Djavad Mowafaghian
CENTRE FOR BRAIN HEALTH

YEAR IN REVIEW 2021/2022

ADVANCING BRAIN HEALTH THROUGH RESEARCH AND CARE

MESSAGE FROM THE DIRECTORS

Despite the ongoing challenges that the COVID-19 pandemic has posed over the last two years, our community has pulled together to continue conducting groundbreaking research and delivering quality patient care. In the past year alone, we made significant progress on many of the goals set out in our strategic plan.

With the easing of COVID restrictions and increased activity on campus came more opportunities to build community and augment our ability to translate science from the lab to the clinic. We held a research retreat at UBC Okanagan, where over 120 faculty and trainees gathered to exchange ideas and learn about the wide range of clinical and foundational research being done at the Djavad Mowafaghian Centre for Brain Health. This year, we made great strides in advancing our five Integrated Research Programs (IRPs) that aim to tackle the most pressing questions about how the brain develops and functions and how these processes go awry in disease. With group leaders established for each IRP, we have developed key goals and action items to guide exciting and new research activities going into the new year.

Research advancements made by our members have been realized in part by Centre-led initiatives including Kickstart Research Grants, AIzheimer Disease Research Grants, and Equipment Funds, which have provided over $1 million in dedicated funding for new partnerships between foundational and clinical scientists since 2020. The hiring of a new grants facilitator has also allowed for increased support for research activities and funding opportunities. In 2021-22, our members forged over 400 collaborations and generated $55 million in research funding.

In addition to our five Integrated Research Programs, the Centre boasts five UBC Research Excellence clusters which boost cross-disciplinary translational research within the greater UBC community and beyond. Two of these clusters, focused on neuropsychiatry and vision research, were established in 2022 and led by members of the Centre.

At the heart of the Centre are our trainees, who are being mentored as the next generation of scientists. A variety of learning opportunities are available to students in the Graduate Program in Neuroscience including programming courses and workshops hosted by the Dynamic Brain Circuits Cluster. We are excited to welcome the first group of students to UBC's new Undergraduate Program in Neuroscience in the fall of 2022. This new Bachelor of Science degree brings

together research and teaching expertise spanning three faculties and multiple departments to offer a unique interdisciplinary learning experience and provides students with hands-on opportunities to work in our members' laboratories.

Our Neuroscience Research Colloquium series continued this year with a mix of in-person and virtual talks by world-renowned neuroscientists, elevating the Centre's profile in the UBC research community. Our members also lead community outreach and educational initiatives such as the Brain Wellness Program and Neuroethics Canada, which host a variety of classes and events that support healthier lifestyles and provide forums for conversation.

While we welcomed many new trainees and faculty members to the Centre in the past year and now have over 130 full and associate members, we also mourned the loss of our biggest champion, Dr. Djavad Mowafaghian, for whom the Centre is named. Dr. Mowafaghian's focus was to improve the health and education of children, with a special interest in advancing research into brain disorders affecting children. We are grateful for his foundation's generous contributions and are confident his legacy will continue through the scientists and clinicians who work tirelessly at the Centre each and every day to advance brain health across the lifespan.

Dr. Lynn Raymond
Director,
Djavad Mowafaghian Centre for Brain Health

Dr. Shernaz Bamji
Associate Director,
Djavad Mowafaghian Centre for Brain Health

"The impact of the research and clinical care that takes place at the Djavad Mowafaghian Centre for Brain Health reaches far beyond the UBC campus, as evidenced by the national and international recognition that our faculty, staff and trainees receive.

I am proud of the progress the Centre has made during my time at UBC over the past six years. In particular, I am pleased to see how well its new strategic plan aligns with the university's academic mission of continued excellence in teaching, learning and research. UBC is grateful for the contributions of the Djavad Mowafaghian Foundation and other supporters in helping to improve brain health and wellbeing."

SANTA J. ONO

President and Vice-Chancellor,
University of British Columbia

"Collaboration is key to our success. I am grateful for the continued leadership of Drs. Lynn Raymond and Shernaz Bamji in ensuring that the Djavad Mowafaghian Centre for Brain Health remains at the forefront of neuroscience research and patient care in Canada. Even with the ongoing pandemic, researchers and clinicians have continued to make important contributions to improving the lives of people with neurological conditions.

It is also exciting to see the Education, Research, Organization and Partnership pillars that are central to the Faculty of Medicine's refreshed strategic plan are perfectly reflected in the Centre's plan. With this shared focus, I look forward to seeing what we can accomplish together as we work towards our vision of "transforming health for everyone."

DR. DERMOT KELLEHER

Dean, Faculty of Medicine and Vice-President, Health,
University of British Columbia

IN MEMORIAM

Dr. Djavad Mowafaghian CM, OBC
(1927-2022)

We were deeply saddened to learn of the passing of Dr. Djavad Mowafaghian. He was a selfless and compassionate man who dedicated his efforts to improving the lives of others, especially children, through education, health and wellness. We join President Santa J. Ono and the rest of the UBC community in extending our sincere condolences to the Mowafaghian family.

During the opening ceremony of the Djavad Mowafaghian Centre for Brain Health in 2014, Dr. Mowafaghian said, "It is my hope that scientists working in this centre will be reborn every day — reborn with a new idea — so that thousands of suffering people who enter through the doors of the brain centre with brain disorders, pain, and tears in their eyes can later exit through the discharge doors with shining, smiling faces, hearts and mouths full of gratitude, and arms and legs swinging joyfully and pain free."

We are forever grateful for Dr. Mowafaghian's kindness and philanthropy. With his transformational gift to the Djavad Mowafaghian Centre for Brain Health, his legacy will continue to motivate our researchers to be "reborn" with new ideas every day to find cures and treatments for the various brain disorders that affect millions of Canadians across the country.

SNAPSHOT OF 2021-2022

$55 million
in research funding

400+
collaborations
between members

6 clinics
with 23,868 clinic encounters and 1,767 new referrals

1000+
publications

100+
media mentions

137 members –
120 full members & 17 associate members spanning UBC, Simon Fraser University and the University of Victoria

150+ trainees
including 43 MSc, 79 PhD and 70+ postdoctoral fellows

9 Canada Research Chairs &
1 Canada Excellence Research Chair

12 donor-funded research chairs & professorships

IN THE NEWS

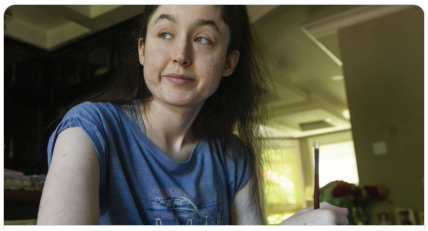
OUR RESEARCHERS MAKING HEADLINES ON TWITTER

Rebecca Bollwitt @Miss604

A talk on how stress affects the brain from @laboyd47 @DMCBrainHealth "Life is stressful & it's full of change, but we can intentionally affect how that stress alters our brain: Exercise, sleep, practice being mindful" these things all help learning too #TEDxSurrey @SurreyTEDx

UBC Media Relations @ubcnews

.@UBCmedicine Neurology professor Dr. Judy Illes and affiliate professor Dr. Patrick McDonald produced a new documentary, Seizing Hope, about treating people living with drug-resistant epilepsy. via @VancouverSun



vancouversun.com
Young epilepsy patient has rare brain surgery to fight for her life

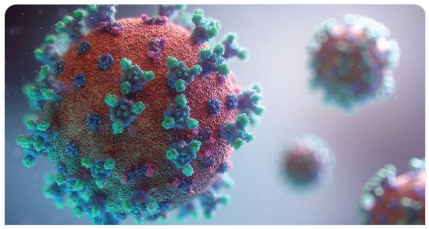
Djavad Mowafaghian Centre for Brain Health @DMCBrainHealth

Congratulations to Dr. Teresa Liu-Ambrose, who is the UBC lead on a new $12M @clsa_elcv project called the Healthy Brains, Healthy Aging Initiative, which will examine factors influencing brain health as we age, including lifestyle & the human microbiome. centreforbrainhealth.ca/news/new-clsa-...

VCH Research Institute and 5 others

UBC Media Relations @ubcnews

A study led by @UBCmedicine professor Dr. Sriram Subramaniam (@cryoem_UBC) has identified a key vulnerability across all #COVID-19 variants that could lead to a new generation of universally effective antibody treatments. via @abcnews



abc.net.au
Canadian researchers find weakness across all Covid-19 variants - ABC Radio
Canadian researchers have discovered a crucial weak spot in Covid 19.

VGH&UBC Hospital Fdn @VGHFdn

This #NationalPhysiciansDay, we celebrate Dr. Brian Kwon, Canada Research Chair in Spinal Cord Injury and Marcel Dvorak Chair in Spinal Trauma at Vancouver General Hospital. Dr. Kwon is establishing a "Living Lab" for spinal cord injury research and care.

vghfoundation.ca
Spinal surgeon donates $1M to build 'Living Lab'
Dr. Brian Kwon donates $1M in award winnings to establish a "Living Lab" for spinal cord injury research and care

CTV Morning Live @CTVMorningLive

CTV Morning Live discovers the latest research breakthroughs that have transformed stoke care with Stroke Neurologist, Dr. Thalia Field 👨‍⚕️

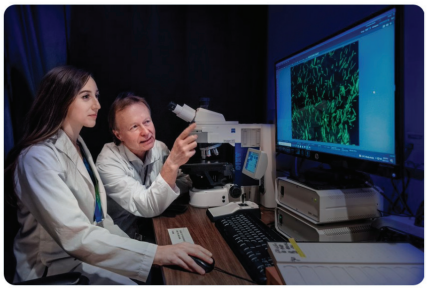
bc.ctvnews.ca
Research Breakthroughs Have Transformed Stroke Care
CTV Morning Live discovers the latest research breakthroughs that have transformed stoke care with Stroke Neurologist, Dr. Thalia Field.

UBC Department of Psychiatry @UBC_Psychiatry

.@UBC_Psychiatry warmly congratulates Dr. Terry Snutch, recipient of the 2021 FoM Bill and Marilyn Webber Lifetime Achievement Award! This honour recognizes the many significant contributions he's made during his distinguished 30+ yr career. @ubcmsl @DMCBrainHealth @UBCmedicine

ICORD @ICORD_SCI

ICORD researchers are part of the #MendTheGap team which received a $24 million New Frontiers in Research Fund 2020 Transformation stream grant to investigate using biomaterials to treat spinal cord injury.
icord.org/news/2022/01/m...



UBC Psychology @UBCPsych

#UBC students interested in studying the brain and nervous system can now earn a Neuroscience degree, thanks to a partnership between @UBC_Arts, @ubcscience and @UBCmedicine.

psych.ubc.ca
UBC launches new undergraduate neuroscience program - UBC Department of...
The program brings together neuroscience research and teaching expertise spanning the three faculties and multiple departments to offer a unique, yet ...

New portable MRI has the potential to change the future of healthcare

Dr. Shannon Kolind has received one of the first Hyperfine portable MRI systems in Canada and will be investigating possible uses in research and clinical settings.

As part of a research project funded by the Bill and Melinda Gates Foundation, Dr. Kolind's team will explore the effect of malnutrition on brain development in paediatric populations of low- and middle-income countries.

"The amazing thing about the scanner is you can take it to the patient," says Dr. Kolind. "For example, one of the immediate applications that has come out of the pandemic is if you need to check whether a COVID patient had a stroke and they couldn't make it to the MRI, the portable scanner would allow you do that at bedside."

To date, a main application of the Hyperfine scanner has been for stroke but funding from Brain Canada and Michael Smith Health Research BC will also allow Dr. Kolind and her team to study its usage in multiple sclerosis, specifically in remote communities and for those with mobility issues.

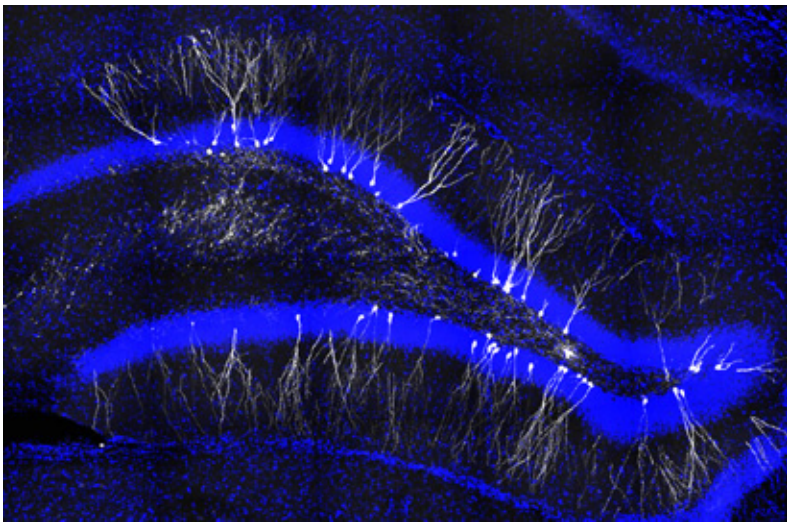
"This technology democratizes access to care and really evens the playing field so that more people can get proper treatment," says Dr. Kolind. "I think it's important that our tools are accessible to everyone in the community."

Sex differences in neurogenesis

Sex differences in neurogenesis – the process by which new neurons are formed in the brain – are relatively unknown since most studies only include male subjects. In a new study by Dr. Jason Snyder, his team identified a novel, sex-dependent function for newborn neurons in stress response to aversive learning situations.

The study found blocking neurogenesis had opposite effects in males and females, causing females to learn faster and males to learn slower. Neurogenesis caused females to adopt different learning strategies depending on stress levels whereas neurogenesis caused males to use the same strategy regardless of stress. Therefore, the formation of new neurons may provide males and females with complementary functions that are equally useful, depending on the situation.

"While we are still far from understanding how this research relates to mental health, it is notable that there are sex differences in stress-related disorders such as anxiety and depression," says Dr. Snyder. "We hope that our findings help lead to a better understanding of the neurobiological basis of these disorders. If we don't systematically study males and females, we lose out on a lot of information that could ultimately improve human health."



Immature, adult-born neurons in an animal model brain, captured on a confocal microscope. Photo by Dr. Jason Snyder.

High-tech mouthguard to track head impacts

A new high-tech mouthguard worn by UBC Thunderbird hockey players is being used to capture data for UBC researchers who study concussions. This collaborative project is led Dr. Lyndia Wu, an expert in brain injury biomechanics at UBC's Faculty of Applied Science, along with Dr. Alexander Rauscher and Dr. Paul van Donkelaar.

In addition to wearing the mouthguards on the ice, the players undergo MRIs, balance and eye tracking tests, and cognitive function tests to track changes in their brain health over time.

"Severe hits to the head are what most people are aware of, but even milder hits may have significant effects if they happen multiple times over the years," says Dr. Rauscher. "Ultimately, we hope to learn how long it takes the brain to recover from a concussion and also give athletes information on when they should take a break after they've had a certain number of hits so they do not risk ending up with long-term negative effects."

Another unique aspect of the study is that it is studying both male and female players. Research suggests that women are more likely to sustain a concussion than men, but most of the research has been performed on men.

"There's been not enough research on female athletes who've suffered a sport-related concussion, and so looking at and comparing to male athletes will potentially provide some insight into the sex differences that occur," says Dr. van Donkelaar. "This research will also help us provide some guidance in terms of allowing both male and female players to play hockey as safely as possible."

Photo: Kai Jacobson

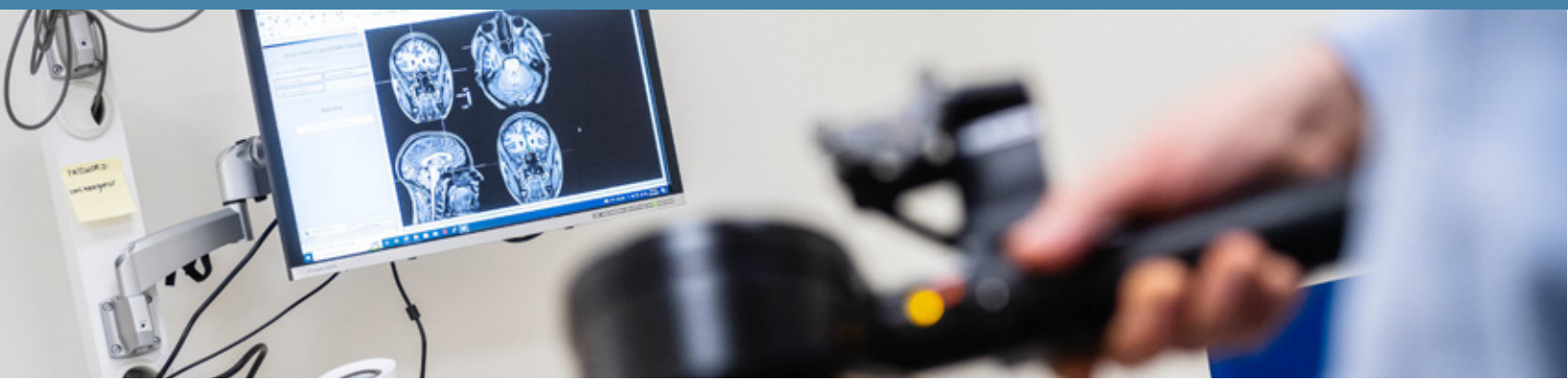
Dr. Alexander Rauscher

Photo: Margo Yacheshyn

Dr. Paul van Donkelaar

Photo: Kai Jacobson

Photo: Kai Jacobson



What happens to the brain during rTMS treatment for depression

For the first time, UBC researchers are using MRIs to show what happens to the brain when a person receives their first round of repetitive transcranial magnetic stimulation (rTMS) to treat their depression.

Dr. Fidel Vila-Rodriguez's team found that by stimulating a part of the brain called the dorsolateral pre-frontal cortex with rTMS, several other regions of the brain were activated. These other regions are involved in multiple functions — from managing emotional responses to memory and motor control.

After receiving their first rTMS session in the scanner, participants underwent another four weeks of rTMS treatment and the team assessed whether the activated regions were associated with participants having fewer symptoms of depression when their treatment ended.

"We found that regions of the brain that were activated during the concurrent rTMS-fMRI were significantly related to good outcomes," says Dr. Vila-Rodriguez. "By demonstrating this principle and identifying regions of the brain that are activated by rTMS, we can now try to understand whether this pattern can be used as a biomarker, or if this treatment can be helpful in other neuropsychiatric disorders."

Training your brain with word games

If you like playing games on your phone, you have probably come across the web-based game Wordle, which has become a recent online obsession.

Other than being entertaining, word games can help keep your brain mentally sharp. But over the past few months, you may have become bored with Wordle as the novelty wore off.

"If your goal is to stay mentally sharp, you should do a lot of different types of puzzles. Don't do just one type," advises Dr. Robin Hsiung. "That's because certain puzzles train certain parts of your brain – for example, the part that controls language and spelling when you play a word puzzle – rather than the brain as a whole. The more you stimulate your brain, the more synapses are formed, which are the connections between brain cells. That helps to ward off diseases."

He says research shows that stimulating the brain by doing mental exercises like puzzles can help prevent Alzheimer disease and dementia in people who haven't yet shown a significant cognitive decline. It's important to train your brain in a variety of ways, which together can improve overall brain health.

Dr. Fidel Vila-Rodriguez

Dr. Robin Hsiung

Cancer chemotherapy drug reverses Alzheimer symptoms in mice

Dr. Wilfred Jefferies and his team have found that a drug commonly used to treat cancer can restore memory and cognitive function in mice that display symptoms of Alzheimer disease.

The drug, Axitinib, inhibits the growth of new blood vessels in the brain—a feature shared by both cancer tumours and Alzheimer disease, but this represents a new target for Alzheimer therapies. Mice with Alzheimer disease that underwent the therapy not only exhibited a reduction in blood vessels and other disease markers in their brains, they also performed remarkably well in tests designed to measure learning and memory.

Potential Alzheimer treatments have shown promise in animal models before, but failed in clinical trials. Typically, these strategies target a protein called tau or a protein fragment known as beta-amyloid, but Dr. Jefferies and his team chose a different approach. They left the traditional targets alone and instead focused on stopping angiogenesis, or the growth of new blood vessels.

"We are really excited because these findings suggest we can repurpose approved anti-cancer drugs for use as treatments for Alzheimer disease," says Dr. Jefferies. "It could shorten the clinical development by years."

Dr. Wilfred Jefferies

Dr. Silke Appel-Cresswell

MIND diet associated with delayed onset of Parkinson disease

Dr. Silke Appel-Cresswell and her research team have identified a link between the Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) diet and a later onset of Parkinson disease.

The MIND diet involves consuming more vegetables, berries, beans, whole grains, nuts, poultry and fish, along with using olive oil as the main cooking oil. It promotes minimizing the consumption of sweets, fried and processed foods and high-fat dairy products such as butter and cheese.

High adherence to the MIND diet corresponded with a later onset of Parkinson disease in women of between 15.6 to 17.4 years. Men who scored higher on the MIND diet were found to have a later onset of between 3.6 and 7.4 years.

"Dedicated studies testing dietary approaches in Parkinson disease are urgently needed," says Dr. Appel-Cresswell. "In the meantime, a healthy diet has many other already proven health benefits without any significant downsides. As a clinician, I encourage my patients to eat according to the principles of the Mediterranean and MIND diets."

Photo: Paul Joseph

Trainee Endowment Awards

The 2022 Djavad Mowafaghian Centre for Brain Health Trainee Endowment Awards recognize excellence in academics and research activities of our trainees. Special thanks to our donors and the Graduate Program in Neuroscience for their generous support.

Jock and Irene Graham Brain Research Endowment:
→ Dr. Mehwish Anwer, Postdoctoral Fellow

Benjamin Feldman and Family Endowment for Transformational Activity in Mental Health:
→ Karling Luciani, MSc student

Neural Repair (Spinal Cord) Endowment:
→ Aysha Allard Brown, PhD student

Schizophrenia Endowment:
→ Hong Lu, PhD student

General Award:
→ Lucy Aceves-Serrano, PhD student
→ Nicole Bailey, MSc student
→ Rocio Hollman, PhD student
→ Philipp Kreyenmeier, PhD student
→ Leah Kuzmuk, MSc student
→ Joyce Lam, PhD student
→ Amanda Namchuk, MSc student
→ Sophia Russo, MSc student
→ Olivia Sullivan, MSc student
→ Tanisse Teale, MSc student
→ Dr. Dongsheng Xiao, Postdoctoral Fellow
→ Brittany Zhang, PhD student

Kickstart Grants

The Djavad Mowafaghian Centre for Brain Health Kickstart Grants are intended to encourage research that demonstrates new collaborations, directions, and technological developments. It supports new projects that generate preliminary data for future grant applications to external funding agencies. Five research teams received 2022 Kickstart Grants:

- Applying unprecedented-scale spatial transcriptomics to understand the single-cell organization of the human neocortex
  Drs. Mark Cembrowski, Nozomu Yachie and Geoffrey Schiebinger
- Eye movements during complex locomotion
  Drs. Douglas Altshuler and Miriam Spering
- Combining MEG and fMRI for multimodal functional neuroimaging in pediatric brain research
  Drs. Hee Yeon Im, Deborah Giaschi, Rebecca Todd and Daniela Palombo
- Advanced Virtual Application for Treatment and Rehabilitation (AVATAR) of Patients with Severe Mental Health and Substance Use Disorders
  Drs. Christian Schütz, Trisha Chakrabarty and Dongwook Yoon
- Decoding the neural basis of contextual action in navigation
  Drs. Manu Madhav and Jeremy Seamans

Alzheimer Disease Research Grant

The Djavad Mowafaghian Centre for Brain Health Alzheimer Disease Research Grant continues to spark new collaborations between foundational and clinical researchers. Each of the funded projects has the potential to transform Alzheimer disease outcomes. Five research teams received grants for 2022:

- Analyzing Inter-Individual Variation in the Ageing Brain
  Dr. Sophia Frangou
- Understanding the Influence of Genetics and Sex Differences in Alzheimer Risk
  Drs. Liisa Galea, Annie Ciernia and Cheryl Wellington
- Developing a Behavioural Biomarker for Alzheimer Disease Diagnosis
  Drs. Manu Madhav and Thalia Field
- Tracking the Impact of Multi-sensory Brain Stimulation on Alzheimer Disease
  Drs. Tim Murphy and Mark Cembrowski
- Analyzing Transcriptome Changes in Human 2D and 3D models of Alzheimer Disease
  Drs. Terry Snutch and Haakon Nygaard

Photo: Paul Joseph

TRAINING THE NEXT GENERATION

Update from the Graduate Program in Neuroscience (GPN)

In the last year, we have slowly started to welcome trainees back to campus for the resumption of in-person research activities, journal clubs, talks, and social activities. As a program, we acknowledge the impact the pandemic has had on the research progress, but also on the mental health and wellbeing of our trainees. As we resume our in-person activities, we focus on rebuilding an inclusive and supportive graduate community to which trainees can relate, in which they can share, and to which they belong, as a cornerstone of their research productivity and wellbeing.

In June 2022, over 70 trainees participated in the Djavad Mowafaghian Centre for Brain Health retreat at UBCO and presented their research in short talks and posters. Prizes for the best talks were awarded to Megan Liu (Soma lab), Elsa Cyr (Gordon/Matthews lab) and Brittany Zhang (Snyder/Vila-Rodriguez labs). Our trainees' research accomplishments are also evident by their success in receiving institutional, provincial and national scholarships. In the last year, this included two Killam Teaching Assistant Awards, and several Canada Scholarship Masters and Doctoral Awards. Thirteen GPN students were awarded Djavad Mowafaghian Centre for Brain Health 2022 Endowment Awards, with projects spanning from ion channel function and neuroinflammation to mental health and spinal cord injury.

We look forward to welcoming our first cohort of undergraduate neuroscience students in the fall of 2022 with the launch of the new Undergraduate Program in Neuroscience at UBC. Trainees and faculty in the GPN have been advocating for this for many years, and this new program is a huge success for our program and a start to a new era for neuroscience at UBC. We look forward to working closely with the undergraduate program and co-develop mentorship opportunities for our trainees.

In the next year, we will continue to foster a diverse, equitable and inclusive training environment. Our events, activities and workshops will focus on community building as well as on skills that translate to careers inside and outside of academia to continue to educate the best neuroscientists in Canada.

Dr. Miriam Spering
Director, Graduate Program in Neuroscience

TRAINEE PROFILES:

Judy Cheng
(MSc student)

The human brain has fascinated Judy Cheng for as long as she can remember. "There is so much that we don't know about it, and every new discovery about the brain is so exciting to me that entering the neuroscience field was a no-brainer!"

During Cheng's undergraduate degree at UBC majoring in Behavioural Neuroscience, she completed a directed studies project in Dr. Lynn Raymond's lab studying behavioural and cognitive deficits in a mouse model of Huntington disease. She thoroughly enjoyed her experience and had the privilege to continue as a Master's student in the Raymond lab.

"My lab is very supportive and provides mentorship while also allowing students to thrive and propose their own ideas," she says. "I am also grateful that the GPN recognizes the importance of student mental health and offers various resources for students, such as wellness workshops, journal clubs and social networking events."

Cheng's research focuses on synaptic plasticity in Huntington disease and how impaired signaling of different neurotransmitters, such as dopamine and endocannabinoids, can lead to the motor and cognitive deficits of this movement disorder.

"I use various methods to study calcium signalling in Huntington disease both in vitro and in vivo, such as live calcium imaging in neuronal cultures and fibre photometry combined with behavioural tests to compare calcium dynamics between Huntington and wild-type mice."

As there is currently no cure for this neurodegenerative disorder, her research will provide novel insight into the underlying mechanisms that give rise to these symptoms and contribute to the foundational knowledge necessary for finding a cure.

Her long-term plans are to apply the research techniques and skills developed in graduate school in an industry setting. She hopes to one day work at a pharmaceutical company and participate in drug development research for epilepsy or mental illness.

Philipp Kreyenmeier
(PhD student)

As a PhD student in Dr. Miriam Spering's lab, Philipp Kreyenmeier is interested in studying how humans control eye movements, one of the most important and frequent movements in everyday life.

"The neural mechanisms that underlie the control of eye movements have fascinated me since my undergraduate degree in Psychology," he says. "Although often unnoticed, we actually move our eyes approximately three times per second. Our eye movements allow us to sample relevant visual information and play a critical role in how we see and interact with our environment."

In his thesis, Kreyenmeier studies how humans move their eyes in response to different sensory stimuli at different latencies: eye movements that occur at ultra-short latency allow for reflexive responses to new information, whereas eye movements with longer latency reflect voluntary movements and integrate more information over time.

"By studying different types of eye movements in combination with computer-based tasks, we can understand how these movements are linked to important functions we rely on in everyday life: how we form predictions of how objects move, and how we catch and hit moving objects."

Because the brain coordinates and controls movement, eye movement deficits are observed in many disorders of the brain, such as Huntington and Parkinson disease. However, most clinical eye movement research only focuses on voluntary, long-latency eye movements, ignoring the contribution of fast, reflexive eye movements in many daily tasks. With his research, Kreyenmeier hopes to provide new insight into clinical tools that can be used to assess the functions and dysfunctions of short-latency, reflexive eye movements in different patient populations.

One of the things he enjoys the most about neuroscience research is the diversity of the field, ranging from biology and psychology to computer science.

"This diversity is reflected in the GPN program and the neuroscience research community at UBC," says Kreyenmeier. "Attending lectures and learning from researchers in all of these disciplines has been an incredibly valuable experience."

After the completion of his PhD, Kreyenmeier hopes to continue his research on eye movements and visual perception as a postdoctoral fellow.

TRAINEE PROFILES:

Dr. Mehwish Anwer
(Postdoctoral Fellow)

Dr. Mehwish Anwer has always been intrigued by the complexity of the human brain, from its ability to carry out highly intricate functions to the abnormalities caused by disease. As a postdoctoral fellow in Dr. Cheryl Wellington's lab, she is investigating the patterns of neuronal activity after traumatic brain injury (TBI) and its link to dementia.

In the Wellington lab, she uses an innovative brain injury model called CHIMERA that was developed at UBC in collaboration with Dr. Peter Cripton's team. Dr. Anwer is also investigating the link between TBI, Alzheimer disease and the development of PTSD-like fear memory deficits. She is a strong advocate of using the latest brain imaging techniques, such as tissue clearing and spatial transcriptomics (in collaboration with Dr. Mark Cembrowski's team), to understand the nervous system in 3D with a whole-brain approach.

"I am always amused by the fact that we use our brains to study the brain!" she says, and is happiest when she can spend time on a microscope looking at neurons.

What attracted her to UBC, and particularly the Djavad Mowafaghian Centre for Brain Health, was the nurturing environment for early-stage researchers.

"I am very inspired by my mentor Dr. Wellington for her extraordinary commitment to professional development and wellbeing of her trainees, as well as her pioneering work in the fields of TBI and Alzheimer disease pathology," says Dr. Anwer. "Building on this amazing support, I aspire to establish myself as an independent researcher in neurodegenerative diseases as well as contribute to the training of students after my postdoctoral studies."

Before moving to Canada in 2021, she completed her doctoral studies at the University of Eastern Finland, studying the development of epilepsy after traumatic brain injury, and worked at the United Arab Emirates University prior to that. Because her experience spans multiple continents and cultures, she is a strong advocate of equity, diversity and inclusion, and believes mutual respect and kindness can go a long way.

Dr. Mehwish Anwer and members of the Wellington lab. Photo credit: Geoff Lister

RESEARCH EXCELLENCE CLUSTERS

UBC's Office of the Vice-President, Research & Innovation announced 40 emerging and established research excellence clusters that will be supported with funding in 2022-23. Five of these Research Excellence Clusters are led by our researchers.

EMERGING CLUSTERS:

Advancing Mental Health Equity in a post-COVID-19 Asia-Pacific

Led by Dr. Raymond Lam, this emerging research cluster positions UBC as a centre of excellence in equity-oriented global mental health research focused on the Asia-Pacific region. The cluster brings together interdisciplinary researchers and stakeholders at UBC, in Canada, and internationally to collaborate on community-engaged research, innovative approaches to knowledge exchange and advancing best practices for equitable mental health, including via the use of digital technologies.

MATRIX-N: Multidisciplinary Alliance for Translational Research and Innovation in Neuropsychiatry

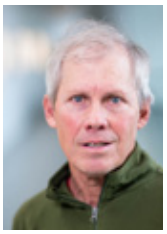
MATRIX-N is led by Dr. Anthony Phillips and seeks to bridge gaps between research, clinical practice, and patient needs to facilitate innovative solutions to global mental health challenges. The cluster will create new multidisciplinary collaborations between foundational and clinical researchers to increase the translational power of neuropsychiatry research into novel pharmacotherapies and ensure more cost-effective, clinically-relevant drug development processes.

Vision: Molecules, Behaviour, Society

The Research Excellence Cluster in Vision: Molecules, Behaviour, Society is led by Dr. Joanne Matsubara, and aims to shape the future of vision research. It does so by connecting a network of diverse vision and brain researchers with scientific experts in cutting-edge technologies. Together, the Vision Cluster focuses on new foundational discoveries to improve the diagnosis, treatment and prevention of eye and brain disorders by state-of-the-art methods in engineering, artificial intelligence, ophthalmic and neuroimaging, telemedicine, proteomics and super-resolution microscopy.

ESTABLISHED CLUSTERS:

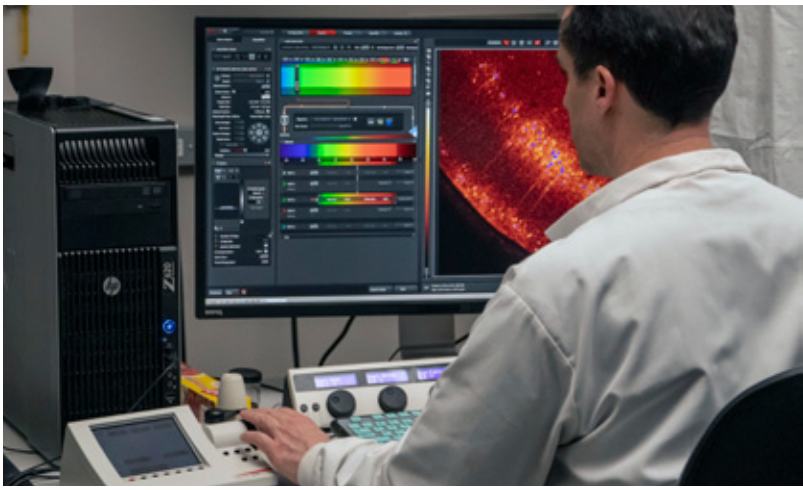
Dynamic Brain Circuits in Health and Disease Research Excellence Cluster



The Dynamic Brain Circuits in Health and Disease cluster is led by Dr. Timothy Murphy and seeks mechanistic insight into normal and dysfunctional brain circuits across illnesses and injuries. Over the past year, the cluster has continued to foster a collaborative research environment through a variety of workshops and courses, such as Introduction to Programming courses, weekly Databinge sessions and access to infrastructure and equipment at the Neuroimaging and Neurocomputation Centre (NINC).

Women's Health Research Cluster

The Women's Health Research Cluster is a network of women's health researchers and stakeholders that are interested in how sex and gender play a role in health outcomes. Led by Dr. Liisa Galea, the cluster works toward creating a future where women can live equitably healthy lives by promoting, expanding, and catalyzing impactful research on women's health. Over the past year, the cluster has expanded its reach with the Women's Health Blog, Women's Health Interrupted Podcast and Women's Health Seminar Series.



Glove Recycling Initiative

Melody Salehzadeh, a doctoral student in Dr. Kiran Soma's lab, first noticed just how much plastic waste her work created during the COVID-19 pandemic. Due to restrictions, custodial staff weren't able to enter her lab in the Djavad Mowafaghian Centre for Brain Health as frequently as usual. Single-use nitrile and latex gloves were piling up in the rubbish.

"I knew it was possible to recycle the gloves, it was just a matter of someone putting in the effort," Salehzadeh says.

Last September, the AMS Sustainability Project and the UBC Student Environment Centre awarded Salehzadeh and her team of seven other students funding to buy two giant pallets for collecting the gloves. The team then launched a competition in October to encourage other labs to take part in the initiative and see who could collect the most gloves. Seventeen labs took part, with the winning Ciernia lab collecting 19 kilograms of gloves.

The gloves are recycled into plastic pellets used for building and construction supplies, lawn furniture or plastic planters.

To date, the project has collected roughly 48,700 gloves, diverting 146.1 kilograms of waste from landfills this year.

In Tune With Your Brain Symposium

Hosted by the UBC Brain and Music student group, the 2022 In Tune With Your Brain symposium focused on the intersection of music and neuroscience, showcasing a variety of speakers who shared their expertise in music composition, acoustics and deep learning, and music therapy.

With over 300 total hybrid registrants from 16 countries and over 80 in-person attendees, the symposium showcased the great interdisciplinarity of science, art, and medicine in an accessible and meaningful way.

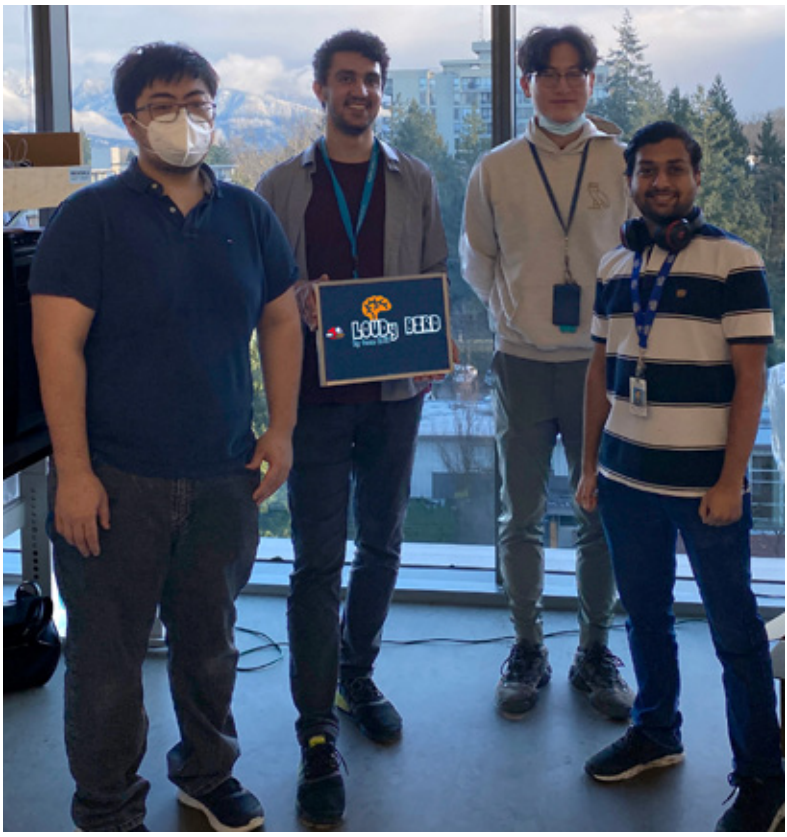
Brain-Tech Hackathon

The Brain-Tech Hackathon is a competition organized collaboratively by the UBC Dynamic Brain Circuits Cluster and the BC Brain Wellness Program, fostering students and researchers to brainstorm and prototype novel applications to support brain health.

Daniel Ramandi, a PhD student supervised by Drs. Lynn Raymond and Tim Murphy, and his team focused on Parkinson disease, specifically speech impairment, by developing a game as a form of speech therapy. They created a modified version of the famous game Flappy Bird and called it LOUDy Bird.

The idea is to make speech therapy routines more enjoyable and something that can be done at home without having to go into a clinic. The game also generates a detailed report for a speech therapist to access. The team took top prize at the Hackathon and are now working on finishing touches to make the game more user friendly.

"My hope is that eventually this type of game therapy could be used for many kinds of motor impairments, including Huntington disease which is what my thesis is focused on," says Ramandi. "It was exciting to be given this opportunity to work on developing a novel therapy."



LOUDy Bird creators, pictured from L-R: Tony Fong, Daniel Ramandi, Edward Yan and Abhijit Chinchani (not pictured: Pankaj Gupta and Hao Hu)

BC Brain Wellness Program

What does the BC Brain Wellness Program mean to you?

Exploring this question with our participants, instructors and staff has been a theme throughout the past year at the BC Brain Wellness Program. The answers have been inspiring and illuminating and have reinforced the uniqueness and importance of our program and have guided us as we worked on our three goals: expansion, evaluation and sustainability.

Expansion: Since April 2020, we have grown to offering 28 different programs, with a user base of approximately 2,000 individuals, delivering more than 2,500 hours of free programming to people in both urban and rural areas of British Columbia. We have added new programs including photography, tap dancing, an intergenerational program, and a series of Care Partner workshops. Through partnerships with UBC's Department of Physical Therapy, we were able to complete more individual intake Safety Screenings, enabling increased participant access to our exercise classes. Building relationships with local community organizations has improved awareness of our program in different populations. Finally, several research projects are underway: Music to improve apathy in Parkinson disease, Impact 360 (combined exercise, nutrition, mindfulness intervention study), and Mediterranean Ketogenic diet intervention in Parkinson disease.

Evaluation: As the world began to open again, it was essential to evaluate our program in relation to the changes happening in our community. Through several measures, we reinforced that our program continues to be highly relevant and in demand and that it truly brings people together as a community. Our Participant Advisory Committee meets monthly and has been instrumental in providing feedback and guidance, particularly regarding our program delivery and our newly designed website and registration system. Through a series of focus groups with instructors and participants, as well as assessments and surveys, we learned what is meaningful to participants: the personalized approach, the strong community built, the mental, physical and cognitive health benefits, the ongoing nature of the program and the focus on function rather than diagnostic labels for participating in classes. Participants also requested some new classes, and an expansion to in-person options.

Sustainability: Going forward, it will be crucial to ensure that we can continue to provide and grow the program which is currently entirely funded by our amazing donors. This past year has shown that support and belief in our program continues to be strong as we were selected as one of four programs within the Faculty of Medicine to be featured at UBC's Giving Day. We will continue to work with donors, develop fundraising events and collaborate with a variety of stakeholders to ensure financial sustainability.

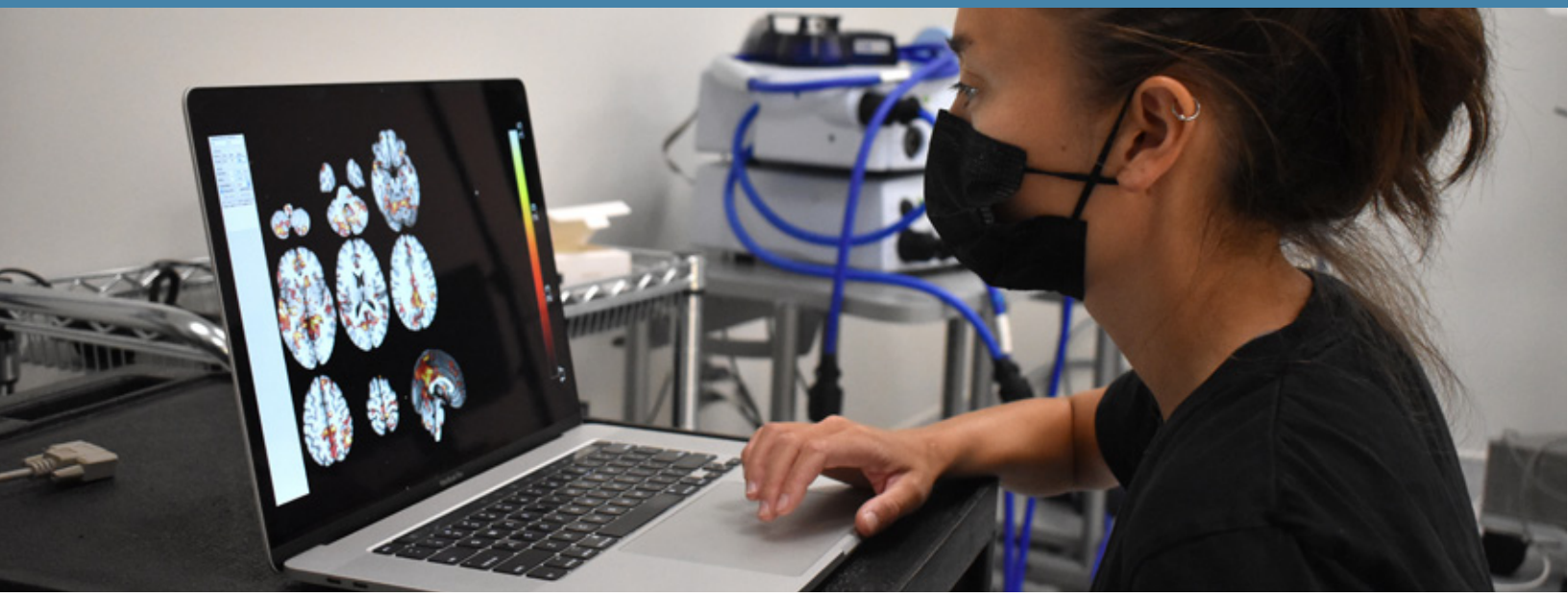
Kolby Hughes

What our participants are saying...

Brain Wellness has shown me that a balanced, integrated approach is what is needed to sustain proper health over the long term. [The program] has given me new vigour, a new outlook, a new chance to interact with the community, increased cognitive power—a new lease on life.
- Kolby Hughes

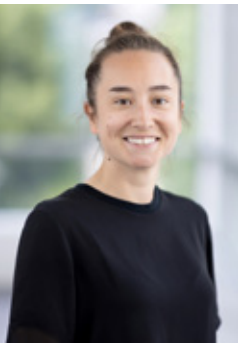
Exercise initially changed my life in my early 30s... it had improved my mood and allowed me to continue with my education and find work that I can really blossom in... this particular class has been great and these instructors are the best I've ever had. The way they provide exact instruction on which muscles to use. I'm more agile, I'm stronger, my mood has improved... overall I think they're fantastic.
- Wanda Schulte

Receiving a diagnosis may make us feel separated from our social groups and we begin a journey of feeling alone, [the program] has really allowed me to have a lived experience of community.
- Anonymous Participant



FACULTY PROFILE:

Dr. Sarah Kraeutner



Growing up, Dr. Sarah Kraeutner liked to build things and had always wanted to be an engineer. However, after taking some psychology courses during her undergrad, she became interested in how the brain works and how it can recover after an injury, such as a stroke. She went on to complete her Master's and PhD in Psychology and Neuroscience at Dalhousie University, taking part in the RADIANT program, which focused on the development, creation and testing of neurotechnology for rehabilitation.

Her first connection with UBC was when she saw Dr. Lara Boyd give a talk at a conference about neuroplasticity in stroke. This eventually led to her joining Dr. Boyd's lab as a postdoctoral fellow. Coincidentally, she came across a faculty job posting at UBC Okanagan's Department of Psychology around the same time.

"I actually got an interview on the first day of working in Dr. Boyd's lab and ended up successfully landing the position," Dr. Kraeutner recalls. "However, the Department was very supportive of me deferring my start date because I still wanted to work with Dr. Boyd to gain neuroimaging and clinical experience."

In her role as Assistant Professor at UBCO, she is merging what she has learned during her graduate studies in fundamental motor learning and mental practice with the clinical experience gained in the Boyd lab. Dr. Kraeutner is currently working on setting up her lab, aptly named NIMBL (Neuroplasticity, Imagery, and Motor Behaviour Lab), which is focused on noninvasive brain stimulation using transcranial magnetic stimulation (TMS). She is gearing up to launch a gamified neuro rehabilitation study for stroke patients in spring 2023 in collaboration with Dr. Boyd.

"Neuroplasticity – the ability of the brain to change and adapt – is just a really cool concept," says Dr. Kraeutner. "Repeated physical and mental practice stimulates changes in the brain. So the power to change your brain, for better or for worse, is really up to you."

By combining both imagined and physical practice, motor learning and relearning can be improved after a stroke or brain injury. Ultimately, the goal of Dr. Kraeutner's research is to improve the quality of life for people with brain injuries and provide options to make recovery accessible, especially for those who may not be able to engage in physical therapy because of their level of impairment or physical fatigue.

Her current NSERC project is focused on identifying optimal practice parameters by characterizing neurophysiology driven by different forms of mental practice and behavioural change that occurs with different practice schedules. Her next project builds on her current work and will examine the neurophysiology associated with mental practice after stroke.

Outside of the lab, her hobbies include outdoor activities, such as hiking or running with her dog, and playing guitar.

"One of the reasons I'm so interested in mental practice is because growing up playing sports and music, so much time was spent on mentally practicing something," says Dr. Kraeutner. "So I thought, how we can take that and leverage it in stroke rehabilitation."

Melanee Henderson

How a new approach to brain wellness inspired one woman to give back to UBC.

After her successful recovery from brain surgery, Melanee Henderson is supporting brain wellness programs at UBC with a gift in her will.

Melanee Henderson had a headache in July 2019 that brought her to the hospital. After several days of tests, a CT scan found a brain tumour measuring close to 14 centimetres that was removed during a lengthy surgery. Unfortunately, the tumour had severely affected her hearing and balance.

"It took away all my hearing on the left-side and the balance system inside my brain," says Melanee. "The tumour had gotten so big it pressed on all the nerves on the side of my face."

Melanee stresses that while the diagnosis and surgery were a significant part of her treatment, the programs she was able to access at the Djavad Mowafaghian Centre for Brain Health at UBC helped her regain her confidence and get her life back.

Entirely donor funded, the BC Brain Wellness Program offers lifestyle programs including exercise, meditation, arts-based practices and education to complement the medical treatment patients receive in the clinics at the Djavad Mowafaghian Centre for Brain Health. The program's goal is to improve and sustain quality of life and function for its participants while pursuing rigorous research into lifestyle interventions for brain health for people with chronic brain conditions, care partners and healthy agers.

Because of her experience, she has decided to make a gift in her will to support the BC Brain Wellness Program at UBC, to help others like her access critical programming.

"I was going from driving myself and being very active with tennis, lifting weights, swimming—to nothing."

Three years later, Melanee has her independence back, which she credits to hard work—and the team at the Djavad Mowafaghian Centre for Brain Health.

"If you're going to leave a legacy gift, decide what you want to give to," says Melanee. "For me, I know it's to support programs and research at UBC benefiting brain wellness."

To learn more about adding a Gift in your Will, reach out to UBC's Gift & Estate Planning at 604-822-5373 or email heritage.circle@ubc.ca

Jeff LeDue working in the NINC.

CORE FACILITY UPDATES:

NeuroImaging and NeuroComputation Centre (NINC)

In 2021-2022, the NINC supported 20 member labs from the Djavad Mowafaghian Centre for Brain Health with more than 200 individual users. In 2021, this group booked over 16,000 hours of equipment usage, showing the growing importance of collaboration and shared resources in accelerating biomedical research. Science is ultimately a community endeavour and our researchers are rallying around the NINC and benefiting from its holistic approach to supporting research projects.

The NINC is rapidly expanding as it hosts the new instruments for its Canada Foundation for Innovation funded iMAP (in vivo Mesoscale Assessment of the neuroProjectome) project. Over $3 million of new resources have been made available for our researchers in the first six months of 2022 alone. This includes a Lattice Light Sheet Microscope (one of two in Canada), two fiber photometry systems, a multiphoton "diesel2p" mesoscope (one of five in the world) and more than 900 compute cores and 4PB of storage added to the Digital Research Alliance of Canada systems. Together, these new resources allow researchers who are working to understand how circuitry in the brain is impacted by diseases, injuries and illnesses, to examine brain function and structure at sizes and times scales that were not previously accessible.

The NINC continues its partnerships with the UBC Brain Circuits cluster and its Databinge team which offers direct peer to peer support with data challenges for our researchers. Recent funding from the Digital Research Alliance of Canada's Data Champions Pilot Project has allowed Databinge to partner with trainees at BC Children's Hospital Research Institute, ICORD and the University of Victoria. This expansion increases the breadth of expertise in the group while making progress toward a scalable, multi-site, regional Databinge network. The close collaboration with the Brain Circuits cluster also connects the NINC to national networks, such as the Canadian Neurophotonics Platform, and global partners in the International Network for BioInspired Computing.

Charles E. Fipke Integrated Neuroimaging Suite

While overall research activities continue to be impacted by COVID-19, research at the Charles E. Fipke Integrated Neuroimaging Suite, which includes the PET/MRI Imaging Centre, the UBC MRI Research Centre and the Electrophysiology Suite, is picking up.

On the GE Signa PET/MR scanner, several novel studies in Parkinson disease (PD), addiction, bipolar disorders, COVID-19 and women's health have started. Some interesting preliminary research findings are beginning to emerge as researchers have found that exercise positively impacts brain production and use of energy in PD, potentially revealing new therapeutic targets and providing new insights into brain plasticity.

The Electrophysiology Suite became fully operational in 2021 and is used for studying stroke, concussion and healthy aging. It now houses state-of-the-art non-invasive brain stimulators which can be paired with a 3D coordinate system that enables real-time visualization of targets in the human brain, muscles and nerves. In addition, high-density electroencephalography (EEG) units have been installed that are MRI and transcranial magnetic stimulation (TMS) compatible.

The UBC MRI Research Centre Philips 3T scanner serves the UBC community with over 100 principal investigators involved in over 450 studies. Upgrades to the scanner shims have improved image quality and it can now conduct MRI and TMS at the same time. In addition, three new technologists have been hired and a new healthy volunteer image registry has been created to allow for data sharing. All of these innovative human studies are possible because of the imaging team's technological advances in data acquisition and processing, for which our trainees are receiving international recognition.

Borgland Family Brain Tissue and DNA Bank

The Borgland Family Brain Tissue and DNA Bank (the Biobank) continues to be a key resource for the collection, storage and distribution of high-quality biospecimens and clinical data at the Centre. Led and managed by Drs. Lynn Raymond and Seti Boroomand, the Biobank is overseen by qualified members of the Centre and local biobank experts.

Over the past year, the Biobank has undergone several operational changes to improve its services to the community. In October 2021, a competitively priced fee-for-service mechanism was implemented to enable the sustainability of the Biobank. Since January 2022, the Biobank has been able to support a variety of clinical trials and studies in biospecimen collection, processing, and storage in a convenient location, at a reasonable cost.

With MedIT support, the Biobank has also acquired a new biobank-specific database to streamline the collection and storage of clinical and specimen data, becoming one of the only users of the OpenSpecimen platform in British Columbia.

The Biobank continues to expand by offering new services to the clinical research community. New clinical trials and projects that wish to develop ethics applications can contact the Biobank team for consultation and support.

Above: Dr. Seti Boroomand working in the Biobank.
Left: Laura Barlow working in the MRI Research Centre.

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, in addition to those of the federal and provincial governments.

THE UNIVERSITY OF BRITISH COLUMBIA

The University of British Columbia is one of Canada's largest and most prestigious public research and teaching institutions and consistently ranks among the top 40 institutes in the world. It offers a range of innovative undergraduate, graduate and professional programs in the arts, sciences, medicine, law, commerce and other faculties. UBC has particular strengths in biotechnology, ranking in the top 10 univerisities in North America and number one in Canada for commericalizing research and for its patent activity in the life sciences. **www.ubc.ca**

Vancouver CoastalHealth

Vancouver Coastal Health (VCH) is responsible for the delivery of $4.1 billion in community, hospital and long-term care services to more than one million people in communities including Richmond, Vancouver, the North Shore, Sunshine Coast, Sea to Sky corridor, Powell River, Bella Bella and Bella Coola. VCH also provides specialized care and services for people throughout BC and is the province's hub of health care education and research. **www.vch.ca**

Vancouver CoastalHealth Research Institute

Vancouver Coastal Health Research Institute (VCHRI) is the research body of the Vancouver Coastal Health and a world leader in translational health research. VCHRI is academically affiliated with UBC Faculty of Medicine and includes three of BC's largest academic and teaching health sciences centres—Vancouver General Hospital, UBC Hospital, and GF Strong Rehabilitation Centre—as well as other hospitals and public health agencies across Vancouver Coastal Health. As one of Canada's top funded research institutes, VCHRI receives over $100 million in research funding annually to support health research and discoveries with direct health, economic and social impact on British Columbians. **www.vchri.ca**

Djavad Mowafaghian
CENTRE FOR BRAIN HEALTH

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centreforbrainhealth.ca

The Centre is located on the traditional, ancestral and unceded territory of the Musqueam people.