

FUNDING BRILLIANCE DAILY

2019/2020 IMPACT REPORT



Brain Canada is a national non-profit organization that plays a unique and invaluable role as the national convener of those who support and advance brain research.

A greater understanding of how the brain works will contribute to the prevention, diagnosis and treatment of brain disorders, thereby improving the health outcomes of Canadians.

While there have been many breakthroughs in recent years, researchers have a long way to go to fully unravel the mysteries of the brain.

2019/2020 Impact Report

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MESSAGE FROM THE CHAIR

It is a truth universally acknowledged that the power of a collective working towards a shared goal is greater than the sum of its individual parts.

This was the year of the team, here at Brain Canada, and around the world.

Since its inception more than 20 years ago, Brain Canada has played a leadership role in changing the way researchers work, encouraging them to be more interdisciplinary, more inclusive, more coordinated and collaborative.

The COVID-19 pandemic and our global response revealed an unequal impact on vulnerable communities. The toll COVID-19 has taken on so many Canadians, including our youth, people who live with mental illness and those in long-term care facilities, highlights the urgent need for Canada to make revolutionary advances in brain health.

For over two decades, we have made the case for the brain as a single system with commonalities across neurological disorders, mental illnesses, and brain and spinal cord injuries, rather than a collection of siloed diseases. The One Brain approach means that every discovery has the potential to impact a spectrum of brain disorders, as well as our overall understanding of brain functioning.

Looking at the brain as one system underscores the need for teamwork, and more than 100 collaborators have joined Brain Canada in its efforts to convene the brain research community and achieve a greater understanding of how the brain functions, and how to better prevent, diagnose, treat and cure brain disorders. Our donors and partners – who wholeheartedly support this approach – include private philanthropists and foundations, corporations, research institutes, provincial agencies and voluntary health organizations.

We are particularly grateful to the Government of Canada, and especially Health Canada. Since 2011, Brain Canada has had a major partnership with Health Canada, which has provided \$120 million to match donations from Brain Canada's private and non-federal partners and committed a further \$40 million over two years starting in 2020-21. This commitment by the federal government empowers Canada to excel as a global leader in the quest to understand the brain and brain disorders. To date, Brain Canada and its supporters have invested \$250 million in 300 research projects across the country, involving more than 1000 researchers at more than 115 institutions.

What have these researchers discovered? From prescribing exercise as medicine, to a pioneering exploration of the connections between the brain, gut and heart in Parkinson's patients, pages 23-37 highlight some of the Brain Canada-funded researchers whose projects are advancing our understanding of the brain and improving the health and quality of life for all Canadians.

Pages 14-17 provide an in-depth look at two ground-breaking research competitions that Brain Canada launched in 2019. Support for the operations and maintenance of Canadian research platforms has been



identified as a gap in the neuroscience research funding environment. Through its Platform Support Grants, Brain Canada is addressing this by improving the technical and research capabilities of research teams in the neurosciences and mental health fields, including investing in resources like brain banks, clinical trial networks, imaging facilities, and data-sharing systems. The Future Leaders program provides funding at a critical juncture for early-career researchers, helping the next generation of brilliant brain scientists explore new uncharted areas and gather preliminary data that will allow them to make major contributions to Canadian brain research in the coming years.

While sex and gender influence many aspects of neurological disorders, such as the risk of developing certain diseases, symptoms and severity of illness, how well we respond to interventions, and how often we seek care, the prevention, management, and treatment of many health conditions still often follow the one-size-fits-all approach. Brain Canada is addressing this disparity by increasing its support for research that examines the brain through the lens of sex and gender differences.

We also understand that good brain science is supported beyond the lab. Philanthropy plays an important role in driving health care innovation, and medical advances happen in part because people go above and beyond for a cause they are passionate about. So, to our supporters across the country, to the dedicated researchers and clinicians committed to brain science, and our own team at Brain Canada, our steadfast Board and staff – we thank you.

In February of this year, we said goodbye to Brain Canada’s long-time CEO and President Inez Jabalpurwala. Ms. Jabalpurwala was an exceptional driver of our mission to lead the brain science community as a national convener, fundraiser and funder of ground-breaking research. After providing more than 18 years of remarkable contributions to the field, we would like to express our deep appreciation and heartfelt wishes for success as she moves on to new challenges.

As we look ahead to our role as the leading convener and catalyst in the area of brain research for the next twenty years and beyond, we are pleased to welcome Dr. Viviane Poupon in September 2020, as the new President and CEO of Brain Canada. Dr. Poupon joins us after an extraordinary career in the non-profit, public and scientific research sectors in Europe and Canada.

Tremendous gains have been made in the past decade, but more can and must be done to advance brain research in this country. Under Dr. Poupon’s leadership, Brain Canada will continue to accelerate innovation and strengthen the brain science community.

Working together as a team, Brain Canada is ready to power the future of cutting-edge brain science. Join us as we build a healthier Canada.



Naomi Azrieli

Naomi Azrieli
Chair, Brain Canada

BRAIN CANADA BY THE NUMBERS

\$250M
INVESTED IN
BRAIN RESEARCH

90%*
FUNDS GO
TO RESEARCH

300
GRANTS
AWARDED

1000+
RESEARCHERS
FUNDED

100+
PARTNERS
LEADING
TO A MORE
COLLABORATIVE
& COORDINATED
RESEARCH
ECOSYSTEM

115
INSTITUTIONS
ACROSS CANADA
RECEIVED
FUNDING

BRAIN CANADA

Researchers across the country and around the world are learning more and more about the brain but the challenges are complex and answers can't come quickly enough. That is why Brain Canada is working to accelerate the pace of discovery and magnify the impact of every breakthrough.

Our work joins people, labs, and platforms across the country, as well as institutions, organizations, and sectors – in order to drive innovation. We believe that a diverse and interconnected brain research system will enable Canada to excel and to make even greater contributions to the global quest to understand the brain and brain disorders.

KEY PRINCIPLES THAT HAVE GUIDED OUR SUCCESS

A focus on excellence and innovation. We select all funding recipients through a rigorous peer review process, which allows us to benchmark against international standards and take greater risk in identifying high-potential projects.

A business approach to science that is both outcome focused and efficient. We closely monitor all funded research, with clear requirements and deliverables to ensure that milestones are achieved.

Fostering Canada's collaborative way of doing research. We bring the best minds together, leading to new thinking and new approaches.

Partnerships to link people and organizations in the brain research community. We enhance collaboration and reduce overlap and duplication of effort.

Ongoing consultation with Canadian and international research, clinical, and patient communities to ensure that we understand needs and opportunities.

Good governance. Our Board is composed of leaders from the business, academic, scientific, philanthropic and Indigenous communities.

TYPES OF GRANTS

Team Grants

Bring together scientists from different disciplines to advance collaborative research on the brain and brain health.

Platform Support Grants

Create and enhance centralized shared research resources (referred to as "platforms") to increase access to equipment, expertise, data, and protocols across research networks.

Capacity Building Grants

Support trainees and early career researchers for training and mentoring, and to convene the Canadian brain research community.



Dr. Gelareh Zadeh, Division Head of Neurosurgery at UHN, Medical Director of the Krembil Brain Institute, Professor of Neurosurgery at University of Toronto and a Senior-Scientist at Princess Margaret Research Institute. Dr. Zadeh was the Principal Investigator of a 2017 Brain Canada/Canadian Cancer Society Innovation Grant.

CANADA BRAIN RESEARCH FUND

The Canada Brain Research Fund (CBRF) is an innovative partnership between the Government of Canada (through Health Canada) and Brain Canada, designed to encourage Canadians to increase their support of brain research, and maximize the impact and efficiency of those investments. The Fund supports the very best Canadian brain research, fostering collaboration across disorders, disciplines, institutions, and provinces, and enhancing global linkages.

In 2011, Brain Canada committed to raising \$100 million over six years from private and non-governmental sources which was matched by the Government of Canada on a 1:1 basis, creating a \$200-million fund. Brain Canada met its fundraising objective of \$100 million by the fall of 2015 – more than one year ahead of schedule. To maintain the positive momentum achieved with donors, partners and the research community, in Budget 2016, the Government of Canada provided \$20 million in additional matching funds, administered through Health Canada, to the CBRF, and another \$40 million in Budget 2019.

This visionary commitment by the federal government will ensure that Canada continues to be among the leaders in the global challenge to understand brain function and brain diseases. More than simply contributing public money to this vital cause, the matching nature of the Fund is stimulating and rallying private donations and other non-governmental funders to support transformative brain research in areas of importance on a scale never before achieved in Canada.

The Martin Family Initiative has been a proud partner of Brain Canada since 2017. Their unique role as the national convener of the brain research community fosters exceptional research and data-driven initiatives. Brain Canada's innovative funding model leverages private donations to make investments that benefit all Canadians.

- The Right Honourable Paul Martin



Since the Canada Brain Research Fund's inception, Brain Canada has committed \$115 million from private donors and non-federal partners—now numbering more than 100— which has been matched by Health Canada with an additional \$5 million for program and operating expenses.

To date, the Fund has committed \$223.5 million to support 266 projects across Canada involving more than 980 researchers at 115 institutions.

Research funded through the Canada Brain Research Fund has led to 1,251 publications, which have been cited more than 35,000 times.

Each of these publications represents a step forward in advancing our knowledge of the brain.

Brain Canada has supported over 500 trainees, either directly as grant recipients or through a Principal Investigator's grant.

In addition to enabling them to pursue their research alongside some of Canada's foremost experts, this funding has also set up trainees with a track record of excellence which will help them secure further funding as they progress in their career.

The Canada Brain Research Fund supports research that is high risk, high reward and that often gets overlooked by other funders.

Several projects were able to leverage the pilot funding received through the CBRF in order to secure further funding from provincial and federal agencies, and other non-profit organizations.

CANADA BRAIN RESEARCH FUND

May 3, 2012

The Honourable Leona Aglukkaq, Canada's Minister of Health, officially launches the Canada Brain Research Fund.

Brain Canada commits to raising \$100 million over six years from private and non-governmental sources which will be matched by the Government of Canada on a 1:1 basis.

May 18, 2012

Launch of Brain Canada's Multi-Investigator Research Initiative (MIRI), the first of the Canada Brain Research Fund's research programs.

Fall 2015

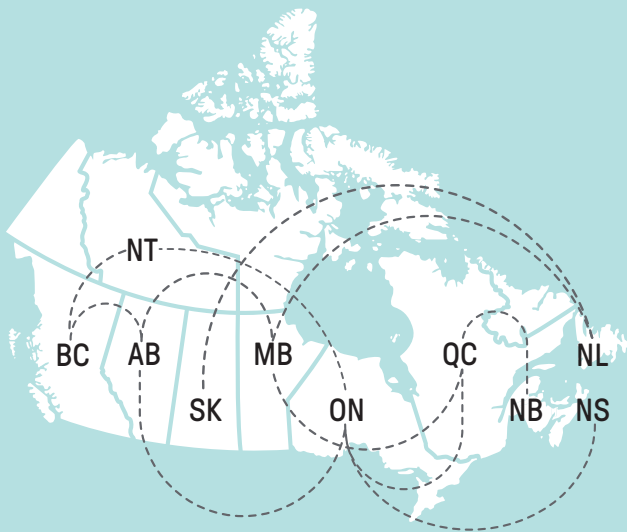
Brain Canada raises \$100 million in donor and partner commitments by October of 2015, a full 18 months ahead of schedule.

2016

Budget 2016, the Government of Canada provides \$20 million in additional matching funds to the Canada Brain Research Fund.

2019

Budget 2019, the Government of Canada provides an additional \$40 million in matching funds to the Canada Brain Research Fund.



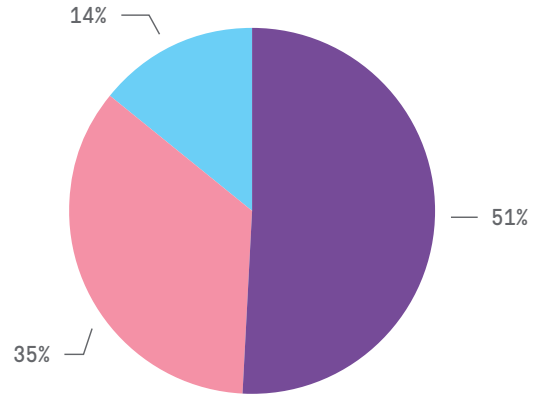
FUNDING PROJECTS ACROSS CANADA

BC / British Columbia 42.25 Projects 132 Researchers/Trainees	ON / Ontario 111.25 Projects 431 Researchers/Trainees
AB / Alberta 27 Projects 131 Researchers/Trainees	QC / Québec 73.5 Projects 233 Researchers/Trainees
NT / Northwest Territories – 1 Researchers/Trainees	NB / New Brunswick 2 Projects 3 Researchers/Trainees
SK / Saskatchewan 1 Projects 5 Researchers/ Trainees	NS / Nova Scotia 2 Projects 20 Researchers/Trainees
MB / Manitoba 3 Projects 20 Researchers/Trainees	NL / Newfoundland 3 Projects 5 Researchers/Trainees

Competition Type

Total Matched Funds to Research: \$223.5M

- Team Grants
- Platform Support Grants
- Capacity Building Grants

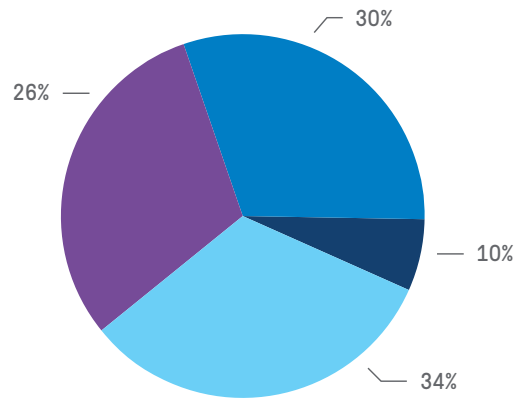


Type of Research

Total Matched Funds to Research: \$223.5M

Whereas basic research is looking at questions related to how nature works, translational research aims to take what's learned in basic research and apply that in the development of solutions to medical problems. Clinical research, then, takes those solutions and studies them in clinical trials. *(Dana-Farber)*

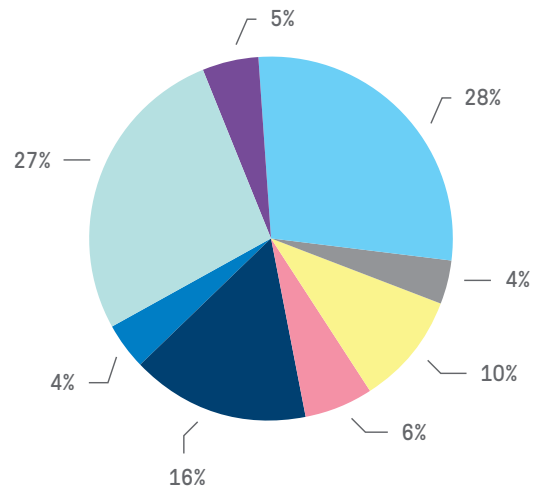
- Basic
- Translational
- Clinical
- Knowledge Translation



Area of Research

Total Matched Funds to Research: \$223.5M

- Neurodegeneration (e.g. ALS, Alzheimer's)
- Neurodevelopmental (e.g. autism)
- Neurotechnology (e.g. drug-screening platforms)
- Brain Cancer
- Basic Brain Function (e.g. learning and memory)
- Sensory Nervous System (e.g. blindness)
- Brain Injury (e.g. stroke, traumatic brain injury)
- Mental Health



REVIEW PROCESS

BRAIN CANADA ALLOCATES FUNDING, FIRST AND FOREMOST, ON MERIT.

Brain Canada's rigour in its scientific review process gives donors and partners a trusted mechanism to ensure projects are chosen on the basis of excellence and innovation. We are committed to an open, fair, and transparent process, and evaluate these procedures on an ongoing basis to ensure they continue to follow best practices.

Once a **Request for Applications (RFA)** is launched, one or more of the following stages may be included in the application process, depending on the funding competition.

REGISTRATION FORM (RF)

Used for administrative purposes to estimate the volume of applications, ensure eligibility criteria are met, and gather relevant information required to form the **Peer Review Panel**.

LETTER OF INTENT (LOI)

- Applicants submit LOIs describing the proposed project.
- LOIs are evaluated and scored by a Peer Review Panel.
- LOIs scoring above a threshold are recommended to advance to the Full Application stage.

FULL APPLICATION (FA)

Invited applicants submit full applications, encompassing the components outlined in the RFA. As part of the FA, applicants must also demonstrate how **sex, gender, and diversity** are taken into consideration within their proposed research.

Full applications are evaluated and scored based on the criteria for assessment outlined in the RFA by a Peer Review Panel.

Top-ranked applications are recommended to Brain Canada for **funding**. All applicants receive objective and constructive feedback in an anonymized fashion from the peer review process.

439 Scientists from Canada and other countries have served on peer review panels for Brain Canada grant competitions.

What is a Request for Applications?

The Request for Applications (RFA) outlines the research focus and scope of the funding competition. RFAs are published and shared with researchers and other stakeholders nation-wide.

Our funding competitions are open to researchers across Canada and applications can be submitted in either English or French. Brain Canada is committed to excellence through equity and encourages applicants of diverse backgrounds to apply for our funding opportunities.

Peer Review Panels

Brain Canada invites national and/or international researchers to participate in the review process, which allows us to benchmark against international standards of excellence and innovation, and create a network of ambassadors and new connections for Canada.

Members of the panel have experience and expertise in the relevant field(s) of brain research. Applications may additionally be reviewed by external reviewers depending on the nature of the research.

Equity, Diversity, and Inclusion in Science

Evidence clearly shows that increasing equity, diversity and inclusion (EDI) in research environments, design, and practice is integral for scientific excellence and innovation.

Understanding sex, gender, and other identity factors as determinants of health can help to ensure that research projects lead to more impactful outcomes that are relevant and beneficial for all Canadians.

Funding - Grants Management

Brain Canada employs a milestone-driven approach with annual scientific and financial progress reporting to ensure close monitoring of funded projects towards achieving measurable goals.

FUTURE LEADERS

A BREAKTHROUGH GRANT PROGRAM, DESIGNED FOR BREAKTHROUGH DISCOVERIES.

Canada's next generation of brain researchers has enormous potential. These scientists are starting their careers just as science and technology are beginning to unlock the secrets of the brain. Now is their moment to dream big with innovative, ground-breaking theories. Their work could uncover answers for anything from depression to Alzheimer's to brain injuries.

Our new grant program provides funding at the most critical point in a researcher's career. This innovative funding model is already giving our budding scientists the courage to dream big and be brilliant. We're establishing Canada's pipeline of future leaders, and laying a foundation of research excellence and innovation.

- Give tactical funding to early-career researchers to kickstart the next generation of Canadian brain scientists.
- Enable early-career researchers to hire graduate students, to give them the training and mentorship they need to grow.
- Fund radically ambitious new theories about the brain and brain disorders, that have huge potential benefits to our society and the economy.

The Future Leaders program was officially launched on November 19, 2019. The program aims to support early-career investigators at a critical point in their career, so they can develop new lines of research and gather preliminary data that will allow them to obtain subsequent funding on the path to a stable and sustainable independent research position. Anchored by a generous gift from the Azrieli Foundation, the 2019 competition will support 20 grants of \$100,000 each, over two years. Funding competitions under this Program will be launched every year for the next five years, ultimately supporting 100 early-career researchers.

In 2017, with generous support from the Azrieli Foundation, Brain Canada created a pilot Early Career Grants Program. We received an astonishing 84 applications. Our review panel was impressed by the quality and inventiveness of the applications. They were emphatic that this program be expanded. Ten grants were awarded in this initial cohort and we're already seeing promising results.

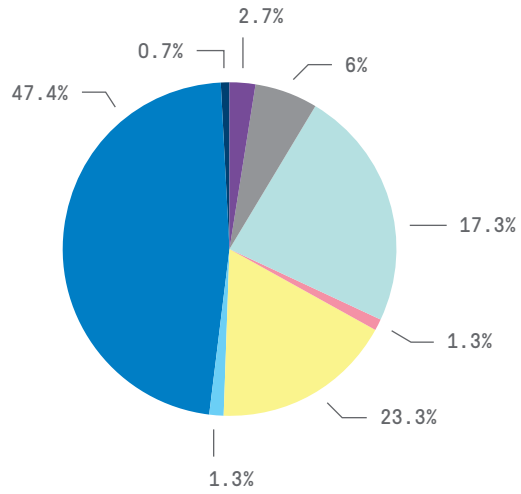
2019 FUTURE LEADERS COMPETITION

Nov. 19, 2019	Dec. 10, 2019	Feb. 19, 2020	Mar. 24, 2020	Apr. 14, 2020	June 2020	Fall 2020
Launch of Future Leaders Competition	Deadline for Letter of Intent Received 150 eligible letters of intent (LOI) across all fields of neuroscience including basic, translational, clinical and knowledge translation approaches	Peer review of LOIs Following peer review of LOIs, 58 applicants invited to submit Full Applications	Deadline for Full Applications (FA)	Deadline for Full Applications extended three weeks due to COVID-19 53 full applications received	Peer review of FAs culminated in two review panels convened over four days via videoconference	Announcement of recipients Funding begins

Applicant Province

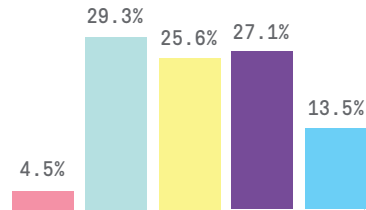
31 institutions across 8 provinces

- British Columbia
- Alberta
- Saskatchewan
- Manitoba
- Ontario
- Québec
- New Brunswick
- Newfoundland and Labrador



Year of Academic Appointment

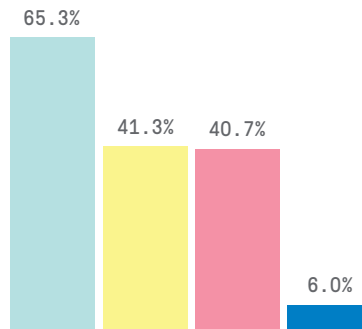
- < 1 year
- 1-2 years
- 2-3 years
- 3-4 years
- 4-5 years



Type of Research

* Numbers do not add up to 100% as categories overlap.

- Basic
- Translational
- Clinical
- Knowledge Translation



PLATFORM SUPPORT GRANTS

SUSTAIN AND ENHANCE THE CAPABILITIES AND ACCESSIBILITY OF RESEARCH PLATFORMS ESSENTIAL FOR TOMORROW'S BRAIN RESEARCH

High-impact research in the neurosciences has always required skill, imagination, determination, and insight. Today, it also requires access to shared equipment, facilities, services, databases, computing/informatics facilities, patient repositories, and biobanks; collectively referred to as “platforms”. Such platforms are complex, highly sophisticated, and expensive—but are recognized as an important enabler of capacity building and as a cost-effective means of accessing cutting-edge equipment, technology, and services beyond what any researcher could achieve on their own. Platforms also play a critical role in fostering innovation and interdisciplinary collaboration. As such, access to platforms is essential to addressing the evolving needs of research.

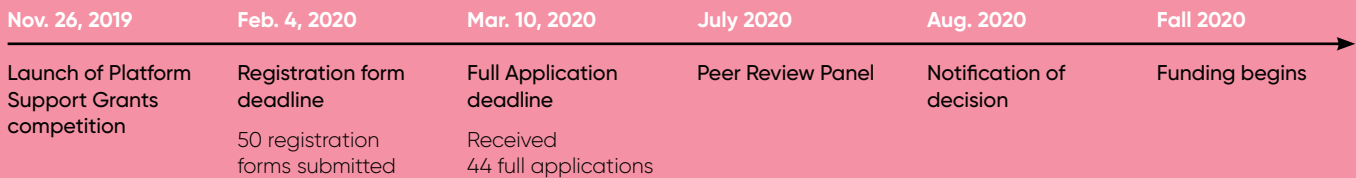
Brain Canada has identified support for operations and maintenance of research platforms as a gap in the neuroscience research funding environment and the Platform Support Grants (PSG) program aims to respond to this critical issue.

The Platform Support Grants program funds major research platforms – at local, regional, and national levels – for up to three years, with the goal of providing enhanced technical and research capabilities to myriads of investigators across all fields of neuroscience.

This is the third iteration of the highly sought-after PSG funding competition. Brain Canada is leading the research competition, peer review, and post-award administration.

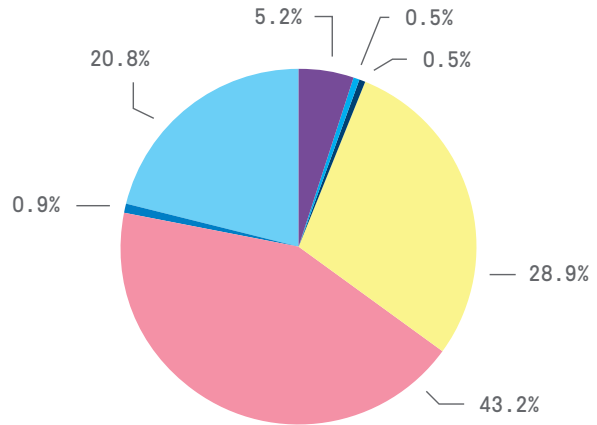
Brain Canada, through the Canada Brain Research Fund, launched the 2019 Platform Support Grants program on November 26, 2019. Brain Canada initially allocated \$6 million to this program, to be matched by sponsor funds, but increased its commitment to \$12.6 million due to high interest in this funding opportunity.

2019 PLATFORM SUPPORT GRANTS COMPETITION



Team Member Distribution

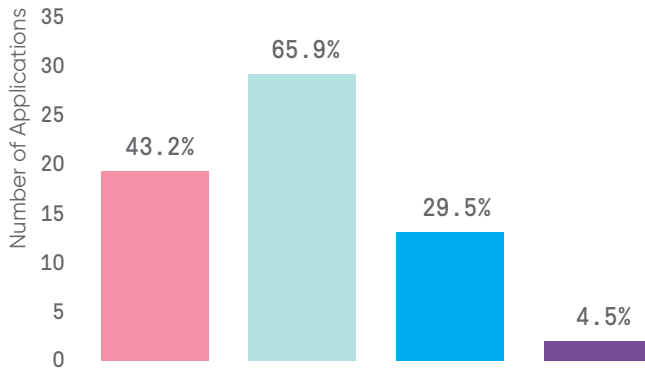
- British Columbia
- Alberta
- Manitoba
- Ontario
- Québec
- Newfoundland and Labrador
- Nova Scotia



Team Composition

* Numbers do not add up to 100% as categories overlap.

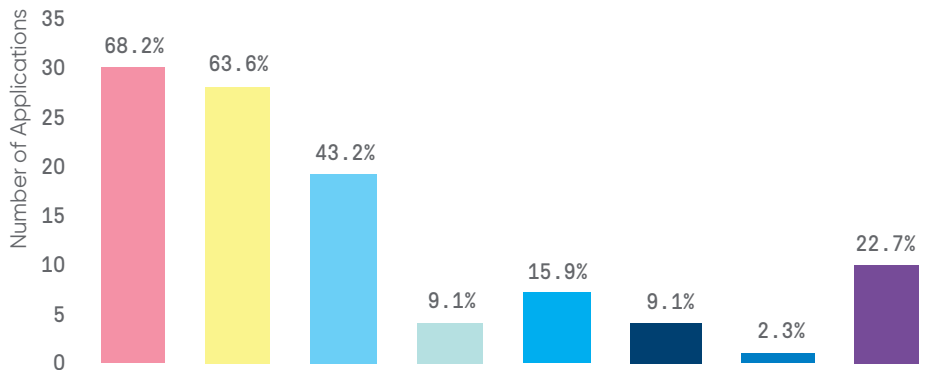
- Multi-Province
- Multi-Institution
- Single Institution
- No Team Members



Type of Research Platforms

* Numbers do not add up to 100% as categories overlap.

- Added Value to Existing Platform
- Data Repository/Sharing
- Imaging Facilities
- Clinical Trial Network
- Drug Discovery
- Brain/Bio Bank
- Transgenic Animal Facilities
- Other (e.g. tool development, disease models)





RESEARCH PROGRAMS OVERVIEW

Charles Ducrot, Trudeau lab.

Brain Canada is proud to announce that \$24,168,263 was disbursed to research grants between June 1, 2019 and May 31, 2020. These projects cover a wide range of diseases, disorders and injuries of the brain. We also launched two grant competitions, Future Leaders and Platform Support Grants. You can read more on these competitions on pages 12-15.

For a complete list of Brain Canada -funded projects, please consult the searchable directory on our website, www.braincanada.ca.

IMPACT OF COVID 19 ON BRAIN CANADA'S RESEARCH PROGRAMS

Brain Canada is actively monitoring the situation and continues to work with funding partners, institutions, and researchers across Canada to mitigate the risks and delays associated with the COVID-19 pandemic. We are maintaining an open dialogue with the research community to assist them during these unprecedented times. Brain Canada is working with each of our funded researchers and institutions to determine next steps and to establish new timelines where necessary. While our funding programs remain intact, we have extended timelines in our funding competitions, and adjusted deadlines and procedures in the peer review process for remote working.

On April 30, 2020, Dr. Jennie Young, Senior Program Manager, represented Brain Canada in a virtual meeting of 18 health charities and health research funding organizations across Canada to share impacts and best practices in responding to the COVID pandemic.

GRANT RECIPIENTS

JUNE 1, 2019–MAY 31, 2020

2019 DR. HUBERT VAN TOL TRAVEL FELLOWSHIP

The fellowship is open to all PhD students and postdoctoral fellows undertaking research on a Brain Canada-funded grant. The award provides up to \$5,000 to enable researchers to attend a major international conference, symposium, or training course.

Julien Ferent, Institut de Recherches Cliniques de Montreal (IRCM)

Dr. Ferent used his travel award to attend the 2019 EMBO workshop on Neural guidance molecules in development and disease in Baveno, Italy.

\$4,164

Michael Skinnider, University of British Columbia

Michael Skinnider used his travel award to attend a training course in the laboratory of Prof. Grégoire Courtine at the EPFL (Switzerland), where he learned their protocols to dissociate the spinal cord for scRNA-seq.

\$3,807

2019 TURNBULL-TATOR AWARD IN SPINAL CORD INJURY AND CONCUSSION RESEARCH

This award aims to recognize an outstanding publication by a researcher at a Canadian institution in the field of spinal cord and brain injury research (including concussion) in the last two years with a \$50,000 prize.

Brian Kwon, University of British Columbia

"Spinal cord perfusion pressure predicts neurological recovery in acute spinal cord injury."

\$50,000

2019 ALS CANADA TRAINEE AWARDS PROGRAM

The goal of this program is to attract the brightest young minds to ALS research to contribute to a succession plan for the Canadian ALS research community. Brain Canada provided funds to the three recipients selected through the *ALS Canada Research Program Trainee Awards Program*.

Myriam Gagné, Université de Montréal

"Biological and Pathological relevance of hnRNP A1B; An alternative splice variant of TDP-43."

\$75,000

Marc Shenouda, University of Toronto

"Validation of small molecules preventing TDP-43 aggregation as a therapeutic for Amyotrophic Lateral Sclerosis."

\$75,000

Terry Suk, University of Ottawa

"Disrupted SUMOylation facilitates rogue TDP-43 in ALS."

\$75,000

BRAIN CANADA/CQDM PARTNERSHIP – QUANTUM LEAP PROGRAM

This program is intended to support outstanding translational research projects implementing state-of-the-art technologies with very high-potential impact in key areas of unmet needs within the biopharmaceutical industry

Thomas Durcan, Montreal Neurological Institute

"Development of a high throughput 3D microphysiological platform for rapid automated assessment of human brain organoids response to drugs targeting neurological disorders."

\$1,600,000

HENRY AND BERENICE KAUFMANN FOUNDATION

Louis-Eric Trudeau, Université de Montréal

"Restoration of mitochondrial function by activation of the NAD⁺/Sirtuin pathway to treat PD."

\$50,000

Dr. Brian K. Kwon has been named the recipient of the inaugural 2019 Turnbull-Tator Award in Spinal Cord Injury and Concussion Research, for his publication "Spinal cord perfusion pressure predicts neurological recovery in acute spinal cord injury" in *Neurology*. The Turnbull-Tator Award, presented in partnership by the Barbara Turnbull Foundation for Spinal Cord Research and the Brain Canada Foundation, with the financial support of Health Canada, recognizes an outstanding publication by a researcher at a Canadian institution in the field of spinal cord and brain injury research with a \$50,000 prize. Dr. Kwon was presented with the Turnbull-Tator Award at the 18th annual Tator-Turnbull Spinal Cord Injury Symposium at Toronto Western Hospital on Friday, November 8th, 2019.

The Turnbull-Tator Award was originally established in 2001 in honour of Barbara Turnbull, and known as the Barbara Turnbull Award for Spinal Cord Research, in recognition of Barbara's tireless efforts to raise awareness about spinal cord injuries, and her advocacy for excellence in Canadian research in this field.

Brain Canada congratulates Dr. Kwon, one of the country's research stars, for leading a truly collaborative project which bridges the gap between basic research and clinical translation to patients. Additionally, his team's work is relevant to our broader understanding of the brain and nervous system with potential application to biomarker development.



PARTNERED PROGRAM

**2019 TURNBULL-TATOR AWARD
IN SPINAL CORD INJURY
AND CONCUSSION RESEARCH**

Speakers at the 18th Annual Tator-Turnbull Spinal Cord Injury Symposium.

KNOWLEDGE TRANSLATION

BRAIN CANADA-BIOGEN MEETING OF THE MINDS

Brain Canada and Biogen co-hosted events on November 20th in Edmonton and November 28th in Toronto, to showcase the latest Canadian research in multiple sclerosis (MS), spinal muscular atrophy (SMA), and amyotrophic lateral sclerosis (ALS). These events brought together researchers, Provincial Government representatives, and industry partners in the field.

“ Our long-standing partnership with the Brain Canada Foundation is founded upon a shared passion and mission to advance brain research in Canada. At Biogen Canada, we believe that collaborations across all stakeholders in brain healthcare are not only a best practice, but essential to achieving the best outcomes in research and medical innovation, and to improving patient lives. We are proudly working together towards the collective goal of understanding progression in MS and have also partnered to provide knowledge sharing forums across important disease areas like MS, SMA and ALS. We also look forward to new collaboration opportunities in fighting Alzheimer’s disease. As a trusted leader in Neuroscience, we are deeply committed to breaking new ground.”

– Marina Vasiliou,
Vice President and Managing Director of Biogen Canada



Dr. Jason Plemel, University of Alberta

The Edmonton event featured presentations from Dr. Fabrizio Giuliani and Dr. Jason Plemel, both from the University of Alberta. Dr. Plemel, a recipient of a 2019 Brain Canada – Azrieli Foundation Early Career Capacity Building Grant, spoke about the role of microglia in white matter disease, and Dr. Giuliani spoke about precision medicine in MS.

At the Toronto event, Dr. Jiri Vajsar from the University of Toronto, discussed advancements in treatment of SMA, and Dr. Alex Mackenzie of University of Ottawa spoke about newborn screening for SMA. Dr. Jeehye Park of the University of Toronto discussed a proposed model for studying ALS pathogenesis.

Dr. Jeehye Park was the recipient of a 2016 ALS Canada – Brain Canada Career Transition Award.



“ RBC Foundation is proud to partner with Brain Canada and Wisdom2Action to support practical innovative solutions that can help today’s youth prepare for tomorrow’s challenges.”
- Cindy Chao, Senior Manager, Youth Strategy and Innovation, RBC



RBC YOUTH MENTAL HEALTH INITIATIVE

Building on the successful partnership launched in 2015, Brain Canada and Royal Bank of Canada (RBC) Foundation are continuing their collaboration to accelerate the practical application of research findings in improving youth mental health services. Phase I of the RBC Youth Mental Health Initiative centred on a workshop held in Toronto on March 9 and 10, 2020. The event convened more than 40 thought leaders, other funders, advocates, experts in the field, and community stakeholders from across the country, with the aim of fostering important discourse on the advancement of youth mental health projects and programs in Canada. The workshop was hosted and facilitated by a youth team, led by Wisdom2Action, an organization specializing in youth engagement knowledge mobilization, while Brain Canada identified and recruited experts and key stakeholders from across the youth mental health sector. The overall goal of the event was to develop a better understanding of the existing gaps in knowledge and services, with the aim of identifying critical areas that require additional funding support and that are most likely to lead to impactful youth mental health outcomes.

The workshop followed the social innovation lab approach – a process that offers a series of structured steps to help groups experiment and prototype potential innovations, and which values diverse stakeholder participation. After thorough discussion, the 40 workshop participants reached consensus and identified five focus areas of priority: family and community support integrated service delivery, integrated mental health and substance use harm reduction services, school-based support for prevention and early intervention, better and more consistent data to enable knowledge translation across jurisdictions and varied sources.

Attendees recognized that certain youth face increased barriers to accessing competent care due to their sexual orientation, gender identity, racial or cultural background, or other unique statuses, highlighting the need for “equity above all.” They reiterated the importance of increased funding to support diverse communities through targeted interventions, policy, research, and advocacy. In addition, participants noted that it is important to bring research, practice, and lived experience, as expressed through child, youth and family voices, together to create a stronger evidence base.

The pandemic and our global response has revealed a starkly disproportionate impact on vulnerable communities, including youth. In addition to immediate necessities as youth deal with uncertainty and the loss of safety nets (such as school, employment, and social connection), long-term solutions are needed to handle the predicted “fourth wave” of health care pressure in mental health. The amazing work carried out by diverse stakeholders across the youth mental health sector requires increased support to meet these new challenges. Ensuring that we are co-creating, funding, evaluating, and researching a responsive and effective youth mental health sector has never been more important.

WOMEN'S BRAIN HEALTH INITIATIVE

Brain Canada and the Women's Brain Health Initiative (WBHI) have an ongoing partnership with the goal of engaging and educating Canadians on the importance of women's brain health. To date, Brain Canada has supported 8 editions of the WBHI publication *Mind Over Matter* (MOM), a magazine featuring articles about brain health and the prevention of age-related cognitive decline.

Over 130,000 copies of the fall 2019 edition of *Mind Over Matter* were printed and distributed across Canada through *The Globe and Mail* and *The Toronto Star* as an insertion, at meetings and presentations across Canada, the U.S., at fund-raising events and global summits. A digital version is also available online.

The spring 2020 edition of *Mind Over Matter* included three articles featuring Brain Canada-funded projects, as well as a one-page overview of Brain Canada.



Spring 2020 edition of *Mind Over Matter*.

MENTAL HEALTH COMMISSION OF CANADA

Brain Canada partnered with the Mental Health Commission of Canada and the Medavie Health Foundation to adapt the Road to Mental Readiness (R2MR) program to create a module for adult family members of first responder groups. The program has been completed and is now available to all the first responder partners and instructors in English and French. A webinar was held for the instructors prior to making the program available for training purposes. The official public launch of the Working Mind First Responders Family Package will take place in 2020.

Brain Canada also partnered with the Mental Health Commission of Canada, Bell Canada, and the Rossy Foundation to support Phase II of "Supporting Student Success – Development of a National Standard to address the psychological health and safety of post-secondary students." The PSS Standard draft is available online for public review and all feedback will be shared with their Committee as the Standard is finalized. The final version is set to be released in 2020, in English and French, and will be reviewed and updated every five years.

BRAIN CANADA RESEARCH STORIES





Dr. Gustavo Turecki

BRAIN CANADA RESEARCH STORIES

ELEVATING BRAIN RESEARCH: PLATFORM GRANTS

Brain Canada identified a gap in neuroscience funding: support for operations and maintenance of research platforms. A critical gap that must continuously be addressed. Hence, the Platform Support Grants competition – with the latest call for applications issued in 2019.

High-impact research in brain science has always required skill, imagination, determination and insight. Modern brain research also requires access to shared equipment, facilities, patient repositories, and biobanks, collectively referred to as technology platforms.

Platform grants have a long history with Brain Canada. They are one of the Foundation's signature grants. Platform grants sustain or enhance research platforms to promote efficient sharing across research networks. Research platforms enable capacity building and are a cost-effective means of accessing equipment, technology, and services beyond what individual researchers can achieve. They are the databanks of brain research.

To date, more than \$83 million has been allocated to supporting these critical research platforms. In addition to benefiting research by promoting open science and data sharing, these funds are also leveraging past investments by other funders which have helped to establish critical platforms.

THE BANK

Dr. Gustavo Turecki is the co-Director of the Douglas – Bell Canada Brain Bank based at the Douglas Mental Health University Institute. The Brain Bank, the recipient of a 2014 Platform Support Grant, is one of the few brain repositories in the world that actively recruits, preserves, and distributes brains from individuals with mental illness or neurodegenerative diseases. The Brain Bank houses and manages over 3,000 brains, as well as a large database containing demographic, clinical, and developmental histories from the donors. Access to healthy and diseased tissue is essential for understanding the physiological and pathological processes underlying disorders affecting the brain.

This internationally recognized brain bank receives tissue requests from a large number of neuroscientists both in Canada and around the world. Requests for tissues have come from leading international laboratories focusing on neurobiological processes as diverse as the normal expression of brain genes, histological changes associated with brain aneurysms, epigenetics processes associated with chronic cocaine use, and the neurobiological consequences of early-life adversity, to name just a few. More than 1,000 brain samples are prepared and sent to researchers each year.

The Brain Bank is a unique and vital resource to strengthen brain research in Canada and around the world. Samples obtained from the Douglas – Bell Canada Brain Bank have been essential to several scientific breakthroughs reported in studies published in high-impact journals.



Members of the Brain Tumour Registry team, from left to right: **Dr. Yan Yuan, Dr. Emily Walker** and **Dr. Faith Davis**.

THE REGISTRY

Brain tumours, whether malignant or non-malignant, can significantly impact the lives of those diagnosed, affecting their health and overall quality of life. It is estimated that 27 Canadians are diagnosed with a brain tumour every day and, until recently, the data available did not reflect the extent and complexity of brain tumour cases in Canada. The Brain Tumour Foundation of Canada identified a gap in available information on Canadian brain tumour patients and prioritized the development of a pan-Canadian surveillance report.

In 2015, Dr. Faith Davis of the University of Alberta received a Brain Canada Platform Support Grant, in partnership with the Brain Tumour Foundation of Canada, to build upon Canada's existing cancer registry data.

THE BRAIN TUMOUR REGISTRY OF CANADA (BTRC) is a pan-Canadian, multi-center surveillance research collaboration with the goal of providing comprehensive data on the incidence, prevalence, and survival rates of both malignant and non-malignant brain tumours. The research team includes cancer epidemiologists and clinician scientists, along with counterpart provincial and territory cancer registry experts. While the existing provincial and territorial cancer registries collect the data, Dr. Davis and her colleagues provide quality control and analysis of the data and prepare reports to make that information available to the research community.

The official launch of the Brain Tumour Registry of Canada in May 2019 was accompanied by their first Incidence Report, which includes data collected from four provinces (BC, AB, MB, and ON) between 2010 and 2015. The report included information on patient characteristics, such as sex, age, location, and tumour histology, which can be used to explore trends in incidence and prevalence. This information, in turn, can stimulate hypotheses on the causes of various types of brain tumours and potential treatments to improve health outcomes, as well as support clinical and policy guideline formation. A Survival Report, published shortly after in December 2019, included survival rates which are critical in informing clinical decision-making, support planning for research, as well as policy development. Significantly, the report included data on non-malignant tumours and is the first of its kind in Canada. The team's next report, expected in late 2020, will include data from all provinces and territories.

“ With funding from Brain Canada, we have enhanced brain tumour surveillance in Canada and made crucial population-level data available for clinicians, researchers, policymakers, and patient advocates for the first time in Canada. Through this project, we have also laid the foundation for ongoing comprehensive surveillance and reporting through a collaboration between the Public Health Agency of Canada, Brain Tumour Foundation of Canada and the University of Alberta,” said Dr. Faith Davis.



BRAIN CANADA RESEARCH STORIES
SEX DIFFERENCES IN THE BRAIN

Dr. Cindy Barha

Empowering women and fostering diversity is the path forward to more equitable and inclusive research and science. Inclusion in all its forms is key to driving diversity in thinking, and acts as a catalyst for innovation, leading to better results for everyone. Diverse systems and organizations better represent the populations they are serving and lead to creative solutions by bringing a breadth of experiences and perspectives to the table. This has always been the central theme of the Brain Canada model.

Brain Canada has been working to remedy an imbalance of focusing largely if not exclusively on male animal models and human subjects, when we know that sex and gender influence our risk of developing certain diseases, our symptoms and severity of illness, how well we respond to interventions, and how often we seek care. We ask researchers applying for grants to describe how sex and gender are taken into consideration in their research project, and to provide justification if they are not. We also fund research with a specific focus on sex or gender, and to date have invested more than \$3.43 million across 11 programs across the country. Including sex and gender considerations into the research we support is improving the way we design, implement, and scale up novel health interventions.

EXERCISE AS MEDICINE?

A case in point is Dr. Cindy Barha, a researcher who received a 2017 Brain Canada - Alzheimer's Association Research Fellowship, and studies sex differences in exercise efficiency. "As a postdoctoral fellow, the support from Brain Canada has allowed me to pursue my interest in promoting women's brain health. In Canada, Alzheimer's disease is more prevalent in females. Thus, it is essential to understand sex differences in dementia prevention strategies, including exercise interventions. My goal is to understand for whom and how exercise benefits cognitive and brain health, by examining sex differences in cognitive response to exercise and determining the underlying mechanisms," said Dr. Barha.

Dr. Barha, based at the University of British Columbia, is conducting an exercise study of male and female participants with mild cognitive impairment. She measures the participants' levels of estrogen, testosterone, cortisol and Brain-derived neurotrophic factor (BDNF) before and after the exercise intervention. The results of this study may provide new information on how exercise affects the brains of men and women differently.

“ Given the immense health and financial burden imposed by dementia, my proposed research could have a major impact in Canada and internationally by advancing our ability to use ‘exercise as medicine’ in a precise, specific manner for women and men to promote healthy brain aging,” said Dr. Barha.

Ultimately, Dr. Barha's research could help guide the design of sex-specific exercise interventions to reduce Alzheimer's risk – a disease whose economic burden is expected to reach \$16.6 billion by 2031.



Researchers in the Trudeau Lab.

BRAIN CANADA RESEARCH STORIES

FROM HEAD TO TOE: THE BRAIN, THE GUT, AND THE HEART

Interconnectedness extends beyond the brain to systems throughout the body: from head to gut to heart. Studying the brain on its own limits the potential for discovery. Therefore, Brain Canada follows a One Brain approach to understand the brain as part of a single interconnected system. It is the smarter way to invest in brain research.

GUT FEELING

Skim through Brain Canada's annual reports and you will spot the familiar face of Dr. Louis-Éric Trudeau. Dr. Trudeau led one of the five teams selected through the Brain Repair Program, launched in 2003, to pursue novel, paradigm-changing ideas. His team had two breakthroughs. They determined the role of genes associated with developing Parkinson's, and they discovered that the brain cells that cause Parkinson's die because they need too much energy and in some way "overheat" due to oxidative stress.

“ The Brain Repair Program linked me with people who were studying diseases from a different angle,” said Dr. Trudeau. “It was instrumental in my professional development, and I think that for a new scientist that is starting out in Canada, having access to team grants will change the way their career develops. The way to make progress and to go faster is to work in teams. It is a unique program that Brain Canada has, there is no equivalent program for neuroscience teams in Canada right now.”

It is in the same Trudeau Lab, tucked in at the Université de Montréal, that Dr. Trudeau and his team made what Québec Science termed one of the ten scientific discoveries of 2019. A discovery made in part through the support of Brain Canada and its partners.

“The brain is linked with the body in many ways. It makes a lot of sense to study interactions between the gut, the brain and the peripheral nervous system. Our angle is to look at how the immune system can trigger an autoimmune disease mechanism in the gut,” explained Dr. Trudeau.

The results of the research, published in *Nature*, show that, in a mouse model, a gut infection can lead to a pathology resembling Parkinson's. A gut infection in an animal that is predisposed to Parkinson's is sometimes enough to transform neurons into targets for the immune system, leading to symptoms of the disease. The results help to better understand Parkinson's and its progression across the body – which may in turn help its detection and eventually its treatment.

THE HEART WILL GO ON

Meanwhile, at the University of British Columbia, Dr. Christopher West and his team are exploring the heart and brain connection in spinal cord injury. With the support of Brain Canada and the Heart and Stroke Foundation, through an Emerging Research Leaders Initiative grant, Dr. West is measuring the function of the heart and blood vessels following spinal cord injury. The goal is to investigate the mechanisms that are responsible for changes that occur post-injury. The second objective is to determine whether physical activity that exercises both the arms and the legs of people with spinal cord injury can improve the health of the heart and blood vessels.

“We showed that with as little as 10 minutes per week of behavioural coaching, we were able to get people with spinal cord injury to increase their habitual physical activity, which resulted in a 20 per cent increase in their peak aerobic power. Given these individuals traditionally present very low levels of peak aerobic power we believe these results have important clinical relevance and may help offset the increased risk of cardiovascular disease that these individuals typically have,” said Dr. West.

The impact of the funding provided by Brain Canada and its partners went beyond Dr. West's research project. “The funding from Brain Canada, which was in the form of a jointly funded operating grant I received early in my independent research career, enabled me and my team to conduct some of the first studies in my own research lab. These early studies were critical in enabling me to publish some preliminary manuscripts and collect data that I used towards successful larger grants,” added Dr. West. “Without this partnered award these early studies would have been impossible to conduct and as such I am very grateful to Brain Canada for their commitment to supporting early career investigators.”



Dr. Christopher West (left) and members of his research team.



Researchers demonstrating the Mydriatic Hyperspectral Retinal Camera, part of Optina's Retinal Deep Phenotyping™ platform.

BRAIN CANADA RESEARCH STORIES

A WINDOW TO THE BRAIN: BRAIN CANADA AND CQDM

Together, Brain Canada, with the financial support of Health Canada through the Canada Brain Research Fund, and CQDM, with the support of their industrial and governmental partners, have invested more than \$18.3M in 14 projects that link neuroscience research to the biopharmaceutical industry.

This unique collaboration provides support for translational research aimed at improving our ability to detect and treat injuries, disorders, and diseases of the central nervous system with the potential to directly benefit patients. The goal of the collaboration is to accelerate the uptake of research into clinical practice by combining the resources and knowledge of the academic and industry sectors.

To date, the partnership has fostered new innovations in high-throughput screening, diagnostic technologies, and drug discovery applicable across a range of diseases and disorders such as ALS, Parkinson's, Alzheimer's, autism, Multiple Sclerosis, and chronic pain.

I SPY WITH MY LITTLE EYE

One of the breakthroughs to emerge from the collaboration is led by Dr. Jean-Paul Soucy. Dr Soucy, in collaboration with Optina Diagnostics, has developed an eye test that could revolutionize the early diagnosis of Alzheimer's Disease (AD).

Alzheimer's Disease is the most common cause of dementia, affecting millions worldwide, with no cure available. Detecting AD earlier in its course could dramatically transform the design of clinical trials to test new treatments. Currently, PET (positron-emission tomography) imaging is done to confirm the presence of amyloid plaques as a condition for inclusion in such clinical studies. However, PET scans are costly, require injections of radioactive materials, and must be conducted in specialized medical centres.

Less invasive and less costly screening approaches will aid in early detection and could vastly impact clinical trials and decrease costs associated with PET imaging.

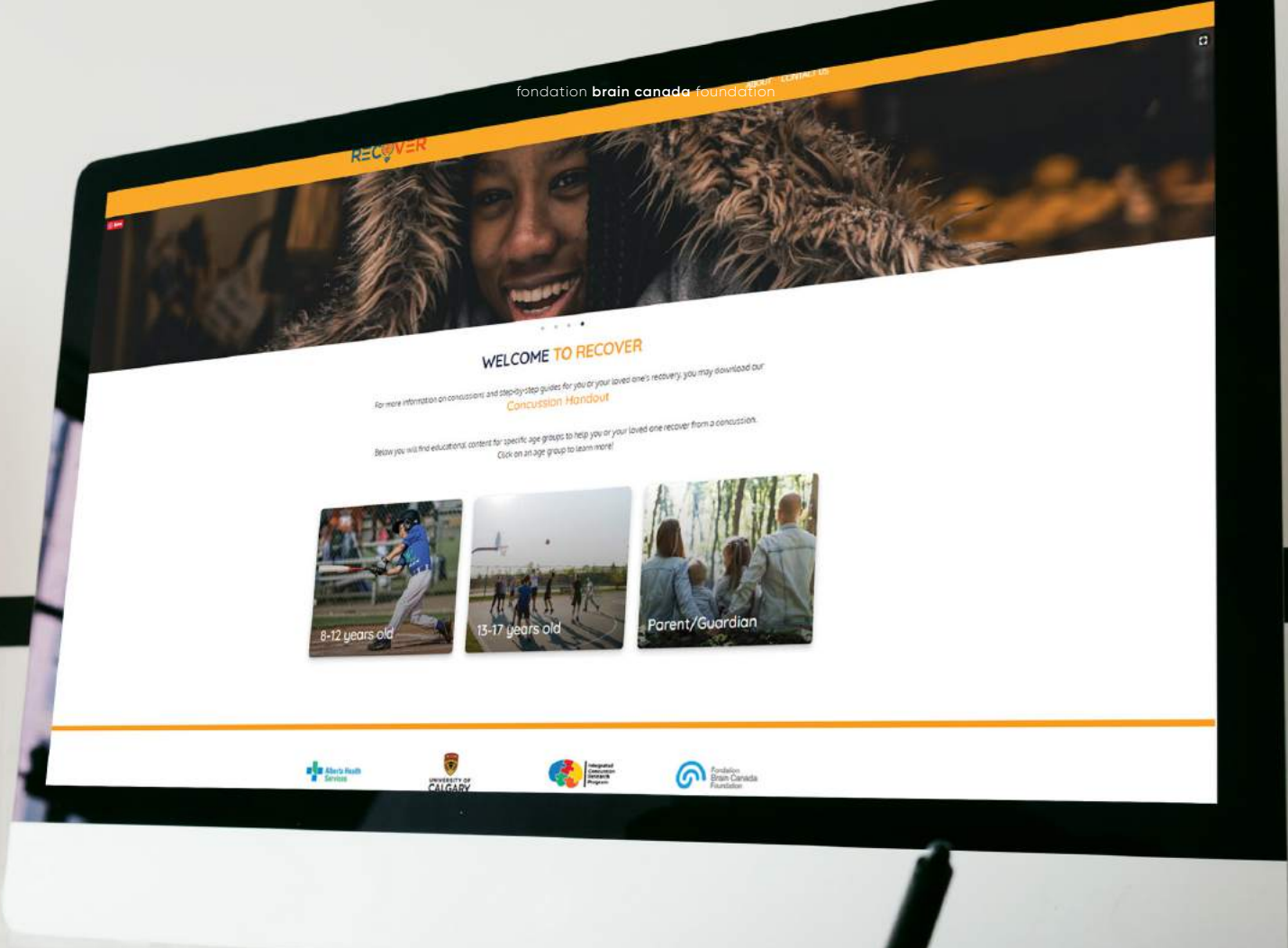
The eye offers a natural window to the brain through the retina, the light-sensitive layer lining the interior of the eye, as it is an anatomical and developmental extension of the brain that remains accessible throughout the lifespan. Indeed, researchers have reported the presence of beta-amyloid (AB) plaques, a key biomarker in AD brains, in the retina of AD patients and mouse models of AD.

Dr. Soucy's research team developed a new version of Optina Diagnostics' Mydriatic Hyperspectral Retinal Camera (MHRC), part of its Retinal Deep Phenotyping™ platform, that can detect these plaques in the retina of asymptomatic individuals by using a simple, safe, and non-invasive eye test that is exceedingly more accessible than the PET scan technology currently in use. A machine learning algorithm was also developed to analyze the images.

“ The Brain Canada grant has allowed me and my co-investigators to create an academia-industry partnership bringing together state-of-the-art techniques which complement each other beautifully in the search for new diagnostic approaches to Alzheimer's Disease. The potential of retinal scanning for amyloid deposition detection to be used earlier in the course of disease, and at a fraction of the cost and of the complexity of currently available approaches, could make it a true screening procedure, and this would have a major impact on the implementation of course-modifying therapies,” said Dr. Soucy.

This eye scan could revolutionize AD research and the development of effective therapeutics. It could aid in identifying who would benefit from treatment and whether a treatment is effective. To date, the development of pharmaceutical therapeutics is entirely derived from research using participants whose symptoms have already significantly progressed. This technology will enable researchers to enlist pre-symptomatic participants who are at risk for developing AD, facilitating the development of drugs targeting AD in its earliest stages, and providing the best hope for developing effective treatment and, ultimately, a cure for this devastating disease.

To date, the team has submitted two patent applications. In April of 2019, the retinal imaging platform received Breakthrough Device Designation from the USA FDA, which will streamline the market clearance and approval process to put the device to use in clinics. Then in April of 2020, it received 510(k) clearance from the FDA. This will allow for partnerships with eye clinics to conduct these eye scans in at risk populations.



RECOVER Concussion web portal: www.recoverconcussion.ca

BRAIN CANADA RESEARCH STORIES

NEW GROUND: IMPROVING HEALTH OUTCOMES

The Government of Canada recognizes the significant impact of brain disorders on the health of Canadians, and supports research to advance our understanding of the brain. To take action, Brain Canada and Health Canada, through the Canada Brain Research Fund, spearheaded the Improving Health Outcomes and Quality of Life Team Grant competition.

Launched in 2017, the Improving Health Outcomes competition aims to accelerate the impact of research advances on health outcomes, including quality of life, of people living with brain disorders. This granting program enables novel collaborations between multidisciplinary teams of researchers, clinicians, allied-health workers, carers and patients.

Following a rigorous international peer review, six research teams across Canada were selected in 2018 to receive funding, for a total of more than five million dollars. These projects cover several high priority research areas, including concussion, mental health, Alzheimer's disease and stroke.

BETTER OUTCOMES FOR CHILDREN WITH CONCUSSIONS

With the support of a Brain Canada Improving Health Outcomes and Quality of Life Team Grant, Dr. Keith Yeates of the University of Calgary is leading a study evaluating the implementation and impact of a clinical pathway for acute care of pediatric concussion. The project aims to design a robust implementation plan, evaluate its impact on patient outcomes, and determine whether it leads to a reduction of health care utilization and costs. The clinical pathway will be implemented at four sites in Alberta over two years. The ultimate goal of the study is to improve the health outcomes of children and adolescents diagnosed with concussion by providing up-to-date and evidence-based information on concussion symptoms, management, and follow-up care.

“Clinical practice guidelines are available to guide the management of pediatric concussion, but are not systematically implemented in clinical settings, resulting in significant practice variation and non-optimal outcomes. The funding provided by Brain Canada and our partner, Alberta Health Services, has allowed us to develop, implement, and examine the effects of a clinical pathway to guide the care of children with concussions,” said Dr. Yeates. “No published studies have rigorously evaluated the implementation of a clinical pathway for the management of pediatric concussion. The project breaks new ground in efforts to promote better outcomes for children with concussion and reduce the attendant public health burden.”

To improve outcomes for children with concussions who are seen in emergency departments, the study has developed tools to help physicians and nurses provide better care and to help families learn more about, assess, and monitor concussion.

One of the tools created through the grant is the RECOVER Concussion web portal (www.recoverconcussion.ca). The portal provides information and resources about concussion in children to help families better understand common symptoms of concussion, where and when to seek medical care, and how to monitor and manage symptoms to promote optimal recovery.

In addition, several handouts have been created for pediatric emergency rooms, including “Pediatric Emergency Department Concussion Teaching Handout” and “Concussion, Pediatric – Emergency Recommendations.”

As a result of this study, one publication has been submitted to the journal *Health Services Research* and several others are currently in preparation. Dr. Yeates is also a co-investigator on a separate research grant, which will replicate the CBRF-funded project in Australia.



Dr. Keith Yeates

BRAIN CANADA RESEARCH STORIES

OPEN SCIENCE: THE BRAIN WITHOUT LIMITS

Since its founding, Brain Canada has played a leadership role in changing the way we do research, to be more interdisciplinary, more diverse and inclusive, more networked, more coordinated and collaborative. Brain Canada acknowledges the crucial role that funders can play in the implementation of open science policies. In recognizing the importance of open science and data sharing in helping accelerate neuroscience research in Canada, Brain Canada has committed more than \$26M in funding to various open science projects. These investments are enabling Brain Canada to realize its vision of Science Without Barriers or Borders – a vision of collaboration in science and a belief that a diverse and interconnected brain research ecosystem will enable Canada to make even greater contributions and to effectively engage with other countries.

New tools, large-scale collaborations and the open science concept make it the ideal time for brain research. Given our sources of funding, from donors, partners and governments, Brain Canada believes that data and knowledge generated from research must have the broadest impact and reach people more rapidly. Therefore, we actively promote open science in health research—which creates efficiencies, improves quality and integrity of data (its reliability and reproducibility), speeds up scientific discovery, enables collaboration across borders and disciplines, and has broad economic benefits. Of course, this must be done with an understanding of the ethical, legal and social implications of sharing data.

THE CANADIAN OPEN NEUROSCIENCE PLATFORM

The Canadian Open Neuroscience Platform (CONP) is a national platform for open sharing of neuroscience research data and brings together many of the country's leading scientists in basic and clinical neuroscience to form an interactive network of collaborations in brain research, interdisciplinary partnership, clinical translation and Open Publishing. The goal of the platform is to improve the accessibility and re-usability of neuroscience data and, by increasing awareness of ongoing and past research efforts, it will reduce unnecessary duplication and overlap, resulting in a more efficient use of funding support.

The platform will propel Canadian neuroscience research into a new era of open neuroscience research with the sharing of both data and methods, the creation of large-scale databases, the development of standards for sharing, the facilitation of advanced analytic strategies, the open dissemination to the global community of neuroscience data and methodology, and the establishment of training programs for the next generation of neuroscience researchers. To encourage successful drug development, CONP will share early-stage findings among academic and pharmaceutical partners through the Tanenbaum Open Science Institute at the Montreal Neurological Institute. Ultimately, the CONP will help researchers collect, link and analyze data from across the country more easily, leading to better and faster outcomes for patients.



CONP Annual Planning Day 2019

CANADIAN OPEN PARKINSON NETWORK

The Canadian Open Parkinson Network is a national network that unites researchers, physicians and patients across Canada to study Parkinson's disease (PD). This pan-Canadian initiative unites the resources of eight PD centres, including the Quebec Parkinson Network, which in under 4 years has enrolled over 1,100 patients and has helped conduct 51 research projects looking at different aspects of PD, and will help the execution of large-scale projects that cannot be addressed without a nationwide database. The network will provide the systems and tools to collect, store and share large amounts of information about PD. The data collected will be securely shared with researchers across Canada to better understand the causes of Parkinson's and find markers that predict disease progression.

CANADIAN PROSPECTIVE COHORT STUDY TO UNDERSTAND PROGRESSION IN MULTIPLE SCLEROSIS (CANPROCO)

Spanning multiple disciplines, this five-year project is a collaborative study combining the efforts of nearly 50 leading MS researchers from across Canada. It is the first project of its kind in Canada aiming to better understand progression in MS and why some people progress in their disease while others do not. The team of researchers will try to pinpoint triggers leading to progression and establish methods of managing them while measuring the impact of MS on individuals, as well as the Canadian healthcare system. Bringing together several fields of study is a powerful way to assess different aspects of progression in MS leading to: a better understanding of the biological mechanisms of progression, identification of risk factors for progression, development of biomarkers to monitor progression and predict treatment response, and inform strategies to improve the lives of people living with MS. Long-term monitoring of MS progression also enables researchers to create a centralized and open source of data that may be relevant for other neurodegenerative diseases including Alzheimer's, Parkinson's, amyotrophic lateral sclerosis, and Huntington's due to the potential for common disease mechanisms.



The CanProCo team

BRAIN CANADA RESEARCH STORIES

THE PATH TO IMPROVING COGNITION

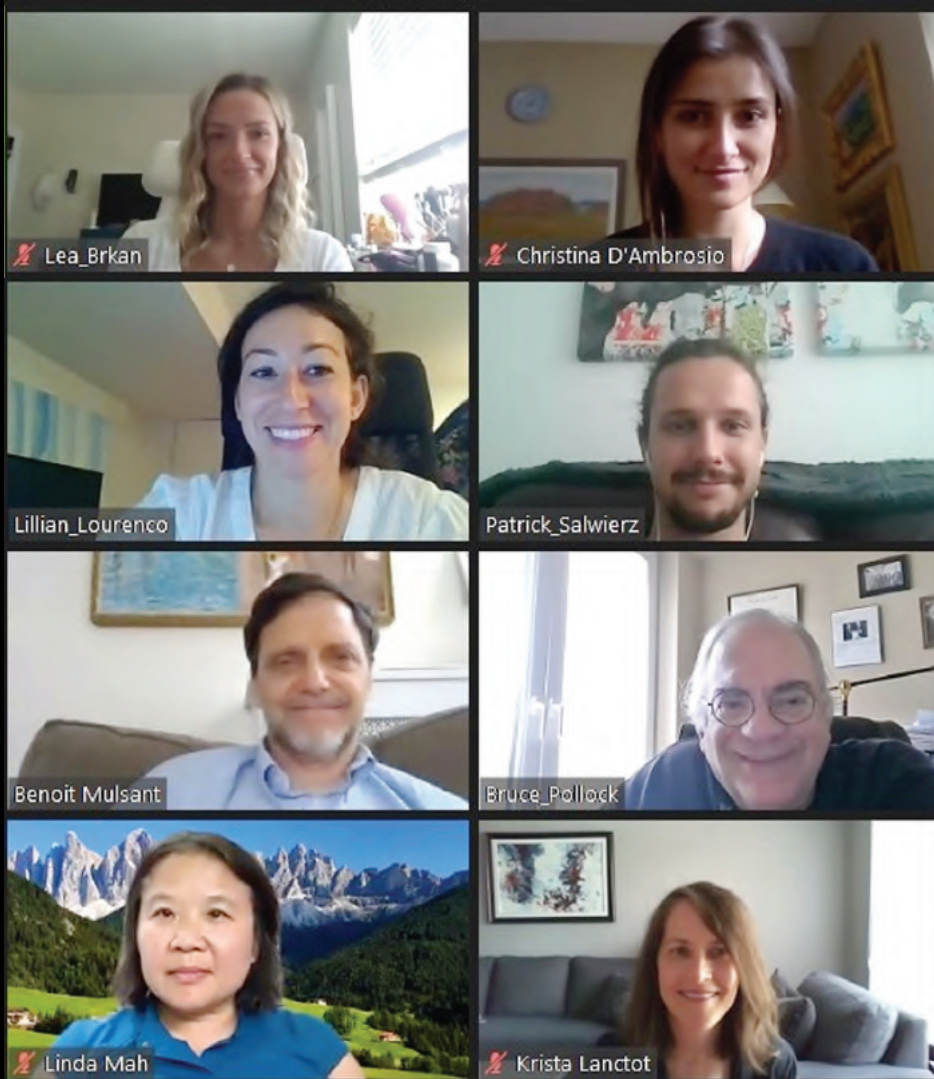


One of Brain Canada's flagship research projects on Alzheimer's is that of Dr. Benoit Mulsant at the University of Toronto. He received a Chagnon Family and Brain Canada Interventions for Prevention of Alzheimer Disease and Related Disorders (ADRD) Team Grant. Dr. Mulsant's project is a testament to the success of the Canada Brain Research Fund (CBRF).

Available treatments for Alzheimer's tend not to work well, as they begin when the disease has already damaged the brain. There is therefore a need to develop preventive treatments, but studies of preventive treatments need to target people who are at higher risk of developing Alzheimer's. Older people at higher risk include those with mild cognitive impairment (MCI) or major depression.

DISCOVERIES IN THE LAB AND AT HOME

Dr. Mulsant and his team are studying how Alzheimer's and depression are linked, and how cognitive remediation and transcranial direct current stimulation work in improving cognition in older persons with MCI or depression. If they are beneficial in older persons with major depression, then they can be tested in the general population, or in other non-depressed populations, at high risk for Alzheimer's. The project is promising and has been extended until June 30, 2022.



Dr. Mulsant and his team during a virtual meeting.

“ The trial reached its recruitment target in August 2018: 375 participants with Mild Cognitive Impairment (MCI) or Major Depressive Disorder (MDD) have been randomized and have initiated the study intervention. Until June 2022, participants will continue to receive the ‘booster’ intervention twice a year and to complete the comprehensive study assessment once a year to determine whether they have progressed and meet criteria for a diagnosis of dementia,” said Dr. Mulsant.

The study continues to proceed successfully despite the COVID-19 crisis: all participants have been contacted by phone and have been offered support by the study staff. As Dr. Mulsant explains: “video-conferencing assessments have been implemented so that both the safety of these vulnerable participants and the scientific integrity of the study can be preserved despite this unprecedented crisis.”

Dr. Mulsant and his team believe that, research on brain disorders can and must go on despite COVID-19. “If we do not make progress, Alzheimer’s dementia and other brain disorders will kill more people during the 2020s than COVID-19,” added Dr. Mulsant.

EVENTS AND CONFERENCES

AAIC 2019 CANADIAN NETWORKING EVENT - July 18, 2019

Brain Canada attended several events linked to the Alzheimer's Association International Conference, including the Canadian Networking Event held at the Consul-General's residence in Los Angeles. The event was organized by the CIHR Institute of Aging, and co-hosted by CIHR, Brain Canada, Alzheimer Society of Canada, CCNA, and the Consortium of Canadian Centres for Clinical Cognitive Research (C5R).

SAVING MINDS PODCAST - September 11, 2019

Inez Jabalpurwala, former CEO and President of Brain Canada, was a guest of the Saving Minds Podcast which explores the future of medicine for Alzheimer's and Parkinson's diseases. During her appearance, she discussed how Brain Canada is advancing BIG, BOLD, BRAIN science in Canada.

CANADIAN NEUROSCIENCE INNOVATION SUMMIT - September 18, 2019

Brain Canada Senior Program Manager Dr. Jennie Young attended this one-day meeting in Toronto that was organized by the Canadian Global Initiative Against Alzheimer's Disease (CGIAA), with the aim of facilitating a space for neuroscience innovation to flourish by encouraging dialogue between diverse stakeholders including policymakers, industry, investors, and community stakeholders in the neuroscience field.

CCNA PARTNERS FORUM - October 5-6, 2019

Brain Canada participated in the two-day CCNA annual meeting in Québec City, which was attended by other partners of the CCNA, and featured presentations by funded researchers and a steering committee meeting of partners. Senior Program Manager Dr. Jennie Young presented an overview of Brain Canada in a session introducing new partners to other CCNA partners and researchers.



11TH ANNUAL CANADIAN SCIENCE POLICY CONFERENCE - November 15, 2019

Brain Canada took part in a panel devoted to how open science is transforming the research landscape. The panel was moderated by Globe and Mail journalist André Picard.

Panel discussion "Open Science is transforming the research landscape", at the 2019 Canadian Science Policy Conference.

ISRAEL CANCER RESEARCH FUND 14TH ANNUAL WOMEN OF ACTION LUNCHEON – November 17, 2019

Brain Canada attended Israel Cancer Research Fund (ICRF) Luncheon in Montreal to honour exceptional women who have led courageously in business, community, and science. Dr. Livia Garzia was awarded for her work on the possible causative link between altered neural activity and pediatric brain tumours, which is funded by a 2018 Brain Canada-Canadian Cancer Society Innovation Grant.

OPEN SCIENCE IN ACTION SYMPOSIUM – November 18, 2019

Brain Canada attended the inaugural Open Science Symposium at the Montreal Neurological Institute. The full-day symposium included concrete examples and practical lessons in implementation. The key-note lecture focused on the critical role that funders play in facilitating Open Science, and Brain Canada was acknowledged throughout the day in several talks for providing support to their programs.



Dr. Jiwon Oh speaking at the 2019 endMS Conference.

endMS CONFERENCE – December 8-11, 2019

The endMS conference is the largest scientific meeting focused on multiple sclerosis (MS) in Canada, and was attended by more than 250 MS researchers, trainees, health professionals, and members of the MS community. Dr. Jennie Young, Senior Program Manager, attended the endMS conference and represented Brain Canada in a meeting with funding partners for the Canadian Prospective Cohort (CanProCo) study, who presented their latest findings at their quarterly milestone check-in.

HEALTH CANADA - BRIDGING SCIENCE, POLICY, AND PRACTICE WITH SEX AND GENDER – February 12, 2020

Brain Canada participated in this symposium, hosted by Health Canada's Gender and Health Unit in collaboration with the Canadian Institutes of Health Research - Institute of Gender and Health. Experts from across Canada were brought together to discuss emerging issues and trends in sex, gender, and health and the integration of research, policy and practice.

FUNDRAISING

BRAIN CANADA CELEBRATES 20 YEARS

On June 18th, 2019, Brain Canada celebrated 20 extraordinary years funding research on the brain, in health and in illness. We took the occasion to honour two Canadian visionaries who have been at the centre of our Foundation: Allan R. Taylor and the late Michael H. Wilson. Their leadership and unwavering dedication to supporting and advancing brain and mental health were central to every major milestone we achieved.

The celebration, under the theme **BIG Science BOLD Science BRAIN Science**, was presented by our lead partners Bell, Biogen and RBC, with support from a range of sponsors. It was held at the Globe and Mail Centre in Toronto and chaired by Dr. Naomi Azrieli, Brain Canada's Board Chair. The evening welcomed nearly 300 champions from the corporate, philanthropic, and research communities. A bold interactive program highlighted Brain Canada's contributions to advancing Canadian brain research over two decades, and our role as a catalyst and convener, enabling researchers to work across diseases, disciplines, institutions and provinces, in order to accelerate the pace of discovery.

Guests were treated to a "Meeting of the Minds" discussion between John Stackhouse, Senior Vice President, Office of the CEO at RBC and Dr. Murdli Doraiswamy, a physician and brain scientist at Duke University, on the future of brain research.

The evening ended with BAM! - a band of world-famous brain scientists and musicians who lit up the room with their classic rock covers.

The band is made up of Adrian M. Owen OBE, Ph.D., Professor of Cognitive Neuroscience and Imaging in the Departments of Physiology & Pharmacology and Psychology at the University of Western Ontario; Earl Miller, Ph.D., Picower Professor of Neuroscience at the Massachusetts Institute of Technology; Hooman Ganjavi, M.D., Associate Professor of Psychiatry at the University of Western Ontario and Tim Bussey, Ph.D. Western Research Chair in Cognitive Neuroscience at Western University.





Former President and CEO, **Inez Jabalpurwala**.



From left to right: **Allan R. Taylor**, **Larry Tanenbaum**, **George Cope**, **Dave McKay**.



John Stackhouse speaking with **Dr. Murali Doraiswamy** on the future of brain research.



Brain Canada Chair, **Dr. Naomi Azrieli**.



BAM! performing at the Brain Canada 20th Anniversary Gala.



FUNDRAISING

GROWLING BEAVER BREVET

The Growling Beaver Brevet (GBB) was set in motion by a group of cyclists in order to support one of their members who was diagnosed with Parkinson's. The GBB is a social, non-competitive ride that celebrates the joy of cycling. This edition of the GBB took place on September 28, 2019, when 230 cyclists rode through the scenic Beaver Valley in Ontario. Cyclists pedaled 40, 60, 100, or 200 km through stunning routes together.

2,100 donors raised more than \$400,000 to support research on Parkinson's. Canadian donations went to the Brain Canada Foundation and US donations to the Davis Phinney Foundation. Some of the funds were raised towards an annual Victory Summit, organized and implemented by the Davis Phinney Foundation. The Victory Summit brings various stakeholders together to deliver up-to-date information and practical resources that patients with Parkinson's disease (PD) can use to live well today. The Summit, held in Ottawa, included presentations by nationally and internationally recognized researchers, clinicians, physical therapists, as well as patients and advocates of PD. The 2019 Victory Summit took place in Ottawa on October 5, 2019.



Evan Siddall, founder of the *Growling Beaver Brevet*.



FUNDRAISING

A RIDE TO REMEMBER

A group of cyclists, who have family members touched by Alzheimer’s disease have been organizing an annual bike ride with funds raised directed to Brain Canada. The 2019 edition took place on August 4th with both a 125 km and 67 km route, and raised \$23,632 for Brain Canada. The 4th Annual A Ride to Remember will be a virtual event enabling participants to take part together, but apart, due to COVID-19 social distancing measures. The annual event is open to both casual and serious cyclists, and participants are invited to choose their own distance goal for themselves and their team either outside or spinning indoors. Each rider posts a photo or short video from their ride to social media by September 27th, 2020.

“ We wanted to build something that would create awareness, and hopefully grow across the country, so that more people would know about Brain Canada and all that it does.”
 - Matthew Wener, A Ride to Remember Co-founder



Participants in the 2019 A Ride to Remember.

“ Brain Canada brings a high level of professionalism to research and how research funds are distributed. The work that Brain Canada supports is phenomenal. It’s really important to have that interconnectedness of research on the brain, and on the central nervous system.”
 - Dan Pfeffer, A Ride to Remember Co-founder

If you would like to organize a fundraiser to support Brain Canada, please contact us.
 90% of every dollar raised goes to fund brain research.

FUNDRAISING



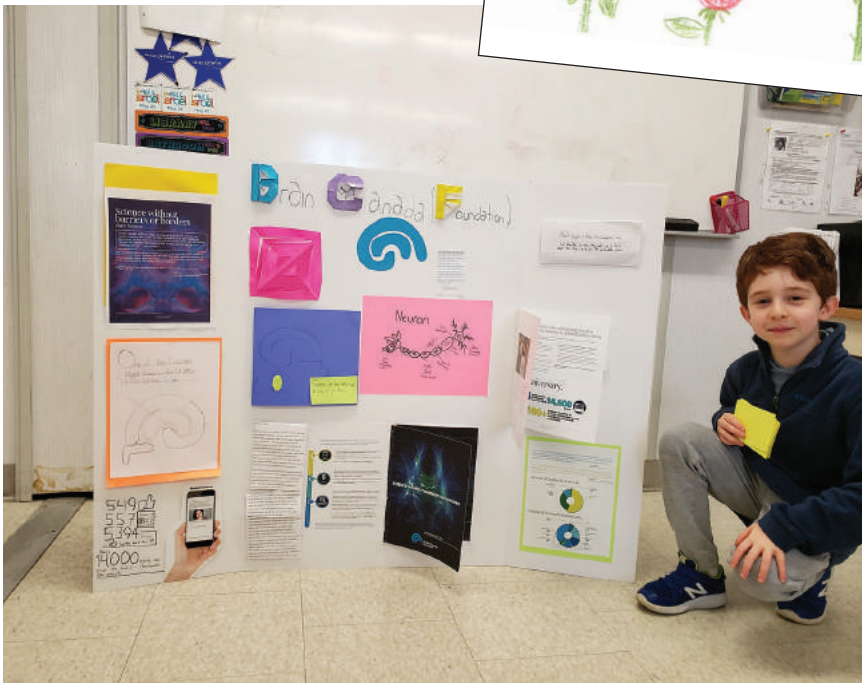
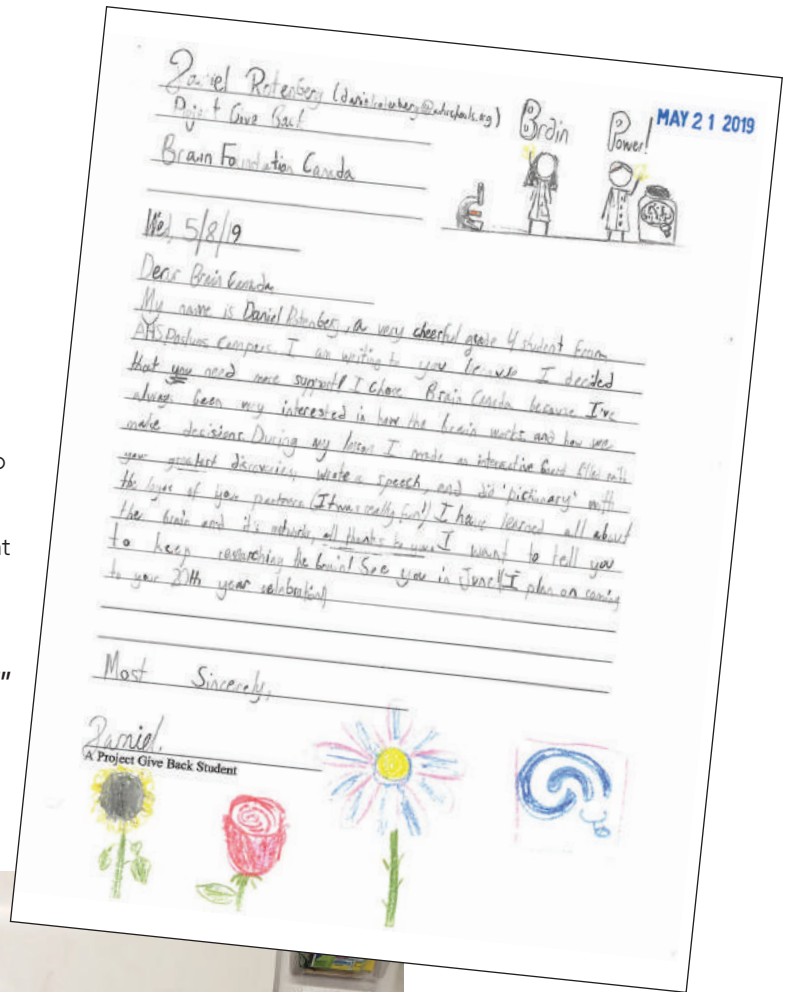
STAND AHEAD™ CHALLENGE

Brain Canada partnered with the Women's Brain Health Initiative on the Stand Ahead™ Challenge. The social media challenge, on Women's Brain Health Day, took place on December 2, 2019 and raised over \$250,000 (and then matched by BCF for a total of \$500,000) for brain research. Participants posted videos or pictures on social media doing handstands, speaking about the importance of standing up against research bias and standing ahead for women's brain health. Brain Canada matched funds raised through the Stand Ahead™ Challenge. Funds raised from the 2019 and 2020 campaigns will be combined to support a funding competition for sex and gender based research in aging and dementia.

OUR DONORS

We would like to thank **Daniel Rotenberg**, a grade 4 student from AHS Posluns Campus in North York, Ontario, who chose to do a school project on Brain Canada. People like Daniel are the perfect champions of Brain Canada as they share our excitement for new discoveries of the brain.

We will follow his advice to **"keep researching the brain!"**



LEAD DONORS

We recognize the cumulative contributions of our lead donors, who have steadfastly supported Brain Canada's work year after year.

The Azrieli Foundation	\$12,575,000
The Chagnon Family	\$5,000,000
Krembil Foundation	\$3,345,000
RBC Foundation	\$795,500
Rossy Foundation	\$505,000
Bell Canada	\$600,000
CIBC	\$500,000

DONORS June 1st, 2019–May 31st, 2020

\$100,000 +

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The Henry & Berenice Kaufmann Foundation has supported the work of Brain Canada for over 15 years, recognizing the critical importance of research in solving the mysteries of chronic pain, dementia and neuro-degenerative diseases such as Parkinson's. It is through the commitment and generosity of Brain Canada donors that progress will be made in improving treatment and care of so many affected Canadians. We are proud to make a difference where we can, in furthering the work of Brain Canada."

- Janis Lee Levine, MSW, MM
President & Executive Officer
The Henry and Berenice Kaufmann
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We would like to give a special thank you to the donors who have supported Brain Canada steadily throughout the years. We also wish to thank the many individuals who have made donations in honour of a loved one.

BRAIN CANADA IN THE NEWS

Brain Canada made the list of the top 100 charities in Canada in 2020 as rated by MoneySense, and was among the top 10 charities in the health sector.



BELL LET'S TALK DAY – January 29, 2020
Dr. Benjamin Goldstein, recipient of a Brain Canada Improving Health Outcomes Team Grant, discussed his research on enhancing fitness among adolescents with bipolar disorder as part of Bell Let's Talk on CP24.



WEBSITE AND SOCIAL MEDIA STATISTICS

Over **29,000**
website visitors
for the period of June 1, 2019 – May 31, 2020

f 841 Facebook followers
t 7,058 Twitter followers

WE'RE ALL SEARCHING FOR A BRIGHTER TOMORROW. SO HERE'S WHAT WE'RE DOING TODAY.

Brain Canada is on a mission to continue to better understand the human brain. The challenge is huge. The rewards, even greater. One in three Canadians will face a mental illness, neurological disorder or a brain injury. It's a \$60 billion burden on our society every year. Greater than cancer and cardiovascular disease combined.

We won't solve this problem with small-minded thinking. We need brave, bold science that dares to dream big. That's why Brain Canada was founded over 20 years ago using a revolutionary funding model. We've invested over \$500 million in Canada's visionary brain researchers and their generation-changing ideas. Together, we're shining a light into the mysterious universe where the most promising solutions lay hidden.

Join us. Because what we do today will mean a brighter tomorrow for all of us.

 Foundation
Brain Canada
Foundation
Funding \$100 million to \$1.5 billion

Brain Canada placed an ad in the June 2020 edition of the Walrus.

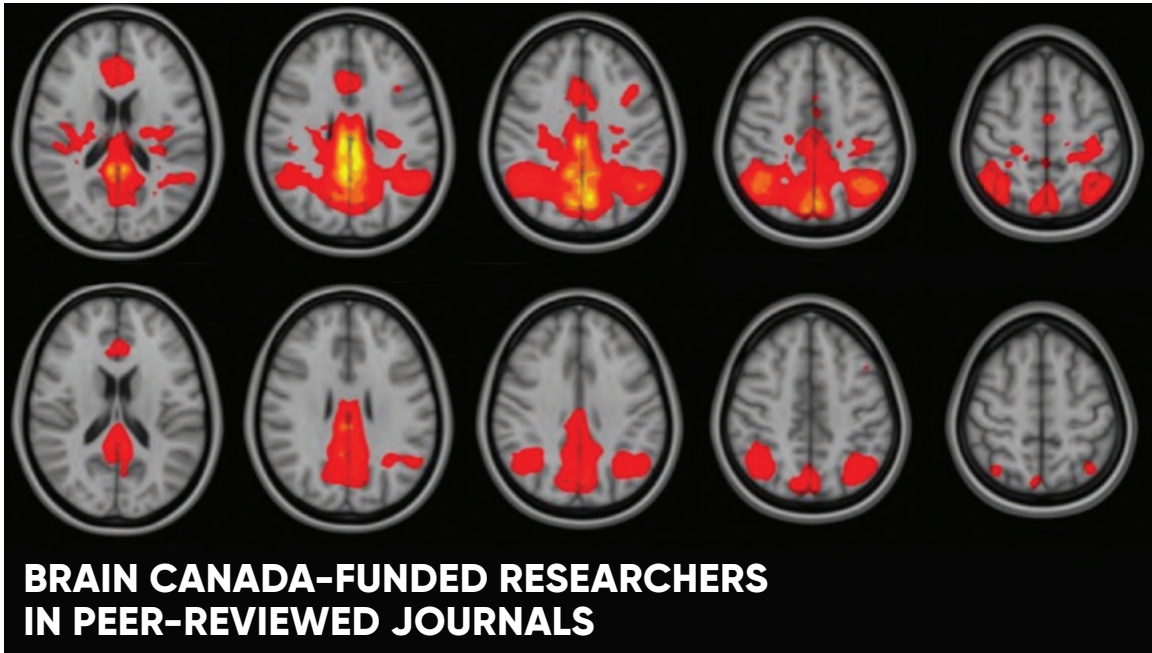


Figure adapted from Dr. Menon's research. Top row: Default mode network 2-3 months post season for the rugby players. Bottom row: Default mode network 2-3 months post season non-contact group of swimmers and rowers.

July 17, 2019 – Nature

"Intestinal infection triggers Parkinson's disease-like symptoms in Pink1^{-/-} mice"

Dr. Louis-Éric Trudeau was supported by a Brain Canada Team Grant.

September 11, 2019 – Science Advances

"Age- and sex-dependent effects of metformin on neural precursor cells and cognitive recovery in a model of neonatal stroke."

Dr. Cindi Morshead was supported by a Brain Canada Foundation - Weston Foundation Multi-Investigator Research Initiative (MIRI) grant.

September 19, 2019 – Cell

"RNA Granules Hitchhike on Lysosomes for LongDistance Transport, Using Annexin A11 as a Molecular Tether".

Dr. Peter St George-Hyslop was supported by an ALS Society of Canada-Brain Canada Arthur J. Hudson Translational Team Grant.

October 15, 2019 – eLIFE

"Implementation of an antibody characterization procedure and application to the major ALS/FTD disease gene C9ORF72"

Dr. Janice Robertson and Dr. Peter McPherson were supported by an ALS Canada-Brain Canada Arthur J. Hudson Translational Team Grant.

December 11, 2019 – eLIFE

"MouseBytes, an open-access high-throughput pipeline and database for rodent touchscreen-based cognitive assessment".

The work was supported through a 2012 MIRI Team Grant and the Canadian Open Neuroscience Platform (CONP).

January 20, 2020 – PNAS

"Molecular adaptations of the blood-brain barrier promote stress resilience vs. depression"

The Douglas-Bell Canada Brain Bank was supported by Brain Canada through a 2014 Platform Support Grant, led by Dr. Gustavo Turecki.

January 28, 2020 – Brain

"Blood and brain gene expression trajectories mirror neuropathology and clinical deterioration in neurodegeneration"

The research was supported through a 2015 Platform Support Grant for the McConnell Brain Imaging Centre.

March 26, 2020 – Frontiers in Neuroscience

"Using Deep Convolutional Neural Networks for Neonatal Brain Image Segmentation"

The study was supported by Brain Canada through a 2014 Platform Support Grant, led by Dr. Gregory A. Lodygensky.

June 17, 2020 – online issue of Neurology®

"Longitudinal changes of brain microstructure and function in nonconcussed female rugby players"

The study was supported through a 2015 Brain Canada Platform Support Grant, led by Dr. Ravi Menon.

LIST OF PARTNERS

HEALTH CHARITIES

Alberta Paraplegic Foundation
 ALS Society of Canada
 Alzheimer Society - Alberta and Northwest Territories
 Alzheimer Society of Canada
 Alzheimer's Association US
 Brain Tumour Foundation of Canada
 Canadian Cancer Society
 Capitalize for Kids
 CHU Sainte-Justine Foundation
 Douglas Mental Health University Institute Foundation
 Fondation CERVO
 Heart and Stroke Foundation of Canada
 Huntington Society of Canada
 Jewish General Hospital Foundation
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 Mount Sinai Hospital Foundation of Toronto
 MS Society of Canada
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 SickKids Foundation
 Sunnybrook Health Science Foundation
 UHN Toronto General & Western Hospital Foundation
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 Women's Brain Health Initiative

PROVINCIAL AGENCIES

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 Michael Smith Foundation for Health Research (MSFHR)
 Network of Applied Medical Genetics (RMGA)
 Nova Scotia Health Authority
 Ontario Brain Institute (OBI)
 Ontario Neurotrauma Foundation (ONF)
 Pacific Alzheimer Research Foundation (PARF)
 Quebec Pain Research Network
 Vancouver Coastal Health Authority (VCHA)

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 Canadian Stroke Consortium
 Canadian Stroke Network
 CQDM
 Kids Brain Health Network (NeuroDevNet)
 Le Réseau québécois sur le suicide, les troubles de l'humeur et les troubles associés (RQSHA)

OTHER ORGANIZATIONS

Canadian Institute for Advanced Research (CIFAR)
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 Healthy Brains, Healthy Lives
 Les Grands Ballets
 Martin Family Initiative
 Medavie Health Foundation
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 National Institutes of Health (NIH)

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BRAIN CANADA FOUNDATION

STATEMENT OF FINANCIAL POSITION

AS OF DECEMBER 31, 2019

	2019	2018
	\$	\$
ASSETS - CURRENT		
Cash and cash equivalents	6,940,303	12,737,831
Short-term investments	825,000	7,778,000
Accrued interest receivable	22,589	87,670
Advance payments on grants and awards	91,500	101,000
Other receivables	79,700	70,808
Grants and awards reimbursement receivable	45,484	34,097
Prepays and deposits	48,670	30,797
	8,053,246	20,840,203
Advance payments on grants and awards	-	91,500
Tangible capital assets	100,399	95,652
	8,153,645	21,027,355
LIABILITIES AND NET ASSETS - CURRENT		
Accounts payable and accrued liabilities	50,936	55,559
Salaries and benefits payable	342,320	282,460
Current portion of deferred contributions	5,034,694	19,205,504
	5,427,950	19,543,523
Deferred contributions	320,593	1,047,890
	5,748,543	20,591,413
NET ASSETS		
Unrestricted net assets	2,304,703	340,290
Invested in capital assets	100,399	95,652
	2,405,102	435,942
	8,153,645	21,027,355

BRAIN CANADA FOUNDATION

STATEMENT OF OPERATIONS

YEAR ENDED DECEMBER 31, 2019

	2019	2018
	\$	\$
REVENUES		
Restricted contributions	32,092,198	44,504,963
Unrestricted contributions	1,194,845	68,061
	33,287,043	44,573,024
FUNDRAISING EVENTS		
Revenues	1,194,450	299,933
Direct costs	420,135	38,818
	774,315	261,115
	34,061,358	44,834,139
EXPENDITURES		
Grants and awards	29,596,762	41,954,908
Operating expenses	2,365,001	2,382,081
Administrative expenses charged by other organizations	113,372	151,670
Amortization of tangible capital assets	17,063	16,304
	32,092,198	44,504,963
Excess of revenues over expenditures	1,969,160	329,176

VISION

To understand the brain, in health and illness, to improve lives and achieve societal impact.

MISSION

Brain Canada is achieving its vision by:

- Increasing the scale and scope of funding to accelerate the pace of Canadian brain research;
- Creating a collective commitment to brain research across the public, private and voluntary sectors;
- Delivering transformative, original and outstanding research programs.

VALUES

- Connecting with purpose.
 - One Brain. Seeking to understand different brain functions and dysfunctions as part of a single interconnected system.
 - Partnerships. Building mutually beneficial and transparent relationships with every partner.
 - Diverse perspectives and approaches. Fostering original insights and outcomes.
- Outcome focused. Delivering value and benefits with efficiency and effectiveness.
- Professional integrity. Ensuring the highest standards of ethical behaviour and good governance.

We fund brilliance daily because we believe that new ideas, tested through research, and leading to innovation and discovery, hold the promise of reducing the burden on Canada's health care system, improving productivity, and enhancing the health of individuals and our communities.

To find out more about our work and the research we are supporting, please visit **braincanada.ca**

*Financial contribution from
Avec le financement de*



Health Canada Santé Canada



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1200 McGill College Avenue
Suite 1600, Montreal, Quebec H3B 4G7
+1 (514) 989-2989
info@braincanada.ca

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This annual report is also available in French.
An online version can be downloaded at www.braincanada.ca.