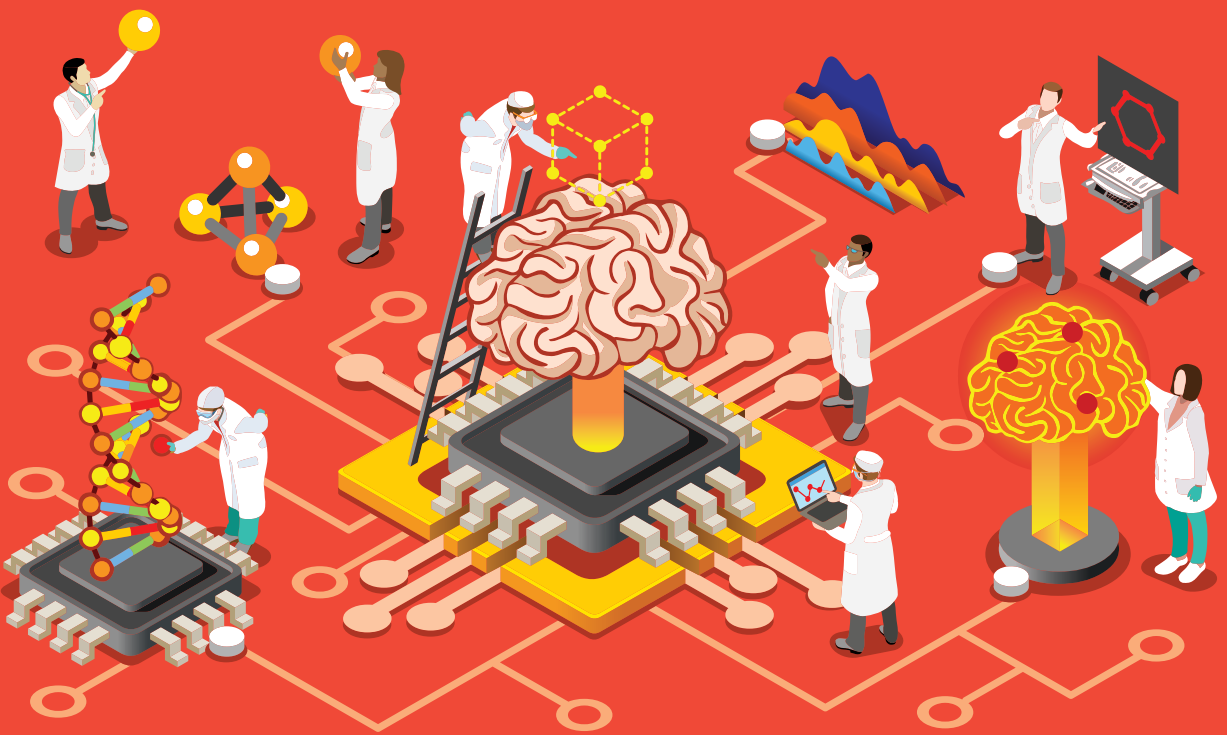


# REPORT

## TO THE COMMUNITY

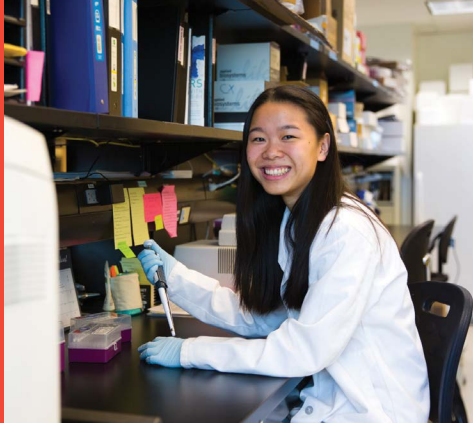
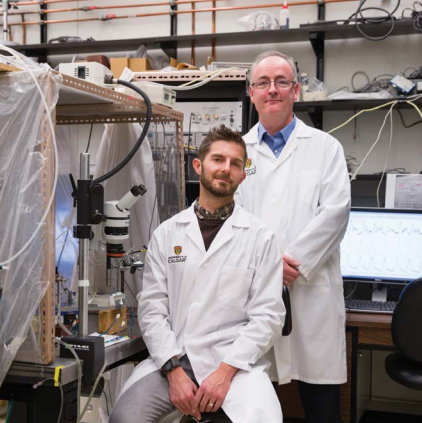
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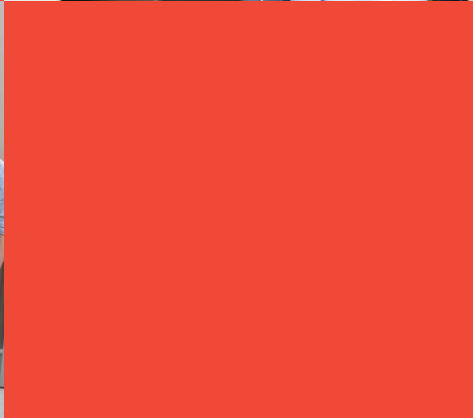
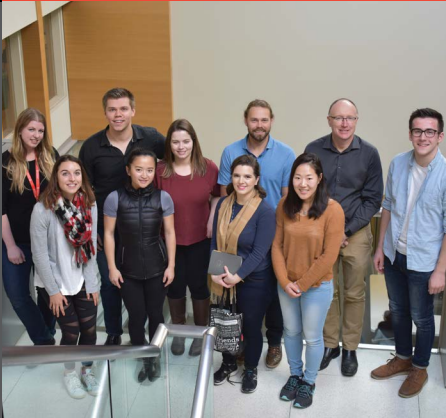


UNIVERSITY OF  
CALGARY



# REPORT TO THE COMMUNITY

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***OUR VISION***

*Healthy brains for  
better lives*



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**OUR MISSION**

*The Hotchkiss Brain Institute inspires discovery and applies knowledge towards innovative solutions for neurological and mental health disorders.*



# MESSAGE FROM THE DIRECTOR



“Without continual growth and progress, such words as improvement, achievement and success have no meaning.” This quote by Benjamin Franklin rings particularly true for us at the Hotchkiss Brain Institute.

The past year has been one of growth and transition at the HBI, and I can say for certain that through the changes, we have spurred progress and attained exceptional levels of achievement. I am pleased to share with you our annual Report to the Community—a summary of the efforts and accomplishments of our scientists, clinicians, fellows, students, technicians and support staff.

All that we do at the HBI is guided by our strategic plan, which is built on our strengths in research, education, and collaborative community partnerships. Our vision, *healthy brains for better lives*, and our mission, *to inspire discovery and apply knowledge toward innovative solutions for neurological and mental health disorders*, came to life this year as we made—and continue to make—significant strides towards becoming an international centre of excellence in neuroscience and mental health research and education.

## Research and clinical advancements are making an impact

As a result of the outstanding and innovative work of our members, transformative research is leading to outcomes that are improving healthcare in our community and beyond. Further on in this report, you'll read about some of the groundbreaking discoveries our members made this year.

It is deeply rewarding to see our members being recognized at the highest levels for their work: four new and five renewed Canada Research Chairs were awarded to HBI members; two members were named to the Royal Society of Canada's College of New Scholars, Artists and Scientists; and two members were recognized with Killam Awards.

Additionally, our members have been prolific this year in acquiring vital funding. Grants recently awarded by the Canada Foundation for Innovation, Brain Canada and the Canadian Institutes of Health Research acknowledge the superb expertise of our researchers. Such funding also plays a direct role in helping them transform brain and mental health knowledge, and advance new approaches to health care in Canada.

## HBI trainees: the next generation driving innovation in brain and mental health

Our Institute aims to be the destination of choice for undergraduate through to postdoctoral training in the neurosciences and mental health in Canada. HBI trainees include all undergraduate students (including those in the BSc Neuroscience program), graduate students, postdoctoral and clinical fellows, and residents supervised by full HBI members. Trainees become the next generation of leaders in the community, in business, the not-for-profit sector, government and academia, and our Institute is dedicated to providing them with the skills and knowledge to succeed not only as researchers, but also as leaders in the brain-health workforce.

We work with our trainees to ensure the HBI's education programs are growing, evolving, and helping them excel. For instance, in the last five years the Neuroscience Graduate Program has doubled in size; our innovative career development program, REALISE, has broadened the learning experience for over 300 trainees; and we also recently introduced an Alumni Engagement Program.

This year, our trainees initiated new collaborative, multi-disciplinary summer student research programs with the Biomedical Engineering program and the Werklund School of Education. The HBI's bright and talented scholars continually surpass expectations in funding and award competitions, garnering seven Vanier Awards over the past two competitions, one Killam Award, three National CIHR Brain Star Awards, three CIHR Banting Postdoctoral Fellowship Awards, one Governor General's Gold Medal and one President's Award. In fact, 41 per cent of all Alberta Innovates Graduate Studentships were awarded to HBI trainees in the Spring 2017 competition, an impressive recognition for our trainees and their supervisors.

## Engaging community, building partnerships

As a locally relevant and internationally recognized centre of excellence for brain and mental health—and the leader of the university's Brain and Mental Health research strategy—we welcome community involvement in philanthropic stewardship, and work to build impactful partnerships that advance awareness and enrich brain and mental health research and education at UCalgary and beyond.

Our community outreach activities and partnerships this year included collaborations with TELUS Spark, the Calgary Public Library, Beakerhead, the Plaza Theatre, UCalgary's Faculty of Arts and Nickle Galleries, and The Mathison Centre for Mental Health Research & Education. We championed Campus Alberta Neuroscience, and supported the development of a pan-Canadian brain research initiative. These initiatives offered excellent opportunities for us to connect one-on-one with community members, from groups to individuals, engaging them through Q & A sessions and interactive, hands-on demonstrations. The HBI has also built robust international partnerships as part of an international strategy that provides opportunities for our investigators and trainees to interact and collaborate with the world's top brain and mental health researchers.

We have so much to be proud of and a multitude of accomplishments to celebrate. We sincerely acknowledge the HBI's volunteers who work tirelessly in the community to support the Institute. It is through their work and their incredible spirit of philanthropy that the full potential of the HBI's discoveries in brain health research are being realized.

Thanks to: Lesley Conway, Jack Davis, Chen Fong, Jeff Hotchkiss, Richard Hotchkiss, Stephen Lockwood, Jamie and Brenda Mackie, Ron Mathison, Mike Rose, Mike Smith, and Paul Wanklyn.

My gratitude to Dr. Richard Frayne, the HBI's deputy director, and Dr. Sarah McFarlane, education director, for their leadership now and over the past year. Thanks, also, to the HBI staff and each of you who contribute to the HBI's achievements—it has been an exceptional year. The extraordinary and unrelenting efforts to advance research and education in brain and mental health have helped the HBI become the world-class institute it is today. I am very proud to be a member of the HBI, and feel privileged to have served as the Deputy Director from 2010 to 2017, and as your Director this past year.

I extend a warm welcome to Dr. David Park, our new director, and I look forward to the HBI's next chapter, and all that we will accomplish together.

A handwritten signature in blue ink that reads "Keith".

Dr. Keith A. Sharkey, PhD, CAGF, FCAHS  
Professor; Crohn's and Colitis Canada Chair in IBD Research  
Director, Hotchkiss Brain Institute (2017-2018)

# COLLABORATORS STUDY IMPACT OF CHILDHOOD ABUSE ON THE DEVELOPING BRAIN

## NEW APPROACH LOOKS AT AN INDIVIDUAL'S HISTORY TO PREDICT A POSITIVE OUTCOME AND PATH TO RESILIENCY



Childhood abuse is a subject everyone wishes needed no study. But studying it could improve the future quality of life for many of those who experience it.

“Because of the vulnerable nature of the population, this has been an area that is sometimes neglected by research,” says Dr. Paul Arnold, MD, PhD, child psychiatrist, Director of The Mathison Centre for Mental Health Research & Education and member of the Hotchkiss Brain Institute (HBI). “Yet, it’s so extremely important because there are kids who

have mental and sometimes physical difficulties down the road due to the trauma they’ve experienced.”

In the past, research in this area focused mostly on the adult looking back on their abuse and how it influenced their life’s course. Arnold is working to shift that focus forward. Under his leadership and in collaboration with the Calgary Child Advocacy Centre (formerly called the Sheldon Kennedy Child Advocacy Centre), researchers at The Mathison Centre and the HBI are developing a protocol for the Calgary Child Advocacy Centre (CCAC) Study. The study aims to collect and compare genetic and biological information from three groups of children—each group having experienced different forms of maltreatment—in order to better understand the changes abuse can trigger.

“By examining brain structure through imaging, along with genetic makeup, we’ll gain a better understanding of how these traumatic events affect the biology of a child’s brain,” says Arnold, whose team will conduct MRI scans and collect DNA samples from study participants. If children with a specific brain chemistry have more success with one form of treatment over another, Arnold hopes health providers will be able to use their information as a template for prescribing more effective treatments to future patients with the same presentation.

Originally, the study recruited 240 participants from two groups of children: those who have recently experienced abuse and those who have not. In response to some external reviews, those 240 participants will now be equally divided into three groups to include children who have experienced other forms of maltreatment.

“There are other forms of toxic stress and adverse childhood experiences,” says Arnold, “such as a parent with a severe mental illness or those who are experiencing a difficult

divorce. By including these children, we will gain a deeper understanding of the impact of all of these experiences and compare this data to what we’ve collected from children with a more specific and severe form of trauma.”

Arnold says one of the most crucial, work-intensive aspects of the study thus far has been the collaborations developed with other community partners who work in this field. Dr. Gina Dimitropoulos, PhD, co-principal investigator on the study, has worked tirelessly to build relationships with Hull Services and Alberta Health Services’ Child and Adolescent Mental Health Program in order to develop the study’s ethical guidelines and to identify children who fit into the study’s cohorts. These partnerships are integral to the study’s success.

“We have to be careful with how we assess the children and how we ask questions about their physical health, mental health and their experiences,” says Dimitropoulos, assistant professor in the Faculty of Social Work, and member of The Mathison Centre and the HBI at the Cumming School of Medicine. “We don’t want to re-traumatize them. I think we are now able to navigate the various pathways of how best to approach these young people and follow them over time.”

Dimitropoulos says the study is currently working on identifying ways to measure these variables and the logistics of following the children over time. For her, it isn’t about understanding the tortured path of the victim, but instead helping them find the road to resiliency.

“I really want to challenge this notion that people who are survivors or who have experienced abuse are broken,” she says. “Through this study, we want to learn more about what makes them resilient and how people in their natural support network help them when they experience trauma or maltreatment.”

### Ronald Mathison: Visionary leadership sparks advancements in youth mental health

In 2012, Ronald Mathison’s gift of \$10 million established The Mathison Centre for Mental Health Research & Education, formed as a grassroots initiative between the HBI and UCalgary’s Department of Psychiatry. Mr. Mathison’s investment started a dialogue about mental health, and his leadership sets an inspiring example of the tremendous impact that is possible when we work together.

Mr. Mathison is the chairman of Matco Investments Ltd. and a proud volunteer on the HBI’s Strategic Advisory Board. A self-made entrepreneur, his visionary leadership, with particular focus on advancing youth and mental health, is helping The Mathison Centre chart a new course in mental health research and education, offering support and hope to families in Calgary, throughout Alberta and around the world.

The Mathison Centre is one of Canada’s leading centres for mental health research and education. Many of its investigators are named among the world’s top one per cent of cited researchers for their work incorporating fundamental and clinical mental health studies using advanced technologies, like imaging, to understand risk factors in brain circuitry. Current and future generations of Mathison Centre investigators are committed to discovering better health outcomes, and improving the lives of young people suffering from mental illness with stronger prediction, prevention and early intervention.

“Mental health has long been ignored at great social and financial cost. It’s time we start funding the research needed to make a difference.”- Ronald P. Mathison, President & CEO, Matco Investments Ltd.





A groundbreaking study may explain why the effects of stress may impact others. The study's research team includes (L-R) Tamás Füzési, Nuria Daviu, David Rosenegger, Neilen Rasiah, Dinara Baimoukhametova, Toni-Lee Sterley, Jaideep Bains, and Agnieszka Zurek. Photos by Adrian Shellard.

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*“There has been other literature that shows stress can be transferred, and our study is actually showing the brain is changed by that transferred stress.”*

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“What we can begin to think about is whether other people’s experiences or stresses may be changing us in a way that we don’t fully understand,” says Bains, professor in the Department of Physiology & Pharmacology at the Cumming School of Medicine. “The study also demonstrates that traits we think of as uniquely human are evolutionary conserved biological traits.”

The study shows that it is only in female mice—not male mice—that the effects of stress on the brain are reversed following a social interaction. The team noticed that, in females, the residual effects of stress on neurons were cut almost in half following time spent with unstressed partners. The same was not true for males.

“If some of the effects of stress are erased through social interactions, but this benefit is limited to females, this may provide insights into how we design personalized approaches for the treatment of stress disorders in people,” says Bains.

## CAN STRESS BE CONTAGIOUS?

### RESEARCHERS AT THE MATHISON CENTRE DISCOVER BRAIN CELLS CHANGE FOLLOWING CLOSE CONTACT WITH A STRESSED INDIVIDUAL

Health-care workers treating soldiers with post-traumatic stress disorder (PTSD) report that loved ones and family members of some soldiers display symptoms of PTSD despite never serving in the military.

Drs. Jaideep Bains, PhD, Toni-Lee Sterley, PhD and Bains’ team at The Mathison Centre for Mental Health Research & Education and the Hotchkiss Brain Institute (HBI) have discovered that stress transmitted from others can change the brain in the same way a real stress does. The research team studied the effects of stress in pairs of male or female mice. They removed one mouse from each pair and exposed it to a mild stress before returning it to its partner. They then examined the responses of a specific population of brain cells in each mouse, which revealed that networks in the brains of both the stressed mouse and naïve partner were altered in the same way.

“There has been other literature that shows stress can be transferred, and our study is actually showing the brain is changed by that transferred stress,” says Sterley, a University of Calgary Eyes High postdoctoral fellow in Bains’ lab and the study’s lead author. “The neurons that control the brain’s response to stress showed changes in unstressed partners that were identical to those we measured in the stressed mice.”

The researchers discovered that the activation of the neurons causes the release of a chemical signal, an “alarm pheromone,” from the mouse that alerts the partner. The partner who detects the signal can, in turn, alert additional members of the group.







Hotchkiss Brain Institute scientists Dr. Andrew Caprariello, PhD (L) and Dr. Peter Stys, MD, have uncovered scientific proof showing that a new, unconventional way to battle MS has merit.

Photo by Pauline Zulueta.

## RESEARCH INTRODUCES NEW THEORY ON HOW TO BATTLE MULTIPLE SCLEROSIS

### FINDINGS CHALLENGE CONVENTIONAL THINKING ABOUT THE ROOT CAUSE OF THE DISEASE

Ridiculous. That's how Dr. Andrew Caprariello, PhD, says his colleagues described his theory about multiple sclerosis (MS) back when he was doing his PhD in Ohio.

Caprariello's passion to explore controversial new theories about MS propelled him to seek out a postdoctoral fellowship with a like-minded thinker, whom he found in University of Calgary's Dr. Peter Stys, MD.

The collaboration paid off. Caprariello, Stys and their colleagues have scientific proof that their somewhat radical theory has merit. "I've always wondered 'what if' MS starts in the brain and the immune attacks are a consequence of the brain damage?" says Caprariello, a postdoctoral research fellow in the Department of Clinical Neurosciences at the Cumming School of Medicine (CSM).

Currently, MS is considered to be a progressive autoimmune disease. Brain inflammation happens when the body's immune system attacks a protective material around nerve fibers in the brain called myelin. Conventional thinking is that rogue immune cells initially enter the brain and cause myelin damage that starts MS.

"In the field, the controversy about what starts MS has been brewing for more than a decade. In medical school, I was taught years ago that the immune attack initiates the disease. End of story," says Stys, a neurologist and professor in the Department of Clinical Neurosciences at the CSM and member of the Hotchkiss Brain Institute.

"However, our findings show there may be something happening deeper and earlier that damages the myelin and then later triggers the immune attacks."

To test the theory, the research team designed a mouse model of MS that begins with a mild myelin injury. In this way, researchers could mirror what they believe to be the earliest stages of the disease.

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*"In the field, the controversy about what starts MS has been brewing for more than a decade."*

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"Our experiments show, at least in this animal model, that a subtle early biochemical injury to myelin secondarily triggers an immune response that leads to additional damage due to inflammation. It looks very much like an MS plaque on MRI (magnetic resonance imaging) and tissue examination," says Stys. "This does not prove that human MS advances in the same way, but provides compelling evidence that MS could also begin this way."

With this result, the researchers started to investigate treatments to stop the degeneration of the myelin to see if that could reduce, or stop, the secondary autoimmune response.

"We collaborated with researchers at the University of Toronto and found that by targeting a treatment to protect the myelin and stop the deterioration, the immune attack stopped and the inflammation in the brain never occurred," says Stys. "Most of the science and treatment for MS has been targeted at the immune system, and while anti-inflammatory medications can be very effective, they have very limited benefit in the later progressive stages of the disease when most disability happens. This research opens a whole new line of thinking about this disease."

Testing an unconventional theory such as this is an example of the forward thinking brought by HBI investigators. This research was funded by the Brain and Mental Health Strategic Research Fund, established by the Office of the Vice-President (Research) at UCalgary to support innovative, interdisciplinary studies within the Brain and Mental Health research strategy.

*"This research opens a whole new line of thinking about this disease."*





Dr. Lawrence Korngut, MD, examines his patient Cliff Barr as part of a clinical trial using Pimozide to treat ALS.  
Photos by Riley Brandt, UCalgary.

## WELL-KNOWN ANTIPSYCHOTIC MEDICATION MAY STABILIZE PROGRESSION OF ALS

### RESEARCHERS HOPE NATIONAL CLINICAL TRIAL WILL SOLIDIFY INITIAL FINDINGS

If you took part in the ALS Ice Bucket Challenge—the fundraiser that had millions of people pouring buckets of ice water over their heads—you may have wondered where the money raised ended up. Through a partnership between ALS Canada and Brain Canada, some of those funds are being invested in a University of Calgary research study investigating a potential drug treatment for amyotrophic lateral sclerosis (ALS) patients.

Dr. Lawrence Korngut, MD, is leading a clinical trial with nine hospital centres across Canada, recruiting patients to confirm whether a well-known antipsychotic medication, pimozide, is safe and effective in stabilizing the progression of ALS over a six-month period.

The phase II clinical trial follows promising results from a collaboration between UCalgary and researchers at the University of Montreal.

Using pimozide, basic science researchers in Montreal were able to stabilize mobility in animal models—worms, fish and mice—born with the equivalent of the human form of ALS. Pimozide works especially well in preventing paralysis in fish with a genetic form of ALS by preserving neuromuscular function, a key finding with relevance to ALS in humans, which normally involves a progressive paralysis of the skeletal muscles.

“Pimozide has been well known for decades as a drug approved for treating certain types of psychiatric conditions, like schizophrenia, and it only costs nine cents per pill,” says Korngut. “Recent studies have shown genetic links between schizophrenia and ALS. We knew the next logical step was to test it on human volunteers—patients living with ALS.”

Korngut is associate professor in the Department of Clinical Neurosciences at the Cumming School of Medicine, a member of the Hotchkiss Brain Institute and director of the Calgary ALS/Motor Neuron Disease Clinic. He launched the first proof-of-principle clinical trial in 2015 with a small group of 25 ALS patients in Calgary.

“We used a lower dose of pimozide than that used for other conditions, and now have preliminary proof that the lower dose may be useful in stabilizing ALS,” says Korngut.

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*“The discovery of a potential treatment marks an important turning point for ALS patients.”*

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The research team had an indication of the drug’s effectiveness after only six weeks. Loss of control of the thenar muscles, located in the palm of the hand between the thumb and index finger, is usually one of the first signs of ALS. For patients who took pimozide during the trial, this function remained stable. It is not yet known, however, whether pimozide has a curative effect, or whether it only preserves normal neuromuscular function to stabilize the disease, as a larger clinical trial is needed in order to gather more information.



The discovery of a potential treatment marks an important turning point for ALS patients. There is currently no highly effective treatment for the disease, and it generally results in death within three to five years of diagnosis. And while initial clinical trial results are promising, Korngut emphasizes it’s too soon to draw firm conclusions about the safety and effectiveness of pimozide.

“At this stage, people with ALS should not use this medication,” says Korngut. “We must first confirm that it is useful and safe in the longer term. It is also important to be aware that pimozide is associated with significant side-effects. Therefore, it should only be prescribed in the context of a research study.”

ALS patients who are interested in participating in this study can contact [pimozide2@ucalgary.ca](mailto:pimozide2@ucalgary.ca), or find more information by visiting <https://clinicaltrials.gov/ct2/show/NCT03272503>.





Dr. Shelagh Coutts, MD, a neurologist and member of the Hotchkiss Brain Institute at the Cumming School of Medicine is leading an international clinical trial to improve treatment for people with minor stroke, and reduce their chance of having a long-term disability. Photos by Adrian Shellard.

## MORE AGGRESSIVE DRUG THERAPY MAY OFFER BETTER OUTCOMES FOR MINOR STROKE PATIENTS

### HBI RESEARCHERS ARE LEADING AN INTERNATIONAL CLINICAL TRIAL ON A DRUG THAT MAY REDUCE RISK OF DISABILITY

Stroke is the third leading cause of death in Canada. About half of these strokes are considered to be a minor stroke, also known as a transient ischemic attack (TIA). Current treatment guidelines recommend against prescribing aggressive clot-busting drugs for these conditions, but researchers at the Hotchkiss Brain Institute (HBI) at the Cumming School of Medicine (CSM) believe the guidelines are outdated, and are leading a study investigating a new treatment option.

In an international clinical trial, researchers are testing a drug called Tenecteplase (TNK). The international trial builds on research already underway at Calgary's Foothills Medical Centre. Known as the TEMPO-2 study, researchers have been testing TNK, a drug commonly used to treat patients who have suffered a heart attack, for its effectiveness in reducing disability in patients who have had minor strokes or a TIA and have a

blocked blood vessel in the brain. In early findings, TNK is proving to work faster and be safer than the usual clot-busting drug used in stroke called alteplase, also known as tissue plasminogen activator or tPA.

The research team conducts brain scans on patients soon after a minor stroke to check for other blockages. If doctors find a blockage, they can administer TNK, reducing the risk of a future stroke and potentially saving lives.

"About 50 per cent of stroke is relatively minor. So it's a massive number of patients that we can treat if this trial confirms the benefit of TNK," says Dr. Shelagh Coutts, MD, a neurologist at the CSM, HBI clinician-scientist and the study's lead. Other members of the TEMPO-2 research team include fellow HBI investigators Drs. Michael Hill and Mayank Goyal.

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*"It's a massive number of patients that we can treat if this trial confirms the benefit of TNK."*

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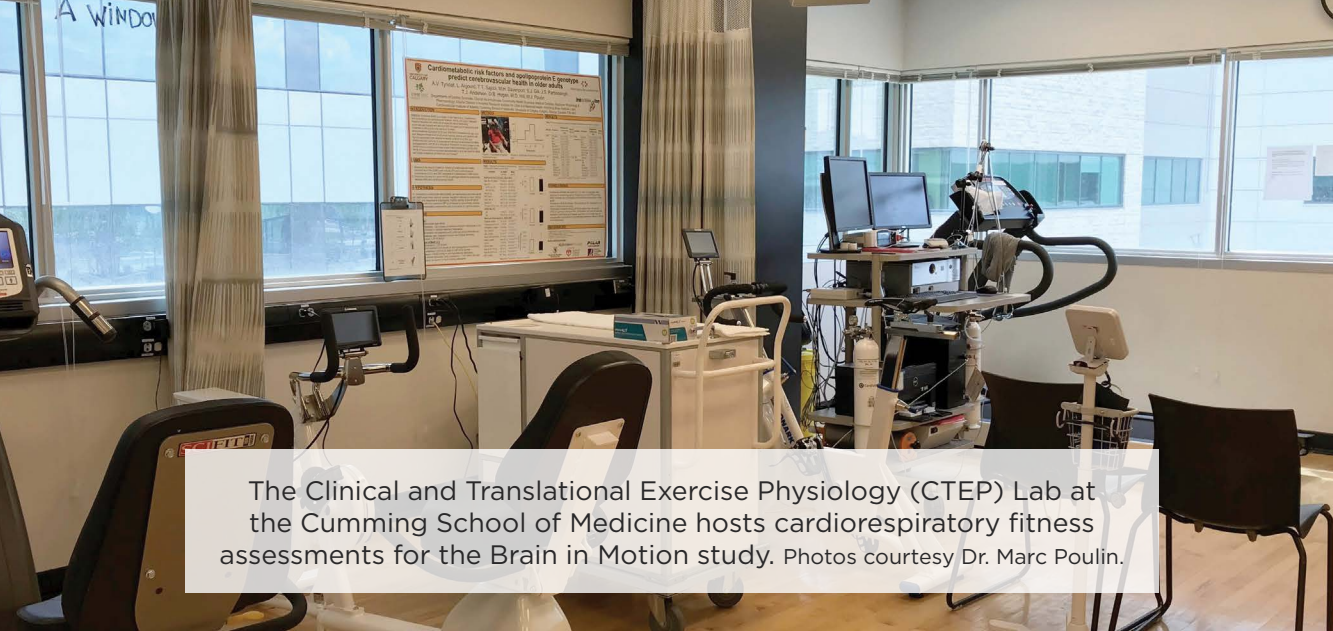


Most minor strokes are due to a lack of blood getting to a part of the brain. When this occurs, the individual experiences a decreased ability to move a limb or to speak. In some cases, this dysfunction resolves itself—considered a TIA. For those people whose symptoms persist, the condition is considered a minor stroke.

Doctors have been reluctant to use clot-busting drugs on minor stroke and TIA patients because there is a risk of bleeding on the brain, which can be fatal. However, research has shown that minor stroke and TIA patients with evidence of a blocked blood vessel on a brain scan are at a very high risk of being left disabled. Coutts says it is this group of patients that can benefit from aggressive therapy with clot-busting drugs.

In this study, nearly 1,300 patients are being recruited around the world, including cities in Canada, Europe and Australia. If the study shows that TNK is effective for reducing disability in minor stroke or TIA in patients with blocked blood vessels, it will change care of patients throughout the world. The study is expected to take four years to complete.





## TRIAL MAY PROVIDE EVIDENCE ON PREVENTING, DELAYING, REDUCING AND MANAGING AGE-RELATED DEMENTIAS

Dr. Marc Poulin, PhD, is the poster child for ‘practice what you preach’, or perhaps more accurately, practice what you research. Despite his busy schedule (he is a professor in the departments of Physiology & Pharmacology and Clinical Neurosciences at the Cumming School of Medicine, and a member of the Hotchkiss Brain Institute (HBI) and the Libin Cardiovascular Institute), Poulin makes sure to fit a daily run into his schedule to clear his mind before getting down to work.

“For me, the impact of exercise is so tangible,” he says. “My goal is to find ways for others to reap the same rewards, especially as they age, and to better understand the connection between exercise, the brain and the mind.”

Poulin’s current research aims to do exactly that. Already in its eighth year and second phase, the ongoing Brain in Motion study is designed to broaden our knowledge of the connection between exercise, the brain and mental health.

In its first phase, the Brain in Motion study followed close to 300 sedentary but healthy older adults for six months to understand the effects of aerobic exercise on blood flow to the brain. The comparisons were measured in brain blood flow, aerobic fitness, cognition, sleep quality, energy levels and mood.

“We found that, over those six months, the people who participated in regular aerobic activity in the form of walking or jogging reported increased vigour and a significant decline in anger, confusion, depression, fatigue and tension,” says Poulin.

Now, with this information in hand, Poulin is leading his researchers down a new path. In keeping with his work as the Brenda Strafford Foundation Chair in Alzheimer Research, the Brain in Motion II study is a randomized controlled trial focused on expanding the knowledge gained in phase one to understand how it applies to those at risk

of developing Alzheimer’s disease or other forms of age-related dementias. The study also aims to recognize and then break down the barriers that prevent older people from being more physically active.

“Each year, 25,000 Canadians are diagnosed with dementia,” he says. “By 2030, the number of Canadians living with the disease will be just over one million. Our hope is that this trial will provide evidence needed to make clinical recommendations for exercise programs to help prevent, delay, reduce and manage these diseases.”

“Brain in Motion II will recruit participants until we reach our target of 264,” says Poulin. “The first of several groups started the six-month exercise regime in May 2018 and finished in November. They will be followed for an additional 12 months, during which some participants will receive support to encourage changes in their health-related behaviour and others will not. We expect the overall study will be completed in 2022.” Poulin says there is also a five-year follow-up underway for Brain in Motion I.

For information to participate in the study, email [bimstudy@ucalgary.ca](mailto:bimstudy@ucalgary.ca).



### Research into healthy brain aging made possible with community investment

Cardiorespiratory fitness assessments for the Brain in Motion study take place at the Clinical and Translational Exercise Physiology (CTEP) Laboratory at the Cumming School of Medicine.

This state-of-the-art facility helps researchers gather and interpret data surrounding the role of exercise in the prevention and management of chronic and neurodegeneration diseases associated with aging.

Research into healthy brain aging, including the critical tools and infrastructure like the CTEP Lab, are only possible with the support of community investors like David Lake, a longtime supporter and friend of the HBI. Mr. Lake’s first gift was the creation of a fellowship in his wife’s name: the Denyse Lajoie-Lake Clinical Fellowship in Brain Research, which continues to support the training of future neuroscience leaders.

In 2015, Mr. Lake expanded his generous commitment to the HBI through a valuable investment in the CTEP lab, inspired by a desire to see better outcomes for friends living with dementia.

“The work being done in Dr. Poulin’s lab is exciting and very promising,” says Lake. “I am pleased to support a program that is having an immediate impact on dementia prevention, and will help many people in the future.”





Dr. Zelma Kiss, MD, PhD, (R) with patient Elias Pharaon, who says the treatment changed his life. Photos by Riley Brandt, UCalgary.

## REVOLUTIONARY TECHNOLOGY ALLOWS BRAIN SURGERY WITHOUT BREAKING THE SKIN

### EXAMPLE OF PRECISION HEALTH RESEARCH OFFERS IMMEDIATE RESULTS TO PATIENTS WITH SEVERE MEDICATION RESISTANT ESSENTIAL TREMOR

Elias Pharaon is 85 years old and can sign his name for the first time in five years thanks to a new way to do brain surgery. Performed by a team of UCalgary physicians and researchers at The Mathison Centre for Mental Health Research & Education and the Hotchkiss Brain Institute (HBI), magnetic resonance guided focused ultrasound (MRgFUS) is a new technology that allows surgeons to access the brain without cutting the skin or drilling into the skull.

“We are able to see the brain with real-time imaging and target a beam of high intensity ultrasound to the brain region responsible for tremor,” says Dr. Zelma Kiss, MD, PhD, neurosurgeon and professor in the departments of Clinical Neurosciences and Psychiatry at the Cumming School of Medicine (CSM). She is also a member of The Mathison Centre and the HBI. “The patient is awake the whole time and the results are immediate.”

Pharaon came from B.C. for the treatment at Foothills Medical Centre, and volunteered to undergo the procedure and participate in the research project. The MRgFUS system is the only one in Western Canada.

“I couldn’t believe the tremor in my right hand was gone after the procedure. I didn’t feel anything while it was happening,” says Pharaon. “I was so happy. It’s changed my life. I feel like I can go out in public again.” Essential tremor is the most common type of movement disorder, and is usually treated with medication.

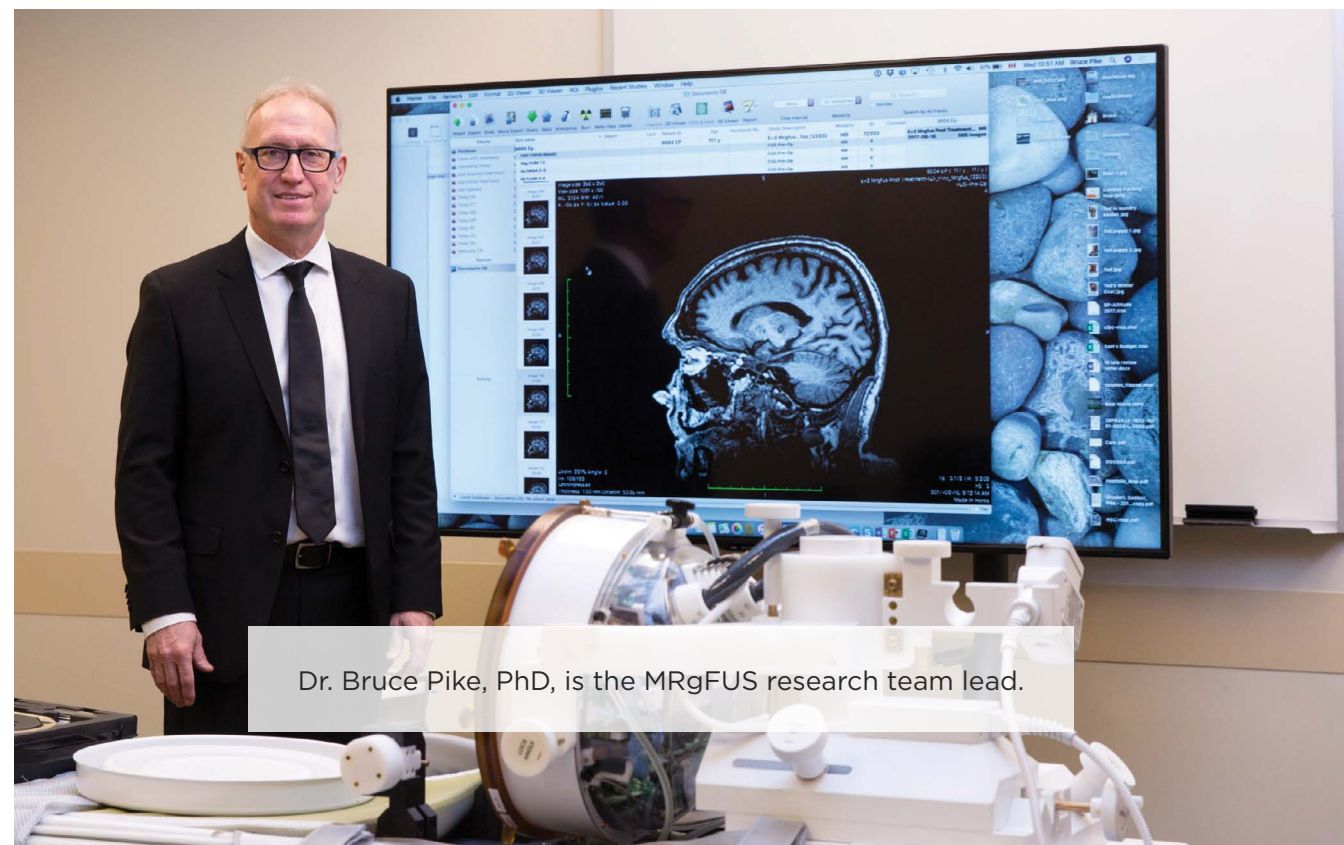
For some, like Pharaon, the medication doesn’t work and the tremors become so severe people can no longer dress or feed themselves.

“The condition occurs because different parts of the brain are not talking to each other properly, and the abnormal network function causes the tremor to appear,” says Dr. Davide Martino, MD, PhD, movement disorder specialist and associate professor in the Department of Clinical Neurosciences at CSM and HBI member. Martino identifies patients who qualify for treatment and conducts all the follow-up work for the research study, which includes brain scans, clinical evaluations, cognitive and functional testing, and motor and sensory abilities over time.

“This is the beginning of a much larger research platform,” says Dr. Bruce Pike, PhD, professor in the departments of Radiology and Clinical Neurosciences at CSM and HBI member. “The idea of neurosurgery in an awake patient without breaking the skin is revolutionary. With the use of this technology we are looking at the possibility of different treatment options for a number of devastating brain diseases such as Parkinson’s disease, dementia, epilepsy and brain tumours.”

Philanthropic support from colleagues, friends and family of Rob McAlpine—through the Rob McAlpine Legacy Initiative—made purchase of the MRgFUS possible. These initial funds were then matched by a grant from the Cumming Medical Research Fund, and then leveraged further with a Canada Foundation for Innovation grant. Currently, only patients with severe medication-resistant essential tremor are being treated with MRgFUS, however, these major investments are expected to propel the focused ultrasound research program forward, facilitating new discoveries and treatments in the future.

“This is a wonderful example of precision health research” says Dr. Jon Meddings, dean, CSM. “The future of health is accurately diagnosing and providing individualized treatments to our patients. The remarkable results of the MRgFUS program show how investing in new technologies can make precision health a reality.”



Dr. Bruce Pike, PhD, is the MRgFUS research team lead.





Dr. Tara Christie, PhD (L) is a mentor in the HBI's REALISE program to Sophie Hu, community health sciences master's student.

Photo by Adrian Shellard.

## REALISE COMMUNITY MENTORSHIP PROGRAM HELPS TRAINEES GET A JUMP START IN THE COMPETITIVE PROFESSIONAL WORLD

### HOW ONE TRAINEE LEARNS TO BRIDGE THE GAP BETWEEN SCIENCE AND ENTREPRENEURSHIP, AND PREPARE FOR THE CAREER OF HER DREAMS

Ever since starting her Bachelor of Health Sciences degree at the University of Calgary, Sophie Hu has been interested in becoming an entrepreneur. At first, it may seem like an odd pairing or perhaps that she chose the wrong discipline, but Hu is one of a growing number of science-minded students looking down an entrepreneurial path.

"I was always more focused on research during my undergrad," says Hu, now a Hotchkiss Brain Institute (HBI) trainee pursuing her master's degree in community health sciences at the Cumming School of Medicine (Hu's supervisor is Dr. Zahinoor Ismail, MD). "I started to explore entrepreneurship more in my graduate studies, especially as the university focused on creating more opportunities for students in order to develop a culture of entrepreneurship."

Understanding the value of mentorship, Hu decided to apply to the HBI's REALISE (Research Education and Leadership in Neuroscience) Community Mentorship Program. The program pairs HBI trainees with professionals who come from a science background but whose careers have taken them outside of a traditional academic path. The mentors offer career advice and personal guidance to students or scholars interested in careers beyond the university setting.

"Being in the Cumming School of Medicine, I often have access to scientists and clinicians who can offer mentorship in research and discovery," says Hu. "What I was lacking was a mentor to help me build innovation skills."

While REALISE mentors are usually brought in from off-campus, the program's coordinators found the perfect match for Hu in Dr. Tara Christie, PhD. Christie, who holds a PhD in molecular biology, now runs the university's My GradSkills professional development program for graduate students.

"I was one of many grad students who spent years planning and preparing to be an academic," says Christie. "For multiple reasons, I chose a career pivot at the end of my PhD and moved into program development and management."

Coming from a molecular biology background, Christie says she understands the stage Hu is at in her career path. In fact, the two understand much more about each other than they originally expected. In addition to their conversations about the entrepreneurial journey, the two have explored a number of personality assessment tools in order to better understand how Hu works and where her strengths lie. "It turns out we have similar strengths," says Hu, with a smile. "We really bonded over that."

Although the mentorship program officially lasts for the academic year (eight months), Christie and Hu have continued to meet and have conversations beyond its completion.

"During one of our meetings, I learned Sophie was interviewing for medical school," says Christie. "We talked about it and discussed how she could consider answering questions. I found it quite fun to coach her through the process even though it wasn't part of the specific requirements of the mentorship program."

Christie says being Hu's mentor has been immensely enjoyable. For those considering taking part in the REALISE Community Mentorship Program, she says the program is quite flexible, which makes it easier to fit the meetings in around a busy work schedule.

"It gives you an amazing opportunity to connect with grad students and feel like you're helping them," says Christie. "You also learn from them. That's the thing about mentoring—it's a back and forth relationship. I get to learn more about the cool things she's doing and help her make a difference while she learns from me."

Hu has taken part in a number of programs designed to help her bridge the gap between science and start-up, including working at the university's Hunter Hub, an initiative designed to bring together students and faculty from all backgrounds to pursue entrepreneurial ideas. Hu also participated in a three-week long innovation program in Europe this past summer. For her, the REALISE mentorship program helped connect all these experiences so she could better understand the relationship between her two passions: science and entrepreneurship.

"The process for scientific thinking is the same as the process for entrepreneurial thinking," says Hu. "You question, you observe, you experiment, you iterate and you network with other people. I realized my undergrad degree and graduate training are actually preparing me very well for the start-up world."



L-R Mike Rose, Chairman, President and CEO, Tourmaline Oil Corp., Dr. Oury Monchi, PhD, Tourmaline Oil Chair for Parkinson's Research, and Christopher S. Potter, Chairman and CEO, Peters & Co. Limited.

Photo by James May.

## SPOTLIGHT: COMMUNITY REPRESENTATIVE

# INSPIRED BY FRIENDS WHOSE LIVES HAVE BEEN AFFECTED BY PARKINSON'S DISEASE, MIKE ROSE IS A FIRM BELIEVER IN BRIGHTER DAYS AHEAD

## DEDICATION TO INVESTING IN MEDICAL RESEARCH SUPPORTS EXISTING PROGRAMS AND ADVANCES INNOVATIVE RESEARCH AND TECHNOLOGY

For Mike Rose, educational philanthropy is about more than funding future research and carving a path for innovation and success. Every donation he makes, every hour he spends on an advisory board, comes with a personal connection to someone who's played a part in his own life. This is perhaps most true for a research program he launched at the Hotchkiss Brain Institute (HBI): the Tourmaline Oil Chair for Parkinson's Research at the University of Calgary.

"I've had two very close lifelong friends who both developed Parkinson's," says Rose, President and CEO of Tourmaline Oil Corp. "One, a friend from university who passed away. The other, a very close colleague with whom I've worked throughout my entire career, but due to the disease, has been unable to work at Tourmaline."

It's been ten years since Rose started Tourmaline Oil Corp. and ten years since his friend has been able to work.

"It's a rotten disease," he says, "but it feels like we're making progress on it all the time."

That progress comes, in part, from the creation of the Tourmaline Oil Chair for Parkinson's Research in 2011. Rose says the idea came as the result of a discussion with then HBI Director, Dr. Sam Weiss, PhD, who approached him with a vision to create a series of research chairs focusing on healthy brain aging. Rose, along with other Tourmaline employees and the company's investment bankers, Peters & Co., came together to fund the Chair, which continues to broaden our understanding of how Parkinson's disease develops and what new treatments may lie on the horizon.

"What I like about how the HBI approaches these issues is their commitment to conduct parallel research and clinical trials for many brain afflictions being investigated," Rose says, "be it Parkinson's, multiple sclerosis, dementia, or stroke. The HBI's vision to focus on healthy brain aging creates a situation where the sum of all this research is destined to be greater than the individual parts."

Despite his dedication to funding medical research, Rose says he has never had a personal interest in pursuing medicine. ("I like dealing with inanimate objects," he jokes, "like rocks.") But this hasn't stopped him from participating on the HBI's advisory board. With his experience in exploration and production research at one point in his career, Rose says he understands the importance of investment in long-term, fundamental research and technology development.

It's part of the reason why Rose is helping to raise \$10 million for the HBI's Research and Education Excellence Fund (REEF), which will support the Institute's existing programs while offering the possibility to expand into new areas of innovative investigation.

"The idea behind REEF is, in part, to keep Harley Hotchkiss's legacy at the HBI going as well as maintaining funding well into the future," he says. "We want to broaden the base of contributors to the HBI, because it is a world class institute responsible for multiple breakthroughs."

Rose says a key focus of the program is about educating people and broadening their exposure to all that the HBI has achieved and is achieving.

"So many illnesses are related to the brain," he says. "The more progress we make into understanding them and pursuing innovative treatments, the better place Canada and the world will be."

*"We want to broaden the base of contributors to the HBI, because it is a world-class institute responsible for multiple breakthroughs."*







## COMMUNITY INVESTMENT IS MAKING RESEARCH POSSIBLE AND IMPROVING HEALTH OUTCOMES

Community investment is key to the success of our programs at the Hotchkiss Brain Institute (HBI) and the Cumming School of Medicine, whether to help facilitate cutting-edge research, provide excellence in training, develop disease prevention strategies or to improve existing treatments. Together, we are working to find a path towards better health outcomes and improved quality of life for patients, their families and all of those in the circle of care. The Institute has recently launched a number of fundraising initiatives to support excellence in brain and mental health research and education:

### **The Research and Innovation in Mental Health (RIMH) Fund**

The RIMH fund was established with a goal to raise \$10 million through community support to advance ongoing research and education programs in mental health, with a focus on children and adolescents. With 1.2 million Canadian children and adolescents affected by mental illness, the need to empower the HBI's groundbreaking research in this field is greater than ever. Funding opportunities exist in several areas, including those to:

- help attract the highest-calibre trainees
- shed light on the link between mental health and academic outcomes
- develop personalized care programs, with specific attention to children who have been abused, and
- offer awards to researchers who take on highly innovative projects that have the potential to yield high-rewards in mental health care.

### **Calgary Parkinson Research Initiative (CaPRI)**

CaPRI aims to support our multi-disciplinary research team as its members work to develop a world-class centre for clinical studies into Parkinson's disease. The CaPRI team carries out numerous clinical trials that could lead to breakthroughs in treatment. The initiative will help create more opportunities for great minds to come together, share data, learn from one another, and subsequently lead to a deepened understanding of a disease that affects the lives of close to 100,000 Canadians. Today, community investment is facilitating the creation of a southern Alberta patient registry and database; the hiring of top level researchers; funding for grants to test new approaches in treatment; and support for the students who will become our future leaders in research and health care.

### **The Research and Education Excellence Fund (REEF)**

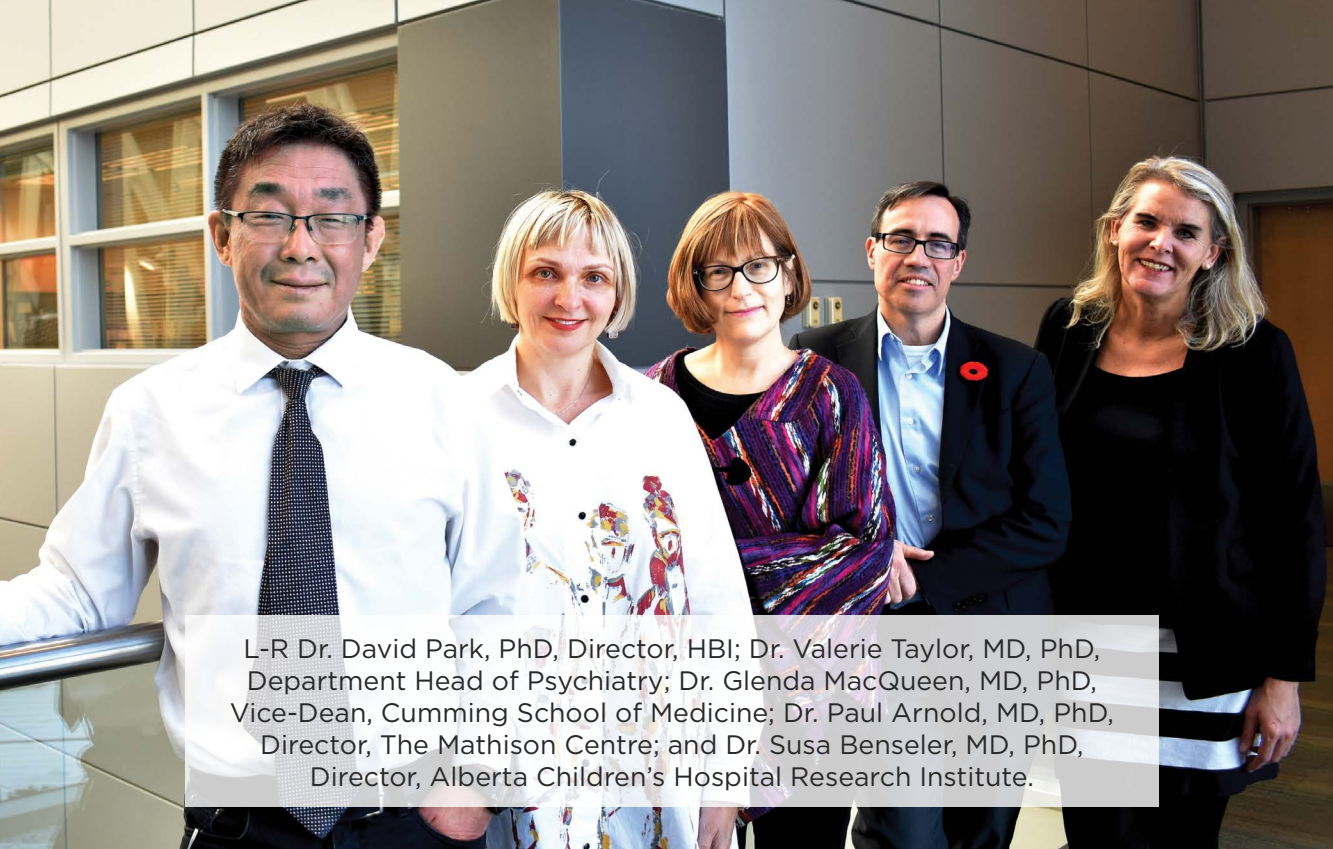
REEF was established with a goal to raise \$10 million to enhance existing programs and create new opportunities for discovery and innovation at the HBI. This level of investment is crucial to ensure we keep pace with technological advances so our researchers and trainees have the freedom to not only ask big and bold questions, but to pursue the answers. Through REEF, our members will be able to search for novel solutions to today's brain and mental health challenges, recruit the brightest trainees, and provide the very best in education to our next generation of brain and mental health experts.

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*Together, we are working to find a path towards better health outcomes and improved quality of life for patients, their families and all of those in the circle of care.*

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L-R Dr. David Park, PhD, Director, HBI; Dr. Valerie Taylor, MD, PhD, Department Head of Psychiatry; Dr. Glenda MacQueen, MD, PhD, Vice-Dean, Cumming School of Medicine; Dr. Paul Arnold, MD, PhD, Director, The Mathison Centre; and Dr. Susa Benseler, MD, PhD, Director, Alberta Children's Hospital Research Institute.

## COLLABORATION THE KEY TO UNLOCKING SECRETS OF THE BRAIN, SAYS NEW HOTCHKISS BRAIN INSTITUTE DIRECTOR

### DAVID PARK IS EXCITED TO SPARK GROUNDBREAKING INSIGHTS AND BUILD ON THE INSTITUTE'S PAST SUCCESSSES

In the future, the Hotchkiss Brain Institute (HBI) at the Cumming School of Medicine (CSM) will focus on creative collaborations to decipher the mysteries of the brain and advance research, says new HBI director David Park.

"What excites me about working here is the way in which all the groups within the Calgary scientific and brain community work together with a can-do attitude," says Dr. Park, PhD, who replaced the HBI's former Director, Dr. Samuel Weiss, PhD, and Interim Director, Dr. Keith Sharkey, PhD, on Sept. 1, 2018. "I've seen that people in Calgary will do what it takes to get things done, and it's impressive."

Before coming to the HBI, Park was the director of the Brain and Mind Research Institute at the University of Ottawa. He is a recognized expert in molecular biology with an emphasis on stroke-related neurodegeneration and the cellular mechanisms involved in Parkinson's disease.

"The challenge for the HBI and for me as director is to continue to create a rich environment

that brings people together, where leading-edge ideas can be generated and developed," says Park. "We'll be building on the Institute's past successes and the amazing job that previous leaders and scientists have accomplished, looking to make impacts in health care and in our understanding of brain function."

"Moving forward, I see the HBI as part of Calgary's wider scientific community, synergizing with willing partners as we work together and make important contributions toward the daunting task of understanding brain function," says Park, who believes encouraging connections among various faculties and groups can spark groundbreaking insights and meaningful changes.

"We must ally people from multiple areas of academics and health care—mathematicians, physicists, kinesiologists, engineers, as well as translational neuroscientists, just to name a few—to help us continue the Institute's excellence in research and education. The societal implications reach beyond health, and deep learnings come about because of fundamental insights into the structure and workings of the brain. At the HBI, we are poised to go to the next level."

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*"What excites me about working here is the way in which all the groups within the Calgary scientific and brain community work together with a can-do attitude."*

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One such alliance is already moving forward. Park is working closely with Dr. Valerie Taylor, MD, PhD, new head of the CSM's Department of Psychiatry; Dr. Paul Arnold, MD, PhD, director of The Mathison Centre for Mental Health Research & Education; and Dr. Susa Benseler, MD, PhD, new director of the Alberta Children's Hospital Research Institute (ACHRI).

"Ron Mathison's visionary leadership when he established The Mathison Centre through a partnership of the HBI, the Department of Psychiatry and Alberta Health Services was an excellent example of collaborations that lead to strength. We are working more closely than ever with our partner faculties and centres. For example, input from ACHRI is critical to much of the work at The Mathison Centre. Together, we will uncover findings that lead to better health outcomes for those living with brain and mental health challenges."

Park views precision medicine, which is the right treatment of the right person at the right time, as vital to understanding how the brain works in individuals. Precision medicine is a CSM strategic priority.

"Each person's emotional, cognitive and motor experiences are combined with our genetics to make us who we are," he says. "How we understand and treat ourselves is very personal in nature and very complex. None of our experiences are identical and there are few shortcuts to understanding our own brain. Like a Swiss watch, it has great subtlety. You can't approach it with a sledge hammer."

While Park acknowledges that there is great strength in individual scientific endeavours, he believes significant impacts are made through teamwork. "No one person or group can always do it alone," he says. "As HBI director, I want everyone to thrive in an environment that welcomes and generates the best ideas and continues to promote our drive toward excellence."





Members of the Hotchkiss family.  
L-R Jeff Hotchkiss, Rebecca Hotchkiss,  
Brenda Mackie, and Richard Hotchkiss.  
Jeff, Brenda and Richard serve on HBI committees.  
Photo by Adrian Shellard.

## MESSAGE FROM THE HOTCHKISS FAMILY

Making a difference in the community that he loved so dearly was a lifelong passion for our father, Harley Hotchkiss. He always said that as long as he was able to make a difference, he would, and so he was an active participant throughout his life. He believed deeply that medical treatment should be accessible to all, and had a vision to help the brilliant researchers and clinicians here at the Hotchkiss Brain Institute (HBI) translate their discoveries into innovative health care solutions.

The past year has been filled with an amazing number of life changing discoveries by our members, as you will have read in this report. These breakthroughs and innovations are leading to better health outcomes, and giving real hope to people and their families affected by mental illness and diseases of the brain.

By focusing on world-class research and education; by engaging our community members to participate in transformative studies and technological discovery; and by staying true to the HBI's core values—excellence, collaboration, integrity, impact, creativity and relevance—the HBI is being recognized as an international centre of excellence for neuroscience and mental health research and education.

Our family is extremely proud to carry our father's vision forward and to continue to play a role in the success of the HBI and its impact in our community. In return, we feel very fortunate to experience first-hand the remarkable influence of community investment and collaboration on the HBI's success. This Institute could not achieve its many accomplishments without the commitment, drive and enthusiasm of you, our community members.

A number of groundbreaking innovations were made possible this year through generous contributions from our donors, champions and supporters. You may have read the article about our new MR guided Focused Ultrasound program (p. 16, 17), made possible in part by the Rob McAlpine Legacy Initiative. This program was brought to life by a

collective of Rob's family and friends. Their exceptional generosity ensured the purchase of the machine that allows our clinician-scientists to conduct brain surgery on an awake patient without a scalpel ever breaking the skin. It sounds incredible, and is the first of this kind of technology to be implemented in western Canada.

Also, funds raised through community efforts like the ALS Ice Bucket Challenge are being invested in the Canada-wide University of Calgary/HBI research study investigating pimozone—a potential drug treatment that may be useful in stabilizing ALS (p. 10, 11).

And our CaPRI initiative—a collaboration of our Movement Disorders Team and Calgary's Movement Disorders Clinic—will allow the University of Calgary to become a leader in basic and clinical research in the field of Parkinson's disease and related disorders (p. 23). Community investment toward this initiative is helping CaPRI become a world leader in providing one of the most comprehensive Parkinson's disease research and therapeutics programs available.

These kinds of research initiatives are enabling patients in our community to participate in important studies in a number of different ways, and embody the meaning of partnership between the laboratory, the clinic and the community. Our dedicated community supporters are a vital part of the lifeblood of the HBI!

Community investment not only propels our research and education goals forward, it also helps the HBI attract and recruit the rising stars and emerging leaders in brain and mental health. These clinicians, scientists, and trainees are exploring inventive new ideas for better health and better health care.

We have many people to thank for their tireless efforts this year, and one in particular is Dr. Keith Sharkey, who stepped in as the HBI's director in early 2017. Keith was the HBI's deputy director from 2010 to 2017, and has played an integral role in neuroscience research leadership at the University of Calgary for over 25 years.

Throughout his tenure, Keith has demonstrated outstanding commitment to neuroscience research, teaching and training, and has made an incredible contribution this year as our lead fundraiser for research and education programs. Our family is extremely proud of the HBI's accomplishments under Keith's leadership, and we sincerely thank him. Although he recently transitioned from his role as director, Keith will remain a key member of the HBI, continuing to achieve significant success.

We are also pleased to extend a warm welcome to Dr. David Park, PhD, the HBI's new director, and look forward to working with David to create new opportunities for discovery and innovation.

Finally, on behalf of the Hotchkiss family, thanks to each and every one of you for your unwavering dedication and support as we work together to spark meaningful change for people with brain and mental health disorders in our community and beyond.

Brenda Mackie for the Hotchkiss family

# HBI BY THE NUMBERS



165 full **members** and 75 associate members



More than 300 research and professional **staff**



More than 550 postgraduate **scholars**, graduate and undergraduate students



\$590,516 spent on **educational support** for trainee scholarships and fellowships, 2017 – 2018 academic year



More than \$47M total **research revenue**, 2017 – 2018



\$10.5M **philanthropic investment** in HBI research and education, April 2017 – May 2018



More than 550 **scholarly articles** published, 2017 – 2018



50 **Research Chairs** representing the Brain and Mental Health research strategy and the HBI, as of October 2018

## DIRECTORS

- |                              |                                  |
|------------------------------|----------------------------------|
| <b>David Park, PhD</b>       | Director                         |
| <b>Richard Frayne, PhD</b>   | Deputy Director                  |
| <b>Sarah McFarlane, PhD</b>  | Education Director               |
| <b>Deborah Kurrasch, PhD</b> | Director, International Strategy |

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| <b>Dr. Richard Walker</b>     | Head, Department of Radiology, CSM   |
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*HBI researchers and trainees are generating  
transformative innovations to address  
brain disorders.*



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