

Transforming

# HOPE

into **Health**

The Krembil Research Institute (Krembil) is the research arm of the Toronto Western Hospital (TWH), and it is one of the six research institutes at the University Health Network (UHN). Most of Krembil's research programs focus on the brain, the eye and arthritis. Its laboratories are located at the Krembil Discovery Tower and at TWH's Main, McLaughlin and Fell Pavilions. Prior to November 13, 2015, Krembil was known as the Toronto Western Research Institute.

Krembil acknowledges that for thousands of years the land on which we gather has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, Toronto is still the home to many Indigenous people from across Turtle Island. We are grateful to have the opportunity to live and work on this land.

Krembil is committed to championing inclusion, diversity, equality, equity and accessibility in the learning, work and service environments. We believe that our differences enrich our ability to develop creative and innovative approaches to deliver exemplary patient care, research and education.

About the cover: Meital Yerushalmi (pictured) is a Krembil trainee who is examining the role of skin bacteria in psoriasis and psoriatic arthritis. She is a PhD candidate in the Institute of Medical Science at the University of Toronto and is supervised by Drs. Vinod Chandran and Mark Silverberg (Sinai Health System).

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# Transforming Hope into Health

Good news! We are living longer. Canadians can now expect to live an average of 82 years.

However, as we age, we are likely to experience a decline in our health and wellbeing. Aging puts each of us—and our loved ones—at higher risk of developing chronic, debilitating illnesses.

To the challenges posed by aging and the illnesses that come with it, Krembil responds with hope. Hope is at the heart of Krembil: we are driven by it, and we inspire it in others.

We—the 600 members of Krembil—are working together to find cures and better treatments for arthritis and diseases of the brain and eye, many of which affect older adults. It is our collective and unwavering hope for the future that drives this relentless pursuit. Hope gives us the energy and perseverance to continue working towards our ambitious goals despite innumerable challenges and disappointments. Without hope, progress would be impossible.

Krembil's research and achievements inspire hope in others. We give hope to patients and their families, especially those cared for at the Toronto Western Hospital, for a healthier future for themselves and others affected by a similar disease. Some are so inspired by our work that

they participate in it. We give hope to our partners who provide donations and other forms of support to help us continue our work. Their generosity is strong proof that they believe that we can make a difference.

Krembil also delivers hope through its trainees. We recruit talented individuals from around the world who spend several years at Krembil, being taught and mentored by our researchers. Once their training is complete, many will lead their own research groups and make new discoveries about health and disease.

Through our research, Krembil is transforming hope—ours and that of others—into cures and new treatments that will bring health to more people, especially older adults. And by doing so, we are helping the University Health Network achieve its vision of creating *A Healthier World*.

This report describes some of the notable progress that we have made in the past year towards transforming hope into health.

Thank you for sharing this journey with us.

**Donald Weaver, MD, PhD, FRCPC, FCAHS**  
*Director, Krembil Research Institute*  
*University Health Network*

# A Picture of Disease

X-ray images reveal severe arthritis in patients

A new study from Krembil recommends that all patients with psoriatic arthritis (PsA) be screened for inflammation in their back joints.

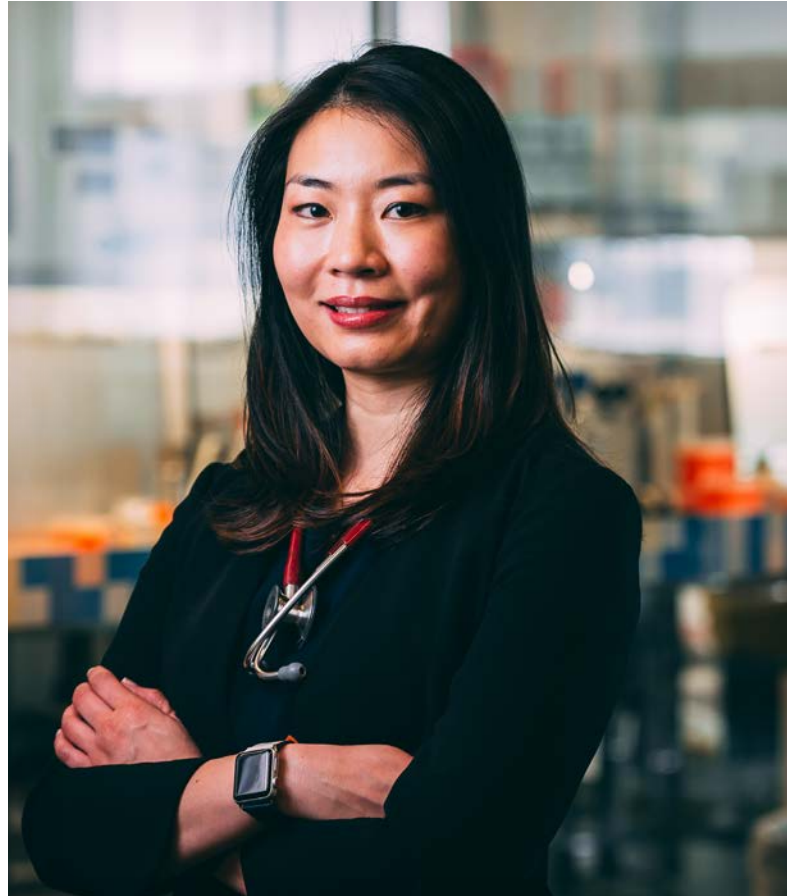
PsA is characterized by inflammation and pain primarily in the joints of the hands, feet, knees, ankles, wrists, elbows or hips.

In some patients, PsA also causes inflammation and pain in their back joints, which is a sign of severe disease. If left untreated, severe disease can lead to irreversible joint damage and disability.

“When a PsA patient has chronic back pain, there is no widely accepted test to determine whether it is caused by PsA-related inflammation or by other factors, such as excess weight or osteoarthritis,” says Dr. Vinod Chandran, senior author of the study. “Consequently, a rheumatologist typically relies on his or her professional judgement to determine the cause of pain.”

In his study, Dr. Chandran found that when rheumatologists used X-ray images of a PsA patient’s back, they could more accurately identify back pain caused by PsA than when they relied on their professional judgment alone. This is because X-ray images provide a more specific way to detect inflammation in joint tissues.

Dr. Chandran also discovered that 30% of PsA patients with inflammation in their back joints experienced no back pain at all.



“Performing X-ray scans on all PsA patients, regardless of whether or not they have back pain, will enable rheumatologists to quickly identify those with potentially severe disease who require more potent treatments to slow their joint damage.”

*Yap K, et. al. Ann Rheum Dis. 2018 Nov;77(11):1573-1577. Supported by the Krembil Foundation and the Toronto General & Western Hospital Foundation.*

*Dr. Kristy Yap (above), lead author of the study, at Monash Medical Center in Melbourne, Australia. Dr. Vinod Chandran (opposite page, middle) and international fellows Dr. Antonio Wong (opposite page, left) and Dr. Ercan Tunc (opposite page, right) examining a model of the spine.*



## An international destination for research

The Toronto Western Hospital (TWH) has one of the top arthritis centres in North America, recognized for its innovative research and exceptional patient care. As a result, rheumatologists from all over the world come to TWH to complete clinical research fellowships.

Much of the research described in Dr. Chandran's study was performed by Dr. Kristy Yap, an Australian rheumatologist, during her fellowship at TWH. Dr. Yap has now returned to Australia, where she is continuing to care for arthritis patients and is an Adjunct Senior Lecturer at Monash University.

Dr. Chandran is currently mentoring two new international fellows—Dr. Ercan Tunc from Turkey and Dr. Antonio Wong from Ecuador—both of whom are leading research projects while enhancing their clinical training in rheumatology.



# Saving Your Breath

A discovery that could improve survival after spinal cord injury

Most people take breathing for granted. However, for those with a traumatic spinal cord injury (SCI), breathing can be a constant struggle.

Traumatic SCI occurs when the nerve tissue in the spine is damaged by a severe blow to the back or neck, which is most commonly sustained during a motor vehicle accident or a fall. If the damage occurs in the neck area, it can impair the function of—even paralyze—the muscles that control breathing.

As a consequence of their dysfunctional breathing, many patients with SCI in the neck area must be intubated and placed on a ventilator within the first five days after their injury. Breathing-related complications such as lung infections and lung failure account for 80% of deaths associated with SCI in the neck area.

A team of researchers led by Dr. Michael Fehlings has made a discovery that inspires new hope for SCI patients with dysfunctional breathing.

The researchers identified a distinct type of cell in the spinal cord that, when stimulated, stimulates breathing. These cells are known as cervical excitatory neurons and do not appear to be required for normal breathing.



Importantly, the researchers found that stimulating these cells enhances breathing immediately after SCI, when the risk of death is the highest.

“Our results have created a lot of excitement in the field,” says Dr. Fehlings. “They are enabling us to develop better strategies to help people breathe after spinal cord injury.”

*Satkunendrarajah K, et al. Nature. 2018 Oct;562(7727):419-422. Supported by the Krembil Foundation, the Toronto General & Western Hospital Foundation, the Canadian Institutes of Health Research, the Paralyzed Veterans of America, AOSpine North America, the Onassis Foundation and the Dezwirek Foundation.*

*Drs. Spyridon Karadimas (above, left) and Michael Fehlings (above, right) in the operating room at the Toronto Western Hospital. Dr. Kajana Satkunendrarajah (opposite page, left) at the Medical College of Wisconsin. Dr. Karadimas (opposite page, right) at the Krembil Research Institute.*



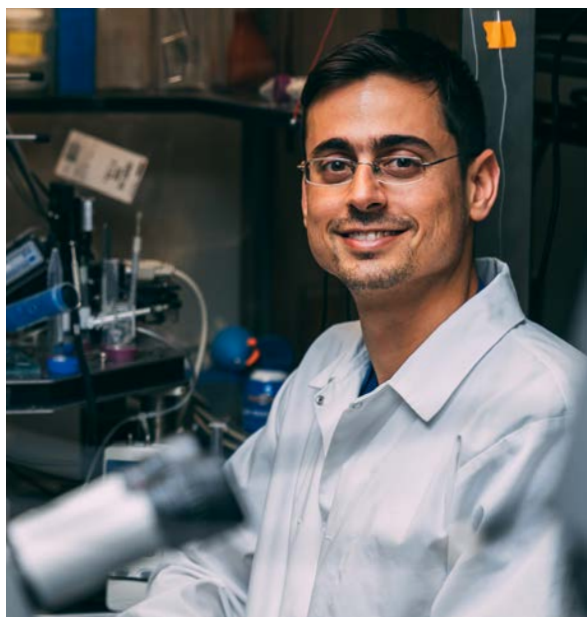


## Great places attract great people

Talented students and fellows come to Krembil to further their research training. Afterwards, many go on to lead their own research groups and make new discoveries. This holds true for the two trainees who led Dr. Fehlings's study.

Dr. Kajana Satkunendrarajah completed her postdoctoral fellowship with Dr. Fehlings. In April 2019, she became an Assistant Professor at the Medical College of Wisconsin in Milwaukee, where she leads her own research program and focuses on developing new treatments to improve breathing after SCI.

Dr. Spyridon Karadimas received his medical degree from the University of Athens in Greece and completed his PhD with Dr. Fehlings. He is currently a neurosurgery resident at the University of Toronto and aims to become a neurovascular surgeon and lead his own research team in the future.



# Getting Connected

New method could help to advance therapy for vision loss

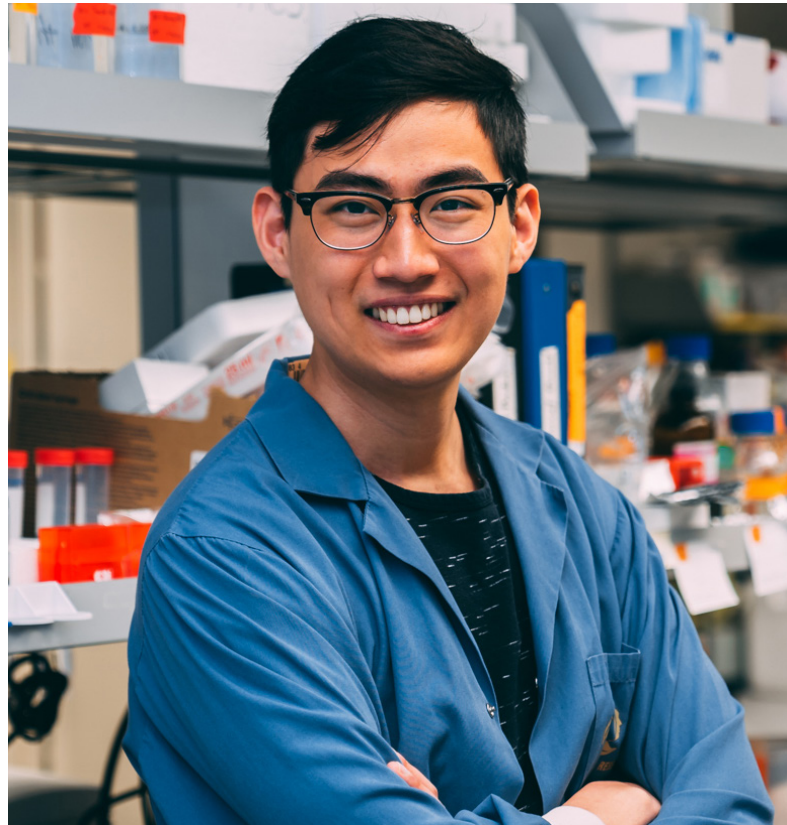
A high-definition TV promises a superior visual experience. To fulfill this promise, the TV must be properly connected to a cable or satellite receiver. Otherwise, no image will appear.

In a similar way, the eye cells that initiate vision—known as photoreceptors—must make the right connections within the eye for a person to see. However, the mechanisms that control the maturation of photoreceptors and their ability to form these connections are unclear.

Dr. Valerie Wallace and her team have developed an efficient and inexpensive method to identify and study these mechanisms.

The researchers isolated eye cells from an experimental model and then seeded the cells in a dish. They then assessed the effect of adding or removing different factors—such as genes or proteins—on the ability of photoreceptors to establish connections with the other cells in the dish.

This method could help researchers develop new treatments for vision loss, such as cell replacement therapy. This emerging therapy involves the surgical transplantation of healthy photoreceptors from a donor into a host, replacing the lost or dysfunctional photoreceptors.



To date, all attempts to restore vision using cell replacement therapy have failed because the transplanted photoreceptors do not establish functional connections with host cells.

“Our method could reveal factors that promote the connections needed for cell replacement therapy to succeed,” states Dr. Wallace.

*Tsai ELS, et al. Stem Cells. 2019 Apr;37(4):529-541. Supported by Brain Canada, the Foundation Fighting Blindness, the Ontario Institute for Regenerative Medicine, the Krembil Foundation, the Canada First Research Excellence Fund and the Toronto General & Western Hospital Foundation. MS Shoichet holds a Tier I Canada Research Chair (CRC) in Tissue Engineering. VA Wallace holds a Tier I CRC in Retina Regeneration.*



## The power of team work

Research projects often require diverse expertise and experience, combined with long hours of careful work. Many different people contribute, including researchers, trainees, technicians and other support staff. This was certainly the case for Dr. Wallace's study.

While Dr. Wallace supervised the research, several of her trainees and staff developed and tested the method described in the accompanying story.

Samuel Tsai, the first author of the study, performed the majority of the work, which formed the basis of his Master's thesis.

Other trainees who made important contributions include postdoctoral fellow Dr. Arturo Ortin-Martinez and graduate students Akshay Gurdita and Nicole Yan.



*Samuel Tsai (top) in Dr. Wallace's lab at the Krembil Discovery Tower. Akshay Gurdita (bottom, left) examining microscope images of eye cells. Dr. Valerie Wallace (bottom, right).*



# Making New Medicines

Moving discoveries from the lab toward the clinic

Krembil researchers identify pathways and proteins that are important in arthritis, and diseases of the brain and eyes. Before these discoveries can be used to develop new drugs, they need to cross what many researchers have labelled the ‘valley of death’.

The valley of death refers to the period of time between a researcher making a fundamental discovery in the laboratory and a company deciding to invest millions of dollars into developing a new medicine based on the discovery. Most discoveries ‘die’ in the valley and do not lead to an effective drug.

To help more discoveries cross the valley of death, Krembil established a new facility—the Centre for Medicinal Chemistry and Drug Discovery (CMCDD). The facility is led by Dr. Mark A Reed, a medicinal chemist with extensive experience in drug discovery and development.

“Turning a discovery into new medicine is a daunting task that requires a huge amount of time and energy. Most researchers do not have the bandwidth to do this alone. This is where CMCDD comes in,” says Dr. Reed. “We shepherd researchers’ discoveries through the earliest and most challenging stage of the drug discovery process.”



In October 2018, CMCDD achieved its first commercial success: Evotec AG and MaRS Innovation chose to support a drug discovery project led by Dr. Jeremy Sivak and CMCDD through their LAB150 partnership. This highly competitive investment was the second of its kind to be awarded in Canada. Dr. Sivak’s project aims to develop a treatment that will prevent glaucoma.

“This is just the beginning,” asserts Dr. Reed. “We have many other exciting projects in the pipeline targeting cancer, arthritis and neurodegenerative diseases.”

*Dr. Mark A Reed (above, left) holding a model of a chemical compound. Dr. Carla Brown (above, right) working at a chemical fumehood. Drs. Reed, Brown and Frank Lee (opposite, far right) discussing a project in the lab.*

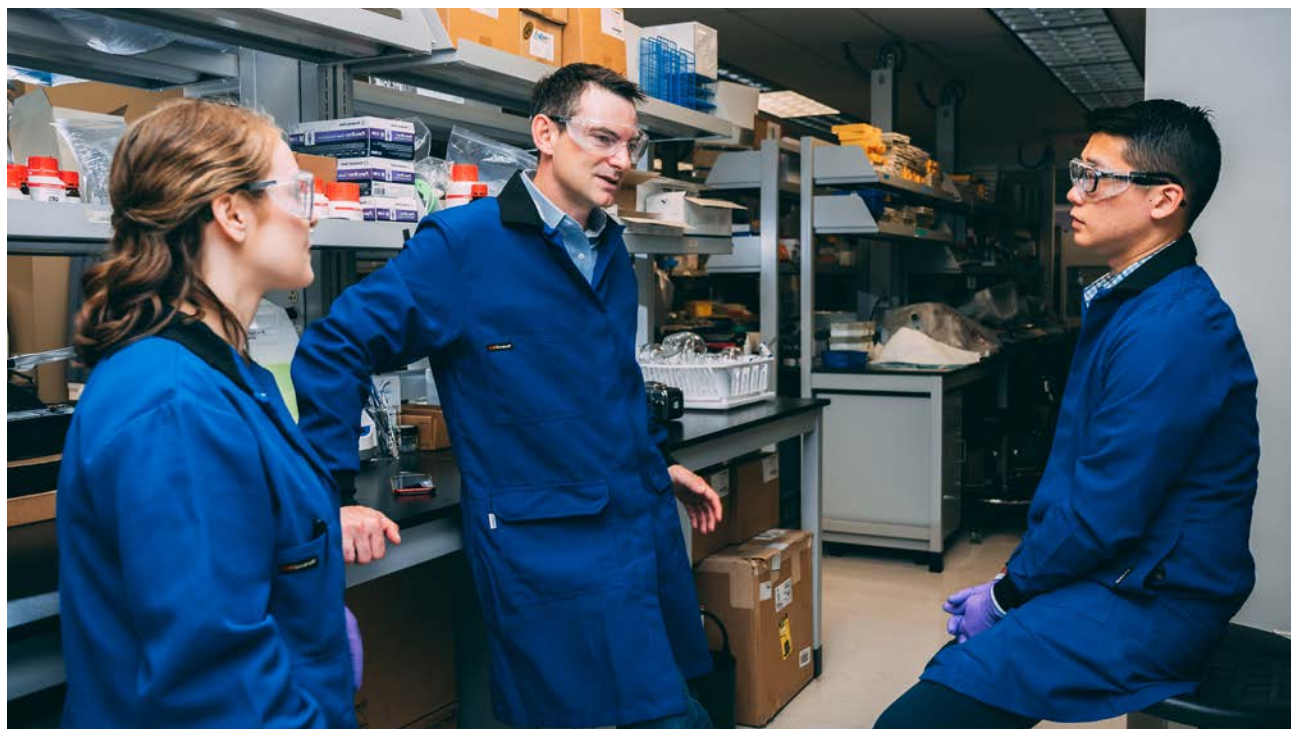


## Teaching trainees the art of drug discovery

Medicinal chemists are at the heart of drug discovery. They design, build and refine the structure of chemical compounds so that the compounds have the desired medicinal effects in the body.

Despite the importance of medicinal chemistry in drug discovery, there is currently a shortage of medicinal chemists in Canada. This in turn is impeding the creation of new medicines based on Canadian discoveries.

Krembil's CMCCD is helping to alleviate this shortage by training new graduates in the art and science of medicinal chemistry. In September 2018, CMCCD hired its first postdoctoral fellows—Drs. Carla Brown and Frank Lee—to support Dr. Sivak's drug discovery project.

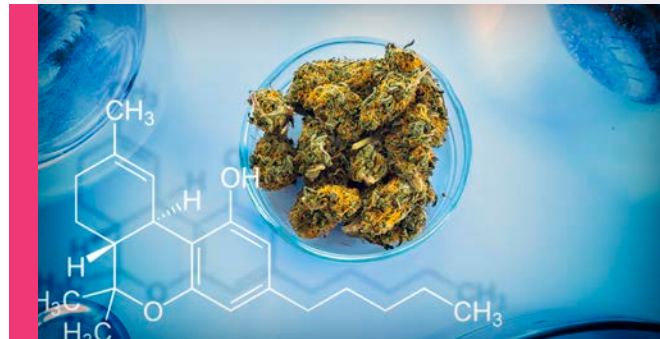


# Research News

## CANNABIS RESEARCH AT KREMBIL

Despite the legalization of cannabis in October 2018, many questions remain regarding the plant's medicinal properties. For example, it is unclear how the hundreds of different chemical components of cannabis will interact with and potentially alter the effectiveness of other medications.

Researchers at the University Health Network (UHN) are committed to answering these questions by leveraging their expertise and resources. Many of UHN's cannabis-related research activities will be centered at Krembil, where researchers will examine cannabis in the treatment of epilepsy, chronic pain and arthritis.



To facilitate this research, Dr. Lakshmi Kotra has been appointed as a Senior Scientist at Krembil. Dr. Kotra is a medicinal chemist with extensive experience in drug development and medicinal cannabis research.



**DONATION TARGETS DEVASTATING DISEASE** A \$14.8 million donation from The Rossy Foundation is supporting the establishment of the first program in Canada devoted to progressive supranuclear palsy (PSP), a rare and severely disabling neurodegenerative disease.

The PSP program will be based at the Toronto Western Hospital and will be led by Dr. Anthony

Lang and other world-leading researchers in movement disorders. The program will provide improved care to PSP patients and enable them to participate in cutting-edge research. Researchers affiliated with the program will investigate the mechanisms causing PSP and develop new treatments and diagnostic tests for the disease.

The neuropathology component of the PSP program will be led by Dr. Gabor Kovacs (left image), an internationally renowned neuropathologist and researcher who specializes in neurodegenerative diseases. Dr. Kovacs has recently been appointed as a Senior Scientist at Krembil. His recruitment from the Medical University of Vienna was made possible by a \$3.8 million contribution from the Edmond J. Safra Foundation.

**ADVANCING SOLUTIONS FOR NEUROLOGICAL DISEASE**

In May 2018, UHN and the University of Toronto launched the CenteR for Advancing Neurotechnological Innovation to Application (CRANIA). The centre is developing new therapeutic strategies for neurological diseases using novel medical devices that are implanted into the brain, spinal cord or nerve fibers. These devices will generate electrical or chemical signals to correct the abnormal neural activity that causes a disease and/or its symptoms.

Drs. Taufik Valiante and Milos Popovic (The KITE Research Institute, UHN) are leading CRANIA’s research team, which includes clinicians, researchers, engineers and computer



scientists. In December 2018, two of CRANIA’s members, Drs. Suneil Kalia and Alfonso Fasano, partnered with clinicians at The Hospital for Sick Children to treat drug-resistant pediatric epilepsy using an implanted device—a first in Canada. CRANIA is aiming to achieve similar clinical landmarks over the next several years.



**A DAY CELEBRATING TRAINEES** Since its creation in 2000, Krembil Research Day has been showcasing the hard work of the institute’s graduate students and postdoctoral fellows. The 2018 edition gave 78 trainees the opportunity to share their research with their colleagues through oral presentations, posters and three-minute

elevator pitches. Trainees were also instrumental in making Research Day happen: they played a leading role in organizing the event and hosting the keynote speaker.

The invited speaker was Dr. Samer Hattar, a Senior Investigator at the National Institute of Mental Health in Bethesda, Maryland (US). Dr. Hattar is most well-known for his research characterizing a light-sensing cell in the eye known as the intrinsically photosensitive retinal ganglion cell and its role in mood and learning.

*The accompanying photo features trainees, staff and researchers at the 2018 Krembil Research Day.*

## RESEARCH NEWS

### KREMBIL BRAIN INSTITUTE LAUNCHED

UHN has established the Krembil Brain Institute (KBI) to harmonize the institution's clinical and research priorities in the neurosciences. The new institute will strengthen collaborations between clinicians and researchers across UHN and accelerate the development of new treatments and cures for diseases of the brain, spine and nerves.

"The Krembil Brain Institute enables us to position ourselves to be the predominant leader in brain medicine now and in the years to come," says Dr. Donald Weaver, KBI co-director.

To celebrate KBI's launch, the Krembil Research Institute and the *Globe and Mail* published 60,000 copies of a magazine insert that were



distributed across Canada. The insert tells the stories of several KBI patients affected by neurological diseases, conditions and injuries and describes how KBI researchers are working to improve care for these patients and others like them.



CFI | FCI

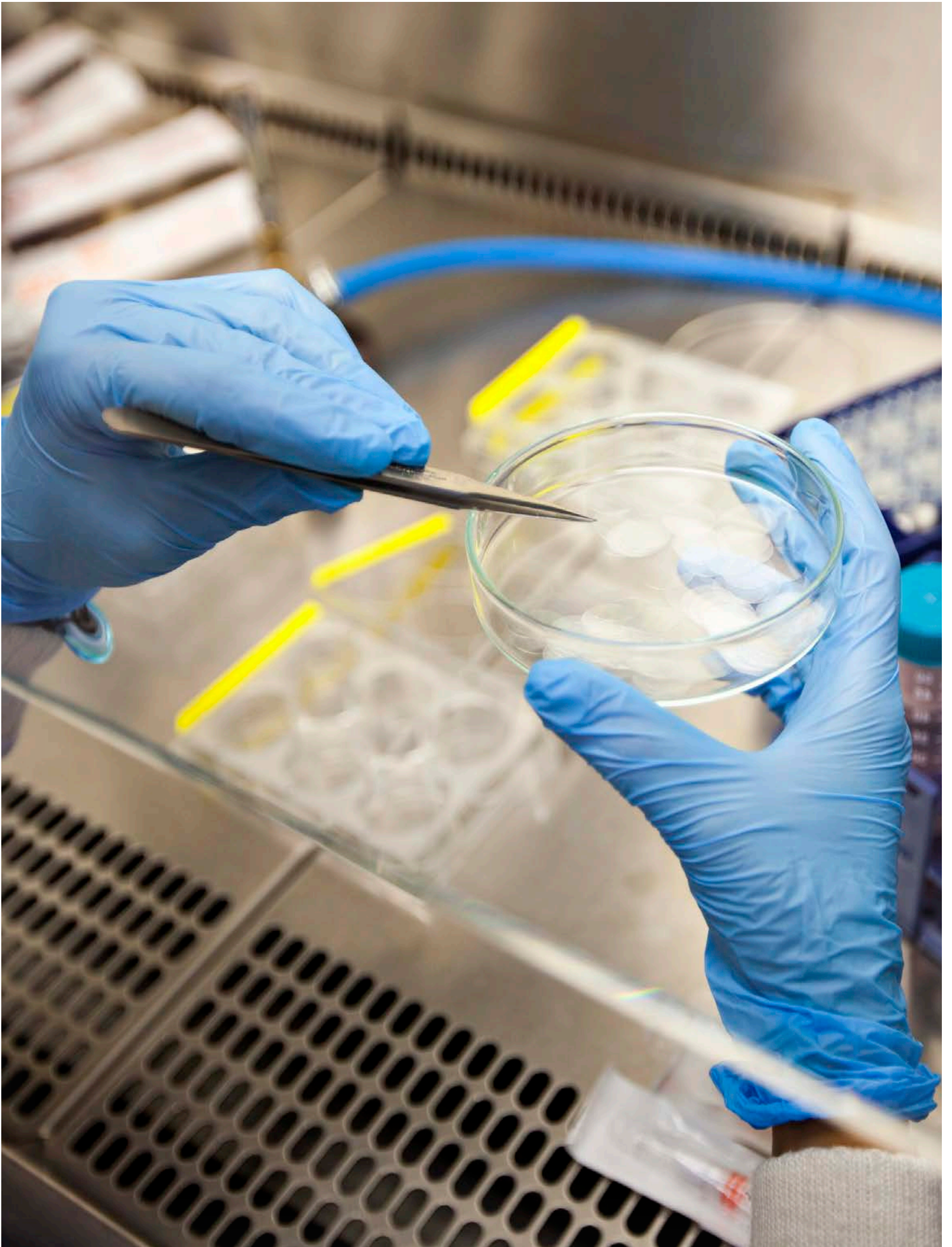
### NEW INFRASTRUCTURE TO SPUR DISCOVERIES

Krembil researchers were awarded a total of \$810,454 from the Canada Foundation for Innovation and the Ontario Research Fund for new equipment to support their innovative research programs.

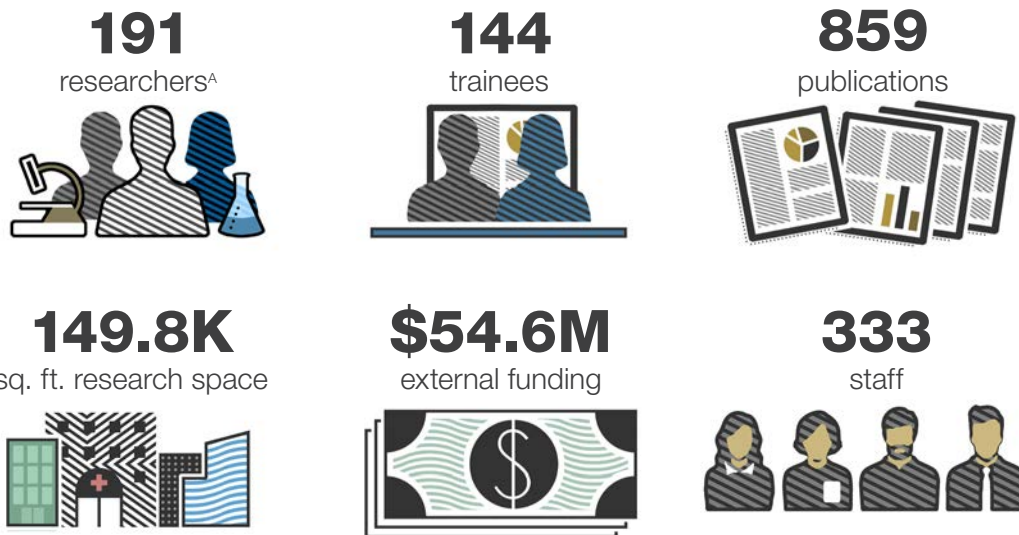
Drs. Robert Chen, Mary Pat McAndrews and Jonathan Downar will leverage the new infrastructure to advance our understanding of brain stimulation techniques and their use as treatments for depression, Parkinson disease and epilepsy.

Drs. Nigil Haroon and Joan Wither will use the new equipment to characterize immune cells from arthritis patients. The findings of their work will inform the development of new diagnostic tools and treatments for different types of arthritis, including ankylosing spondylitis and systemic autoimmune rheumatic diseases.





# Krembil by the Numbers

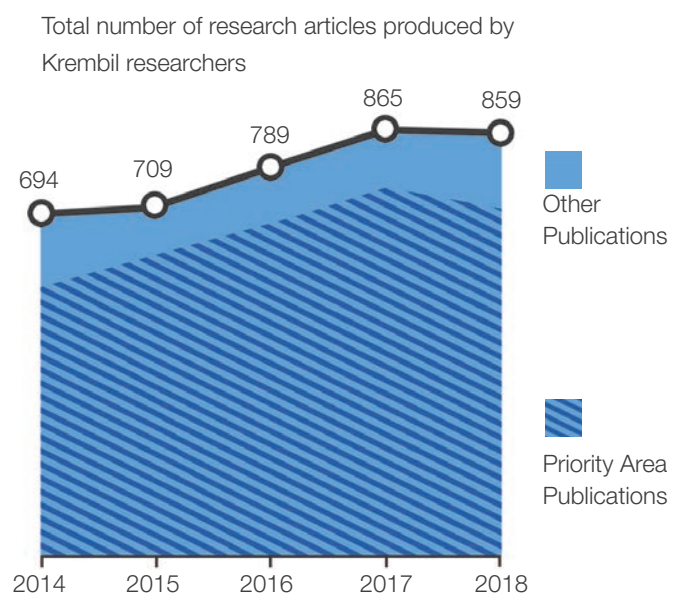


## Performance: How Are We Doing?

The articles collectively published by Krembil researchers in the past year are an indicator of the institute’s overall performance. This is a common approach used by universities and research hospitals worldwide to evaluate the performance of their researchers.

### Total Number of Research Articles

In 2018, Krembil published a total of 859 research articles. Of these, 706—corresponding to 82%—are published in journals that focus on the institute’s priority research areas (i.e., arthritis, brain and eye).



<sup>A</sup>Total comprises 95 Krembil-appointed researchers and 96 Krembil-aligned researchers.

## Importance of Research Articles

The Normalized Citation Impact (NCI) is a measure that reflects the perceived importance of a research article in its field. It is based on the number of times that an article is referenced by other researchers.

In 2018, Krembil’s average NCI was 1.8. This means that the research articles published by Krembil researchers in 2018 were referenced 1.8 times more than the average article published in the same year and in the same field. Krembil’s NCI compares favourably with those of some of Canada’s top research hospitals (see graph below).

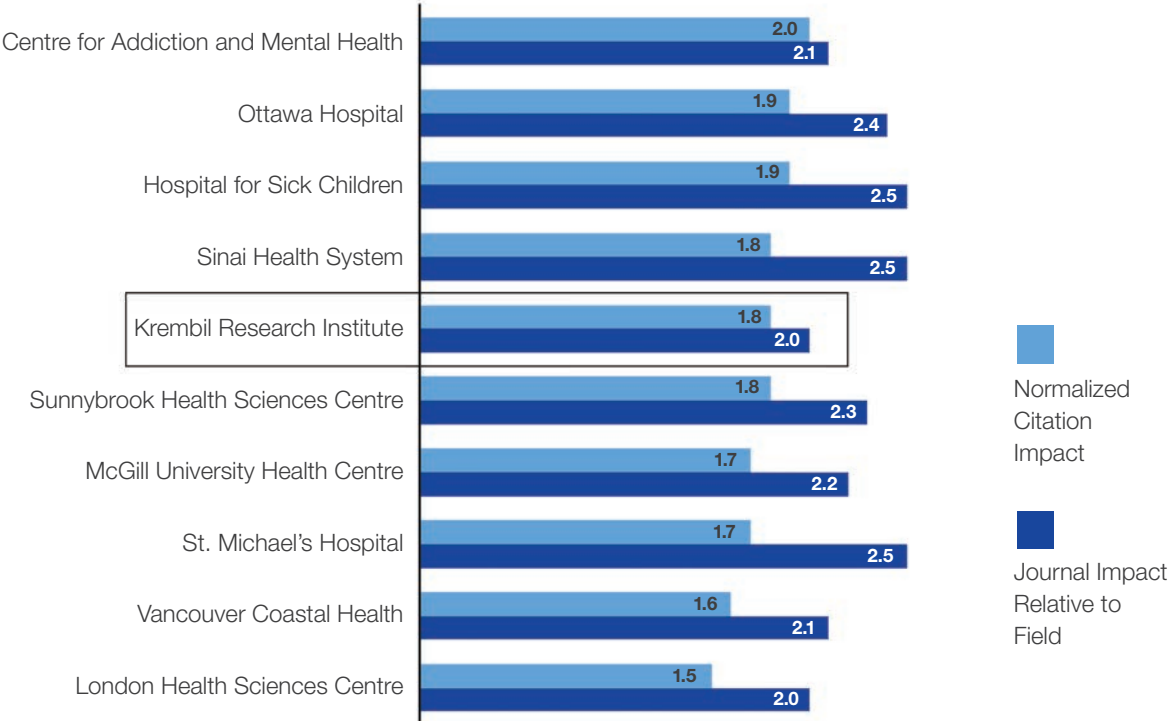
## Journal Prestige

Research articles are mainly published in academic periodicals known as journals, which are similar to magazines. The perceived importance of a journal is based on the total number of times the articles published by the journal are referenced.

The Journal Impact Relative to Field (JIRF) is a measure that indicates the importance of a journal, based on its total number of references, compared to that of other journals in the same field and in the same year.

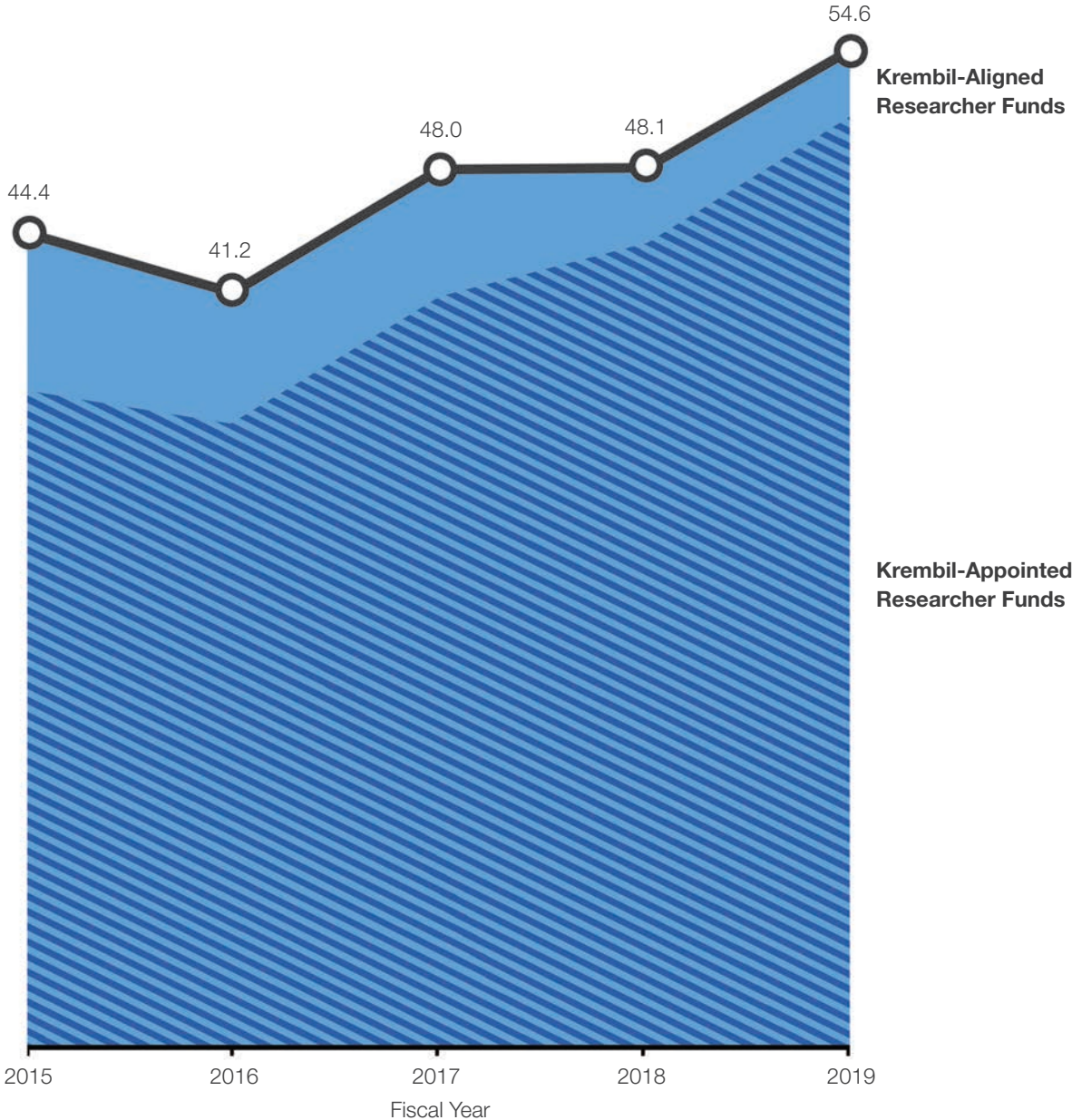
In 2018, Krembil’s overall JIRF was 2.0. This means that Krembil’s research articles were published in journals that are perceived as being twice as important as other journals in the same field. The graph below shows that Krembil’s JIRF compares favourably with those of some of Canada’s top research hospitals.

Indicators of publication importance and prestige across Canada’s top research hospitals



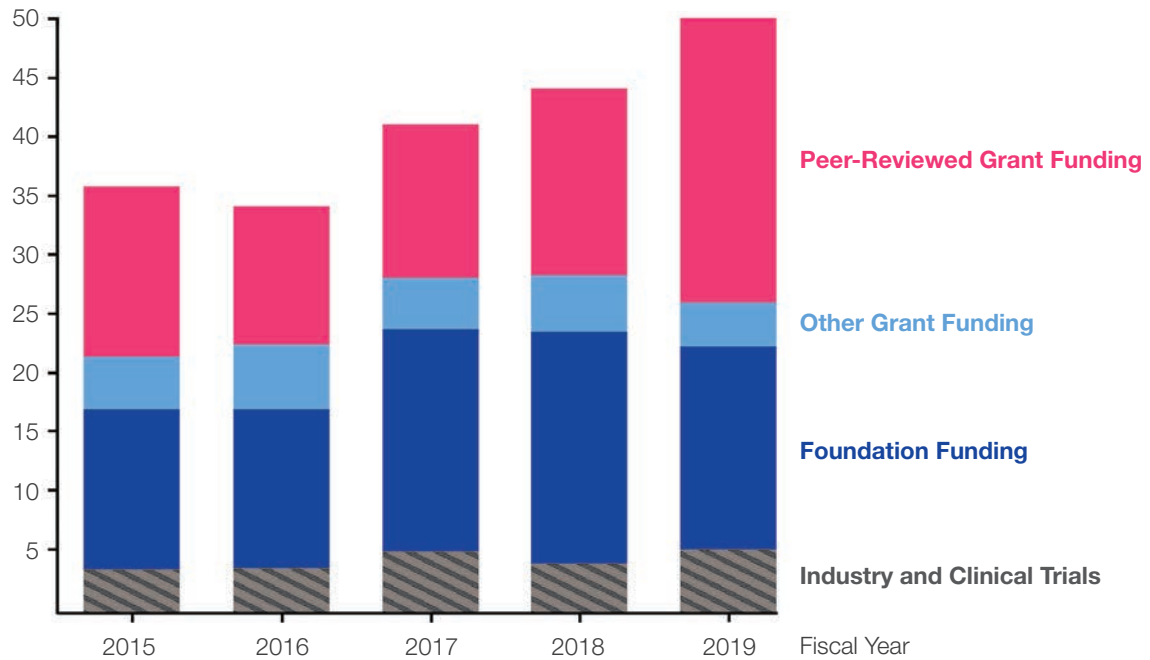
# Financials

Research Funding Trends (\$, Millions)<sup>B</sup>

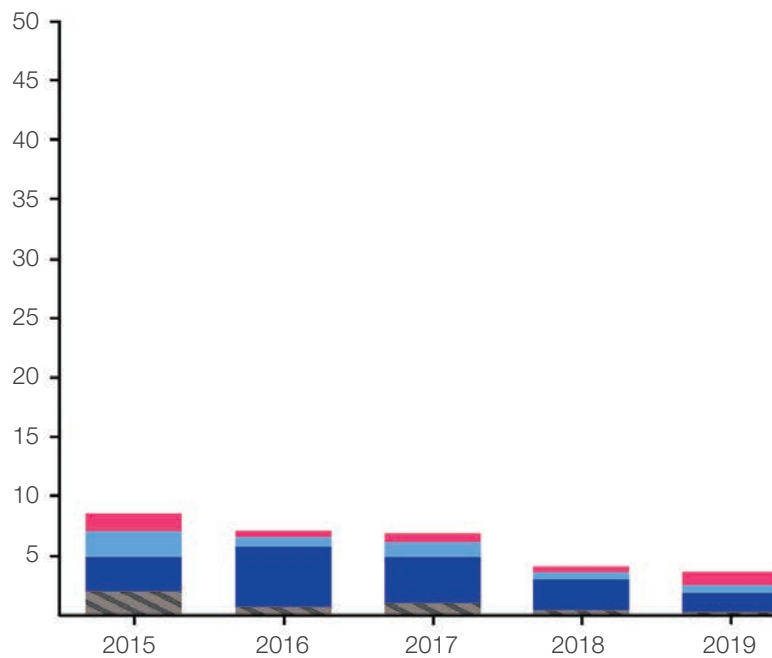


## Research Funding Trends (\$, Millions)<sup>B</sup>

### Krembil-Appointed Researchers



### Krembil-Aligned Researchers



<sup>B</sup>See disclaimer on page 26.

# Awards and Distinctions

Selected honours awarded to Krembil researchers

## **Dr. Karen Davis**

2019 Distinguished Career Award, Canadian Pain Society

Fellow, Canadian Academy of Health Sciences

President-Elect, Canadian Pain Society

## **Dr. Michael Fehlings**

President, International Neurotrauma Society

## **Dr. Dafna Gladman**

2018 Distinguished Clinical Investigator Award, American College of Rheumatology

## **Dr. Igor Jurisica**

Doctor of Medical Sciences, Slovak Academy of Sciences

Top 100 AI Leaders in Drug Discovery and Advanced Healthcare, Deep Knowledge Analytics

## **Dr. Anthony Lang**

2018 Weston Brain Institute International Outstanding Achievement Award, W. Garfield Weston Foundation

## **Dr. Rosemary Martino**

Tier 2 Canada Research Chair in Swallowing Disorders (renewal)

## **Dr. Philippe Monnier**

Restore Vision 20/20 Award, Fighting Blindness Canada (formerly known as the Foundation Fighting Blindness)

## **Dr. Charles Tator**

The Barbara Turnbull Foundation for Spinal Cord Research and Brain Canada Foundation named a new award (the Turnbull-Tator Award in Spinal Cord Injury and Concussion Research) after Dr. Tator.

## **Dr. Zahi Touma**

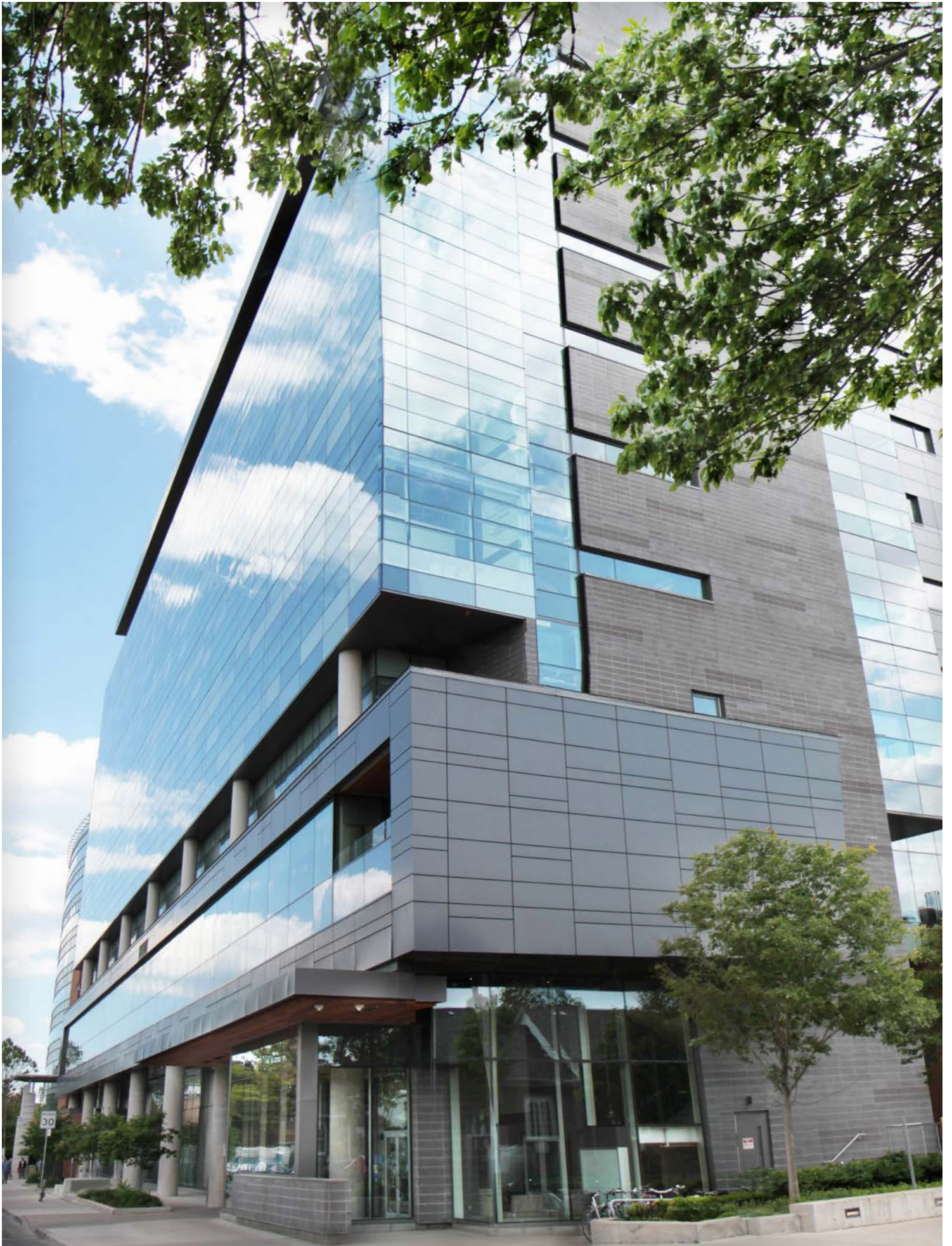
2018–2020 CRA (CIORA) Clinician Investigator Award, Arthritis Society

## **Dr. Michael Tymianski**

Tier 1 Canada Research Chair in Translational Stroke Research (renewal)

## **Dr. Gelareh Zadeh**

2018 William E. Rawls Prize (co-recipient), Canadian Cancer Society



# Krembil Researchers

## **Krembil-Appointed Researchers**

### **Emeritus Scientist**

Charles Tator

### **Senior Scientists**

Elizabeth Badley  
Cathy Barr  
Jonathan Brotchie  
Peter Carlen  
Robert Chen  
Aileen Davis  
Karen Davis  
James Eubanks  
Michael Fehlings  
Dafna Gladman  
Christopher Hudson  
William Hutchison  
Robert Inman  
Igor Jurisica  
Mohit Kapoor  
Sidney Kennedy  
Lakshmi Kotra  
Anthony Lang  
Andres Lozano  
Nizar Mahomed  
Rosemary Martino  
Mary Pat McAndrews  
David Mikulis  
Philippe Monnier  
Michael Reber  
Jeremy Sivak  
Frances Skinner  
Antonio Strafella  
Shuzo Sugita  
Michael Tymianski  
Murray Urowitz  
Valerie Wallace  
Donald Weaver  
Joan Wither

## **Scientists**

Jonathan Downar  
Nigil Haroon  
Mojgan Hodaie  
Lorraine Kalia  
Suneil Kalia  
Armand Keating  
Milad Lankarany  
J r mie Lefebvre  
Anthony Perruccio  
Ivan Radovanovic  
Taufik Valiante  
Liang Zhang

## **Affiliate Scientists**

Vinod Chandran  
Moshe Eizenman  
Paul Fortin  
Brenda Gallie  
Monique Gignac  
Esther Gonz lez  
Clement Hamani  
Magdy Hassouna  
Walter Kucharczyk  
Joyce Poon  
Elise Stanley  
Sowmya Viswanathan  
Agnes Wong  
Georg Zoidl

## **Clinician Investigators**

Dimitri Anastakis  
Danielle Andrade  
Heather Baltzer  
Mark Bernstein  
Anuj Bhatia  
Michael Brent  
Daniel Buchman  
Frances Chung  
Melanie Cohn  
Robert Devenyi  
Dean Elterman  
Alfonso Fasano  
Susan Fox  
Kenneth Fung  
Rajiv Gandhi  
Timothy Jackson  
Efrem Mandelcorn  
Daniel Mandell  
Shane McInerney  
Roger McIntyre  
Renato Munhoz  
Laura Passalent  
Fayez Quereshy  
Yoga Raja Rampersaud  
Aylin Reid  
David Rootman  
Cheryl Rosen  
Allan Slomovic  
David Tang-Wai  
Maria Carmela Tartaglia  
Zahi Touma  
Christian Veillette  
Mary Elizabeth Wilcox  
Mateusz Zurowski



## **Krembil-Aligned Researchers**

Tarek Abdelhalim  
Nadine Abdullah  
Ronit Agid  
Lori Albert  
Laila Alshafai  
Ehtesham Baig  
Eric Bartlett  
Robert Bleakney  
Arthur Bookman  
Leslie Buckley  
Esther Bui  
Yvonne Buys  
Jennifer Calafati  
Simon Carette  
Leanne Casaubon  
Andrea Chan  
Clara Chan  
Vincent Chan  
Ki Jinn Chin  
Panos Christakis  
J Roderick Davey  
Justin Delwo  
Michael Dinsmore  
Sherif El-Defrawy  
Richard Farb  
Philip Gerretsen  
Peter Giacobbe  
Robert Gordon  
Raed Hawa  
Cheryl Jaigobin  
Sindhu Johnson  
Hans Katzberg  
Stephen Kraft  
Hatem Krema  
Timo Krings  
Cindy Lam  
Johnny Lau  
Jason Lazarou

Timothy Leroux  
Stephen Lewis  
Reuven Lexier  
Gianni Lorello  
Lindsey MacGillivray  
Mark Mandelcorn  
Rodrigo Mansur  
Edward Margolin  
Samuel Markowitz  
Connie Marras  
K Wayne Marshall  
Jose Martin del Campo  
Eric Massicotte  
Steven McCabe  
Tatiana Melnyk  
Jonathan Micieli  
David Munoz  
Ali Naraghi  
Darrell Ogilvie-Harris  
Daniel Panisko  
Christine Papoushek  
Sagar Parikh  
Ryan Paul  
Philip Peng  
Vitor Pereira  
Anahi Perlas Fontana  
Aleksandra Pikula  
Atul Prabhu  
Sidney Radomski  
Amandeep Rai  
Sapna Rawal  
Shail Rawal  
Jorge Sánchez-Guerrero  
Paul Sandor  
Joanna Schaafsma  
Matthew Schlenker  
Kathleen Sheehan  
Frank Silver  
Neera Singal  
Shaun Singer  
Mandeep Singh

Marisa Sit  
Elizabeth Slow  
Roger Smith  
Neilesh Soneji  
Peter St George-Hyslop  
Khalid Syed  
Peter Tai  
Graham Trope  
Lakshmikumar Venkat Raghavan  
Herbert von Schroeder  
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*All data are accurate as of March 31, 2019. Financial data are reported for the 2019 fiscal year ending on March 31, 2019. Awards and distinctions include those announced during the 2019 fiscal year.*

**Researchers** Data provided by UHN's Research Strategy and Planning. Krembil researchers include those appointed by the institute and those aligned with the institute. Only Krembil-appointed researchers are subject to the institute's scientific and performance reviews. Krembil-aligned researchers are included in the institute's funding and publication data. **Staff** Data provided by UHN's Human Resources. **Trainees** Data provided by UHN's Office of Research Trainees and only include trainees who are supervised by Krembil-appointed researchers. **Space** Data provided by UHN's Facilities Management - Planning, Redevelopment & Operations (FM-PRO). **Financials** Data provided by UHN's Research Financial Services. Research funding represents the total research project funding held by Krembil researchers in each fiscal year. **Publications** Data provided by UHN's Research Strategy and Planning. Publications include articles, reviews and proceedings papers published in the 2018 calendar year and in journals indexed in the Web of Science (WoS) Core Collection (Clarivate Analytics); those authored by more than one Krembil researcher are included once in the institute's total number of publications. Using Krembil publications from previous calendar years, 22 WoS subject categories were identified to represent one or all of Krembil's priority areas. The 2018 publications were then allocated to one or more of the priority areas based on their WoS subject category. A Medline search using priority-themed keywords was matched to the Krembil publication lists to identify relevant priority-themed publications not otherwise identified using the 22 WoS subject categories. **Benchmarking** Data provided by UHN's Research Strategy and Planning. Top Canadian research hospitals (as per RESEARCH Infosource 2017) that produced the most 2012–2016 publications within Krembil's priority research areas (i.e., arthritis, brain, eye) were selected as comparators. Each institution's publications (i.e., Krembil and comparators) were retrieved from WoS using customized search strings that included subordinate organizations. The resulting publications were then filtered by type (i.e., articles, reviews and proceedings papers) and year. Citation and journal impact metrics were obtained from InCites databases (Clarivate Analytics). Krembil and comparator publication data were retrieved within the same day to ensure citation data were contemporaneous. **Production Credits** This report is published by Krembil's Directorate Office. Graphic design, writing and production of this report by UHN's Strategic Research Initiatives Development (StRIDE).

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# Krembil

## Relentless.

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Scientists at the Krembil Research Institute are relentlessly pursuing cures for arthritis and diseases of the brain and eye.

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**[discoverkrembil.ca](http://discoverkrembil.ca)**

### **Brain**

Clusters of potassium-transporting ion channels with microglia in an injured spinal cord

Dr. Lyanne C. Schlichter  
*Former Krembil Senior Scientist*

### **Arthritis**

Fluorescence image of human cartilage stained to show live and dead cartilage cells

Dr. Mohit Kapoor  
*Krembil Senior Scientist*

### **Eye**

Slice of an adult retina stained with blue to show all the nuclei of neurons

Dr. Valerie Wallace  
*Krembil Senior Scientist*



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