

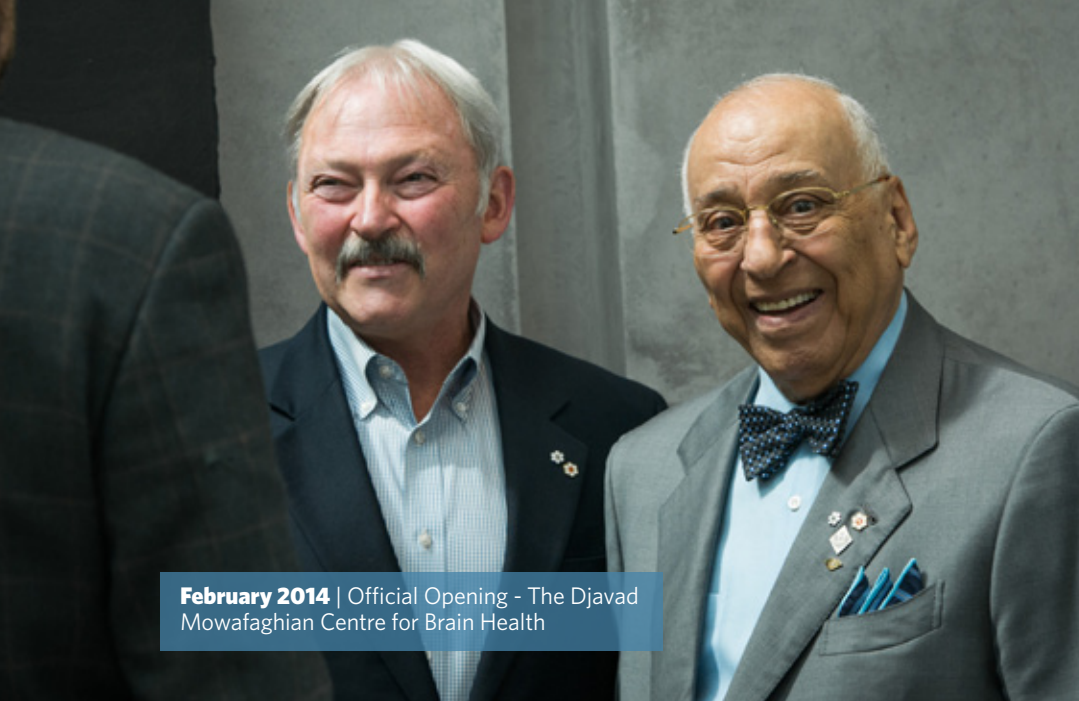
DJAVAD MOWAFAGHIAN CENTRE FOR BRAIN HEALTH

YEAR IN REVIEW

2018/19



ADVANCING BRAIN HEALTH THROUGH RESEARCH AND CARE



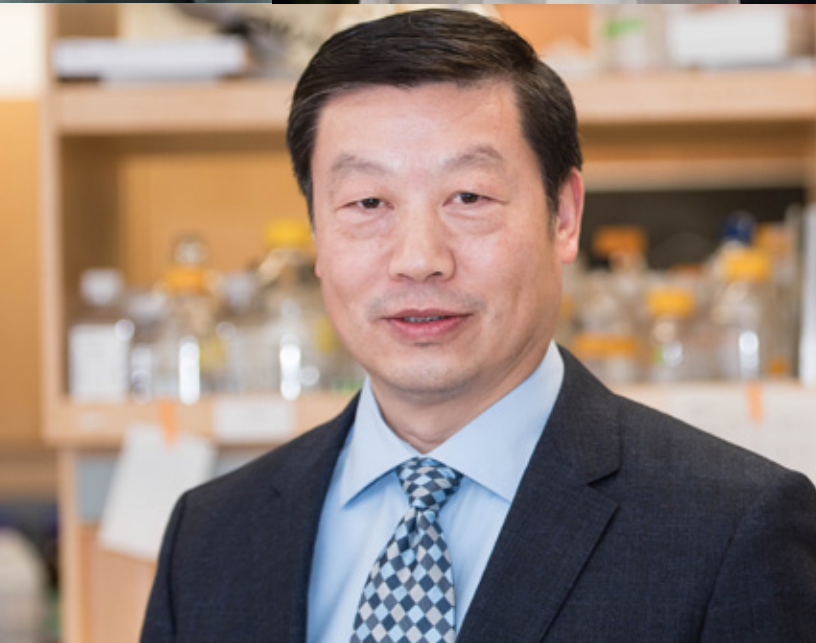
February 2014 | Official Opening - The Djavad Mowafaghian Centre for Brain Health



February 2014 | Key ALS Advancement - Dr. Neil Cashman and his team discover how ALS spreads, paving the way for future treatments



May 2017 | A Revolution in Healthy Aging - Dr. Teresa Liu-Ambrose finds nothing protects the brain quite like regular exercise



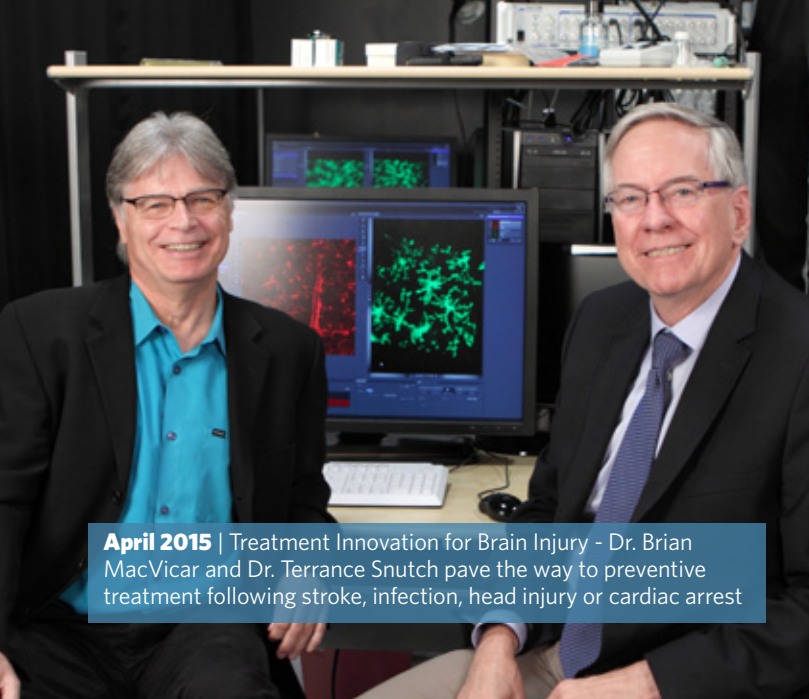
A SNAPSHOT OF JUST SOME OF THE DEVELOPMENTS THAT HAVE TAKEN PLACE SINCE THE OPENING OF DJAVAD MOWAFAGHIAN CENTRE FOR BRAIN HEALTH



July 2018 | Progression in MS Treatment - Dr. Helen Tremlett discovers MS 'warning signs,' offering hope for earlier treatment and care



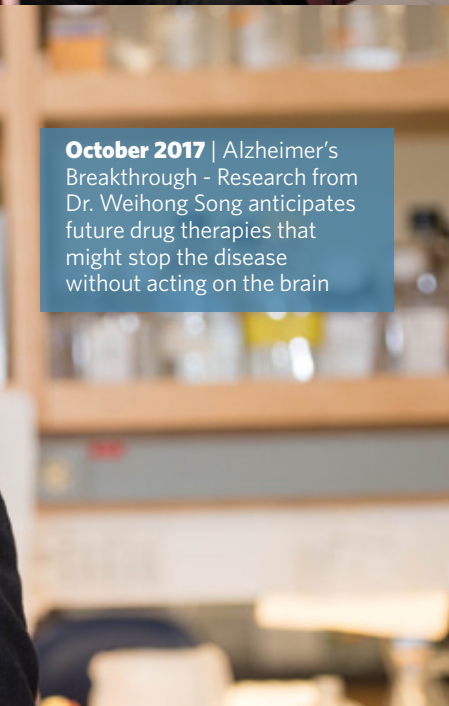
August 2018 | Parkinson's Disease Advancement - Dr. Matthew Farrer and his team develop a new tool to inform trials of emerging therapies that could help halt or prevent the disease altogether



April 2015 | Treatment Innovation for Brain Injury - Dr. Brian MacVicar and Dr. Terrance Snutch pave the way to preventive treatment following stroke, infection, head injury or cardiac arrest



August 2015 | Huntington's Disease Discovery - UBC scientists, led by Dr. Blair Leavitt, develop an innovative test to measure the effect of promising new gene silencing therapies for the disease



October 2017 | Alzheimer's Breakthrough - Research from Dr. Weihong Song anticipates future drug therapies that might stop the disease without acting on the brain



May 2018 | New Finding in Depression Treatment - Dr. Fidel Vila-Rodriguez proves magnetic pulses around the brain to be extremely successful in managing depression



February 2019 | Charles E. Fipke Integrated Neuroimaging Suite opens - This new state-of-the-art imaging facility represents the realization of a nearly decade-long dream for researchers including Dr. Vesna Sossi and Dr. Alex MacKay

FIVE YEARS IN:

A LETTER FROM THE DIRECTOR



Five years ago, we opened the doors to the Djavad Mowafaghian Centre for Brain Health with a sense of optimism—this place was a dream realized; the culmination of years of effort and vision.

On its five-year anniversary, the centre represents a promise fulfilled. Since 2014, our researchers have worked together to conduct game-changing clinical trials, to find evidence in the body of changes in the brain, and to combine their expertise to find new solutions to longstanding research questions. We are stronger researchers for the relationships that are forged in the Djavad Mowafaghian Centre for Brain Health.

Dr. Cheryl Wellington is using unique, donor-funded technology to establish biomarkers for brain injury and Alzheimer disease; she has partnered with Dr. Paul van Donkelaar at UBC's Okanagan campus to establish blood biomarkers for concussion in women victims of intimate partner violence. Dr. Helen Tremlett has found definitive evidence that MS can be preceded by early symptoms—known as a prodrome—that aren't considered "classic" manifestations of the disease; as recently as the year 2000, medical textbooks asserted that MS did not have a prodrome. And since 2015, Dr. Neil Cashman has filed more than 20 patents for the identification of protein misfolding-specific epitopes as targets for immunotherapies of Alzheimer's and Parkinson's disease and amyotrophic lateral sclerosis. Projects including a new Brain Wellness Project under the direction of Dr. Silke Cresswell and a neuroplasticity and opera program linking Dr. Lara Boyd and UBC Arts' Dr. Nancy Hermiston are currently underway and represent some of the most ambitious interdisciplinary, university-wide collaborations we have seen to date, with stakeholders in faculties across the university and in communities outside academia.

At the end of our first year, we looked forward to opening a biobank that would facilitate closer links between clinician- and basic scientists, as well as a multimodal imaging facility that would make clinical trials more efficient and answer research questions we couldn't pose anywhere else. Under the leadership of Dr. Seti Boroomand, our biobank continues to grow and is now a hub for important microbiome research; Dr. Cresswell initiated collaboration between basic scientists,

microbiologists and the movement disorders clinic this past year to study the role of microbes in health and disease. And, with the support of donors and the Canada Foundation for Innovation, the Charles E. Fipke Integrated Neuroimaging Suite opened this spring.

Looking back over these past five years, we are tremendously proud of our collective accomplishment. The era of interdisciplinary team science that we anticipated in the beginning is here and profoundly impactful. Five years ago we imagined ourselves at the leading edge of neuroscience discovery; now we can see that we are scaling a mountain and propelling Canadian brain research to previously impossible heights.

Five years ago, we could only imagine the possibilities of a centre built on a vision of collaboration and community. Every single day we are surprised and moved by the passion of our people—from the researchers and trainees working tirelessly in the clinics and labs, to the staff who go above and beyond in service of the centre's mission and values—and I am so very grateful to share our successes again, with you.

Sincerely,

Dr. Jon Stoessl

Director, Djavad Mowafaghian Centre for Brain Health



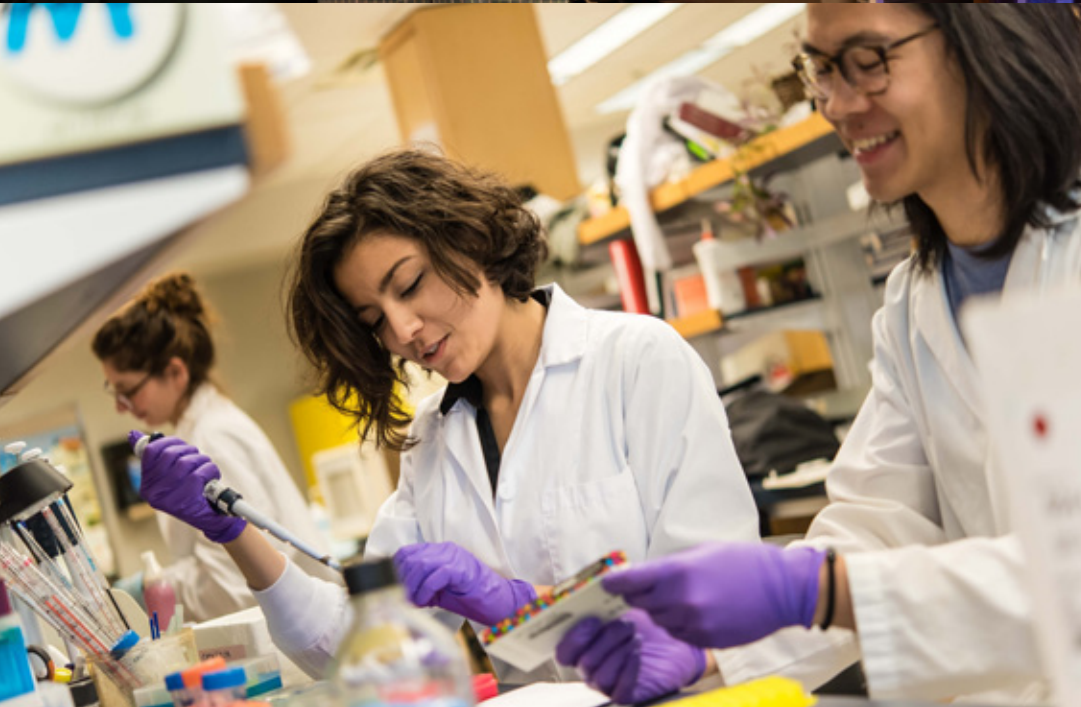
Graduate student Wansu Qiu, postdoctoral fellows Dr. Travis Hodges and Paul Sheppard, and research assistant Muna Ibrahim in Dr. Liisa Galea's laboratory.

"The purpose of our great university is reflected in the amazing work that takes place every day in the Djavad Mowafaghian Centre for Brain Health. Pursuing excellence in research, learning and community engagement to advance a better world for us all is at the heart of the groundbreaking discoveries that have come out of this facility in just the past five years. UBC is profoundly honoured to have such a close friendship with the Djavad Mowafaghian Foundation and realize Dr. Mowafaghian's vision of improving brain health throughout the world."

Santa J. Ono, President and Vice-Chancellor - Santa J. Ono, President and Vice Chancellor

"The Djavad Mowafaghian Centre for Brain Health has achieved nothing short of what was envisioned—clinicians and scientists with a breadth of expertise and experience are working in concert to advance knowledge and solutions to some of the greatest health challenges of our time. The past half-decade of multidisciplinary collaborations have delivered steady progress and remarkable breakthroughs toward our shared goal of bettering the lives of individuals and families suffering the effects of neurodegeneration and neurological and psychiatric conditions. I am proud of the work we have accomplished together, which is effecting change not only here at the Djavad Mowafaghian Centre for Brain Health, but in communities across British Columbia and around the world."

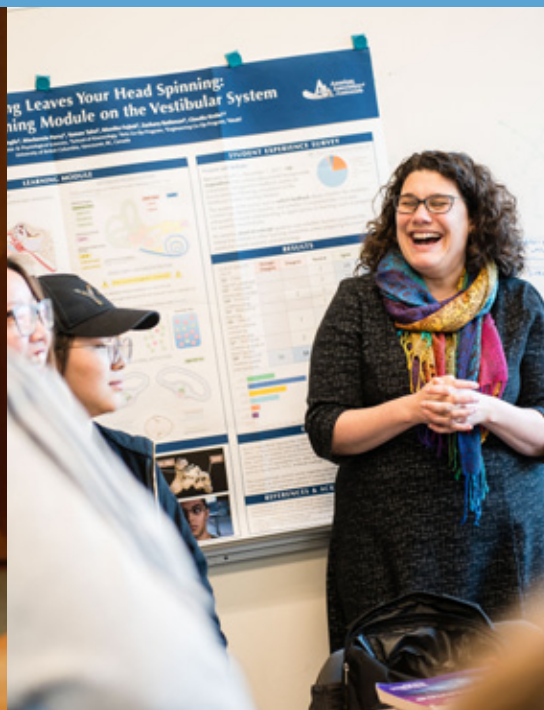
Dr. Dermot Kelleher, Dean, Faculty of Medicine and Vice-President, Health, University of British Columbia



FIVE YEARS IN

Since the opening of the Djavad Mowafaghian Centre for Brain Health in 2014, the centre has continued to grow exponentially and produce research that changes our world. The centre is now home to an extraordinary 20 Canada Research Chairs, supported by Government of Canada funding for the world's most accomplished and promising researchers, as well as 70 PhD students and 44 masters students who are well on their way to becoming the next leaders in brain health.

This past year alone, research funding topped \$44 million. Support included funding for vital Alzheimer's research led by Drs. Haakon Nygaard and Teresa Liu-Ambrose, and a gift towards Dr. Neil Cashman's work in discovering the root causes of neurodegeneration, which could have profound effects on treatment for diseases like Parkinson's and ALS.





Graduate student Jasmine Gill (left) and Dr. Cheryl Wellington (right).

NEW APPROACHES TO TREATING DEPRESSION

A new Magnetic Seizure Therapy (MST) machine is now operational in Dr. Fidel Vila-Rodriguez's lab. The MST machine, one of only a handful available in the world, can provide groundbreaking treatment for people who suffer from severe depression. MST therapy may also prove useful in treating schizophrenia, bipolar depression or obsessive-compulsive disorder, and could offer researchers groundbreaking solutions for how mental illnesses are diagnosed and treated.

A BLOOD TEST FOR BRAIN CHANGES

Dr. Cheryl Wellington, a key researcher in the Djavad Mowafaghian Centre for Brain Health and internationally recognized for her work in Alzheimer's disease, is using donor-funded, state-of-the-art technology to establish blood biomarkers to help treat traumatic brain injury. Known as the Simoa HD-1 Analyzer, this remarkable piece of technology—the only known analyzer of its kind in Canada—is used to detect changes in the brain via the blood, ultimately helping to improve treatment and recovery outcomes after concussion. The possibilities for Dr. Wellington and her team to make new discoveries is exciting. "Our lab at the Djavad Mowafaghian Centre for Brain Health is now the go-to laboratory in Canada for this technology," says Dr. Wellington. "With these new resources we have the potential to make new breakthroughs in treating brain injury and significantly improve lives."

The new General Electric Healthcare SIGNA™ hybrid PET-MRI scanner housed in the Charles E. Fipke Integrated Neuroimaging Suite.

THE CHARLES E. FIPKE INTEGRATED NEUROIMAGING SUITE

Construction on the Charles E. Fipke Integrated Neuroimaging Suite wrapped up in February 2019, and the suite officially opened in the spring. Home to the only PET/MRI designated for brain-related research and the only GE PET/MRI in Canada, this new facility will enable leading academics to accelerate clinical trial discoveries, improve research participant experiences, create unmatched learning experiences for students, and design more robust research studies.

The imaging suite represents a new era of discovery in the Djavad Mowafaghian Centre for Brain Health. The unification of all brain imaging and next-generation technology in a single location will help advance knowledge of how the human brain functions in disease and health and ensure that the centre remains at the forefront of brain research.





RESEARCH HIGHLIGHTS

Welcoming New Researchers

Dr. Mark Cembrowski

Dr. Cembrowski is a mathematician and neuroscientist who represents a new generation of brain health researchers. His work investigates how the brain forms, stores and retrieves memories. The Djavad Mowafaghian Centre for Brain Health's environment of collaborative energy complements Dr. Cembrowski's multidisciplinary, multiscale approach.

Dr. Annie Vogel Ciernia

Dr. Ciernia will be joining the Djavad Mowafaghian Centre for Brain Health on July 1, 2019. Her research in genetics and the mechanics of brain neuroplasticity—how the brain continues to adapt to our environments and experience—will uncover improved therapy for neurodevelopmental disorders.

The Next Generation of MS Research

Across Canada, the next generation of multiple sclerosis (MS) researchers is working together on an interdisciplinary longitudinal study to understand how and why MS progresses differently in different individuals. From the microscopic mechanisms that lead to changes in the brain, to the economic impact of the disease on the Canadian healthcare system, the Canadian Proactive Cohort in MS (CanProCo) study will look at the disease from all angles.

MS is an autoimmune disease that occurs when the body's immune system attacks myelin, the fatty material that insulates neurons and enables rapid transmission of electrical signals. When myelin is damaged, communication between the brain and other parts of the body is disrupted, leading to vision problems, muscle weakness, difficulty with balance and coordination, and cognitive impairments. The causes of the disease and mechanisms of its progression remain unknown, though scientists have implicated genetic variations and environmental factors, including a lack of Vitamin D.

Canada has one of the highest rates of MS in the world. An estimated 100,000 Canadians are living with MS, and the disease is most often diagnosed in young adults aged 15 to 40.

Above: Dr. Lara Boyd explains her research during a visit with The Honourable Bill Morneau. In the background, postdoctoral fellow Dr. Jason Neva demonstrates transcranial magnetic stimulation on graduate student Ronan Dyer.



Dr. Shannon Kolind (left) and Dr. Karen Lee (right).

CanProCo is the first national effort directed at understanding progression in MS, and will look at the biological, clinical, epidemiological, and health systems factors underlying disease progression. To do so, the project is drawing on expertise from nearly 50 researchers at five sites across Canada. At UBC, Dr. Anthony Traboulsee will lead recruitment at the UBC Hospital MS Clinic at the Djavad Mowafaghian Centre for Brain Health; Dr. Shannon Kolind and Dr. Roger Tam will lead the neuroimaging pillar of the study; Dr. Jacqueline Quandt will provide an immunology perspective; and Dr. Larry Lynd with the Faculty of Pharmaceutical Sciences will provide a health economics perspective to better inform the “big picture” in MS.

“The exciting part of this research is who we’re engaging,” said Dr. Traboulsee. “This really is an effort led by our younger researchers, but also our patient community, and experts from areas outside of traditional siloes. There is tremendous talent across Canada, and so we believe we’re working towards a model for what research can be when we work across disciplines toward a single goal.”

For Dr. Karen Lee, Vice-President, Research at the MS Society of Canada, this five-year national project represents an opportunity to bring many lines of inquiry into focus. Dr. Lee has been a champion of this initiative since 2013.

“This is really a convergence of many different areas of research, and if we can do this right from the start, we’re hopeful that we will be able to answer some of the tougher questions we hear from our community,” said Dr. Lee. “We’re asking big questions, bringing in truly varied perspectives, and leveraging our discoveries to date.”

Canadian MS research has a rich history of success, and CanProCo will build on that important legacy. The study will follow 1,000 people with MS from five sites across Canada, including here at UBC.

In addition to the wealth of information the researchers will collect, the team will also evaluate treatment effects, the impact of early diagnosis and treatment on progression, and the impact of physical activity and other non-pharmacologic interventions.

“The results from the cohort study have the potential to provide a better understanding of the biological mechanisms of progression, risk factors for progression, biological markers indicative of progression, and how people will progress over time,” said Dr. Lee.

“CanProCo offers an unprecedented opportunity to evaluate a spectrum of factors related to MS onset and progression,” says Dr. Traboulsee. “The insights we glean from this research will inform clinical practice, health policy, and a new generation of studies; we’re not only working to understand MS more fully, we’re also putting a foundation in place for future research in Canada and beyond.”

Healing the Leading Cause of Brain Injury in Women

Each year 276,000 Canadian women experience domestic violence, and of those who seek the safety and support of a women’s shelter, up to 90% demonstrate signs of concussion—a traumatic brain injury that affects normal functioning of the brain. Despite this high prevalence, women who are escaping violent relationships aren’t often screened for traumatic brain injuries.

Dr. Paul van Donkelaar, from the University of British Columbia Okanagan, is working with Dr. Cheryl Wellington to find blood biomarkers that can indicate trauma to ultimately improve diagnosis, treatment and recovery outcomes so better support can be provided to survivors.

When Life Gives You Parkinson's

"One of the most amazing things I've discovered about the scientific community is that the researchers are so passionate about what they are doing," says Larry Gifford, Senior Program Director at CKNW and Global News. "When you think about scientists you think about their brains, but what I've been really struck by is the heart they put into their work."

We first met Larry Gifford in September, when he visited the Djavad Mowafaghian Centre for Brain Health to film a series of interviews with researchers including Dr. Matt Farrer, whom he met at a Porridge for Parkinson's event last year, and neurologist Dr. Jonathan Squires for a special series on Parkinson's disease (PD) on Global BC. Gifford, who has worked in radio broadcasting both on air and behind the scenes for nearly 30 years, is a natural storyteller who has been demystifying the disease for listeners around the world on his podcast, *When Life Gives You Parkinson's*.

Gifford was diagnosed with Parkinson's disease in August 2017, at age 45. He remains actively employed in local media, and since revealing his diagnosis during a Global BC special on World Parkinson's Day (April 11, 2018), Gifford has been using his platform to explore PD from every angle in order to shine a light on a disease that many people do not know very much about. Recent podcast episodes have explored the link between PD and depression and anxiety, the role of exercise as a therapeutic intervention, and the way PD challenges aspects of our lives we may take for granted, like pet ownership.

"The idea with the podcast was always to ground the story of Parkinson's disease in the personal – my



Dr. Jonathan Squires (left) checks in with Larry Gifford (right) in the movement disorders clinic.

experience, and the experiences of others with PD – in consultation with neurologists, geneticists, and others in research to provide expertise and context," says Gifford. "It's a little bit about me, but it's also about anyone with PD. Our experiences are so different, and our stories are all unique. At the end, I like to bring it home and talk about the personal impacts of PD—the complexities of caregiving, what it's like to live with a parent with PD – it's something different every week."

The podcast, despite its relatively short history online, was selected as one of Apple's best podcasts of 2018. For Gifford, this speaks to the uniqueness of the topic, and the appetite for this type of content.

"More than 10 million people around the world have PD," says Gifford, who was invited to join the board of the Pacific Parkinson's Research Institute (PPRI) in September. "We need to keep telling our stories, to raise awareness, to drive funding for research. It's in research where we will discover new treatments and hopefully one day a cure. With PPRI, I am in a position where I feel like I can make a direct impact in that regard. But, whether it's fundraising or advocacy, I'm happy to help however I can."

Long-Term Effects of Pre-Birth Exposure to Anti-Depressants

Researchers with the Djavad Mowafaghian Centre for Brain Health found selective antidepressant treatment during pregnancy is associated with better cognitive performance in 12-year-old children. Dr. Tim Oberlander's research team assessed mothers' moods during and after

pregnancy and their children's skills in creative problem solving and ability to focus. These findings build on Dr. Oberlander's broader research program, examining the developmental effects of maternal depression on babies and children. They also build on Dr. Adele Diamond's research program, examining how children's skills can be affected by biological and environmental factors.

Dr. Thalia Field



Dr. Matthew Farrer



Dr. Haakon Nygaard



Better Testing for Stroke Patients

Dr. Thalia Field is investigating the methods used to diagnose subtle cognitive issues in stroke patients. Specifically, she wants to learn how the current gold standard in cognitive impairment test for stroke patients—the Montreal Cognitive Assessment (MoCA)—stacks up against the NIH Toolbox, Cognitive Battery (NIH) test, a more challenging, iPad-based exam.

Dr. Field's research will lead to better detection and tracking of subtle cognitive issues that are usually only noticed by the patient themselves or their family members. She says, "Someone might pass the MoCA, but still not be able to function at the same level they were before having a stroke in terms of their ability to multitask, make decisions and fulfill their duties at work."

Research Collaboration—A Key To The Centre's Success

As life expectancy increases, so does the risk of diseases related to old age. Dr. Matthew Farrer and Dr. Haakon Nygaard are working together at the Djavad Mowafaghian Centre for Brain Health to lead the charge in strategies to prevent age-related neurodegeneration. They are initiating a unique collaboration that will bridge clinical research and medical genetics to prove that large-scale genetic screening for diseases like dementia can help people around the world.

Popular Theory vs. Scientific Evidence

For nearly a decade, some people with MS have put their hopes in a controversial intervention known as venoplasty to reduce inflammation and avoid disability progression. The invasive surgery, which involves dilating and stenting veins in the neck, was becoming popular through social media despite limited scientific evidence. There was a clear demand for information and investigation. For Dr. Anthony Traboulsee, Director of the UBC MS & NMO Research Program at the Djavad Mowafaghian Centre for Brain Health, it was an opportunity to listen to the MS community and ensure patients could have better access to information. Dr. Traboulsee was the lead investigator on two Canada-wide clinical trials that determined that venoplasty was an ineffective treatment for MS.



Dr. Anthony Traboulsee

COMMUNITY OUTREACH

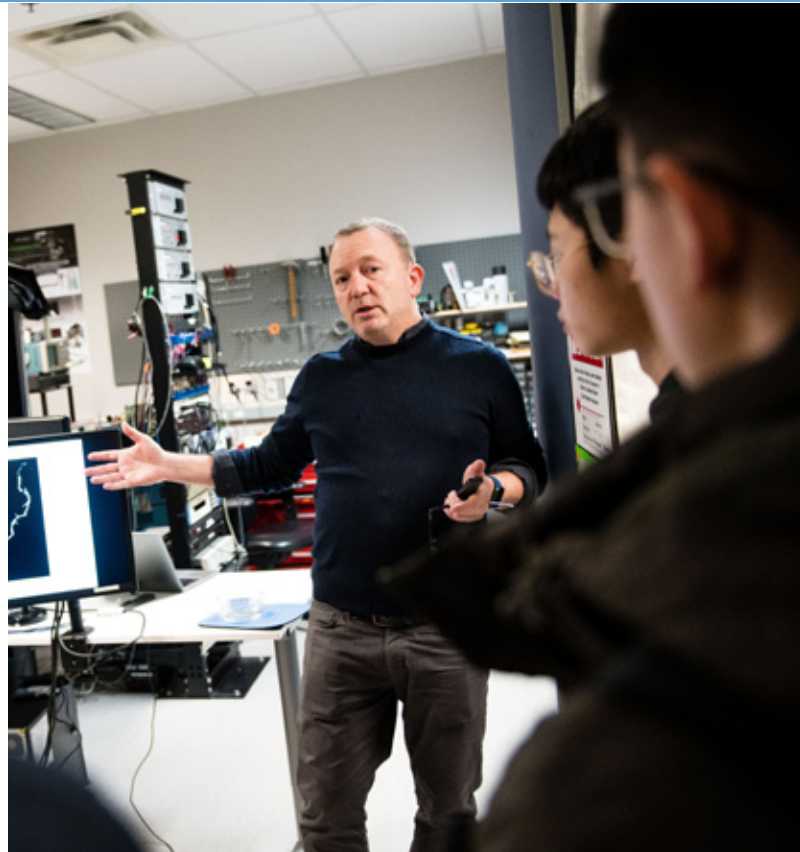
Bringing people together is the heart of the Djavad Mowafaghian Centre for Brain Health. People from all walks of life, from communities all around the world, come together within the centre to share knowledge, gain perspective and provide support. The centre held several significant events that helped to advance health and education in the past year.

Participating in Language Research

Learning language is one of the most mysterious and exciting achievements of early childhood. Dr. Janet Werker's Infant Studies Centre continues to focus on research to explain the mechanisms that make it possible. Elizabeth Hand, Digital Media Producer at Science World, who participated in Dr. Werker's study with her nine-month-old son Jericho, was excited to take part. "This research is important to better understand how children adopt language. I am happy that we could contribute data. Jericho listened to a series of unique sounds in a variety of languages to give researchers an idea of when a child loses the ability to hear these unique sounds. I want researchers to work on issues of child development, and that's difficult if children aren't involved, so it's important to participate in research."



Elizabeth Hand and Jericho



Dr. Kurt Haas explains neuron growth to high school students.

Lighting the Way

On January 22, nearly 130 Grade 10 students from Vancouver's Prince of Wales Secondary School visited the Djavad Mowafaghian Centre for Brain Health. Researchers and clinicians shared their unique career paths with the students, who were given rare insights into the challenges people face in life and the value of failure. Michelle Eisner, Program Coordinator for the UBC MS Connect Education Program, inspired students and shed light on the myriad of possibilities a career in science can offer. A second tour in May also encouraged 150 students from Vancouver's Lord Byng Elementary to look into scientific professions; Eisner receives regular requests from local schools, and will continue the program into 2019.



Michelle Eisner

Staff Highlight: Michelle Eisner

Michelle Eisner is the program coordinator for the UBC MS Connect Education Program, but the scope of her influence extends beyond the trainees, clinical fellows, and residents who will be the neurologists and multiple sclerosis (MS) researchers of tomorrow. While she is essential to the operations of the MS & NMO Research Program, she is also a strong advocate for science education, and her work in connecting high school students with researchers, clinicians and graduate students in order to inspire high school students to choose science has raised the profile of her team and the Djavad Mowafaghian Centre for Brain Health.

A major pillar of Eisner's work has been in elevating the reputation of the UBC MS and UBC MS Connect Programs in order to attract the best and most ambitious new fellows and researchers to the program. Having worked at UBC since 2002, she is a problem solver who

builds relationships across disciplines in order to further the goals of the program and Dr. Anthony Traboulsee, Director MS Clinical Trials Research Group and Medical Director of the MS Clinic at DMCBH. She is the "go-to" for many people looking for information or interaction with MS researchers and clinicians at UBC.

"Michelle does an amazing job, and her work has a big and very positive impact on our community," said Dr. Traboulsee.

"We all owe Michelle a big thank you for organizing such wonderful outreach for local high school students," said Dr. Anthony Traboulsee. "Michelle does an amazing job, and her work has a big and very positive impact on our community."

"The DMCBH and the UBC MS Program provide me the perfect opportunity to take new ideas and 'think outside of the box' and develop exciting new educational opportunities for learning not only the researchers and clinician of today's but also those of tomorrow," said Eisner.

"On behalf of the Byng students and staff, I must tell you just how pleased our students were with the entire UBC Neuroscience Day! They came away from their experience with new knowledge, and the enthusiasm for science and research shared by all the presenters was quite contagious. The students are asking great questions, and eager to learn more in the area. Also, the brochures we are now giving out will really help the students in their decision-making process for post-secondary. I too hope that many of them choose Science!" – Marilyn Snell, Science Department Head, Lord Byng Secondary School.

How Music Changes the Brain

The Djavad Mowafaghian Centre for Brain Health welcomes visitors who are drawn by its innovative and encompassing approach to brain health. Renée Fleming, renowned American opera singer and soprano, enjoyed meeting several members of the research community at the Djavad Mowafaghian Centre for Brain Health following her popular "Music and the Mind" presentation at UBC in September 2018. "Today we are riding a wave of scientific discovery in music and neuroscience, and I'm fascinated by the breadth of the research being conducted," said Fleming.

Dr. Jon Stoessl tours Renée Fleming through the Djavad Mowafaghian Centre for Brain Health.



THE WALL OPERA PROJECT

To understand the potential of opera training to sculpt a brain for better learning, the Wall Opera Project is the first of its kind and spans across the faculties of Arts, Medicine, Education, Science, and Applied Science. This integrated approach represents a vision for what the future of research could look like at UBC and beyond.

Professor Nancy Hermiston, Director of the UBC Opera Ensemble, brought the team together to observe the long-term benefits of opera training, and whether it leads to lasting changes in brain function.

“Our main question is whether or not opera training rewires the brain,” says Dr. Lara Boyd, who is one of eight Principal Investigators on the project. “Students who are gifted in one area can exhibit challenges in other areas of learning, but we know that students who train in opera demonstrate remarkable plasticity.”

Universe of the Brain

In 2018, the Djavad Mowafaghian Centre for Brain Health continued its collaboration with the H. R. Macmillan Space Centre for “Universe of the Brain”—a popular lecture series illuminated under the mesmerising visuals of the planetarium dome.

“Mapping the Final Frontier” featured the MRI Research Group, including Drs. Shannon Kolind and Alex Mackay. The audience was able to learn about navigating the brain’s terrain through different MRI techniques.

“Debunking the Modern Mythology of the Brain” was an interactive evening that offered a candid look at popular science myths with Drs. Liisa Galea and Julie Robillard.



Dr. Liisa Galea and Dr. Julie Robillard

Indigenous Community Outreach Project

The Djavad Mowafaghian Centre for Brain Health is an innovative hub that sparks inspiration and discovery, offering students enriched educational experiences and unprecedented opportunities to learn. As part of a community outreach program advocated for by Dr. Kurt Haas, three Indigenous undergraduate students will have the opportunity to participate in 16-week summer research internships in labs at the Djavad Mowafaghian Centre for Brain Health. According to Dr. Haas, “The program represents an opportunity for students from Indigenous backgrounds, who are underrepresented in the life sciences field, to gain fundamental neuroscience experience and inspiration to continue with careers in brain research.”

Partnerships

The Djavad Mowafaghian Centre for Brain Health is advancing collaboration to transform the potential of research partnerships across the globe. By working together there is no limit to what we can achieve for society.

EMBED PROJECT

The Enhanced Measurement-Based Care Effectiveness for Depression (EMBED) project is one of the first major initiatives for the Asia-Pacific Economic Cooperation (APEC) Digital Hub at the Djavad Mowafaghian Centre for Brain Health. The project will adapt and develop innovative digital tools such as smartphone apps to see how technology can help solve the global burden of mental illness.

UCLA GRAND CHALLENGE

The University of California Los Angeles (UCLA) Depression Grand Challenge team visited the Djavad Mowafaghian Centre for Brain Health on May 9, 2018. The Depression Grand Challenge is an ambitious, long-term student health project to decrease depression at UCLA. Collaboration could inform a similar project for student health at UBC and facilitate promising breakthroughs to address one of the world’s greatest health problems.

TRAINING THE NEXT GENERATION

Great people in an inspiring space. This combination has allowed the Djavad Mowafaghian Centre for Brain Health to provide UBC students with exceptional training and support, and attract the world's leading minds to create lasting and meaningful advancements in brain research and care.

Student Profiles

RAND EID, PHD STUDENT

Pregnancy and motherhood don't just lead to "mom brain," a sort of fogginess that occurs during pregnancy and in the months post-partum; in fact, reproductive experiences may change the trajectory of women's aging across the lifespan, finds new research from PhD candidate Rand Eid and colleagues in Dr. Liisa Galea's and Dr. Joanne Weinberg's labs.

Eid and her team found that adult hippocampal neurogenesis—the process by which new neurons are formed in the hippocampus, a brain region involved in cognitive and emotional function—slows during pregnancy and the post-partum period, perhaps contributing to the cognitive and emotional changes that many new moms experience. However, in middle age, mothers seem to experience an increase in neurogenesis, a time when non-mothers experience a steep decline.

"Evidence is emerging that pregnancy and motherhood alter disease susceptibility later in life in a spectrum of disorders including diabetes, breast cancers and even dementia," says Dr. Galea. "Understanding how the brain ages, and the relationship between immune and neuroplastic markers, may help researchers shed some light on what happens during a female reproductive experience that alters the course of aging and disease susceptibility."

During gestation, a mother's immune system adapts in order to maintain the pregnancy and support the developing fetus, but little research exists on neuroimmune changes associated with motherhood. Because neuroimmune processes are also involved in emotional and cognitive regulation, Eid and colleagues studied microglia, the brain's immune cells, in the context of motherhood. They found that in rats, microglia change shape in the postpartum period, retracting their processes which suggests an increase in brain inflammation during that time.



"We are not sure what the functional significance of these changes to the brain's immune cells might be, but we question whether there is a link between inflammation in the brain and postpartum depression in some mothers," says Eid.

They also found that rats that were mothers showed a decrease in neurogenesis—the production of new neurons in the hippocampus—during pregnancy and immediately afterward. Interestingly, as these mothers aged, they showed even more neurogenesis than rats that had never given birth.

"This finding is exciting because neurogenesis in the hippocampus has been linked to learning and memory, and there is evidence to suggest that motherhood can impact cognitive function later in life," Eid says.

For Eid, these insights were important and represented further evidence that motherhood has a lasting influence on female physiology in clinically relevant ways.

"Beyond studying differences between males and females, sex-specific factors such as motherhood should be taken into consideration as a long term health factor for women," says Eid. "Studies like this one are important as they show that sex-specific experiences alter the trajectory of brain aging."

ALIREZA KAMYABI, MASTER'S STUDENT

Alireza Kamyabi began his relationship with the Djavad Mowafaghian Centre for Brain Health in January 2016 as an undergraduate co-op student in Dr. Brian MacVicar's lab. He left Vancouver in 2017 to take graduate courses in sensory neurobiology at the University of Munich, but returned in September 2018 to begin his graduate studies with the Graduate Program in Neuroscience, returning to the MacVicar lab.

"There are many factors that motivated me to pursue a master's in neuroscience, but the most significant one for me was the challenge of describing and understanding how the nervous system functions," says Kamyabi.

"The brain is one of the least understood organs in the body and also one of the most interesting ones to study. It's often described as the last frontier of science, so it's exciting to take part in discovering how our nervous system works."

Kamyabi studies astrocyte calcium signalling to understand how astrocytes—star-shaped glial cells—regulate the transmission of communication within the brain, and whether they release glutamate, an excitatory amino acid that, in excess quantities, can cause brain damage.



"I'm specifically looking to see if glutamate is released by astrocytes and whether they contribute to excitotoxicity, a process that destroys neurons and impairs electrical transmission in the brain," Kamyabi explains. "It was important to me to get to work with Dr. MacVicar at the Djavad Mowafaghian Centre for Brain Health because his research style—systematic, very analytical—is something I aspire to and would like to mirror in my own studies."

While Kamyabi is currently focused on earning his Master's degree (he would like to complete his PhD eventually, perhaps), he has also been a key figure in establishing an undergraduate neuroscience program at the University of British Columbia.

Student demand for an undergraduate program in neuroscience has been quietly increasing for a number of years, as the courses that are currently available span several faculties and departments, making for an inefficient approach to cobbling together a foundational neuroscience education. Last year, Kamyabi initiated a survey to understand student sentiments around a prospective program. The survey confirmed what many already knew – there is an appetite for this type of education on campus, and UBC is an ideal place to nurture young would-be neuroscientists.

"The faculty have demonstrated a lot of enthusiasm for the idea of an undergraduate neuroscience major, and Professor Ono has as well," says Kamyabi. Thanks to his efforts—and the efforts of the UBC Undergraduate Neuroscience Club—the process of launching a program is now underway. "Faculty have begun making plans and looking into possible curricular structures that would be a good fit, and our first Town Hall will take place in March. We have great world-class faculty and the resources to support an excellent comprehensive neuroscience program here at UBC. "

The undergraduate neuroscience major will unite neuroscience education across the faculties of medicine, science, and arts. Students currently interested in neuroscience often pursue opportunities through co-op programs, as Kamyabi did, or by volunteering in labs.

"Students need the opportunity to learn about research before they embark on graduate studies in neuroscience," says Kamyabi. "Undergraduate students feel the gap in their neuroscience curriculum, but it seems like we're finally making progress toward establishing a fundamental neuroscience program and UBC, and I'm proud of what we've accomplished so far."

BRIANNE KENT, POSTDOCTORAL FELLOW

As anyone who has ever lain awake in the dark hours after going to bed will attest, sleep is complicated and a lack of it can be disruptive to every aspect of one's life. Deep sleep is important for a number of brain functions, and essential in clearing the brain of toxic proteins such as beta-amyloid, which can accumulate in the brain over the course of the day. Beta-amyloid proteins contribute to the plaques that form in the brain in disorders such as Alzheimer's disease.

Dr. Brianne Kent has been conducting her postdoctoral research in Dr. Haakon Nygaard's lab since 2015, studying sleep and the role of circadian rhythms—the body's internal clock—and how those patterns change in Alzheimer's disease. In early 2019, with generous career transition support from the National Institutes of Health (NIH), Dr. Kent will be taking on a new role with the Division of Sleep and Circadian Disorders at Brigham and Women's Hospital and Harvard Medical School.

"This is an incredible opportunity for Dr. Kent, as she has secured a highly coveted pre-faculty award from the NIH," said Dr. Howard Feldman, who has mentored Dr. Kent throughout her postdoctoral fellowship at the Djavad Mowafaghian Centre for Brain Health. "Her postdoctoral



fellowship at UBC with us has been very successful, and we are very enthusiastic about this next phase in her career as she transitions to an independent research career.”

This opportunity represents an important step in establishing an independent research program. As a translational neuroscientist with a keen interest in the relationship between basic science discoveries and patient care, Dr. Kent honed her unique skill-set in collaboration with Dr. Nygaard and the clinical and research teams with the UBC Hospital Clinic for Alzheimer Disease and Related Disorders (UBCH CARD). The overarching goal of her research is to uncover early biomarkers for Alzheimer’s disease in order to develop novel therapeutic interventions to slow disease progression.

“In the Nygaard lab, we’ve been able to identify a reduction in slow wave brain activity in transgenic mouse models of Alzheimer’s disease,” says Dr. Kent. **“We’re looking to determine if there is a similar Alzheimer’s signature in the electroencephalogram (EEG) recorded in patients. To do this we have developed a wearable tool—essentially a portable EEG headband—in collaboration with Dr. Martin McKeown and Dr. Jason Valerio in the UBC Pacific Parkinson’s Research Centre. The goal is to determine whether UBCH CARD patients experience a reduction in slow-wave sleep indicating reduced sleep quality and higher risk of cognitive impairment.”**

For Dr. Kent, who received a Banting Postdoctoral Fellowship from the Canadian Institutes of Health Research last year, this next phase of her postdoctoral training is an opportunity to pursue gold-standard certification in sleep and circadian rhythms research as she works toward a career as a translational scientist.

“The K99/R00 award from the NIH will help me establish a research program as an independent scientist,” says Dr. Kent. “The award provides funding support to transition from the postdoctoral phase to establishing my own lab. It’s a unique program, and such funding doesn’t really exist in Canada, which is too bad—this period is a challenging one for an early career researcher, but Canada does not offer the dedicated research funding to support postdoctoral fellows as they try to transition to an Assistant Professorship.”

With the K99/R00 award from the NIH, Dr. Kent will receive five years of funding, including start-up funds,

which will enable her to complete her training and establish her own lab, improving the odds of her recruitment to a tenure-track faculty position.

Despite her move, Dr. Kent will remain involved with ongoing research at UBC including MINT, a clinical trial in Alzheimer’s patients evaluating the benefits of a dietary supplement high in medium-chain triglycerides, such as those found in coconut oil.

“Working with the Alzheimer’s clinic at DMCBH was my first opportunity to be involved in clinical research, and it’s informed how I’d like to see my career unfold,” says Dr. Kent. “Working with patients is the best way to understand the value and impacts of translational research, and I feel so fortunate to have had this unique immersive learning experience.

Directors’ Innovation Fund

Incredible things happen when we work together. That’s the philosophy of a new student award that supports home-grown innovation at the Djavad Mowafaghian Centre for Brain Health, and its member-affiliated labs across campus. This new award will provide students in need with access to a life-changing education, empowering them to collaborate and make new breakthroughs in brain health.

New Opportunities for UBC Psychiatry Students

2018 brought many new opportunities for UBC students based out of the Djavad Mowafaghian Centre for Brain Health, including the establishment of the Marshall Scholars and Fellows Program in Mental Health. The program, which supports promising young scholars who will contribute to advancing research and treatment of psychiatric disorders, is expected to provide financial backing for up to 19 students every year. Annual grants will offer excellent support for students who are training to be the next generation of leaders in mental health. The funding generated by the Marshall Scholars and Fellows Program in Mental Health has also unlocked additional funds from the Province of British Columbia’s BC Graduate Scholarships program and will be able to benefit even more students for years to come.

Partnerships

The Djavad Mowafaghian Centre for Brain Health represents a partnership between Vancouver Coastal Health and the Faculty of Medicine at the University of British Columbia. The centre was made possible with a generous donation from the Djavad Mowafaghian Foundation, as well as contributions from other philanthropists and leaders, as well as those of the federal and provincial governments.



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