

kite WORKS

How KITE's Research Keeps Us Grounded

How KITE and Centennial College Work Together

FEATURE STORIES

- ◆ The Science of Swallowing
- ◆ Benefits of Creative Arts
- ◆ Reimagining Brain Discovery

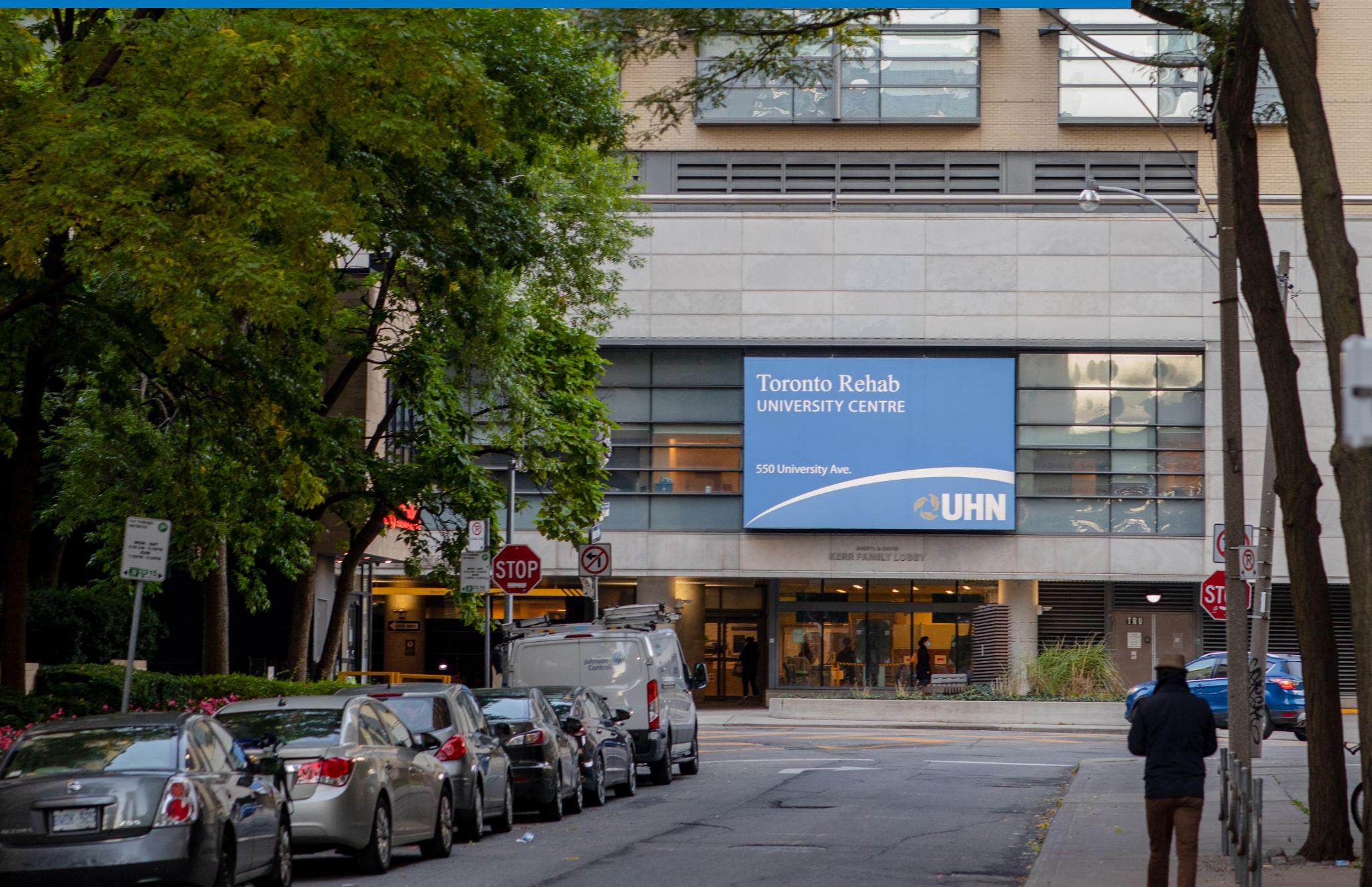
INCLUDES

Canada Research Chairs Assisting Underserved Communities

 **UHN** Toronto Rehabilitation Institute

The Kite Research Institute

KITE is a world leader in complex rehabilitation science and is dedicated to improving the lives of people living with the effects of disability, illness and aging. KITE is one of the principal research enterprises at the University Health Network (UHN), Canada's top research hospital with more than \$350-million in total annual research expenditures.



What is KITEworks?

We are thrilled to introduce the first issue of *KITEworks*, a magazine born from a months-long collaboration between the KITE Research Institute (part of the University Health Network) and the Storyworks class from Centennial College's Communications – Professional Writing program.

Storyworks is a course where students apply classroom knowledge and translate it to a real-world, client-centred experience. Through KITE, the Storyworks students were able to immerse themselves in advancements within physical rehabilitation and injury prevention, while exhibiting their ability to produce eye-opening stories.

Showcased here are awe-inspiring stories about

KITE's research, the people and technology involved, and the lives that have been touched as a result. We hope that what we've started here will continue; that the people and partners behind KITE's research will benefit from another avenue to reach the community; that the opportunity to work with research and technology will help shape the future of the next batch of creative students; and that this collaboration between KITE and Centennial College is given a spotlight, so it can be a beacon of how, when students and client-mentors collaborate, bright the industry is.

We hope you'll enjoy and benefit from what you read here!

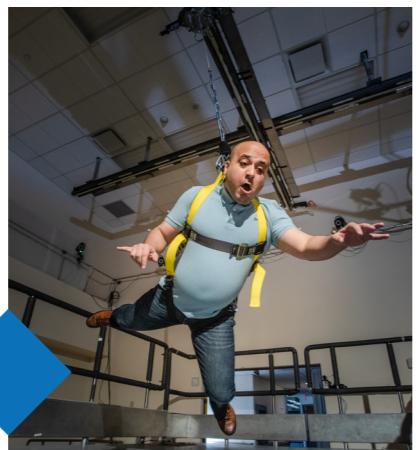


**Communications – Professional Writing
Class of 2021**

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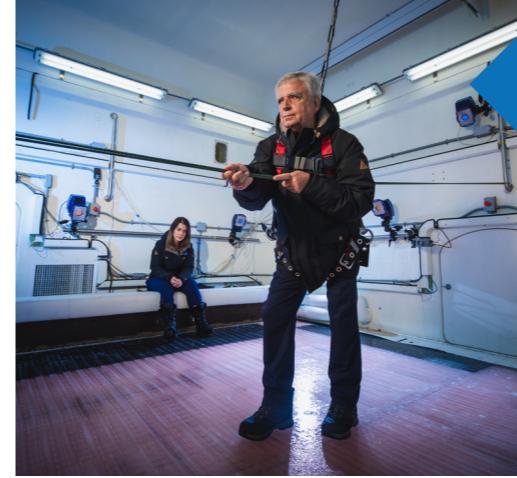
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KITES SOARING

To Bring Care Across the Globe

Story by
Chiara Smith



Kites have unclear origins, but many scholars believe they were invented in China, with the earliest written account of kite flying dating back to 200 BC. The use of kites eventually spread across the globe, each cultural group developing their own styles and uses for kites. For example, people in Malaysia, Indonesia and the South Pacific used kites as fishing instruments, while Chinese merchants used kites to determine whether a voyage would be successful.

Kites eventually found their way into the hands of physicists and

meteorologists who began using them for scientific purposes. Electrical experiments conducted by Benjamin Franklin established the connection between lightning and electricity using a kite. The Wright Brothers' success as pioneers of the aviation industry would also have been impossible without their impressive kite flying abilities.

Until the 1600s, kites were primarily used by adults for fun. Afterward, however, they became popular toys for children. It wasn't until the early 1970s that kites became used for recreational sports. Kite flying

competitions emerged around the world along with an extreme sport: kite surfing!

Kites have been used throughout history to discover new and exciting things about the world, but there is so much more to learn. The KITE Research Institute at the University Health Network (UHN) is taking the kite, a symbol of innovation and progress, above and beyond the clouds! KITE – which stands for Knowledge, Innovation, Talent, Everywhere – is dedicated to helping improve the lives of everyday people living with the effects of disability, aging and illness. The



Left: Testing out the FallsLab.

Right: Dr. Geoff Fernie overlooking the HomeLab.

Bottom Right: Take a spin in the DriverLab.

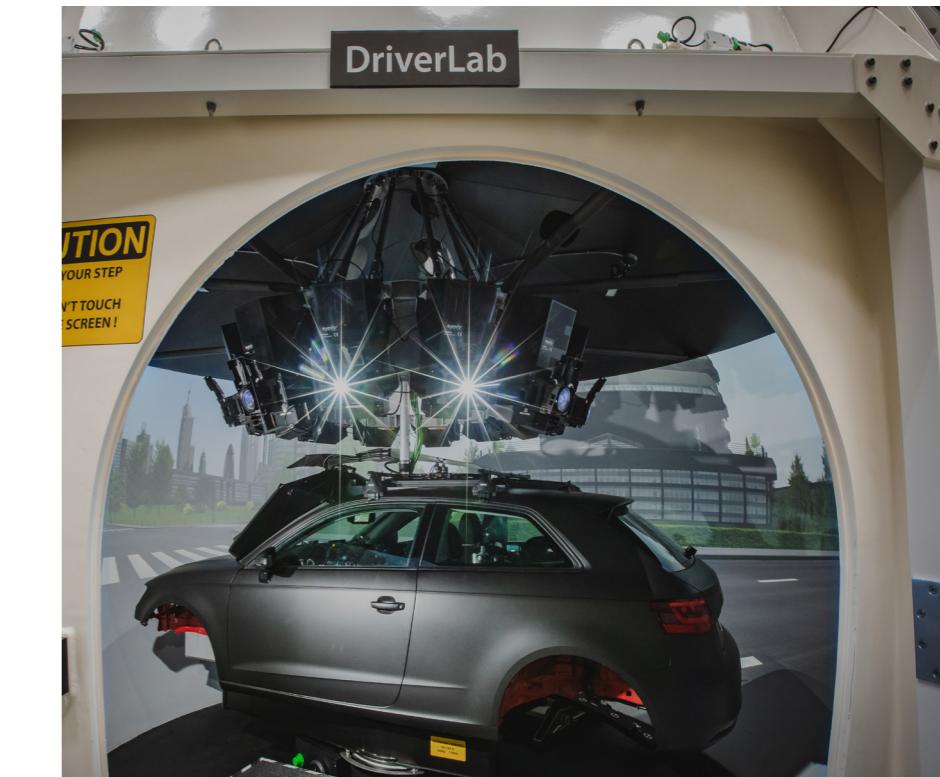
research group has four main areas of focus:

- 1. Prevention of disability**
- 2. Restoration of function following injury or illness**
- 3. Enabling independent living at home**
- 4. Optimization of the rehab system**

With ten research labs studying everything from patient care to sleep science, KITE is already succeeding in its mission



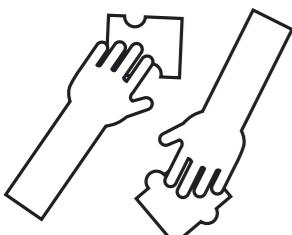
to be a trailblazer in research, education, knowledge translation and clinical application. With a deeper understanding of issues surrounding disability, aging and illness, the scientists, trainees and staff at KITE believe they can make a difference in the lives of millions and help UHN achieve its overall vision of creating a healthier world!



HOW CREATIVE ARTS HELP PATIENTS TAKE THE NEXT STEP FORWARD

At the Intersection of Music, Dance, Art and Science Lies the Potential to Reduce Stigma and Improve Quality of Life

Story by
Alexander Sauve



There are many reasons why the KITE Research Institute is consistently ranked the number one rehab research facility in the world. Near the top of the list is the institute's commitment to supporting multiple innovative new programs and services and providing patients and their families the

knowledge they need to make informed decisions and secure the best possible care available.

For two award-winning scientists at KITE, research and modern innovation are the first steps required to help patients take back their freedom, mobility and confidence with the arts.

For Dr. Pia Kontos, patient care and well-being are a priority. Her research primarily focuses on improving the lives of patients living with dementia. She incorporates music, dance, general movement and

other similar forms of play to give dementia patients a better quality of life. This also includes removing the stigma that is often associated with dementia. Stigma is often described as having a lack of awareness or understanding of a disease or disability.

"Understanding the harm stigma imposes and how we can challenge that stigma can improve the quality of life for people living with dementia and their families. To achieve this, I use research-based theatre and film to help audiences understand stigma and

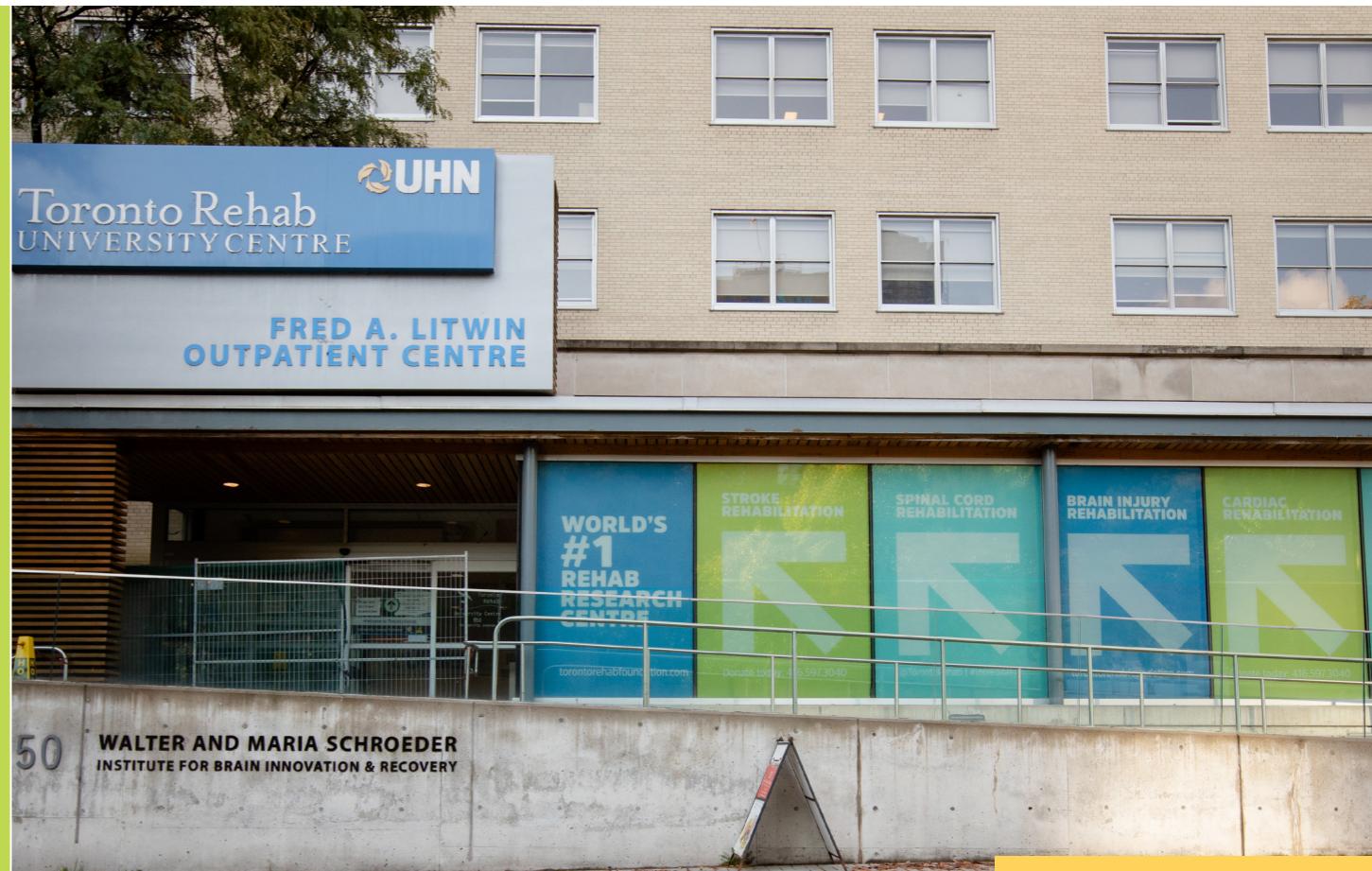
how they can better support those living with dementia," says Kontos.

According to the Alzheimer Society of Canada, as many as half a million Canadians are currently living with or have symptoms of dementia. Another one in five have cared for someone living with dementia. And yet, with a lack of support and awareness, proper treatment and care are still major issues in treating the disease appropriately.

Part of the issue with the stigma surrounding dementia is not under-

standing the disease or those suffering from it. For Kontos, it's finding and implementing a crucial balance between what is best for the patient while respecting their rights as a person.

Much of the research-based films and theatre produced by Kontos feature qualitative research for people living with dementia, its family care partners and healthcare practitioners. The productions give insight on how stigma is often a tremendous barrier in treatment but stress the importance of maintaining positive



We are advocating for relational caring, which is another approach to care.

relationships with people suffering from dementia, as well as their families.

"We are advocating for relational caring, which is another approach to care. This is based on research that I and my colleagues have conducted, looking at the importance of maintaining relationships with people living with dementia," she says.

Although Kontos has made great strides in bringing awareness to the stigma surrounding dementia, there has been a pivotal shift in healthcare and how treatment and care is

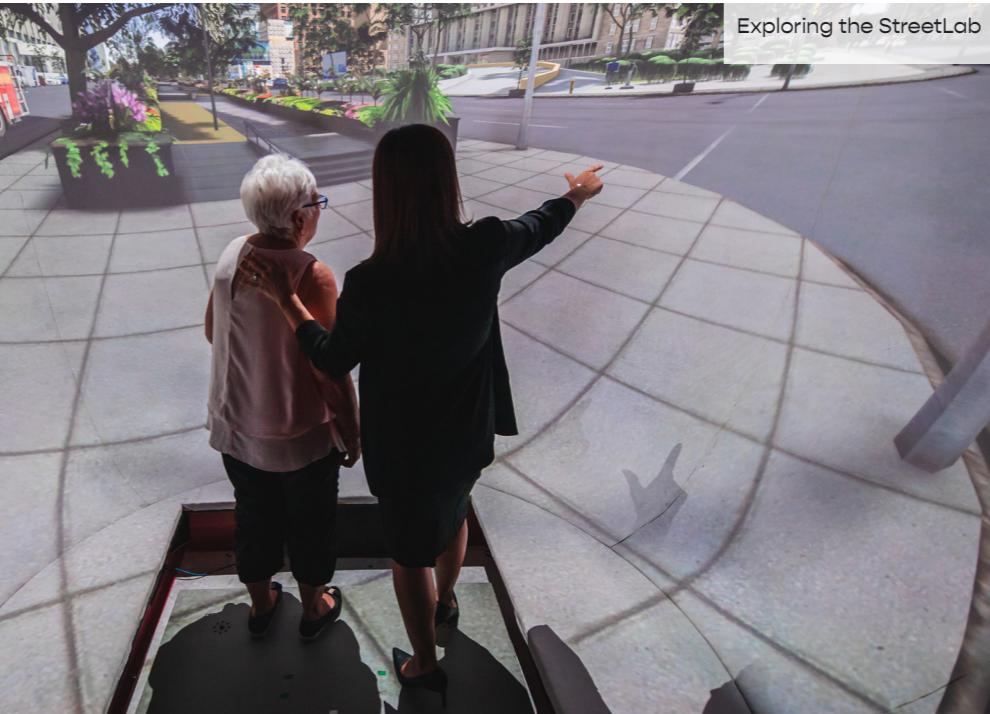
delivered due to the pandemic. She says, "Since the pandemic started, there has been a moral urgency to address the humanitarian crisis that we have witnessed. I am specifically referring to the impact of COVID on long-term care and the stigma-related inequities it highlights."

Due to the ongoing crisis, Kontos and her colleagues have started a coalition to further help patients who are suffering from dementia. Relmagining Dementia: A Creative Coalition for Justice has support from academics, artists, human rights

activists and various legal representatives.

Similarly, Dr. Kara Patterson's work uses various forms of art to help treat patients. The aim is to give patients alternative ways to treat neurological impairment through music and dance.

"Due to my focus on intervention, I am very interested in researching how dance and music help people move – the ways music helps patients interact with others and how it affects their mood. Our team is also interested in the interplay of a person's rhythm ability and how rhyth-



mical their walking is."

For Patterson, the overall goal of her research program at KITE is to help advance neurorehabilitation practice to improve mobility and gait and to improve outcomes for people living with a neurological injury.

"Our work focuses on two areas. The first area focuses on how walking is affected after a person has a stroke. The second area is trying to use that knowledge to then develop rehabilitation interventions to try and improve the outcome. We test the effects, but also want to explore how these interventions help people," says Patterson.

According to the Ontario Stroke Network, a stroke

occurs when there is a blood vessel that has become blocked, causing a disruption in blood flow. It's noted that during a stroke, the brain is gravely deprived of oxygen and glucose, which eventually causes cell death. The longer the brain is deprived of oxygen and other important nutrients, the greater the possibility of permanent impairment.

Although Patterson's research aims to improve the gait and mobility in patients that have been affected by neurological injuries most often present after a stroke, much of Patterson's research is also cross-platform.

She says, "My research primarily focuses on

neurological injury and disease, but I also had the opportunity to be involved in other projects and have supervised students who are working with other neurological conditions like brain injury and multiple sclerosis."

Patterson and her colleagues have also been working on a randomized trial which involves looking into incorporating a dance program with the intent to prove it has a positive impact for patients.

Unfortunately, due to the pandemic this program is on hold, but the researcher has plans to reboot the study in the future. Taking more of a holistic approach to treatment, the ultimate goal for her research is to use dance, music and art to fully understand how each works in relation to a patient's overall health both physically and mentally.

Although both researchers work on different projects in separate areas of KITE, each have a common goal: to work diligently to improve the lives and mobility of patients. It's something that goes far beyond care alone.



Left: Dr. Pia Kontos
Right: Dr. Kara Patterson

CANADA RESEARCH CHAIRS SHARE PASSION FOR CREATIVITY AND ASSISTING UNDERSERVED COMMUNITIES



Dr. Azadeh Yadollahi sits in SleepdB.

Story by
Kelsy Vivash



With their commitment to innovative research and dedication to inclusion, diversity and equity, it's no wonder that the KITE Research Institute is home to globally recognized, award-winning researchers like Dr. Angela Colantonio and Dr. Azadeh Yadollahi. Outstanding in their inclusive research practices and relentless pursuit of accessible healthcare, these two scientists were recently awarded prestigious Canada Research Chairs: awards funded by

the federal government with the goal of making Canada a globally recognized hub of research and development.

Dr. Angela Colantonio was awarded a Tier 1 Canada Research Chair, which spans seven years and gives \$200,000 annually to the University of Toronto, for her team's work on traumatic brain injuries in underserved communities. Dr. Azadeh Yadollahi received a Tier 2 Chair, which spans five years and gives \$100,000 to KITE, for her

Women, particularly victims of intimate partner violence, are disproportionately affected by traumatic brain injury.

research into cardio-respiratory engineering. While their research interests are different, what Colantonio and Yadollahi have in common is a passion for bringing care to marginalized communities and approaching their research with creativity.

It is not only innovation, but her dedication to accessibility that pushes Colantonio to dig deeper into care for those with traumatic brain injury (TBI). As a leading cause of death and disability worldwide, TBIs are particularly dangerous for those who face barriers to care due to their circumstances or identities. Incarcerated populations have reported rates of TBI far above the national average, with some samples indicating TBI in close to 100 per cent of the death row population. Behaviours associated with these injuries amongst this population can be misinterpreted as



Reviewing brain scans.

hostile or defiant, leading to further penalties.

Victims of intimate partner violence are also disproportionately affected by TBI. One in three women will be a victim of intimate partner violence in her lifetime and up to 92 per cent of strikes from a violent partner are to the head, face and neck. Meanwhile, research into TBIs has historically focused on males and tends to use data that cannot account for the ways that males and females experience TBI differently. In undertaking this research, Colantonio's lab has been inter-

nationally recognized for their focus on sex and gender in relation to TBI.

Colantonio has dedicated her research, in part, to educating those working with vulnerable populations about compassionately assisting those who suffer from TBIs. As part of this initiative to spread awareness, Colantonio has co-developed a play entitled *After the Crash: A Play about Brain Injury*, with her colleagues Julia Grey and Dr. Pia Kontos, a senior scientist at KITE. The play uses verbatim monologues to speak to what TBI patients experience, what their families

go through and the challenges for clinicians who work with them. This interdisciplinary project both reaches into the arts to benefit the sciences and vice versa: it has been embraced at conferences, included in the 2009 Toronto Fringe Festival and has received invitations for performances across Canada. It has also inspired a study of audience members who have reported a change in their own behavior after seeing the piece. Colantonio and her research partners found that these audience members demonstrated real, positive changes in their patience towards and treatment of those with TBIs over a year after seeing the play.

Noting that theatre has the capacity to create enormous empathy and to present complex information in an accessible way, Colantonio says that incorporating research-informed theatre into her practice will be ongoing. As a tool that both delights and instructs, theatre has the potential to spread information to diverse audiences and generate positive change amongst



Dr. Angela Colantonio was awarded a Tier 1 Canada Research Chair for her work on traumatic brain injuries in underserved communities, and Dr. Azadeh Yadollahi received a Tier 2 Chair for her research into cardiorespiratory engineering.

Left: Dr. Angela Colantonio
Right: Dr. Azadeh Yadollahi



researchers, clinicians, families and anyone working with TBI patients.

To the general public, Yadollahi's research seems somewhat mysterious. She holds the Tier 2 Canada Research Chair for cardiorespiratory engineering, studying the way fluids shift about the body, and undertakes this work in a state-of-the-art sleep lab.

Yadollahi was walking on a treadmill during this interview, as she explained that her primary focus is to try to better understand cardiorespiratory problems in sleep, namely snoring and sleep apnea. She does this by focusing on how bodily fluids affect breathing when a

person is lying down and has found that walking during the day can redistribute bodily fluids that have settled in the legs during sedentary waking hours. These fluids would otherwise flow into the chest and neck when a person lies down to sleep, which can cause breathing disruptions as it puts pressure on the lungs and throat. Even 30 minutes of walking per day, she says, can reduce snoring and sleep apnea by up to 25 per cent.

Like Colantonio, Yadollahi is passionate about helping underserved populations with her research. She primarily works with at-risk populations, hoping to develop better technologies to monitor patients in their

homes and create better treatments for them. Due to the prevalence of poor sleep conditions and quality, homeless populations and those living in remote Indigenous communities are disproportionately affected by respiratory disturbances in sleep, but Yadollahi notes that studies of these groups are rare. It is a challenge to study them in a sleep lab both due to the barriers they face in getting there and the difficulties in replicating their regular sleep environment in a lab. Women, too, are at

particular risk because of pervasive assumptions that women who are chronically tired are simply overworked. This results in fewer women undergoing studies for sleep apnea compared to men.

Moving forward, Yadollahi hopes her Chair will help promote equitable access to care for people living with cardiorespiratory disorders impacting their sleep. One of her initiatives has been to address the inaccessibility of sleep labs that patients must travel to

– exacerbated, of course, by COVID-19 – by sending monitoring devices home with patients. These devices can be sent through the mail and worn at home and the data downloaded from them once they are returned to the lab. This gives diagnostic access to patients with mobility issues or those in remote areas and resolves issues for patients who are unable to sleep in the lab due to the unfamiliar environment.

The Canada Research Chair Program's noble cause, to facilitate excellence and support leading talent, is only made more philanthropic by recipients who insist on using the award to the benefit of everyone. Prioritizing access to clinics, diagnoses, treatments and even to complex knowledge does just that. In expanding their research focuses to include groups that have been historically overlooked, Colantonio and Yadollahi's work truly embodies KITE's mandate: to promote Knowledge, Innovation and Talent, Everywhere.



Even 30 minutes of walking per day can reduce snoring and sleep apnea by up to 25 per cent.

TETHERED BY KITE

Soaring High with Research Feet Planted on the Ground

Story by
Marren JT MacAdam



When we think of kites, we often think of them soaring high in the warm summer skies. Sometimes, we remind ourselves of the connection, the tether, that ties and grounds this freedom to the earth. Sometimes, the thin line between the soaring fabric and the steady

hand on the ground escapes us. But without it, what would happen to that fluttering kite?

Tethered by KITE explores the relationship between the lives of those living with various forms of disabilities, ailments and injuries and the teams of researchers at the KITE Research Institute who

help them soar high. This article explores that thin line – sometimes forgotten – that tethers KITE's research to those who benefit from it. First, a look at the research done by Dr. Andrea Furlan on educating and reconfiguring how the public and physicians view and treat chronic pain. Second, Dr. Kristin Musselman's

research into spinal cord injuries and increasing individuals' autonomy. And finally, Dr. Paul Oh's amazing research around cardiovascular events and exercise.

Navigating Chronic Pain in a Nuanced Way

It is not everyday that you hear a medical practitioner tell you, "Pain is good!" but Furlan is not your everyday medical practitioner. She explains that our body's natural reaction to injuries is both healthy and important: if you've broken your arm, it's probably best you stop using it. She compares it to an alarm system in your home. "When there's a burglar, a fire or a medical emergency, the alarm goes off throughout the house, alerting the 'central office' to send the proper aid," she explains.

Chronic pain is when that alarm system is malfunctioning. There isn't a fire, but the alarm system thinks there is one. So, it responds with all the

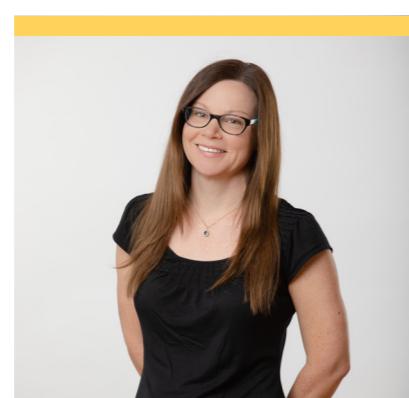
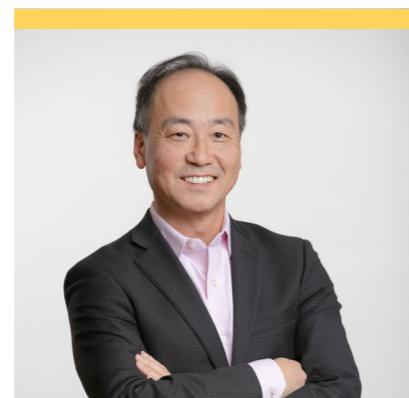
typical responses, except it's doing it constantly. Chronic pain is like this malfunctioning alarm system as individuals feel there is something constantly wrong in their body, yet nothing shows up in tests. It can be frustrating for those suffering from it, and even more perplexing for medical professionals as tests fail to indicate that something is wrong.

Furlan says treating chronic pain requires a reconfiguring of the malfunctioning alarm system. To treat chronic pain effectively across the board, we need to reconfigure our views on the condition, too. Patients often come to her and burst into tears once she explains their condition and understands them. She says, "They start to cry when they hear this, 'You're the first person who knows what I have,' and then they trust me. And then they say to me, 'Tell my doctor what I need to do and I will do it.'"

Reconfiguring our response to chronic pain is the chief project for Furlan. She works with project ECHO (Extension for Community Health-care Outcomes) to bring education to those treating patients with chronic pain. ECHO offers clinicians across Ontario (and now Canada) an hour and a half discussion on chronic pain. After a twenty-minute presentation, the group of clinicians all discuss one individual case together. Furlan guides the conversation and corrects incorrect practices, but it is a collegial and safe environment. It is also fully online, helping clinicians in rural or underserved areas gain access to this education.

Rehabilitation and Autonomy in Spinal Cord Injuries

Autonomy and living the life we want is a key focus of our own health and one that rehabilitation sciences are known for. When asked what autonomy looks like,



From top to bottom:
Dr. Paul Oh
Dr. Andrea Furlan
Dr. Kristin Musselman

Musselman provides a beautifully simple phrase, "It doesn't matter what it looks like to me, but what it looks like to each patient." Working with individuals who have had spinal cord injuries or sustained injuries from falls, Musselman focuses on the individuals' needs first and foremost.

For one person, autonomy might look like a return to walking in their community; to another, upper body strength so they can pick up their grandchild while in their wheelchair. Musselman shares how, over the past five years, she has learned that while they can design interventions, systems and programs to help individuals rehabilitate their functional movements, how they execute those will be entirely different from one person to another. "It's for them to decide what recovery and autonomy mean," says Musselman.

Another highlight of Musselman's work is on fall prevention. Rather

When asked what autonomy looks like, Musselman provides a beautifully simple phrase, "It doesn't matter what it looks like to me, but what it looks like to each patient."

than just focusing on the event of the fall, Musselman highlights the psychosocial aspects of a fall. She says, "The physical consequences are what people think of: bruises and cuts, maybe fractures or head injuries. What we haven't paid as much attention to is the psychosocial aspect: the fear of falling." Her work aims to bring relief to this fear of falling through fall prevention research, such as balance and muscle training. The objective is to lessen the impact of falls, allowing people, "To be the parent they want to be, to work at the job they want to, to be social and go out again."

Creating Hope for the Future After a Cardiovascular Event

"Congratulations, you've had a heart attack!" Oh says, recounting something he often tells many of his patients, quickly noting the facetious nature of the statement. Of course, after a chuckle, he qualifies the strange statement, "This is a chance to take back your health!" highlighting that a cardiovascular event is often caused by a history of health issues. He explains you



can come out of rehabilitation stronger than before. While much of the pizzazz of cardiovascular research is on the event itself, Oh shows how it can also be a great moment for long-term care and rehabilitation. He frames it as a move from survival to thriving.

Oh describes life after a post-cardiovascular event as one where the patient can change their perspective on their health. A focus on exercise and being active are key elements for him. "The interventions that we can offer are just as

powerful as some of the other interventions we can offer that get more attention, like a new drug or a new procedure," he says. "Taking a walk is often as good as the latest new therapy. We shouldn't lose sight of it."

The focus becomes how to move forward with a life that is oftentimes healthier than before the event. It is about "Creating hope for the future," he says. Living a more active life doesn't just mean prescribed exercise, but a real hard look at the daily activities we all do. He notes that

The focus becomes how to move forward with a life that is oftentimes healthier than before the event.

much of his research shifts what we think of as physical activity. It is more than just a prescribed daily set of motions, but rather a holistic look at all the types of activity we do in a day. "When we're not on Zoom, that is!" he muses.

Research Participants: More Than Just Volunteers, But Part of Our Talent!

It's no secret that research participants are what allow medical research to function. Medical research requires people to achieve breakthroughs and progress. At KITE, research participants are vital members of the research team.

Sometimes the research participants themselves benefit from volunteering. With Furlan's program, Rehab & Education for

Control Over Unresolved Pain, educating patients and the public isn't restricted to in-person meetings and appointments. By utilizing YouTube, research participants can access information wherever they may be, and maybe most importantly, access the ability to better explain their condition. "It's educational for them. What is chronic pain, how to explain it to family members – it being an invisible

disability. They can take this home and watch them and then teach others," says Furlan.

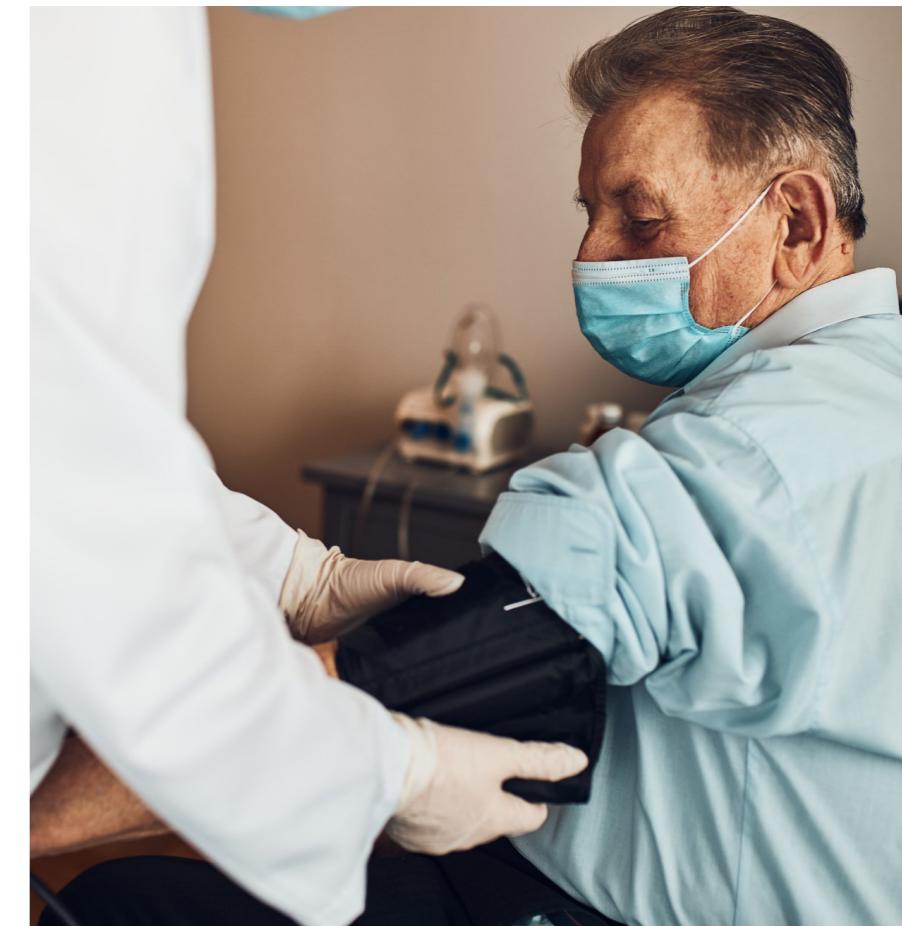
Musselman highlights how her team does not view research participants as volunteers but as consultants. It is an opportunity for them to make real suggestions and assist in designing interventions. Many of her research participants become education and outreach members for her teams and research

afterwards, taking part in publications and conferences. "We wouldn't be able to do our work without them," she says.

Oh echoes much of the same sentiments. He calls them "research team members," not just participants. He views the role as becoming an active member of cutting-edge research. He too highlights how many research participants grow into being even more involved, leading educational outreach and spearheading fundraising initiatives. "It creates a kind of loop, where they are constantly involved and helping us grow stronger," he says.



Left: A patient in physiotherapy.
Right: A patient having their blood pressure checked.



How High Can We Soar Together?

When we think of medical research and intervention, it is not uncommon to focus on the medical event research, the survival aspect of the field. But the work after that, the move from surviving to thriving, from getting by to becoming autonomous, is just as vital.

Tethered by KITE has highlighted just a small section of the work that KITE's research team does in this vitally important field. Rehabilitation may not always be

considered glamorous, but it's here that we can see medical research changing people's lives – something that could never happen without the invaluable participation of research participants.

Maybe now, on warm summer days where the wind tosses kites around playfully, we'll be reminded of all the lives lifted up by the many research teams at KITE. Maybe we'll notice the thin line that tethers that graceful kite, providing independence while preventing it from fluttering away.





TRAILBLAZING THE LESSER-KNOWN WORLD OF SWALLOWING SCIENCE

With Catriona M. Steele

Story by
Adele Paul



Most people don't accidentally pioneer a cutting-edge rehabilitation research lab, but that's exactly what happened to Dr. Catriona M. Steele. "You get the job and it's kind of what's expected," she says without so much as a trace of grandiosity. Steele accepted a job as a clinical scientist at the Toronto Rehabilitation Institute in 2003 and, over the course of nearly two decades, built what is now the KITE Research Institute's Swallowing Rehabilitation Research Lab (SRRL).

The SRRL is central in producing research that aids the global effort to understand swallowing impairment. At first glance, swallowing impairment might seem a niche expertise and Steele admits the community of international researchers

interested in this field is quite small, but its applications are vast and growing. Swallowing impairment is often linked to stroke, accidents and other chronic illnesses, but Steele explains that it can be a component of almost any neurological or respiratory condition as well as cancers of the throat and neck. Steele's team has even launched research that will examine the effect of COVID-19 on swallowing function.

So how does one get into a career like this? Steele explains that after more than a decade of work in speech and language pathology, she became disenchanted with the limited therapies available for what is a very broad spectrum of impairments. She returned to the University of Toronto to get her PhD and very quickly discovered that swallowing science was in its infancy. As such, her team has devoted much of their work over the past 17 years to describing a range of "normal" when it comes to swallowing function. Their research aids clinicians in determining when swallowing inter-

ventions are warranted and when they are not.

The first question is: how do clinicians determine when their patient has a swallowing impairment? The primary diagnostic tool, and one that heavily influences the research done at SRRL, is video fluoroscopy. Video fluoroscopy, as Steele explains, is a moving X-ray of the mechanics of swallowing. A fluoroscopy captures dozens upon dozens of X-ray photos that require analysis. Depending on the project they are working on, Steele's team spends at least one day a week in the hospital lab working in real time with clinicians and patients, and a lot more time analyzing the results. In fact, one of SRRL's significant contributions to the field has been using these X-rays to develop the metrics that now define a range of "normal" in swallowing function. Steele compared this to the ranges of normal one might expect to find on a blood test.

The next question is: what interventions are available for individuals struggling with swallowing impairment? Steele explains that there are currently two options: therapeutics and management. The SRRL's research informs interventions that resemble physiotherapy or speech and language exercises for the neck, throat and tongue function. The goal of therapeutics is to help regain swallowing function, whereas management, Steele explains, really comes down to one thing: food texture modification.

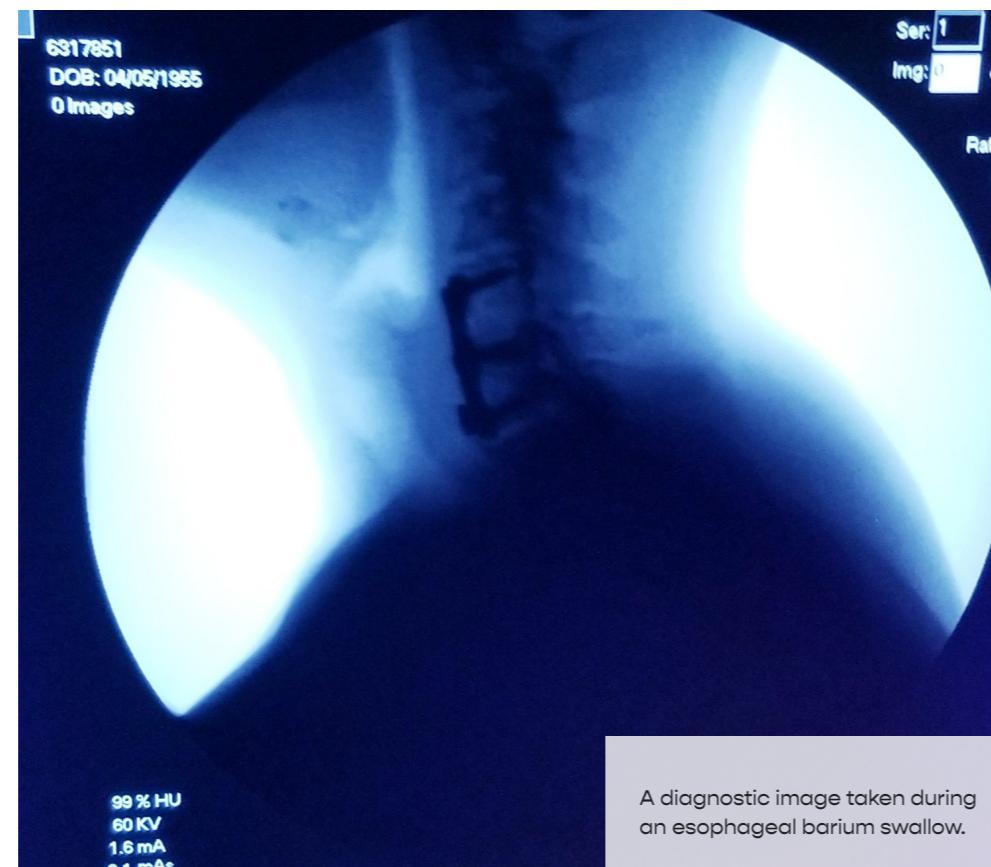
Food texture modification is widely practiced in hospitals, care facilities and in the community. It tries to achieve a consistency of food or liquid that can be easily swallowed without causing the individual to choke or breathe matter into their lungs. Until 2017, the science of texture modification had been something of guesswork for clinicians, researchers and caregivers,

The first question is: how do clinicians determine when their patient has a swallowing impairment?

and wildly inconsistent between countries and facilities. This was problematic for the whole spectrum of people who work in the field or who suffer from swallowing impairments. Until recently, food consistencies were described in loose terms like "syrupy" or "nectar" or "honey" and, depending on the jurisdiction and country, foods were placed on inconsistent ranking scales of letters, numbers or other ill-defined categories. Steele and her colleagues in the field of swallowing science identified the need for a universally recognized, standardized approach to food consistency and decided to do something about it.

On a volunteer basis, this group founded the International Dysphagia Diet

The next question is: what interventions are available for individuals struggling with swallowing impairment?



A diagnostic image taken during an esophageal barium swallow.

Standardisation Initiative (IDDSI), which identified and standardised a continuum of eight levels of consistency for food and liquids ranging from 0 (Thin-Liquid) to 7 (Regular-Food). The best part of this identification system is that the different levels of consistency can be identified based on simple, practical tests that can be performed by anyone anywhere, from a care home to a kitchen table. To give an example that is uniquely reflective of KITE's mission to bring its innovation 'everywhere', one of the IDDSI tests involves measuring the particle size of a substance between the prongs

of a fork. Twenty-two countries have adopted this system since its launch in 2017. IDDSI helps everyone from caregivers to clinicians adopt a more consistent approach to food texture modification. As if "accidentally" founding a swallowing lab wasn't enough, Steele describes the IDDSI project as a "tsunami" of learning, innovating and international collaboration.

The question that remains and one that plagues all research is: how do these amazing innovations created in KITE's swallowing lab find their way into best clinical practice? For

Steele, getting the SRRL's research into the hands of clinicians and caregivers is a multi-faceted approach. She is active in the international community of scientists and practitioners interested in swallowing science. She attends and presents at major swallowing science conferences in North America, Europe and Asia. Her team is present on the ground on a weekly basis at the video fluoroscopy lab at Toronto General Hospital and the SRRL regularly posts to their social media channels about exciting developments at KITE.

Just as important as the research itself is ensuring that it gets used to impact real people in real

time. Getting swallowing science off the ground over the last 20 years was no small feat for Steele, and publicizing and adopting the innovations developed at this KITE lab will be the challenge of the next 20. At the SRRL, swallowing science has moved from its infancy into a solid discipline of knowledge and innovations that, true to KITE's mission, are impacting real people with real solutions... everywhere.



The goal of therapeutics is to help regain swallowing function, whereas management, Steele explains, really comes down to one thing: food texture modification.

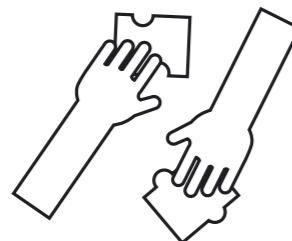


Dr. Catriona Steele



REIMAGINING BRAIN DISCOVERY AT THE SCHROEDER INSTITUTE FOR BRAIN INNOVATION AND RECOVERY

Story by
Giselle Gardonyi



In 2017, philanthropist Walter Schroeder, who made his fortune founding the Dominion Bond Rating Service, and his wife Maria Schroeder donated \$20 million to the KITE Research Institute. Their generous donation enabled the founding of the Schroeder Institute for Brain Innovation and Recovery, where a team of engineering and clinical neuroscience experts research and develop new therapies for brain-related disorders. Brain disorders such as Alzheimer's, Parkinson's, epilepsy and traumatic brain injury affect an estimated 3.6 million Canadians living in the community and 170,000 in long-term care

facilities, according to the National Population Health Study of Neurological Conditions from 2013. As the population ages, the numbers are projected to grow.

Everyone at the Schroeder Institute has been working toward the common goal of improving the lives of those living with brain disorders and their families. This will, in turn, benefit Canadian society in general. New technological innovations such as distance therapy, machine learning and neuromodulation are driving this research forward.

Meet three of the scientists at the Schroeder Institute.



Dr. Robin Green

DISTANCE THERAPY

Dr. Robin Green specializes in traumatic brain injury (TBI) rehabilitation. With funding from the Schroeder gift, she helped develop the Telerehab Centre for Acquired Brain Injury, a research and treatment center for people living with TBIs. The two aims of the centre are to study TBIs and offer therapy for long-term recovery.

Research by Green has uncovered that, contrary to previous assumptions, TBI recovery is not linear. Sometimes patients lose recovery gains after their initial improvement. Green and her lab have been studying what causes this regression and what can prevent it. This led to the discovery that anxiety and lack of cognitive stimulation in early recovery can cause brain deterioration later on. These findings are already being used to help patients by intervening during that crucial time.

Online participatory therapy is offered in groups of five to eight which, according to Green, "can be surprisingly intimate." Navigating through streets

by memory using Google Street View is one example of therapeutic exercises patients do to improve their spatial memory skills.

These days, online medical appointments are common, but they were pioneering in 2017 when the Telerehab Centre began offering its services almost entirely online. As a result, patients only need to appear in person for MRIs. This is beneficial for patients living outside Toronto, since getting to appointments can be difficult for those living far away or with mobility issues.

The Schroeder Institute also helps patients if they don't have insurance or have trouble accessing the technology they need for remote treatment, such as computers or internet access. The Schroeders wanted their donation to assist in addressing economic inequalities and immediately improve the quality of life for as many Ontarians as possible. By removing these barriers to access, the Telerehab Centre is doing just that.

MACHINE LEARNING

Dr. Shehroz Khan and his team have been studying ways to detect, and even predict, agitation in people living with dementia. This would be extremely useful to prevent accidents, such as falls and injuries to patients and staff, especially in chronically short-staffed nursing homes. The hope is to eventually be able to prevent dangerous incidents before they happen.

Every dementia patient expresses agitation in their own unique way. Some people move around a lot when upset, while others don't move at all but express themselves verbally. That's why a personalized, multi-modal approach that analyzes different factors like motion, heart rate and skin temperature is best. A human caregiver can easily learn which behaviors indicate when a patient is agitated but training a computer to do it – machine learning – is a challenge.

Khan used raw data collected from multi-modal detecting devices to analyze agitation patterns. What sorts of detecting devices? A "Fitbit on ster-



Dr. Shehroz Khan

oids," Khan laughs. One such device is the Empatica E4, a bracelet that patients wear to collect data. They also collected data from cameras set up in common areas of nursing homes.

Khan and his team analyzed the data collected from a nursing home lobby by using artificial intelligence (AI) algorithms to establish what typical activity in the lobby looked like. The plan was to train the AI to detect atypical activity on its own. This wasn't as easy as it sounded because all the activity in the busy lobby created noisy data that was difficult to sort from the clean data.

However, this research has revealed incredible potential for this technology to make nursing homes safer for both the residents and staff in the future.



NEUROMODULATION



A large portion of the Schroeder donation went to CRANIA, the Center for Advancing Neurotechnological Innovation to Application. Scientists at CRANIA and around the world have been researching new treatment strategies for neurological disorders using neuromodulation devices. Neuromodulation is "the alteration of nerve activity through targeted delivery of a stimulus to specific neurological sites in the body." Neuromodulation devices

stimulate nerves to help restore function or relieve symptoms.

A promising area for neuromodulation devices is drug-resistant epilepsy. According to Dr. Taufik Valiante, co-founder of CRANIA and a neurosurgeon at the Krembil Brain Institute, epilepsy lends itself to this sort of research because it displays an obviously detectable example of abnormal brain activity.

Valiante has been working on a groundbreaking treatment for epilepsy involving a microchip implanted in the brain that uses machine learning to distinguish normal brain activity from abnormal brain activity over time. The chip is called NURIP, which stands for Neural Interface Processor. The research goal is to train the chip to sense when the brain is heading into a state where a seizure could happen and then to prevent it. NURIP would be connected to electrodes, which would redirect the electrical activity toward a more normal state.

Solving engineering problems involving the brain is so challenging because there is no map for such a complex structure. There are 80 billion neurons and 200 trillion connections in the brain, which make it difficult to make predictions about its behavior. "We don't have a model that tells us that if you stimulate at this strength, with this frequency at this location, what will happen. So that's the hard problem we're trying to solve with NURIP," explained Valiante.

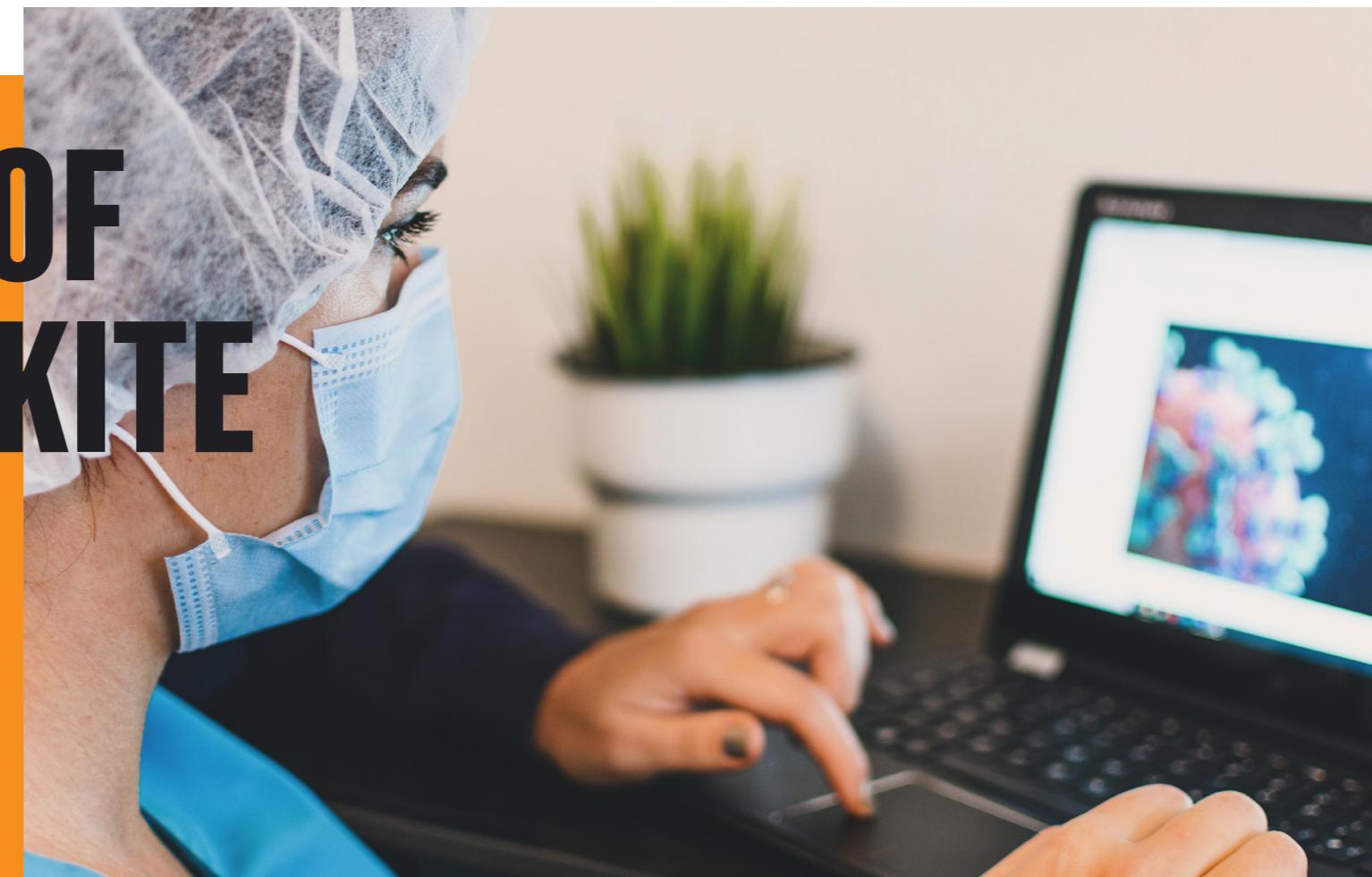
"We are at a very unique point in time from a computer science and an engineering point of view," said Valiante. That is why the Schroeder donation came at the perfect time and why it has been so effective so far. It is only now that many of these technological tools are available to researchers at KITE. Their research is already helping Canadians living with brain disorders and will help many more in the future.



THE CULTURE OF RESEARCH AT KITE



Story by
Krzysztof Kalwak



When it comes to the field of scientific research, there are certain commonplace perceptions that spring to mind for many in our society. The two extremes range from visions of plumes of smoke wafting from laboratory beakers containing volatile chemicals to images

of diligent scientists endlessly scribbling notes on their clipboards.

As with most things, the truth falls somewhere in between.

Dr. Elizabeth Rochon's research at the KITE Research Institute deals directly with patients, most commonly ones recovering from a stroke and suffering

from aphasia, a form of language impairment. Clinicians refer interested patients to her after they have finished their rehab programs. If found eligible, patients can then become a part of one of the many ongoing studies looking at developing new post-stroke interventions. Her day-to-day work is highly collaborative and social; she works with clients,

their family members, clinicians and physicians at the stroke unit, speech language pathologists, neurologists, various colleagues, students and social workers.

On top of that, Rochon is often called to collaborate with other colleagues, even ones working in completely different parts of the University Health Network (UHN), an organ-

ization that ties several major hospitals in downtown Toronto together. For instance, she has been called away to assist people suffering from language speech impairments due to a specific kind of dementia called primary progressive aphasia.

Science and research, by their very nature, are a collaborative effort.

That is, in a nutshell, one of the greatest strengths of KITE. Science and research, by their very nature, are a collaborative effort. However, via institution or tradition, different disciplines often are kept entirely separate from each other.

KITE, on the other hand, focuses on diversity and collaboration. It enables knowledge and resources to be shared widely while promoting and encouraging interdisciplinary work that can lead to truly novel and unique outcomes.

KITE was built on a vision of incorporating diverse disciplinary approaches into rehabilitation. The nature of the fully collaborative research environment is what originally

appealed to Rochon and drew her to get involved with the venture. Its diversity, its people and its adaptability are its greatest strengths, she says.

She recalls one of her recent grant applications,

The Toronto Rehabilitation Institute was built on a vision of incorporating diverse disciplinary approaches into rehabilitation.



Dr. Elizabeth Rochon

where she realized there wasn't anyone on her team with expertise in electrical stimulation of the brain. Rather than having to begin a lengthy scouting process, appropriate specialists were a mere phone call away. The interdisciplinary collaboration is smooth, efficient and fruitful.

The ease of access enables innovation. If Rochon wants to develop a new speech therapy that incorporates virtual reality (VR), for example, there are experts available through KITE and they are a proverbial phone call away. If there is a need for any specialist, there are means to

reach them. Without such access, without the spirit of collaboration, a lot of the innovations or concepts simply would not be feasible. If the process of scouting, checking and hiring VR specialists was a daunting, weeks-long process, it simply would be a waste of time and not worth the effort. Or the idea wouldn't have been considered in the first place.

Diversity of people and of disciplines leads to new perspectives and new prospects, which all promote innovation, creativity and progress. Rochon believes that KITE is ahead of the curve,

that others will have to catch up and incorporate more of KITE's philosophies of diversity into their own inner workings.

The reality of our societal perceptions is not always accurate. While smoke doesn't plume above KITE's facilities, it doesn't mean that progress isn't being reached in awe-inspiring ways; from VR integrated rehabilitation to state-of-the-art simulators.

Progress can manifest itself everywhere through the knowledge and innovation that comes from the hard work of talented scientists and doctors working together for a better future.



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WORKING TOGETHER FOR A BRIGHTER FUTURE

Building a Partnership Between KITE and Centennial College



Story by
Kyria Sztainbok



For almost two years, the KITE Research Institute and Centennial College have partnered to create opportunities for students to put their skills into practice and get involved in the rewarding world of scientific research.

In the summer of 2019, Anthony Palma, Director of Research Operations at KITE, connected with Susan Kates, a professor in the business department at Centennial College. As it turned out,

project management students were looking for internships, so they decided to join forces to give the students an opportunity to gain valuable experience in the industry.

Since that summer, Centennial students with backgrounds in healthcare, business and journalism have completed internships at KITE. Regardless of background, students are given opportunities to develop their skills and share ideas in a space that encourages innovation and growth.

Through the KITE internship program, students get to work alongside scientists, staff and clinicians in a world-class research institute. Students receive mentorship and training and are given opportunities to take on projects tailored to their specific interests. Some students even end up working at KITE once their placement is over. "Many of our interns are international students," says Janitha Shanmugarajan, Operations

Planning Coordinator at KITE. "Many of them have never worked in Canada before, so we give them a Canadian experience."

Students are at the forefront at KITE. Rather than having tasks assigned to them, students are encouraged to share their interests and provide ideas for potential projects. "At KITE, we make sure students meet their objectives. We ask them what they want out of the program and what they're interested in.

"Then, we try to give them those opportunities," says Shanmugarajan. Palma adds, "Everyone is different; everyone has their own needs. We want

to make sure their expectations are met."

As the word spreads, more and more Centennial students are learning about KITE and the internship program. The partnership has allowed students to discover opportunities they wouldn't have otherwise heard of and KITE has been able to work with

Through the KITE internship program, students get to work alongside scientists, staff and clinicians in a world-class research institute.

students from different backgrounds and expand the types of opportunities their program has to offer. “The program has become international,” says Palma. “We’re able to reach out to the rest of the world.”

More recently, KITE has begun to branch out and collaborate with the Storyworks program at the School of Communications, Media, Arts and Design at Centennial College – resulting in the KITEworks project, which, incidentally, this story is part of. Shanmugarajan and Palma are also working on a project with the photography students at Centennial. While writing and photography aren’t usually associated with healthcare and rehab, Palma believes there is a real opportunity to branch out and use the arts to communicate

“Everyone is different; everyone has their own needs. We want to make sure their expectations are met.”

complex ideas and change the narrative by challenging the stigma around the word “rehab.”

This partnership has been beneficial for both students and KITE alike. Working with the students at Centennial has been an invaluable experience for the KITE team and the partnership is one they will continue to cultivate for years to come. Palma points to the KITE acronym – Knowledge, Innovation, Talent, Everywhere – to underscore that the partnership is working. The collaboration allows KITE to share knowledge in new ways, innovate, work with talent from all walks of life and share stories everywhere. The partnership only makes this acro-

nym stronger. With this, Palma hopes that KITE rises to a new level, which people will take notice of and want to emulate.

For Centennial, the partnership has also proven to be valuable. “We’ve established a template for how to work with multifaceted and influential clients. We have created a special project where not only the work that KITE is doing will be highlighted, but the people who are doing the work will be highlighted,” explains Jennifer McIlroy, Storyworks coordinator. She adds that the students take initiative with KITEworks by creating, running and producing the entire project. She is ecstatic that students are able

to have this opportunity to use their talent and challenge themselves. “Students are empowered to do their best. We get to work with really great people at KITE. They really understand the importance of the opportunity for students.”

The fact that everyone involved in this collaboration – students, teachers, program coordinators and KITE staff – is genuinely invested in their projects makes the experience unforgettable. “I love meeting the people, getting to know different personalities, different experiences and learning from everyone,” says Shanmugarajan. Palma says, “We want to create the kind of environment that allows us to push forward. We want students to be able to try things without any fear of failure.”

Having a team that is excited to work with and mentor students allows the students to flourish and gain confidence by applying their skills in a supportive environment.

When it comes to mentoring advice, the program coordinators have plenty to offer. “Don’t be afraid to speak up on your ideas,” says Shanmugarajan. “No idea is a bad idea,” Palma adds. “When you get an opportunity, take full advantage of it. Treat it with respect. Take it seriously. You’re not only representing yourself; you’re also representing your academic institution.” McIlroy says, “Use these experiences to do something with which you are unfamiliar. It’s the only way you will create a memory of exceeding your own expectations.” All three

are extremely proud of the work that the Professional Writing students are doing with KITE.

Future projects are already in the works, including a collaboration between the Children’s Media program and KITE. “We’re better when we can do things in collaboration,” says Palma. “This merging of health and education into one space shows everyone outside of the circle that you can create new opportunities by bringing the two sectors together. In the end, everyone benefits.”

McIlroy, Palma and Shanmugarajan hope to provide valuable work experience and mentorship to as many students as possible. As the partnership has developed over the years, the number of opportunities continues to increase, giving students the potential to expand their horizons and enrich the lives of others. The projects that have been completed through the collaboration are just the beginning!



Left: Janitha Shanmugarajan
Right: Anthony Palma



KITE IS EVERYTHING AND EVERYWHERE



It's in the Name

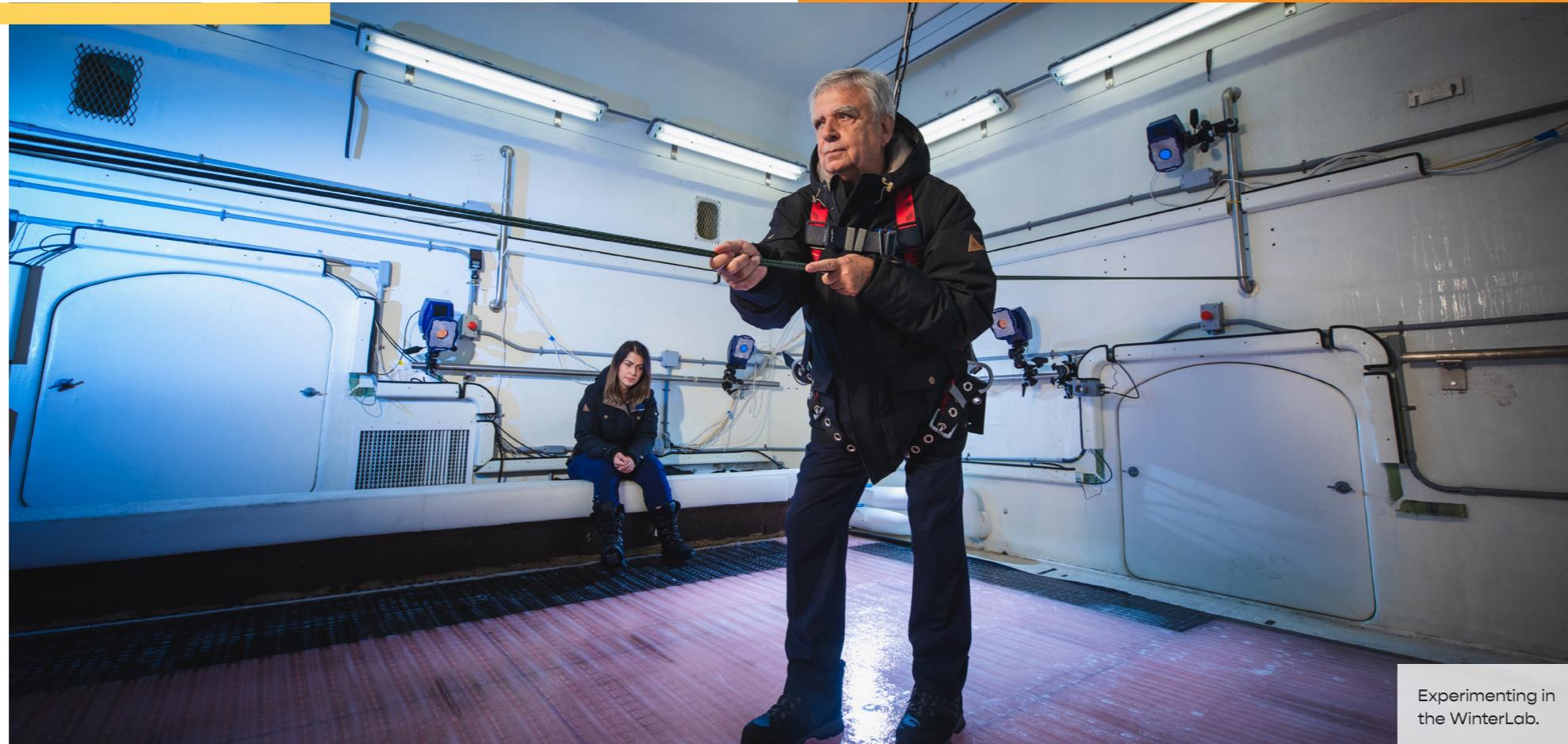
Redefining Research and Rehabilitation

Story by Dylan Godfrey

was the type of person responsible for the Toronto Rehabilitation Institute's rebrand a few years ago when they changed the name of their research institute to the KITE Research Institute.

Why?

Because when I heard the word "rehab," my mind immediately



Experimenting in the WinterLab.

went to an exercise ball-filled medical office or an addiction treatment group meeting. Rehab was an unpleasant thought.

And when I heard the word "research," it triggered images of isolated, obsessive and genius scientists.

To me, "researchers" were hidden away

from the world in sterile-looking laboratories or underground bunkers, left to their own devices to follow their muses. Why develop better heart monitors when ray-guns are more exciting and can blast holes through walls?

Until recently, this logic guided my view of rehab, research and the people who work in these

areas. And maybe it informed your view, too.

I had the opportunity to speak with KITE's Dr. Sophia (Yue) Li, Partnerships and Strategic Project Manager, and Dr. Milos Popovic, Institute Director of Research. Li said something that struck me.

"Rehab is everything." "But how can that be?"

I thought to myself. "How can rehab be everything? Isn't it for recovering addicts or people who've been in terrible accidents?"

Then, when speaking with Popovic, he reached over his shoulder, pointed to the last letter in the KITE logo and said, "Everywhere – we want our knowledge to go everywhere so that everybody on the

planet can benefit from that knowledge."

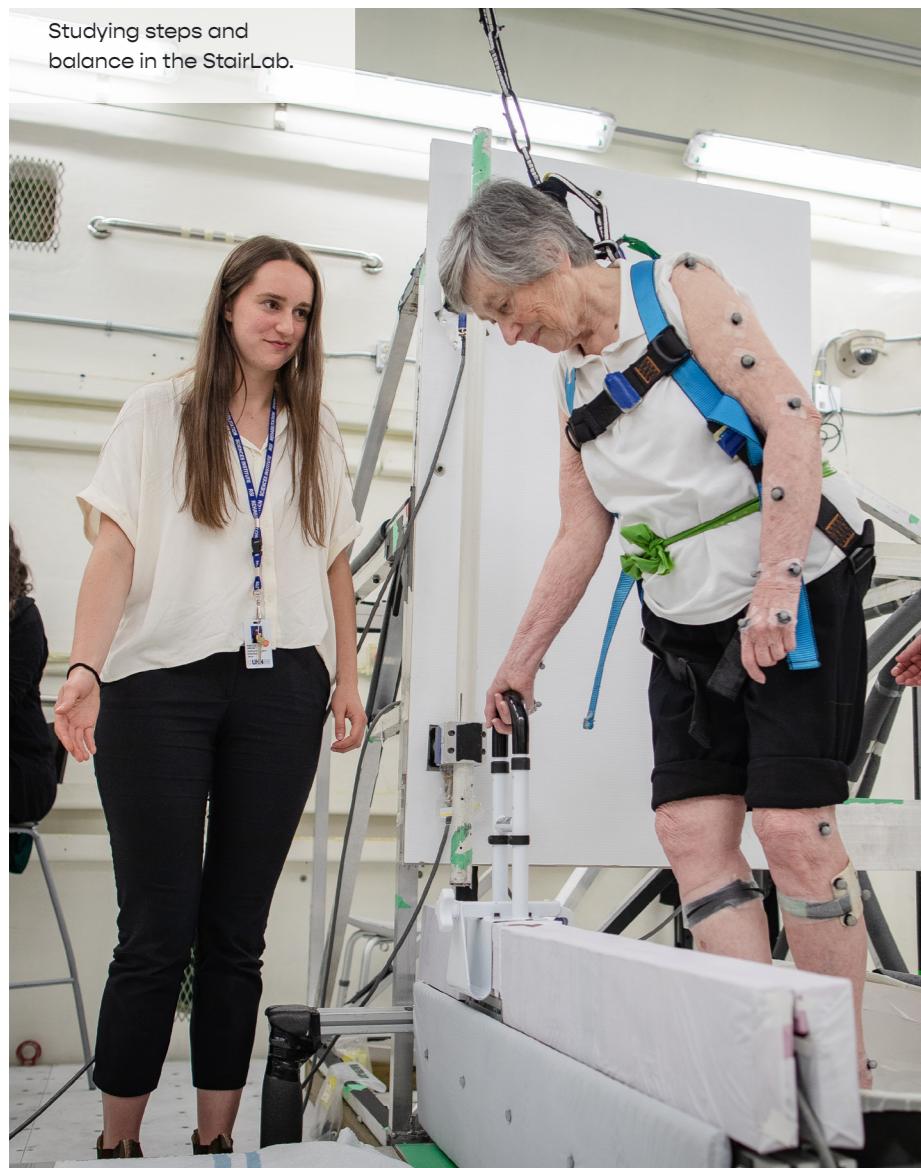
Now I understand.

"Rehab is everything because KITE is everywhere."

My half-baked perception of rehab and research is a component of what KITE does – they do employ scientists, have laboratories (some of which are underground, by the way) and help people recover from traumatic and debilitating situations.

But it also goes beyond stereotypes, conventions and "pure" rehab. KITE also focuses on injury prevention and enhancing the participation and independent living of those who've gone through rehab.

KITE is local and global; its work isn't confined to basements, islands or rural country houses. As Popovic says, KITE's research is for everyone. To better understand their work, let's take a look around our everyday world.



IN OUR HOMES

The stairway in your house: the one you've slipped on once or twice, sending you into a panicked survival mode. Well, KITE's been working on that.

That's right, KITE's outreach begins within your own home and reflects the belief that injury prevention is the first key to rehabilitation.

Rehab does not just start after you've tumbled down a flight of stairs.

Li told me about KITE's Alison Novak and her team. They used their innovative StairLab to research staircase-related injuries and deaths. They discovered you could reduce the roughly 270 daily staircase injuries in Canada if stair

treads were at least ten inches long. But did KITE's researchers keep this discovery to themselves? No.

"Partnerships are essential," Popovic explains. "Research isn't helpful if it remains in the laboratory and only affects test subjects or a limited number of people. We need partners who will take our research and implement it as new standards, codes and products."

So, KITE worked with the National Building Code of Canada to get its recommendations codified. Private staircases, beginning with those built in 2015, are now safer and backed by research and science.

These new safety regulations aren't an excuse to run down the stairs – remember injury prevention? Instead, they show that KITE's research is so close to home that it's actually in it. The fruits of research are for everyone and shouldn't be hidden away on an island.

Studying steps and balance in the StairLab.

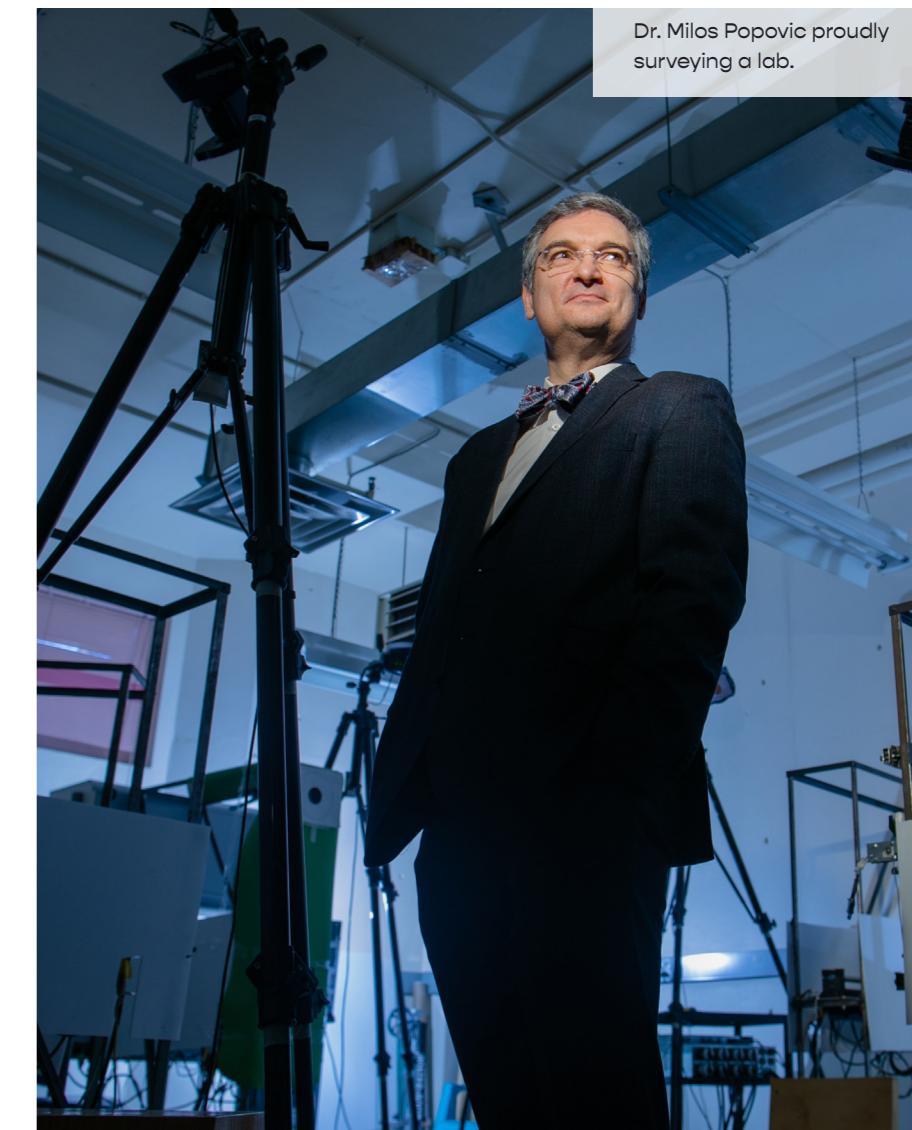
IN THE NEWS

There's a story about China and its aging population. Of China's 1.4 billion people in 2019, around 18 per cent of them were 60 years old or above: that's about 254 million people! Such an aged population can heavily strain a country's resources and social infrastructure. Believe it or not, even based halfway across the globe, KITE's helping to find solutions.

In China, KITE has many partners in the medical and technology industries, including:

- **Nanjing Medical University**
- **Southeast University**
- **Fourier Intelligence**
- **Chinese Association of Rehabilitation Medicine**
- **Ninth People's Hospital, Shanghai Jiao Tong University**
- **Sun Yat-sen University**

Working with global partners has its challenges, so KITE often partners with agencies when developing new research partnerships abroad.



Dr. Milos Popovic proudly surveying a lab.

"Sometimes, if the culture is so different, it's tough to work together," Li explains. "That's why we align with the Canadian embassy in China and other trade commissioners to identify the right research and rehab partners."

And the "right partners" have both the proper resources and, most importantly, share KITE's values. Many Chinese organizations want help researching their aging population crisis, sharing KITE's enhanced participation and independent living values. KITE assists these partners in many research areas, including helping China

adopt Canada's senior citizen models and programs. In turn, the partners offer access to different technologies and research that KITE does not yet have.

KITE also invited a Chinese researcher to spend a year in their Canadian facilities. Through this experience, the partners learned about each other's strengths and areas to assist the other in, strengthening their partnership.

"We become smarter for their experience and knowledge," Popovic answers when asked why KITE aligns with those across the globe. "Learning from these partners can be tremendously beneficial."

KITE's work with global partners in China is another example of how they break the lone-wolf scientist stereotype. The research and rehab work produced by these partnerships will touch over a billion people!



ON OUR STREETS

Notice the narrow, snow-covered sidewalks. Then, look at the broad, snow-cleared roads beside them. Doesn't it seem like the cars whizzing by have priority over the people? Well, the City of Toronto noticed this, too, so they asked KITE for help.

In 2017, the City of Toronto pledged to adopt Vision Zero, a safety plan which originated in Sweden. The program seeks to eliminate traffic-related fatalities and injuries while increasing the accessibility of transportation systems for pedestrians. Because the initiative prioritizes injury prevention, enhanced participation and

independent living values, KITE was eager to help.

"Our perspective is that it is important to develop preventative solutions so that people never have to come to KITE," Popovic says, reinforcing KITE's holistic approach to rehab.

So, they got to work.

"We used our resources and facilities, like the WinterLab," Li explains. "We researched snow-banks, puddles, curb ramps, sidewalks and crosswalk design – even heated pavement! We could then present the City with important discoveries like the advantage of raising

the street level so that pedestrians don't have to step down curbs in the snow or onto the ice."

The City could then use KITE's research and discoveries to fulfill the Vision Zero mandate and, most importantly, make Toronto safer for everyone. And because they continue to share the same goals, KITE and the City's relationship will continue beyond this project.

This partnership is another example of work that encompasses all injury stages and brings research beyond the laboratory's confines; KITE's taking its research to the streets!

“Our perspective is that it is important to develop preventative solutions so that people never have to come to KITE.”

ON OUR FEET

Finally, look down. No, not the grass. Our shoes. That's right: KITE's got its feet in the domain of footwear, too.

KITE's Rate My Treads program is at the forefront of injury prevention. It perfectly demonstrates how both government and retail partnerships can transform experiments and tests into practical, real-world applications.

In 2015, Canada Post came to KITE with a question: is our employee protective footwear actually safe? Their postal workers seemed to be injury-prone, particularly in the winter.

Again using WinterLab, KITE researched the cold weather suitability of hundreds of different types of footwear.

"Unlike some organizations, we test products in ways that humans actually use them," Li proudly explains.

"Spikes, casual and safety footwear are all tested and rated. We can also recommend safer materials to use."

Because of KITE and Canada Post's partnership, we now know which footwear is safest to wear in the winter. And because of further partnerships with retailers like Mark's, the products developed using KITE's research are available to everyone.

And why does the world's rehabilitation leader do this type of research? When given this question, Popovic didn't miss a beat.

"Why would we help redesign shoes?" he asks rhetorically. "Because that way you won't fall, you won't have a traumatic brain injury and you won't have to come to our hospital. Bingo. That's why we help redesign shoes."

Bingo, indeed.

EVERYTHING AND EVERYWHERE

KITE redefines many people's ideas of research and rehabilitation.

In my conversations with Li and Popovic, there was no mention of self-obsessed geniuses or isolated workstations on Antarctica. And KITE's research includes and goes beyond people dealing with a disability.

KITE's rehab is everything. Of course, its researchers help people recover from injury. But their work also includes injury prevention and the enhancement of participation and independence. They are not a mad scientist oper-

ation, holed up pursuing self-interest. They care about everyone.

KITE's research is everywhere, too. It's in our homes and our streets, improving our lives and keeping us safe in ways that we may not have considered. KITE also reaches across the globe, working with organizations in countries like the U.S., Switzerland, Germany, the U.K., France, Japan, India, Brazil, Israel and Australia. And that list continues to grow. With both local and global partnerships, KITE knows that they'll make a significant impact.

Why?

"Because if you are only close to yourself, you can't grow," Li says. "By learning from other people, that's how you grow."

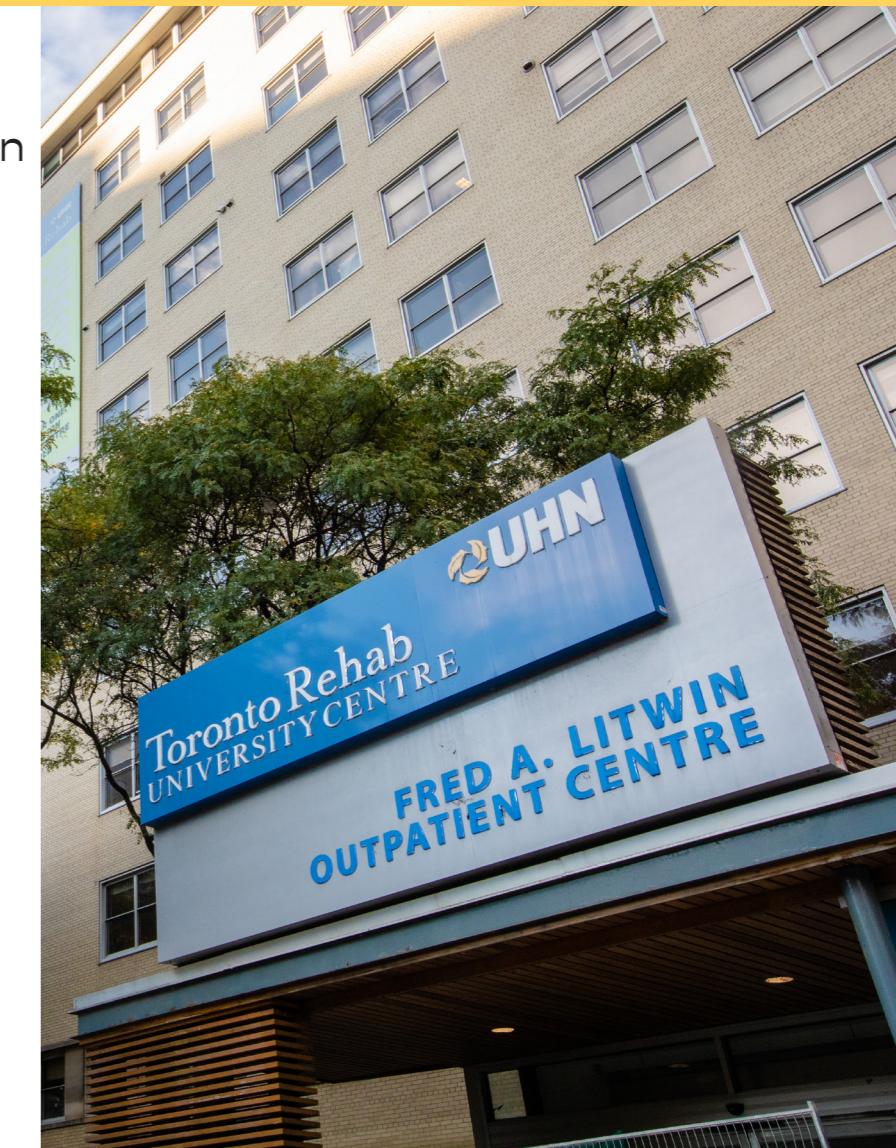
There are still people who worry about rehab or have tunnel-vision about research. But as KITE continues to grow and expand, their vision of rehab and an understanding of what they do will spread, too. And I don't think I need any research to back up this claim.

On second thought, I should ask KITE to look into it. I hear they're good.

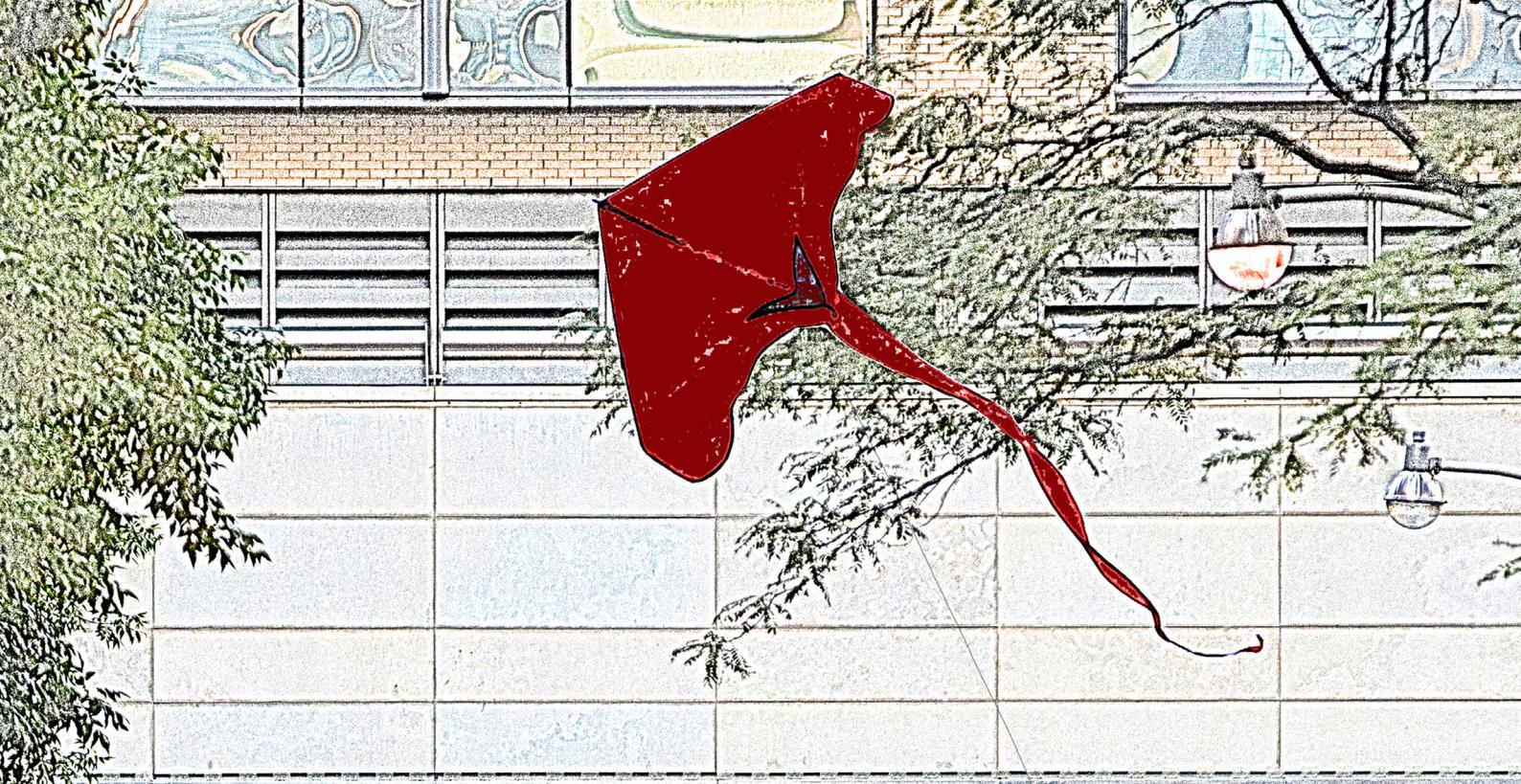
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KERR FAMILY LOBBY

