients sooner. Award-winning psychosocial, survivorship and palliative care programs will be developed to further assist patients and families.

The initiative will solidify the Princess Margaret Cancer Centre's reputation as one of the world's top cancer research centres. Medical Director of the Cancer Program Dr. Mary Gospodarowicz adds, "It's not just at The Princess Margaret—it's people working collaboratively across Canada and the world that will help to conquer cancer in our lifetime."

Image (L-R): Constable April Dequanne, Cara Finley, Dr. Mary Gospodarowicz, Dr. Benjamin Neel and Paul Alofs, President and CEO of PMCF.

The Brain Gain

Toronto General & Western Hospital Foundation

The Krembil Discovery Tower will provide a platform to launch new treatments that will transform the lives of people with neurological diseases.

August 22nd 2012 marked the completion of the main structure of the Krembil Discovery Tower–a new cutting edge facility that will bring the world's leading neuroscientists under one roof. Located at TWH, the new 9-story LEED-certified Tower consists of 150,000 square feet of state-of-the-art space that will allow researchers to explore new treatments across the spectrum of diseases linked to the brain.

To date, Krembil Neuroscience Centre scientists have made an impressive number of breakthroughs including the development of improved treatments for stroke, brain cancer, depression and spinal cord injuries. The new facilities will further extend their ability to develop therapies and rehabilitation solutions for neurological illnesses, including Parkinson's disease, epilepsy and Alzheimer's disease. In particular, arthritis and vision research will make important advancements.

UHN has celebrated pivotal steps throughout construction of the Tower, including the start of full scale construction in March 2010 and a Hard-Hat Tour in May 2012. Most recently, a Beam Signing Ceremony commemorated the completion of the main structure, where the final construction beam was signed by attendees. In attendance were Robert and Linda Krembil, whose lead gift made the Tower a reality, and Mark and Stacey Krembil, representing the Krembil Foundation.

With the bricks and mortar in place, more donations will ensure that Krembil researchers have the support staff they require and the ability to collaborate internationally. *The Brain Campaign*, co-chaired by Todd Halpern and Gerry Halbert, aims to raise a further $200M to support this cause.

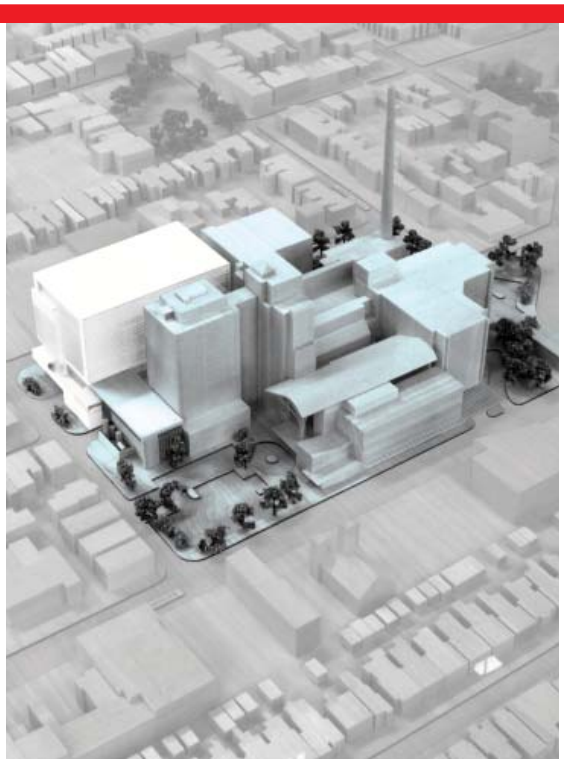


Image (above, left): Architectural model of TWH showing the Krembil Discovery Tower in white. Image (above, right): Robert and Linda Krembil sign the final beam of the Krembil Discovery Tower.

The Power of Movement

Arthritis Research Foundation

By increasing arthritis awareness we can help establish strong community partnerships that will help us finally find a cure.

March 4th 2012 marked the sixth anniversary for the *Power of Movement*, the Arthritis Research Foundation's signature event, which has grown into Canada's largest yoga fundraiser. Thousands of Canadians practiced their best warrior pose, all in the hopes of one day finding a cure and beating arthritis and autoimmune diseases. Communities from Vancouver, British Columbia to St. John's, Newfoundland took to their mats that Sunday morning and raised over $300,000 for research.

"I'm amazed that my tiny idea turned into such a movement…about movement" commented Dorna Chee, the woman who inspired the *Power of Movement's* inception. In 2005, Dorna, a yoga instructor, had turned to her yoga breathing exercises to help her get through a lengthy stay in the hospital after being diagnosed with lupus. Dorna believed that the benefits she experienced from yoga could benefit others and thus the *Power of Movement* was born.

This unique fundraising event has inspired philanthropists of all ages to get involved and to make a difference in the lives of more than 4.6 million Canadians living with arthritis. This year the event was hosted at a local Toronto area high school for the first time, which fundraised over $9000. "The passion that this school demonstrated has definitely inspired us to involve more schools. By participating, the children learned that arthritis is not a disease that only affects their grandparents. One in 1000 kids in Canada under the age of 16 are living with some form of arthritis," said David Prowten, Executive Director of the Arthritis Research Foundation. "These kids are our future, and if they grow up with more knowledge about a group of diseases that are very misunderstood, then we are going to have a very bright future, one hopefully without arthritis."

Realizing the Benefits of Rehab

Toronto Rehab Foundation

Donor support is helping to transform Toronto Rehab into a place where innovation meets determination.

A leading Ontario litigator, Harvey T. Strosberg suffered a stroke in 2010 that left him unable to speak. He received acute care through Toronto Western Hospital and rehabilitation through Toronto Rehab. “I couldn’t have imagined I would have a stroke at my age, and yet I did. They saved my life.”

During his rehabilitation, his speech therapists would show him ordinary objects such as a toothbrush to help him regain language skills. “I recognized the toothbrush, but I couldn’t say the word,” Harvey says. “I had to learn language all over again. But thanks to Toronto Rehab, my family, my friends and my health care team, I’m back.”

In November 2011, the Toronto Rehab Foundation hosted the *Harvey’s Back* gala event in his honour. Harvey gave a speech about the positive impact of his rehabilitation and how his stroke has profoundly influenced his perspective on life. “Harvey is one of a kind. When he had his stroke, everyone was shocked because he seemed so invincible. A brilliant man who speaks eloquently in court suddenly could not utter a word,” says Terry O’Sullivan, event co-chair and a Toronto Rehab Foundation Board Member.

The event raised $315,000 for rehabilitation studies and the iDAPT Centre, the world’s most technologically advanced rehabilitation research facility. TRI’s program continues to create innovative solutions to help the recovery of stroke patients such as Harvey regain their everyday lives.

... to our Research Institutes

UHN Research is organized on a multi-institute model. Each hospital has an affiliated research institute. Institutes have separate governance structures and all are under the direction of UHN's Vice President, Research.

Ontario Cancer Institute
Toronto General Research Institute
Toronto Western Research Institute
Toronto Rehab Institute
Techna Institute


Toronto General Hospital

Ontario Cancer Institute

Senior Scientists

Arrowsmith, Cheryl
Asa, Sylvia
Barber, Dwayne
Boyd, Norman
Bristow, Robert
Chakrabartty, Avijit
Devins, Gerald
Dick, John
Ezzat, Shereen
Gagliese, Lucia
Gallie, Brenda
Hakem, Razqallah
Hedley, David
Hill, Richard
Ikura, Mitsuhiko
Iscove, Norman
Jaffray, David
Jurisica, Igor
Keller, Gordon
Khokha, Rama
Lilge, Lothar
Liu, Fei-Fei
Mak, Tak
Medin, Jeffrey
Messner, Hans
Minden, Mark
Minkin, Salomon
Muthuswamy, Senthil
Neel, Benjamin
Ohashi, Pamela
Pai, Emil
Paige, Christopher
Penn, Linda
Privé, Gilbert
Rodin, Gary
Rottapel, Robert
Schimmer, Aaron
Tannock, Ian
Till, James
Tsao, Ming Sound
Vitkin, I Alex
Wilson, Brian
Wouters, Bradly
Zheng, Gang

Scientists

Ailles, Laurie
Brock, Kristy
De Carvalho, Daniel
Edelstein, Kim
Hirano, Naoto
Howell, Doris
Kislinger, Thomas
Koch, Anne
Liu, Geoffrey
Lupien, Mathieu
Moghal, Nadeem
O'Brien, Catherine
Okada, Hitoshi
Raught, Brian
Roehrl, Michael
Stambolic, Vuk
Tiedemann, Rodger
Tillier, Elisabeth
Trudel, Suzanne
Zimmermann, Camilla

Affiliate Scientists

Bradley, Grace
Chen, Eric Xueyu
Esplen, Mary Jane
Gauthier, Mona
Martin, Lisa
Moore, Malcolm
Moran, Michael
Reedijk, Michael
Ritvo, Paul
Sherar, Michael
Wang, Jean
Xu, Wei

Assistant Scientists

Araki, Toshi
DaCosta, Ralph
Hao, Zhenyue
Salmena, Leonardo

Clinical Resource Unit (CRU) Members

Alasti, Hamideh
Baker, Michael
Banerjee, Subrata
Barth, David
Bayley, Andrew
Bedard, Philippe
Beiki-Ardakani, Akbar
Bell, Robert
Berman, Hal
Bernardini, Marcus
Bernstein, Lori
Bernstein, Mark
Bezjak, Andrea
Bissonnette, Jean-Pierre
Blackstein, Martin
Blasutig, Ivan
Boerner, Scott
Borg, Jette
Brade, Anthony
Brandwein, Joseph
Breen, Stephen
Brien, William
Brierley, James
Brown, Dale
Bryson, John
Burkes, Ronald
Butler, Marcus
Carlone, Marco
Catton, Charles
Catton, Pamela
Chan, Kelvin
Chang, Hong
Chen, Christine
Cheung, Carol
Cheung, Fred
Cho, Charles
Cho, John
Cho, Youngbin
Chow, James
Chung, Caroline
Chung, Peter
Cil, Tulin
Clarke, Blaise
Cleary, Sean
Coolens, Catherine
Craig, Timothy
Croul, Sidney
Crump, R Michael
Cserti, Christine
Cummings, Bernard
Czarnota, Gregory
D'Agostino, Norma
Damyanovich, Andrei
Darling, Gail
Dawson, Laura
de Perrot, Marc
Dhani, Neesha
Diamandis, Eleftherios
Dinniwell, Robert
Dodge, Jason
Done, Susan
Easson, Alexandra
Elantholi Parameswaran, Saibishkumar
Elliott, Mary
Elser, Christine
El-Zimaity, Hala
Escallon, Jaime
Evans, Andrew
Feld, Ronald
Fenkell, Louis
Ferguson, Peter
Ferguson, Sarah
Finelli, Antonio
Fleshner, Neil
Freeman, Jeremy
Fyles, Anthony
Gaind, Sonu
Gallinger, Steven
Geddie, William
Gentili, Fred
Ghazarian, Danny
Gilbert, Ralph
Gladdy, Rebecca
Goldstein, David
Goodwin, Pamela
Gospodarowicz, Mary
Grant, David
Green, David

Research Space		**Senior Scientists**	*44*	**Fellows**	*248*
394,926 sq. ft.		**Scientists**	*20*	**Graduate Students**	*235*
Total External Funding		**Affiliate Scientists**	*12*	**Total Trainees**	*483*
$149,973,312		**Assistant Scientists**	*4*		
Publications		**CRU Members**	*220*	**Total Staff**	*672*
937		**Total Researchers**	*300*		

Greig, Paul
Gryfe, Robert
Gullane, Patrick
Gupta, Abha
Gupta, Vikas
Hafezi-Bakhtiari, Sarah
Hales, Sarah
Heaton, Robert
Heydarian, Mostafa
Hodgson, David
Hofer, Stefan
Hogg, David
Hope, Andrew
Irish, Jonathan
Islam, Mohammad
Jewett, Michael
Jezioranski, John
Jones, Jennifer
Joshua, Anthony
Kamel-Reid, Suzanne
Kassam, Zahra
Kaya, Ebru
Keating, Armand
Keller, Harald
Kennedy, Erin
Keshavjee, Shaf
Kiehl, Tim-Rasmus
Kim, Dennis
Kim, John
Knox, Jennifer
Krzyzanowska, Monika
Kukreti, Vishal
Kulasingam, Vathany
Kuruvilla, John
Laframboise, Stefane
Laperriere, Normand
Leighl, Natasha
Leong, Wey-Liang
Letourneau, Daniel
Levin, Wilfred
Li, Madeline
Lindsay, Patricia
Lipton, Jeffrey
Lo, Christopher
Mackay, Helen
MacPherson, Miller
Mak, Ernie
Manchul, Lee
Mason, Warren
Matthew, Andrew
McCart, J Andrea
McCready, David
McGilvray, Ian
McLean, Michael
McLeod, Robin
McNiven, Andrea
Melnyk, Tatiana
Ménard, Cynthia
Mete, Ozgur
Millar, Barbara-Ann
Miller, Kim
Miller, Naomi
Milosevic, Michael
Moseley, Douglas
Moulton, Carol-Anne
Mulligan, Anna Marie
Murphy, K Joan
Nissim, Rinat
Olivieri, Nancy
O'Sullivan, Brian
Oza, Amit
Payne, David
Pendergrast, Jacob
Perez-Ordonez, Bayardo
Pierre, Andrew
Porwit, Anna
Purdie, Tom
Rasty, Golnar
Razak, Albiruni
Reece, Donna
Ridley, Julia
Ringash, G Jolie
Rink, Alexandra
Rosen, Barry
Rotstein, Lorne
Rouzbahman, Marjan
Sahgal, Arjun
Santos, Gilda
Schuh, Andre
Serra, Stefano
Sharpe, Michael
Shaw, Patricia
Shepherd, Frances
Simpson, E Rand
Siu, Lillian
Sridhar, Srikala
Stanescu, Teodor
Strevel, Elizabeth
Sun, Alexander
Sutherland, D Robert
Swallow, Carol
Sweet, Joan
Taremi, Mojgan
Taylor, Bryce
Torlakovic, Emina
Trachtenberg, John
Tsang, Richard
Tsao, May
van der Kwast, Theodorus
van Prooijen, Monique
Waddell, Thomas
Waldron, John
Ward, Richard
Warde, Padraig
Warr, David
Wei, Alice
Weinreb, Ilan
Wells, Woodrow
Winer, Daniel
Witterick, Ian
Wong, Rebecca
Wood, Bob
Wunder, Jay
Yasufuku, Kazuhiro
Yee, Karen
Yeo, Erik
Yeung, Ivan
Youngson, Bruce
Zadeh, Gelareh
Zhang, Bei Bei
Zhong, Toni
Zlotta, Alexandre

Research Council on Oncology (RCO)

RCO Director and Chair; Director, Executive Committee
Benjamin Neel
Executive Committee
Rama Khokha
Ming-Sound Tsao
Mitsuhiko Ikura
Bradly Wouters
Senthil Muthuswamy
Pamela Ohashi
Gary Rodin
Brian Wilson
Chair, Appointments Committee
Rama Khokha
Medical Director, Laboratory Medicine Program
Sylvia Asa
Medical Director, Cancer Program
Mary Gospodarowicz
Head of Medical Oncology and Hematology
Malcolm Moore
Chief, Surgical Oncology
Jonathan Irish
Senior Clinical Vice President
Marnie Escaf
Executive Director, Research Operations
Lisa Alcia
Vice President, Research
Christopher Paige

Toronto General Research Institute

Advanced Diagnostics

Senior Scientists

Allard, Johane
Backx, Peter
Berger, Stuart
Cardella, Carl
Cattran, Daniel
Cybulsky, Myron
Fantus, I George
Fish, Eleanor
Fisher, Joseph
Floras, John
Gorczynski, Reginald
Gotlieb, Avrum
Jin, Tianru
Lewis, Gary
Liu, Mingyao
Liu, Peter
MacDonald, Kelly
Pei, York
Rubin, Barry
Siminovitch, Katherine
Wheeler, Michael
Zacksenhaus, Eldad
Zhang, Li

Scientists

Dunn, Shannon
Fish, Jason
Gramolini, Anthony
Lam, Tony
Nanthakumar, Kumaraswamy
Perkins, Bruce
Reich, Heather
Volchuk, Allen
Winer, Daniel
Woo, Minna

Affiliate Scientists

Branch, Donald
Chang, Hong
Cherney, David
Clark, David
Medin, Jeffrey
Rocheleau, Jonathan
Sawka, Anna
Wong, Florence

Experimental Therapeutics

Senior Scientists

Bradley, T Douglas
Cattral, Mark
Grant, David
Husain, Mansoor
Kain, Kevin
Keating, Armand
Kelvin, David
Keshavjee, Shaf
Kucharczyk, Walter
Levy, Gary
Li, Ren-Ke
Liles, W Conrad
Lindsay, Thomas
Olivieri, Nancy
Rao, Vivek
Waddell, Thomas
Walmsley, Sharon
Weisel, Richard

Scientists

Chauhan, Vijay
Cypel, Marcelo
de Perrot, Marc
Feld, Jordan
Herridge, M Margaret
Karkouti, Keyvan
Kaul, Rupert
Kotra, Lakshmi
McCart, J Andrea
McGilvray, Ian

Affiliate Scientists

Belsham, Denise
Chen, Limin
Chow, Chung-Wai
Downey, Gregory
Fremes, Stephen
Ghanekar, Anand
Husain, Shahid
Hwang, David
Katz, Joel
Lee, Ping
McGowan, Cheri
Raboud, Janet
Radisic, Milica
Reilly, Raymond
Riazi, Sheila
Ross, Heather
Rotstein, Coleman
Sato, Masaaki
Sefton, Michael
Selzner, Markus
Tan, Darrell
Yasufuku, Kazuhiro
Yau, Terrence

Assistant Scientists

Serghides, Lena
Vasconcelos, Sara

Support, Systems & Outcomes

Senior Scientists

Alibhai, Shabbir
Bombardier, Claire
Cheung, Angela
Daar, Abdallah
Easty, Anthony
Eysenbach, Gunther
Flint, Alastair
Heslegrave, Ronald
Kaplan, Allan
Kapral, Moira
Krahn, Murray
Naglie, I Gary
Rodin,Gary
Singer, Peter
Stewart, Donna
Urbach, David

Scientists

Gagliardi, Anna
Grace, Sherry
Lee, Douglas
Morra, Dante
Nolan, Robert

Affiliate Scientists

Baker, Brian
Barata, Paula
Carnahan, Heather
Colton, Patricia
Davis, Caroline
Gucciardi, Enza
Hall, Peter
Hodges, Brian
Irvine, M Jane
Jones, Jennifer
Kennedy, Erin
Kovacs, Adrienne
Lok, Charmaine
McVey, Gail
Olmsted, Marion
Tomlinson, George
Styra, Rima
Wei, Alice
Woodside, D Blake

Clinical Studies Resource Centre (CSRC) Members

Bargman, Joanne
Beattie, W Scott
Bril, Vera
Brister, Stephanie
Cameron, Douglas
Chan, Charles
Chan, Christopher
Colman, Jack
Cooper, Richard
David, Tirone
Djaiani, George
Dzavik, Vladimir
Fedorko, Ludwik
Fenton, Stanley
Gardam, Michael

Research Space
242,010 sq. ft.
Total External Funding
$61,698,253
Publications
822

Senior Scientists	*57*
Scientists	*25*
Affiliate Scientists	*50*
Assistant Scientists	*2*
CSRC Members	*47*
Total Researchers	*181*

Fellows	*201*
Graduate Students	*135*
Total Trainees	*336*
Total Staff	*491*

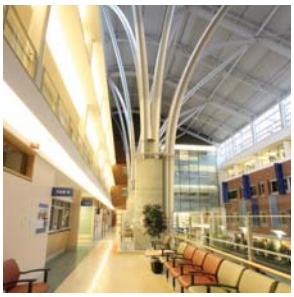
Gold, Wayne
Goldszmidt, Eric
Granton, John
Grigoriadis, Sophie
Harris, Louise
Ing, Douglas
Jassal, S Vanita
Kachura, John
Karski, Jacek
Kennedy, Sidney
Keystone, Edward
Lilly, Leslie
McCluskey, Stuart
McRae, Karen
O'Malley, Martin
Parker, John
Rajan, Dheeraj
Rakowski, Harry
Ralph-Edwards, Anthony
Richardson, Robert
Roberts, Heidi
Ross, John
Salit, Irving
Seidelin, Peter
Sherman, Morris
Singer, Lianne
Siu, Samuel
Slinger, Peter
Straus, Sharon
Sweet, Joan
Wolman, Stephen
Yeo, Erik

TGRI Research Council

TGRI Research Council Director and Chair; Acting Division Head, Experimental Therapeutics
Mansoor Husain
Division Head, Advanced Diagnostics
Myron Cybulsky
Division Head, Support, Systems & Outcomes
David Urbach
Program Medical Director, Peter Munk Cardiac Centre
Barry Rubin
Program Medical Director, Transplantation
Gary Levy
Surgeon-in-Chief; Program Medical Director, Surgical and Critical Care
Shaf Keshavjee
Physician-in-Chief; Program Medical Director, Medical & Community Care
Edward Cole
Chair, TGRI Appointments Committee
Thomas Waddell
Group Lead, Cardiovascular
Douglas Lee
Group Lead, Metabolism
Michael Wheeler
Group Lead, Infection & Immunity
TBD
Group Lead, Respiratory & Critical Care
Mingyao Liu
Group Lead, Communities of Health
Shabbir Alibhai
Executive Director, Research Operations
Lisa Alcia
Clinical Vice President UHN; TGH Site Lead
Scott McIntaggart
Vice President, Research
Christopher Paige

Toronto Western Research Institute






Brain, Imaging & Behaviour - Systems Neuroscience

Senior Scientists
Brotchie, Jonathan
Chen, Robert
Davis, Karen
Hutchison, William
Lozano, Andres
McAndrews, Mary Pat
Mikulis, David
Sandor, Paul
Strafella, Antonio

Affiliate Scientists
De Nil, Luc
Diamant, Nicholas
Dostrovsky, Jonathan
Kucharczyk, Walter

Fundamental Neurobiology

Senior Scientists
Carlen, Peter
Skinner, Frances
Sugita, Shuzo
Tymianski, Michael

Affiliate Scientists
Gaisano, Herbert
Hassouna, Magdy
Valiante, Taufik
Zhang, Liang

Genetics & Development

Senior Scientists
Barr, Cathy
Bremner, Rod
Eubanks, James
Fehlings, Michael
Inman, Robert
Jongstra, Jan
Schlichter, Lyanne
Stanley, Elise
Tator, Charles
Tsui, Florence
Wither, Joan

Scientist
Monnier, Philippe

Affiliate Scientists
Haroon, Nigil

Health Care & Outcomes Research

Senior Scientists
Badley, Elizabeth
Cassidy, J David
Davis, Aileen
Gignac, Monique
Gladman, Dafna
Mahomed, Nizar
Urowitz, Murray

Scientist
Côté, Pierre

Affiliate Scientists
Cott, Cheryl
Fortin, Paul
Martino, Rosemary

Patient Based Clinical Research

Senior Scientists
Heathcote, Jenny
Lang, Anthony
Shapiro, Colin

Scientists
Bernstein, Mark
Ferguson, Niall
Tarlo, Susan

Vision Science

Senior Scientists
Flanagan, John
Sharpe, James
Steinbach, Martin
Trope, Graham
Wong, Agnes

Scientists
Hudson, Christopher
Sivak, Jeremy

Affiliate Scientists
Dimaras, Helen
Eizenman, Moshe
Gallie, Brenda
Irving, Elizabeth
Wilkinson, Frances

Clinical Studies Resource Centre (CSRC) Members

Anastakis, Dimitrios
Bookman, Arthur
Buys, Yvonne
Chan, Vincent
Chapman, Kenneth
Chung, Frances
Davey, J Roderick
del Campo, Jose Martin
Devenyi, Robert
Epstein, Trina
Escallon, Jaime
Etlin, David
Farb, Richard
Fung, Ken
Gentili, Fred
Graham, Brent
Hawa, Raed
Iwanochko, R Mark
Lam, Wai-Ching
Lam, Robert
Manninen, Pirjo
Massicotte, Eric
McGuire, Glenn
McIntyre, Roger
Melvin, Kenneth
Miyasaki, Janis
Moro, Elena
Oandasan, Ivy
Ogilvie, Richard
Ogilvie-Harris, Darrell
Panisko, Daniel
Parikh, Sagar
Peng, Philip
Radomski, Sidney
Rampersaud, Yoga Raja
Rootman, David
Rosen, Cheryl
Saltzman-Benaiah, Jennifer
Seyone, Chanth
Silver, Frank
Simons, Martin
Singer, Shaun
Slomovic, Allan
St George-Hyslop, Peter
Stanbrook, Matthew
Stubbs, Barbara
Syed, Khalid
Terbrugge, Karel
Tu, Karen
Tumber, Paul
von Schroeder, Herbert
Wherrett, John
Willinsky, Robert
Wong, David
Wong, Jean
Yu, Eric

Research Space		Senior Scientists	39	Fellows	92
105,154 sq. ft.		Scientists	7	Graduate Students	111
Total External Funding		Affiliate Scientists	17	**Total Trainees**	203
$30,961,425		CSRC Members	56		
Publications		**Total Researchers**	119	**Total Staff**	193
533					

TWRI Research Council

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Peter Carlen

Interim Vice Director, TWRI
Barry Greenberg

Division Head, Brain Imaging & Behaviour – Systems Neuroscience
Karen Davis

Division Head, Genetics & Development
Rod Bremner

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Elizabeth Badley

Division Head, Patient Based Clinical Research
Jenny Heathcote

Division Head, Vision Science
Martin Steinbach

Clinical Representative, Krembil Neuroscience Program
Michael Fehlings

Clinical Representative, Musculoskeletal Health & Arthritis Program
Robert Inman

Clinical Representative, Musculoskeletal Program
Nizar Mahomed

Chair of the Trainee Affairs Committee
Frances Skinner

Senior Director, Finance
Peggy McGill

Vice President, TWH
Katherine Sabo

Vice President, Research
Christopher Paige

Toronto Rehab Institute

Research Space	*67,000 sq. ft.*	Fellows	*35*
External Funding	*$9,918,649*	Graduate Students	*69*
Publications	*323*	**Total Trainees**	*104*
Senior Scientists	*18*		
Scientists	*14*	**Total Staff**	*83*
Adjunct Scientists	*76*		
Total Researchers	*108*		

Senior Scientists

Artificial Intelligence & Robotics
Mihailidis, Alex

Cardiorespiratory Fitness
Alter, David

Cognition
Colantonio, Angela
Green, Robin

Communication
Rochon, Elizabeth

Mobility
Brooks, Dina
Maki, Brian
McIlroy, William

Neural Engineering & Therapeutics
Popovic, Milos
Verrier, Molly

Optimize
Cott, Cheryl
Jaglal, Susan
McGilton, Katherine
Naglie, I Gary
Rappolt, Susan

Sleep & Upper Airway
Bradley, T Douglas
Steele, Catriona

Technology
Fernie, Geoff

Scientists

Alibhai, Shabbir
Bayley, Mark
Campos, Jennifer
Craven, Catharine
Cullen, Nora
Furlan, Andrea
Gage, William
Hitzig, Sander
Kontos, Pia
Marquez, Cesar
Masani, Kei
Novak, Christine
Oh, Paul
Wodchis, Walter

Adjunct Scientists

Allin, Sonya
Anderson, Nicole
Angus, Jan
Baecker, Ron
Baker, G Ross
Ben-David, Boaz
Black, Sandra
Boe, Shaun
Boscart, Veronique
Cameron, Jill
Carnahan, Heather
Chambers, Craig
Chau, Tom
Dawson, Deirdre
Dickinson, Sven
Fleet, David
Flint, Alastair
Fox, Mary
Furlan, Julio
Gerber, Gary
Giangregorio, Lora
Goodman, Jack
Grace, Sherry
Hebert, Deborah
Hoey, Jesse
Houghton, Pamela
Katz, Joel
Keightley, Michelle
Klein, Cliff
Kulic, Dana
Laing, Andrew
Lanctôt, Krista
Landry, Michel
Levine, Brian
Little, James
Mackworth, Alan
Mahomed, Nizar
McConville, Kristiina
Mendelson, Julie
Middleton, Laura
Mochizuki, George
Muller, Matthew
Murray, Brian
Nagai, Mary
Namasivayam, Aravind
Nejat, Goldie
Nussbaum, Ethne
Perry, Stephen
Philip, Donald
Pichora-Fuller, Kathleen
Poupart, Pascal
Pratt, James
Rapson, Linda
Reid, Denise
Richards, Doug
Russo, Frank
Ryan, Clodagh
Salbach, Nancy
Seltzer, Ze'ev
Shaw, Alex
Shein, Fraser
Shepherd, John
Singh, Gurjit
Staines, Richard
Steeves, Jennifer
Strong, Graham
Thomas, Scott
Tsotsos, John
van Lieshout, Pascal
Wadey, Veronica
Welsh, Timothy
Wong, Willy
Yoo, Paul
Yunusova, Yana
Zabjek, Karl
Zettel, John

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Geoff Fernie

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Milos Popovic
Elizabeth Rochon
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Dayle Levine
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Bridgette Murphy
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Clinical
Susan Jewell
Gaétan Tardif

Liaisons
Katherine Berg
Susan Rappolt
Christopher Paige

Techna Institute

External Funding	$224,242	Fellows	4
Publications	161	Graduate Students	23
Core Leads	8	**Total Trainees**	27
Affiliated Faculty	18		
Total Researchers	26	**Total Staff**	47

Design & Engineering for Health

Core Lead
Cafazzo, Joseph

Affiliated Faculty
Easty, Anthony
Trbovich, Patricia
Tse, Leonard

Guided Therapeutics

Core Leads
Irish, Jonathan
Jaffray, David

Affiliated Faculty
Hope, Andrew
Lozano, Andres
Murphy, Kieran
Paul, Narinder
Pekar, Vladimir
Purdie, Tom
Rajan, Dheeraj
Stanescu, Teodor
Wintersperger, Bernd
Yasufuku, Kazuhiro

Informatics & Communications Technology

Core Leads
Jurisica, Igor
Rossos, Peter

Affiliated Faculty
Eysenbach, Gunther
Gallie, Brenda
Jadad, Alejandro
Tait, Gordon
Wu, Robert

Nanotechnology & Radiochemistry

Core Leads
Metser, Ur
Zheng, Gang

Photonics

Core Lead
Wilson, Brian

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Director, Operations & Engineering
Luke Brzozowski
Director, Research Faculty
Paul Santerre
Director, Clinical Faculty
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Director, Commercialization
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Gunther Eysenbach
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Clinical Lead, Design and Engineering for Health
Joe Cafazzo
Clinical Lead, Guided Therapeutics
Jonathan Irish
Scientific/Clinical Leads, Informatics & Communications Technology
Igor Jurisica
Peter Rossos
Scientific/Clinical Leads, Nanotechnology & Radiochemistry
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Ur Metser
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Lian, Sandra (Ex-officio)
McGilton, Katherine
McIlroy, William
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Popovic, Milos
Rochon, Elizabeth
van Lieshout, Pascal
Ward, Lois (Ex-officio)
Wu, Michael (Ex-officio)

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Lozano, Andres (Chair)
Steinbach, Martin

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Chen, Robert
Eubanks, James (Chair)
McDermott, Ian
Steinbach, Martin
Vidic, Frank
Wither, Joan

TWRI Trainee Affairs Committee

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Alavi, Mahan
Baglaenko, Yuriy
Bhardwaj, Renu
Christopher, Leigh
DeSouza, Danielle
Fan, Susan
Figley, Sarah
Hutchison, William
Khuu, Lee-Anne
Kucyi, Aaron
Rosen, Allie
Rozanski, Gabriela
Ruff, Crystal
Skinner, Frances
Strafella, Antonio (Chair)
Tran, Christopher
Vasudeva, Manoj
Vetiska, Sandra
Wan, Julie
Want, Gang
Wither, Joan

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Aga Medical
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Alpha Cancer Technologies
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Canadian Cancer Society Research Institute
Canadian Diabetes Association
Canadian Gene Cure Foundation
Canadian Health Services Research Foundation
Canadian HIV Trials Network
Canadian Initiative for Outcomes in Rheumatology cAre
Canadian Institute for Photonic Innovations
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Canadian Liver Foundation
Canadian Pain Society
Canadian Partnership Against Cancer
Canadian Patient Safety Institute
Canadian Psychological Association
Canadian Pulmonary Fibrosis Foundation
Canadian Radiation Oncology Foundation
Canadian Research and Education in Arthritis
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Cystic Fibrosis Canada
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Estate of Ilonka Seder Szabolcsi
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Foundation for International Education in Neurological Surgery
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Genentech
General Research Fund
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International Society for Heart & Lung Transplantation
Interrad Medical
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Janssen
Jewish General Hospital
Joslin Diabetes Center

Juvenile Diabetes Research Foundation
Kiadis Pharma
Kidney Foundation of Canada
Lady Tata Memorial Trust
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Leukemia & Lymphoma Society
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Lundbeck Canada
Lupus Ontario
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Mayo Clinic
McMaster University
Med Biogene
Medical Council of Canada
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Medpace
Medtronic
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Merck
Merrimack Pharmaceuticals
Mesothelioma Applied Research Foundation
Michael J. Fox Foundation for Parkinson's Research
Microvention
Millenium Pharmaceuticals
Ministry of Economic Development & Innovation
Ministry of Health and Long-Term Care
Mitacs
Molecular Insight Pharmaceuticals
Montreal Heart Institute
Mount Sinai Hospital
Mount Sinai School of Medicine
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Multiple Sclerosis Society of Canada
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National Institutes of Health
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Ontario Brain Institute
Ontario Centres of Excellence
Ontario Clinical Oncology Group
Ontario HIV Treatment Network
Ontario Institute for Cancer Research
Ontario Mental Health Foundation
Ontario Neurotrauma Foundation
Ontario Problem Gambling Research Centre
Ontario Psychiatric Outreach Program
Ontario Stroke Network
Onyx Pharmaceuticals
OSI Pharmaceuticals
Ottawa Hospital Research Institute
Parkinson Society Canada
Partners HealthCare
Pfizer Canada
Phonak
Physicians' Services Foundation
Phytopharm
Pierre Fabre Médicament
Plastic Surgery Educational Foundation
Population Health Research Institute
PPD Development
PRA International
Princess Margaret Cancer Foundation
Prostate Cancer Canada
Proteolix
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Public Health Agency of Canada
Queen's University
Questcor Pharmaceuticals
Quintiles Canada
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Respironics
Rick Hansen Foundation
Roche
Royal College of Physicians and Surgeons of Canada
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Stem Cell Network
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Susan G. Komen Breast Cancer Foundation
Synta Pharmaceuticals
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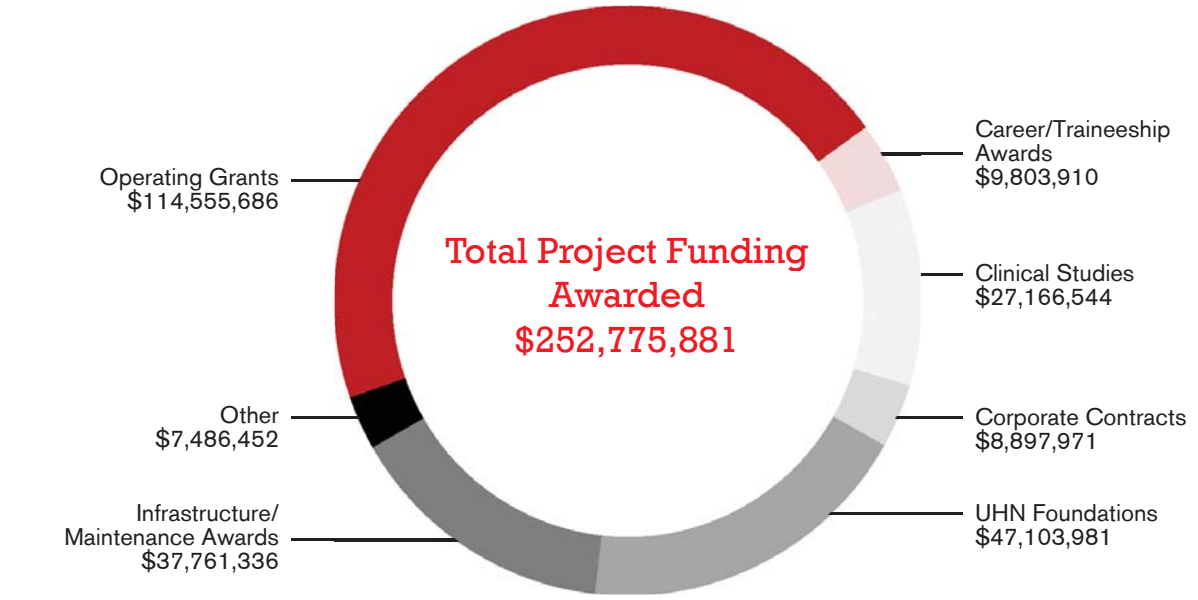

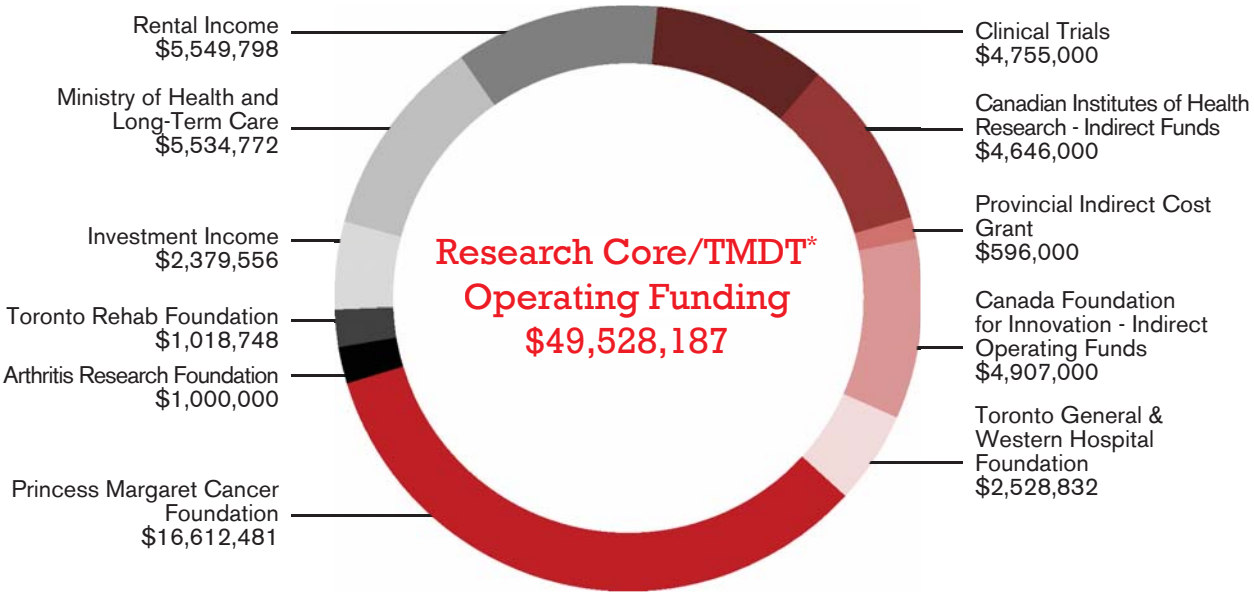

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†Dr. Steinman passed away September 30, 2011.

Disclaimers:
Financial Data: All figures represent fiscal year 2011/12 and include the Ontario Cancer Institute (Princess Margaret Cancer Centre), Toronto General Research Institute (Toronto General Hospital), Toronto Western Research Institute (Toronto Western Hospital), Toronto Rehabilitation Institute (Toronto Rehab), Techna Institute and the Toronto Medical Discovery Tower (TMDT). Figures have been provided by UHN Research Financial Services. Figures may not sum due to rounding. These figures have not been audited. However, they have been included in the overall UHN statements and have been subjected to audit procedures deemed appropriate by auditors in order to determine their overall reasonableness.
Publication and Personnel Data: Data provided by UHN Research Support Services. Respective data types are accurate as of December 31, 2011 (publication count year-end), March 31, 2012 (fiscal year-end) or June 30, 2012 (academic year-end). Some figures may be rounded and/or may include data not represented in Institute data. Publications jointly authored by investigators at multiple UHN Institutes are counted only once in the UHN Research total. Researchers who have more than one affiliation within an Institute, or between Institutes, are only included once in the total count. Total funding includes external and core funding.
Connectivity Maps Data: Connectivity maps (pp. 16-19, 24, 25) created by Kevin Yager (Brookhaven National Laboratory). Data sourced from Thomson Reuters Web of Knowledge, accessed via Web of Science. Current as of October 2012. Items retrieved were confined to articles published from 1999 to 2011, where UHN and its affiliated research Institutes and hospitals appear in the Address field (with the exception of Toronto Rehab/TRI which integrated with UHN in July 2011). Source documents consisted of citable items such as, original Articles, Reviews, Editorial Materials and Letters. In the interest of reproducibility, the data search was confined to using the following Address field search string: "Univ Hlth Network or (Princess Margaret Hosp SAME Toronto) or (Ontario Canc Inst) or (Toronto Gen) or (Toronto Western) or (Campbell Family SAME Toronto) or (AMGEN SAME Toronto)". Centres that were clearly variations of the same organization were conflated, and counted as one entity; conversely, entities that were clearly consolidated, for any reason, were disambiguated. Each collaboration unit identifies one entity; entities that appear on more than one publication are included only once in the total count. For optimal visual representation, TAHSN collaborations are omitted from the Canadian connectivity map (pp. 18-19) and Canadian collaborations are omitted from the global connectivity map (pp. 24-25).
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