



BIG SCIENCE **BOLD** SCIENCE **BRAIN** SCIENCE

2015 Annual Report



Brain Canada
Foundation

Brain Canada and the Canada Brain Research Fund

\$100 + **\$100** = **\$200**
MILLION **MILLION** **MILLION**
RAISED **MATCHED** **INVESTMENT**
FROM DONORS **BY THE GOVERNMENT** **IN CANADIAN**
AND PARTNERS **OF CANADA** **BRAIN RESEARCH**

138 PARADIGM-CHANGING PROJECTS
700+ RESEARCHERS ACROSS CANADA
75+ DISCIPLINES
70 INSTITUTIONS

Brain Canada is a national non-profit organization headquartered in Montreal, Quebec, that enables and supports excellent, innovative, paradigm-changing brain research in Canada. For more than one decade, Brain Canada has made the case for the brain as a single, complex system with commonalities across the range of neurological disorders, mental illnesses and addictions, brain and spinal cord injuries. Looking at the brain as one system has underscored the need for increased collaboration across disciplines and institutions, and a smarter way to invest in brain research that is focused on outcomes that will benefit patients and families.

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Photos: Cover: Ron Levine
Page 2,35: Owen Egan



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Brain Canada Board of Directors: Back row, from left to right: The Hon. W. David Angus; Dr. Max S. Cynader; Dr. Naomi Azrieli; Ms. Lili de Grandpré; Dr. Franco Vaccarino; Dr. Samuel Weiss; Mr. Wayne Bossert.

Front row: Dr. Catherine Zahn; Mr. Rupert Duchesne, Chair of the Board; Ms. Inez Jabalpurwala, President and CEO; Mr. Mark Krembil. Missing from photo: Dr. Vincent Castellucci; Mr. Brandt C. Louie; Mr. Lawrence Tanenbaum.



Brain Canada staff: Back row: Ms. Taline Bedakelian; Ms. Alix Dudley; Ms. Angelina Marchetta; Dr. Nabilah Chowdhury; Dr. Marc Cuesta; Ms. Patricia MacDonald. Front row: Mr. Paul Shay; Ms. Inez Jabalpurwala; Mr. Mario Chartrand.

Message from the Chair and President

BIGSCIENCE **BOLD**SCIENCE **BRAIN**SCIENCE

Unravelling the mysteries of the brain is one of the last frontiers in human science. As researchers delve deeper into our understanding of the brain and brain disorders, the complexity of the challenge increases, and so too does our need to join different disciplines and to pursue new thinking and new approaches. Collaborations are linking researchers and clinicians, academia and industry. Understanding the brain is no longer just about neuroscience—it now includes chemistry, physics, mathematics, engineering, computer science, and ethics. Equally important is the involvement of patients, families, caregivers, voluntary health organizations, business leaders, philanthropists and governments. They drive priorities and create a sense of urgency in moving research from ideas to outcomes that will benefit people. Canadian research has always been a collaborative effort and that spirit is all the more important in today's context.

The theme of this year's Annual Report reflects both the size of the challenge to understand the brain and brain disease, and the excitement and promise of brain research, made possible by advances in science and technology. Our work fosters collaborations involving different disciplines and sectors; encourages risk taking and sharing data and research results; and is building a brain community that is better coordinated to achieve common goals.

Our cover features Dr. Yves DeKoninck, the Principal Investigator of a project we are funding that is at the intersection of brain science and new technology: an emerging field that uses photons (units of light) to non-invasively measure and control the nervous system. The project is the catalyst for a cross-country network that is providing capability to many neuroscience investigators, with potential applications including a better understanding of the brain and the development of new therapeutics for neurological and mental illnesses. Our cover is just one example of the really exciting work that we have enabled. Pages 8 to 18 showcase other projects and researchers, and these best tell the story about the range of initiatives that are part of our growing portfolio.

Since our founding almost 20 years ago, Brain Canada has dramatically increased funding to support excellent and innovative Canadian brain research; 2011 marked the launch of a \$200-million public-private partnership, the largest national fund devoted to brain research in the history of Canada. Through this partnership, named the Canada Brain Research Fund, the Government of Canada is matching all funds raised by Brain Canada and its partners on a 1:1 basis, up to \$100 million. The most important milestone reached in 2015 was closing the \$100-million campaign 18 months ahead of schedule and thereby triggering the \$100 million in matching funds from the Government of Canada.

Our success has been due to an ever-expanding list of donors and 77 partners including research institutes, provincial agencies and voluntary health organizations. By the end of 2015, we had allocated \$156.7 million in new funding to support 138 projects across Canada involving more than 700 researchers at 70 institutions. The full list is presented on pages 25-30. As of the publication of the report, we have committed about \$165 million to support 143 projects.

All of our projects are selected further to national, open calls and international peer review, and monitored throughout against agreed-upon milestones. This has been the case since we first launched our signature team grants, the Brain Repair Program, in 2003. On pages 25-30 you will find a description of that process and can read testimonials from researchers and clinicians from around the world who have been involved with our in-person review process—some for more than 10 years.

Brain Canada has always been, and will always be, a collective effort. We therefore extend a heartfelt thank you to all our supporters, especially the Government of Canada and Health Canada in particular, our donors and many partners across the country, the dedicated researchers and clinicians, and our committed Board and much-valued staff. We are all part of one brain community, working to benefit all Canadians.

We close by sharing that 2016 began with a positive validation from the newly elected Government, with a commitment of an additional \$20 million in matching funds to Brain Canada and the Canada Brain Research Fund in their first Budget. This begins the next chapter in our history, and the expansion of the Fund to a potential \$240 million. Stay tuned.



Rupert Duchesne
Chair, Brain Canada

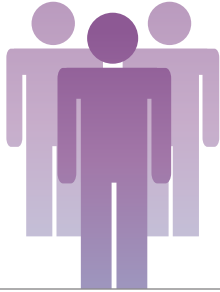


Inez Jabalpurwala
President and CEO, Brain Canada

The brain

The brain is our command centre and determines how we live, how we think, how we feel, and who we are. Unravelling the mysteries of the brain is one of the last frontiers in human science. While there have been many breakthroughs in recent years, researchers still have far to go toward fully understanding brain function.

When a brain is damaged from disease or injury — the impact can be devastating.

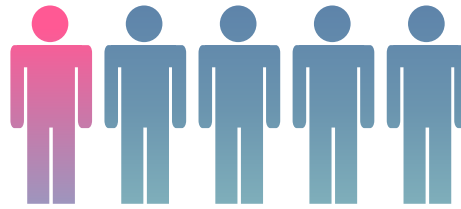


Brain disorders impact **1 in 3 Canadians** and impose a **\$60 billion burden** on the Canadian economy every year — an impact that is greater than the burden of cancer and cardiovascular disease combined.

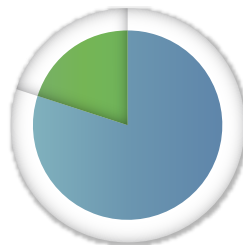
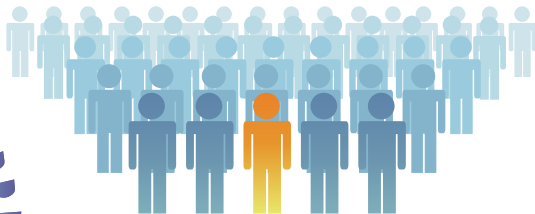


There are about **1,000 disorders** of the brain and nervous system

1 in 5 adults suffer from chronic pain



One in 88 children in Canada has Autism Spectrum Disorder (ASD), and globally, the known prevalence of the disorder is rising dramatically.



20% of Canadians will personally experience a mental illness in their lifetime.

More than **85,000** Canadians are currently living with a spinal cord injury.



Today, the combined direct (medical) and indirect (lost earnings) costs of dementia total **\$33 billion per year**. If nothing changes, this number will climb to **\$293 billion a year by 2040**.



What we do

Brain Canada seeks to accelerate research advances at all stages in the process: from basic science through population health. We bring together researchers from different disciplines and institutions to form new collaborations and new networks.

SOME PROJECTS BRAIN CANADA IS CURRENTLY FUNDING

- Preventing language decline in dementia
- Developing a carrier-mediated approach to deliver therapeutic proteins across the blood-brain barrier
- Understanding the role of the immune system in schizophrenia
- Uncovering biomarkers associated with Seasonal Affective Disorder
- Creating a national biobank and database for patients with traumatic brain injury
- Understanding learning in machines and brains
- Measuring the role of physical activity, exercise and cardiovascular function in spinal cord injury
- Understanding stress to improve mental health
- Exploring where human consciousness comes from, and why it is important
- Developing a non-invasive treatment of pediatric neurological disorders using MR-guided focused ultrasound (MRgFUS)

A SYSTEMS APPROACH that recognizes common underlying mechanisms across disorders.

A UNIQUE MODEL:

enabling **INNOVATIVE, INTEGRATED** and **COLLABORATIVE** brain research;

across **DISCIPLINES** and **INSTITUTIONS**;

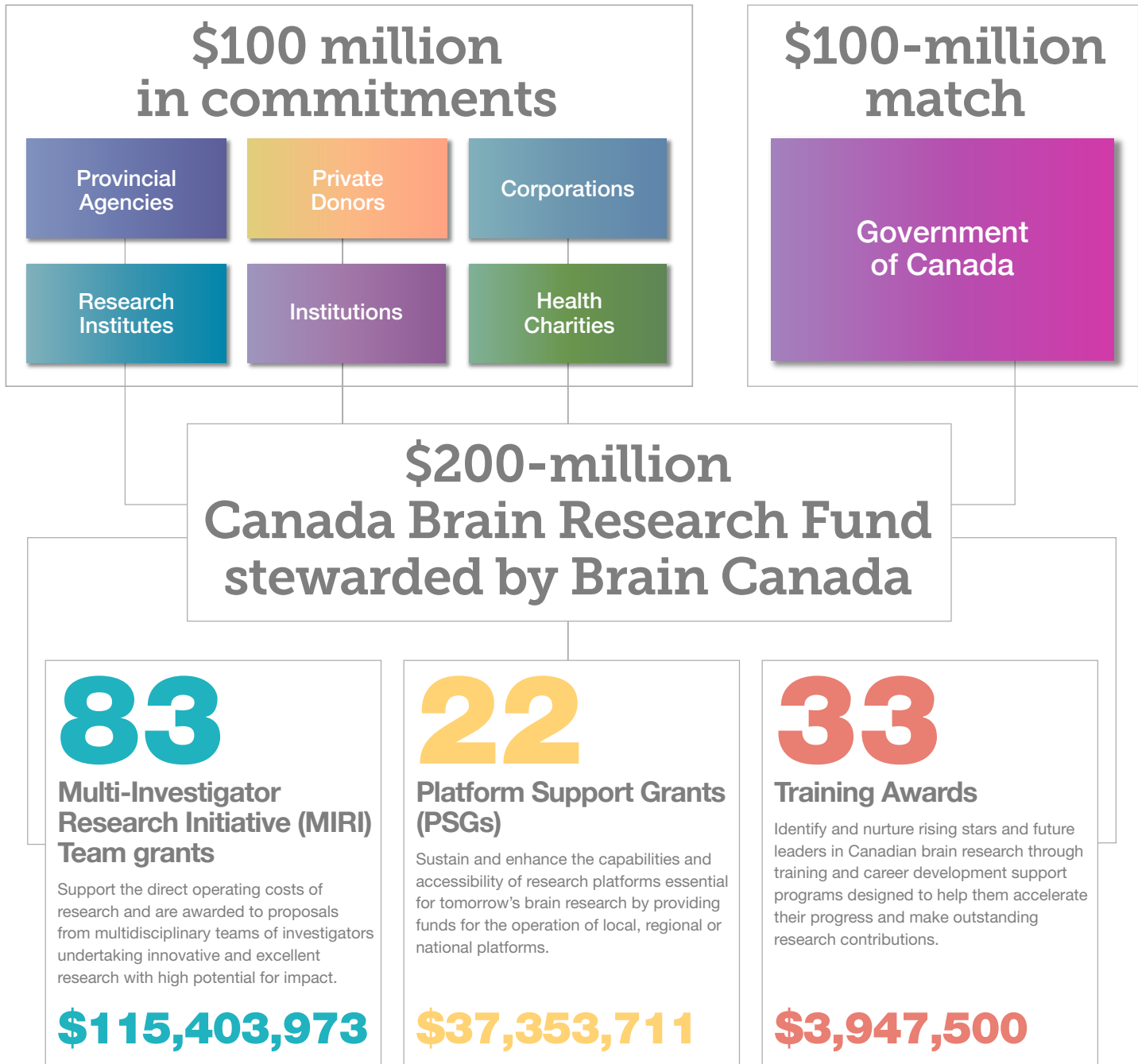
on a **RANGE OF DISEASES**, disorders and injuries;

but all part of **ONE INTERCONNECTED SYSTEM.**

Canada Brain Research Fund

The Canada Brain Research Fund (CBRF) is a public-private partnership designed to encourage Canadians to increase their support for brain research, and maximize the impact and efficiency of those investments. Brain Canada committed to raising \$100 million over six years from private and non-governmental sources, which is being matched by the Government of Canada on a 1:1 basis creating a \$200-million fund. This fund supports Canadian brain science research to advance knowledge and our understanding of the brain and brain disorders.

We are proud to announce that we secured \$100 million in donor and partner commitments by October of 2015, a full 18 months ahead of schedule. As of December 31st, 2015, we had awarded \$156,705,184 to research programs. The balance will be allocated in 2016.



LARGEST PUBLIC-PRIVATE fund in Canadian history devoted to supporting brain research across Canada

\$200M

of new funding directed to brain research

\$156.7M

committed by DECEMBER 31st, 2015

138

PROJECTS

More than

700

researchers across Canada

Distribution of Projects across Canada



| | | | | |
|---|---|---|--|---|
| <p>British Columbia 27.5 projects* 102 researchers/trainees 13.8% of researchers</p> | <p>Alberta 13 projects* 96 researchers/trainees 13% of researchers</p> | <p>Northwest Territories 1 researcher/trainee 0.1% of researchers</p> | <p>Saskatchewan 2 researchers/trainees 0.3% of researchers</p> | <p>Manitoba 2 projects* 17 researchers/trainees 2.3% of researchers</p> |
| <p>Ontario 57.5 projects* 325 researchers/trainees 44% of researchers</p> | <p>Quebec 35 projects* 176 researchers/trainees 24% of researchers</p> | <p>New Brunswick 1 project* 1 researcher/trainee 0.1% of researchers</p> | <p>Nova Scotia 1 project* 18 researchers/trainees 2.5% of researchers</p> | <p>Newfoundland and Labrador 1 project* 1 researcher/trainee 0.1% of researchers</p> |

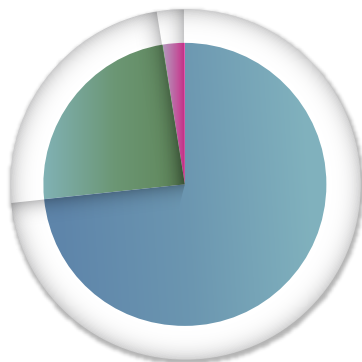
*Based on location of the principal investigator.

Funding allocation by program

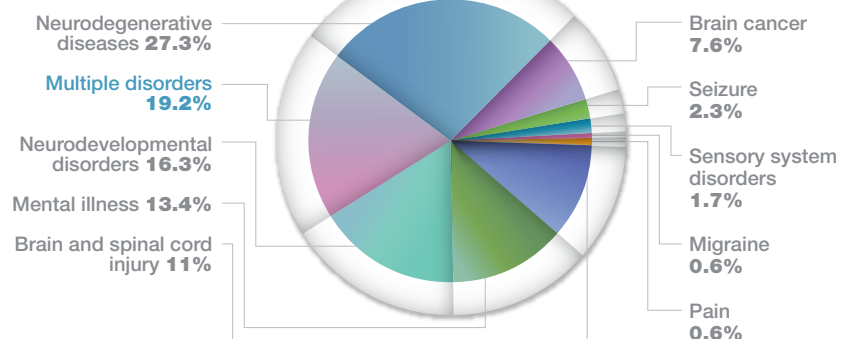
73.6%
Teams
(\$115.4M)

23.9%
Platform Support
(\$37.4M)

2.5%
Training and Mentorship
(\$3.9M)



Distribution of funding across brain disorders



Project profiles

Brain Canada's 700+ funded researchers are conducting research along the continuum from basic high-impact discovery to translational work of direct relevance to the clinic. Their research covers the full range of brain disorders including neurodegenerative disorders, neurodevelopmental disorders, mental illness, and brain and spinal cord injuries. We are very proud of the progress made by our researchers and in the following pages we highlight just a few of the teams and young investigators pursuing novel ideas.

RESTORATION OF VISUAL FUNCTION: A CELLULAR REPROGRAMMING AND BIOENGINEERING APPROACH

2012 MULTI INVESTIGATOR RESEARCH INITIATIVE
TEAM GRANT

PRINCIPAL INVESTIGATOR: VALERIE WALLACE, UNIVERSITY
HEALTH NETWORK

FUNDING PARTNERS: THE W. GARFIELD WESTON
FOUNDATION, THE GOVERNMENT OF CANADA

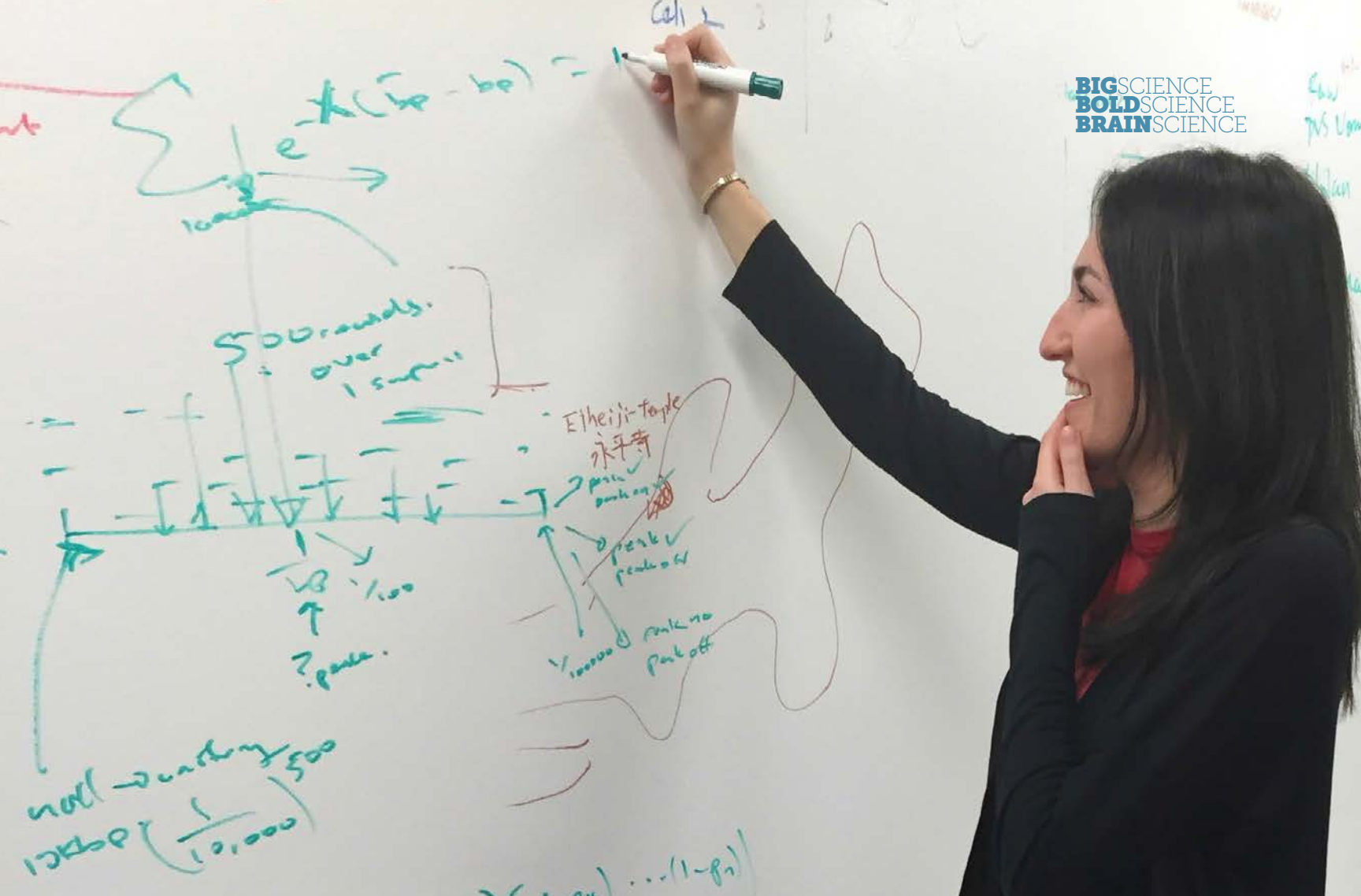
"We were able to establish a retina reprogramming and transplantation team involving investigators from several sites in Canada. This resulted, in part, on successful investigation into the feasibility of cone transplantation to the retina."

—Dr. Valerie Wallace

The retina is the part of the eye that is responsible for processing visual information. Loss of neurons (nerve cells) in the central nervous system, which includes the brain and retina, is a particularly serious problem because, with few exceptions, these neurons do not regrow after they are lost in the adult. Loss of photoreceptors, the neurons in the retina that sense light, leads to irreversible vision loss. The goal of this project is to develop new therapies to treat the millions of people worldwide who are afflicted by retinal photoreceptor degeneration. To meet this challenge, a unique, multi-disciplinary team of investigators with expertise in stem cells, brain development, bioengineering, vision science and molecular biology has been assembled. By pooling their combined expertise, they have devised a pre-clinical research plan to develop treatments for retinal degenerative disease. Specifically, they are developing strategies to: 1) convert a patient's own skin cells into functional photoreceptors that can be used for therapeutic purposes; 2) test the ability of skin-derived photoreceptors to restore sight in animals; and 3) use novel bioengineering approaches to optimize integration of these new photoreceptors into the diseased retina. The long-term goal is to initiate clinical trials involving cone photoreceptor transplantation into the human retina.



From left to right: Dr. Phil Nickerson, Research Associate; Ms. Lacrimioara Comanita, Technician; Dr. Valerie Wallace, Senior Scientist; Mr. Sam Tsai, MSc Student; Ms. Miriam Bergeret, MSc student, Dr. Arturo Ortin Martinez, Postdoctoral Fellow.



THE ROLE OF IMMUNE GENES IN SCHIZOPHRENIA

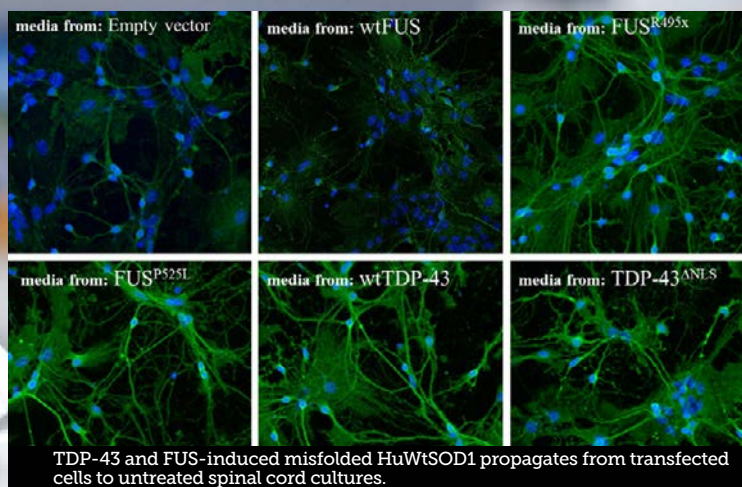
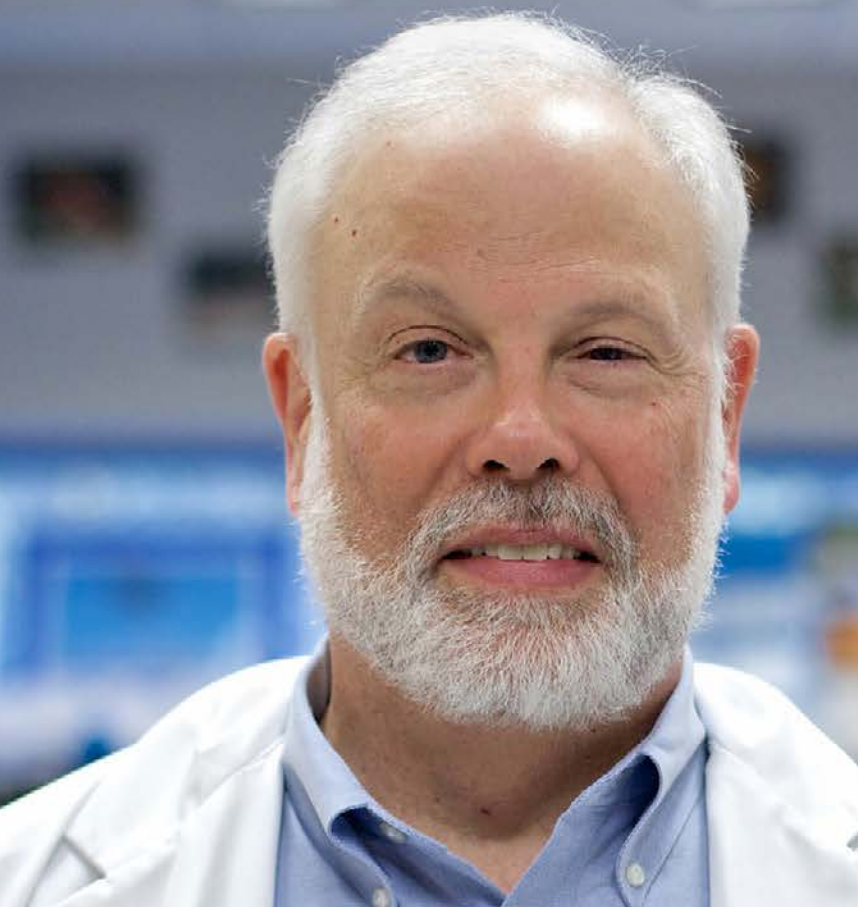
2012 BELL MENTAL HEALTH TRAINING AWARD
 AWARD RECIPIENT: JENNIE POUGET, CENTRE FOR ADDICTION AND MENTAL HEALTH
 FUNDING PARTNERS: BELL CANADA, THE GOVERNMENT OF CANADA

"Brain Canada's funding support made it possible for me to attend international conferences in my field of research. This gave me the opportunity to meet with leaders in the field and ultimately led to an ongoing collaboration with geneticists studying autoimmune disease at Harvard Medical School, allowing me to spend eight months learning new techniques in their lab and pushing my research on the immunogenetics of schizophrenia in exciting new directions."

—Dr. Jennie Pouget

The primary aim of this project was to explore the role of immune genes in schizophrenia. Ms. Pouget initially studied an association between the neuroinflammatory translocator protein and schizophrenia and antipsychotic induced weight gain. She has recently published this finding as a first author in the peer-reviewed journal, *Pharmacogenomics*. Her findings were also included in a patent for a genetic test for predicting weight gain in patients undergoing antipsychotic treatment. In order to continue investigating immune genes and their association in schizophrenia, Ms. Pouget was awarded two travel fellowships, from Fulbright Canada and The W. Garfield Weston Foundation, to pursue her research at Harvard Medical School and Brigham and Women's Hospital in Boston. With this experience, Ms. Pouget was able to successfully complete two major scientific projects. Her main findings included 1) genes that have a key role in immune-mediated diseases such as multiple sclerosis and rheumatoid arthritis may not have a major role in schizophrenia susceptibility; 2) there is a modest sharing of genetic risk factors between schizophrenia and 19 immune mediated diseases. She has submitted two manuscripts based upon the results of this project, and received an Early Career Investigator Award to attend the World Congress of Psychiatric Genetics, where she gave an oral presentation to over 200 people.

Project profiles



PROPAGATED PROTEIN MISFOLDING OF SOD1 IN ALS: EXEMPLAR FOR NEURODEGENERATION

2012 MULTI INVESTIGATOR RESEARCH INITIATIVE TEAM GRANT
PRINCIPAL INVESTIGATOR: NEIL CASHMAN, BRAIN RESEARCH CENTRE, UNIVERSITY OF BRITISH COLUMBIA

FUNDING PARTNERS: FONDS DE RECHERCHE DU QUÉBEC – SANTÉ (FRQS), GENOME BC, INSTITUT UNIVERSITAIRE EN SANTÉ MENTALE DE QUÉBEC (IUSMQ), MICHAEL SMITH FOUNDATION, UNIVERSITY OF BRITISH COLUMBIA, THE GOVERNMENT OF CANADA

“Our Brain Canada grant enabled us to support a particularly talented PhD student, Eddie Pokrishevsky, to accomplish this important work to demonstrate that SOD1 can independently propagate its toxic misfolding to neighbouring cells, without a requirement for transmission of TDP43 or FUS pathology. Thanks to Brain Canada, we are also “hot on the trail” of the mechanism for how TDP43 and FUS induce SOD1 misfolding in the first place.”

—Dr. Neil Cashman

Amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig’s disease, is a progressive fatal disease that affects the nerve cells responsible for muscle movement (motor neurons). The disease is characterized by systematic paralysis of the muscles of the limbs, speech, swallowing, and respiration, due to the progressive death of motor neurons. 30,000 individuals in North America are currently suffering from the disease; two to three Canadians are lost to ALS every day. Moreover, less than 20% of the affected individuals survive for longer than five years after diagnosis. The disease is caused by a variety of inherited genetic mutations, but the vast majority of cases occur sporadically. ALS is currently incurable, though marginal disease-slowness is provided by the drug riluzole. Work by this group, and others, have identified the importance of the three dimensional shape of the copper-zinc superoxide dismutase-1 (SOD1) protein in the ALS disease process. This protein, when abnormally shaped, or misfolded, is prone to accumulate into a toxic form that can cause motor neuron death. Subsequently, these misfolded proteins are able to convert their normal counterparts into disease-causing forms; this process is believed to occur from cell to cell, eventually destroying muscle function. This disease mechanism has also been found in other neurological diseases, such as Alzheimer and Parkinson diseases.

Although ALS is the specific target of this proposal, protein misfolding appears to be prevalent in other neurodegenerative diseases. Having made previous breakthroughs into the pathogenesis and treatment of ALS, the team now proposes a concerted effort aimed toward the molecular dissection of propagated protein misfolding in this disease, and development of translational models for ALS preclinical programs. The development of effective models of intermolecular and intercellular protein misfolding propagation will have broad application for the rational design of therapeutics for all neurodegenerative diseases in which protein misfolding is implicated.

'BEST IN CLASS' PLATFORM FOR BLOOD BRAIN BARRIER DELIVERY OF THERAPEUTICS

2014 FOCUS ON BRAIN TEAM GRANT

PRINCIPAL INVESTIGATOR: DANICA STANIMIROVIC, NATIONAL RESEARCH COUNCIL OF CANADA

FUNDING PARTNERS: CONSORTIUM QUÉBÉCOIS SUR LA DÉCOUVERTE DU MÉDICAMENT (CQDM), THE ONTARIO BRAIN INSTITUTE (OBI), THE GOVERNMENT OF CANADA

"The Brain Canada grant through the Focus on Brain program enabled the team to start developing and validating translational PET imaging methods to evaluate brain exposure to newly developed BBB carrier antibodies in various formats. This expertise was accessed through participation of the University of Sherbrooke team led by Dr. Brigitte Guerin. This previously not available capacity will enable the team to both accelerate the in vivo validation of novel CNS-targeting antibodies and to develop imaging protocols that can be used to support their development towards and during clinical trials." –Dr. Danica Stanimirovic

The blood-brain barrier (BBB) is a tightly woven layer of vascular cells in the brain that prevents harmful molecules, viruses and toxins, from entering the brain. To allow entry of nutrients into the brain, the BBB employs molecular transporters that shuttle nutrients back and forth between blood and the brain across these barrier cells. Unfortunately, the same barrier that protects the brain is also an obstacle for brain delivery of therapeutics to treat brain diseases. Special strategies have to be developed to 'sneak' therapeutics past the BBB. One such strategy is to link therapeutics to molecules – ligands – that bind natural barrier transporters. Potential therapeutics thus 'hitch a ride' across the barrier using a natural molecular shuttle as a Trojan horse. In the project, a Canadian company biOasis Technologies Inc, National Research Council of Canada and Université de Sherbrooke are developing very small human antibodies (10-fold smaller than regular antibodies) as molecular Trojan horses to enable delivery of therapeutics across the BBB. The team is screening thousands of antibodies to identify those that can efficiently cross the blood-brain barrier and that also can be linked to many different therapeutic molecules. The team will then develop 'fusion' molecules consisting of the BBB-crossing mini-antibodies and selected therapeutics that presently could not be used in patients because they cannot access the brain from the circulation. The efficacy of these 'fusion' molecules (BBB carrier + therapeutic) in treating brain diseases such as brain tumours will be tested in animals. New non-invasive imaging methods by PET scan will be used to monitor brain penetration of BBB-crossing antibodies. If proven effective, these novel BBB 'carriers' will be transferred to biopharmaceutical companies who will link them to many more 'old' and new therapeutics to create improved treatments for devastating brain disorders.



Project profiles

PREVENTION OF ALZHEIMER'S DEMENTIA IN HIGH RISK POPULATIONS: A RANDOMIZED CONTROLLED TRIAL OF A COMBINATION OF COGNITIVE REMEDIATION AND BRAIN STIMULATION

CHAGNON FAMILY AND BRAIN CANADA INTERVENTIONS FOR PREVENTION OF ALZHEIMER DISEASE AND RELATED DISORDERS TEAM GRANT

PRINCIPAL INVESTIGATOR: BENOIT MULSANT, CENTRE FOR ADDICTION AND MENTAL HEALTH

FUNDING PARTNERS: THE CHAGNON FAMILY, THE GOVERNMENT OF CANADA

Available treatments for Alzheimer's Dementia (AD) do not work well enough because they are started when the disease has already damaged the brain. We need to develop preventive treatments for AD but studies of preventive treatments are very hard to conduct unless they target people who are at high risk for developing AD. Older persons who suffer from major depression ("clinical depression") are at very high risk for developing Mild Cognitive Impairment (MCI – a condition that leads to AD in many cases) or AD. After physical inactivity, major depression has been identified as the second most promising target for studies that try to prevent AD.

This project is applying recent advances in methods that stimulate neurons to the prevention of AD. It is studying a novel intervention in 250 older persons whose major depression has been successfully

treated with an antidepressant medication: a combination of cognitive remediation (CR, consisting of memory and problem solving exercises) plus transcranial Direct Current Stimulation (tDCS, a non-painful low electrical current that circulates through the brain of awake patients and stimulates their neurons). The team hypothesizes that this intervention will be more beneficial than a control ("placebo" or "sham") condition in acutely improving cognition and then slowing down its decline over time, and in preventing the onset of MCI or AD. In addition, this project will conduct a series of laboratory tests (for example neuroimaging or genetic testing) to understand better how AD and depression are linked and how CR plus tDCS works in improving cognition in older persons with depression. If CR plus tDCS is indeed beneficial in older persons with major depression, then it can be tested in the general population or in other non-depressed populations at high risk for AD.

"With the support of Brain Canada and the Chagnon Family we are studying whether we can delay the onset of Alzheimer's dementia in high risk patients, using a combination of neurostimulation and cognitive remediation to enhance neuroplasticity and cognitive reserve. Without this grant, it would have taken several years before we could assess these innovative interventions in the clinic."

—Dr. Benoit Mulsant



Dr. Tarek Rajji, a researcher on Dr. Mulsant's team, demonstrating transcranial Direct Current Stimulation.

NON INVASIVE IDENTIFICATION OF A β PLAQUES IN HUMAN RETINA FOR THE DIAGNOSIS OF ALZHEIMER'S DISEASE

2014 FOCUS ON BRAIN TEAM GRANT

PRINCIPAL INVESTIGATOR: JEAN-PAUL SOUCY, MCCONNELL BRAIN IMAGING CENTRE, MONTREAL NEUROLOGICAL INSTITUTE, MCGILL UNIVERSITY

FUNDING PARTNERS: CONSORTIUM QUÉBÉCOIS SUR LA DÉCOUVERTE DU MÉDICAMENT (CQDM), THE ONTARIO BRAIN INSTITUTE (OBI), THE GOVERNMENT OF CANADA

Alzheimer's Disease is the most common type of dementia, affecting millions worldwide, with no cure available at this time. Currently, AD diagnosis can only be confirmed post-mortem by observing two AD hallmarks in the brain, β -amyloid (A β) plaques and tau strands. Diagnosing AD earlier in its course could dramatically transform the design of clinical trials to test new treatments.

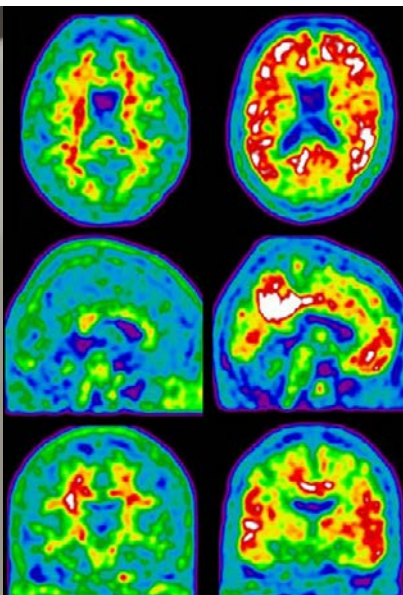
The eye offers a natural window to the brain through the retina, the light sensitive layer lining the interior of the eye, which is an extension of the brain. Recent research has reported the presence of A β plaques in the retina of AD patients, in humans and in mice models. This discovery opens the possibility that an AD hallmark could be detected in the eye by a simple non-invasive scan.

The project aims to explore this avenue with the development of a retinal imaging platform that uses fluorescence to detect the

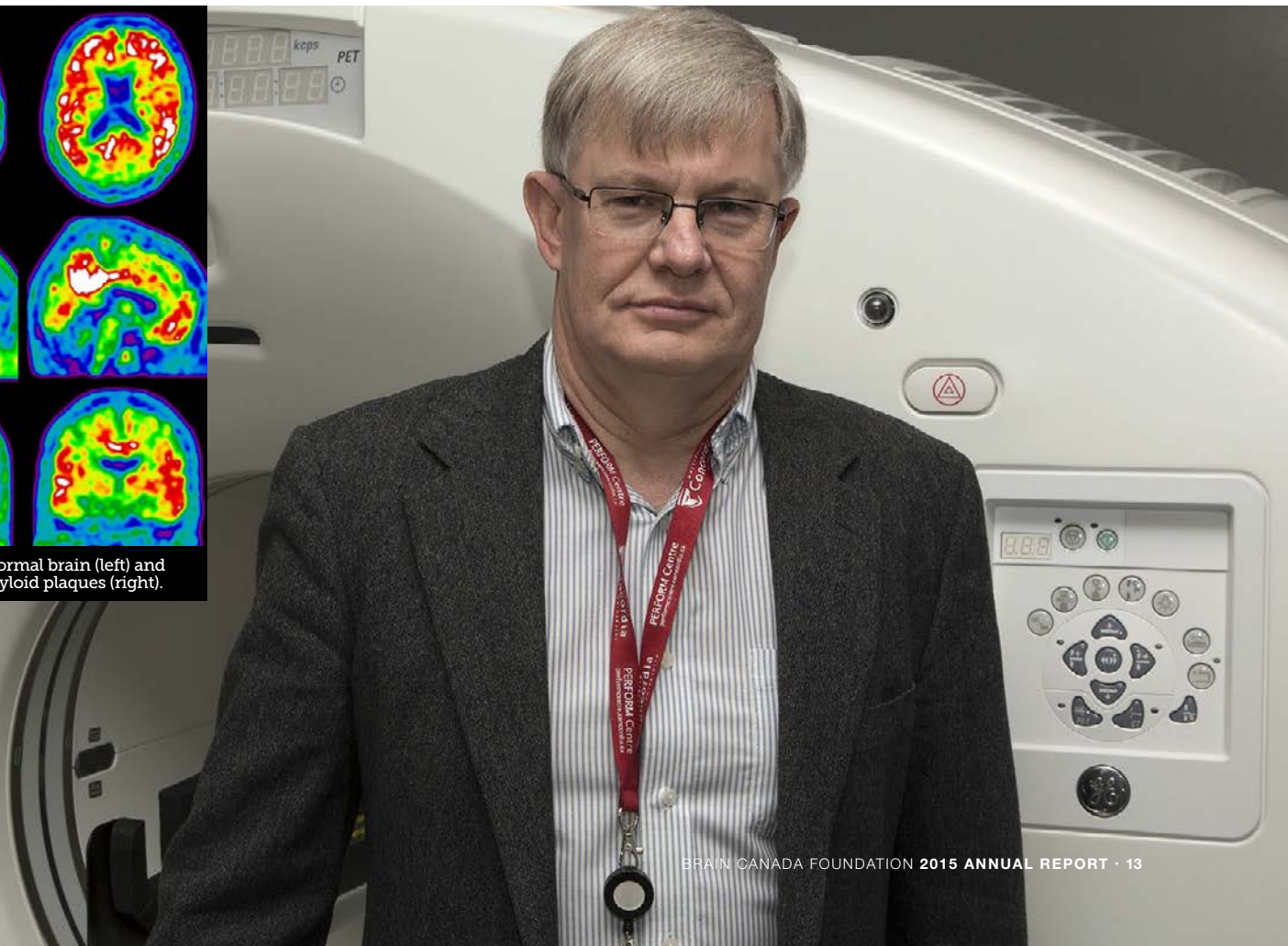
A β plaques in the retina of AD patients. The method will be validated by comparing results with established PET measures of brain A β plaques in the same patients. The novel imaging platform is expected to help aid the early detection and diagnosis of AD as well as in the future development of AD drugs. The development of a simple eye test 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 are 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.

"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."

—Dr. Jean-Paul Soucy



PET images of a normal brain (left) and of a brain with amyloid plaques (right).





THE ROLE OF PERIPHERAL INFLAMMATION IN ALS: AN EXPLORATORY STUDY

2015 ALS CANADA-BRAIN CANADA DISCOVERY TEAM GRANT
PRINCIPAL INVESTIGATOR: FABIO ROSSI, UNIVERSITY OF BRITISH COLUMBIA
FUNDING PARTNERS: ALS SOCIETY OF CANADA,
THE GOVERNMENT OF CANADA

It has been more than a decade since scientists proved that ALS is not simply a disease of motor neurons, but that other cells in the neighbourhood around them could play an active role in the disease process. A series of intricate experiments demonstrated that genetically 'turning off' ALS in mouse motor neurons at various time points did not stop the disease from happening and other work showed that making ALS mutations in motor neurons alone wasn't sufficient to cause disease either. Non-motor neuron research in ALS has predominantly focused on a set of support cells called astrocytes and inflammatory/immune cells called microglia, but a number of other cell types, including inflammatory cells from outside the CNS, have also been implicated in various experiments. With his team, Dr. Fabio Rossi at the University of British Columbia (UBC), aims to revolutionize our knowledge of inflammatory changes in ALS using a novel technique called mass cytometry where cells can be sorted and identified in a complex mixture. Ultimately, in collaboration with Dr. Charles Krieger of Simon Fraser University and Dr. Ryan Brinkman of UBC, Dr. Rossi aims to identify an "inflammatory signature" in the blood of ALS patients and compare it with the blood of spouses to control for environmental influences. What is especially unique is that the power of this technique allows them to examine circulating cells in "38 dimensional space". This means they can detect different cells with precision based on their levels of 38 different markers as opposed to previous studies that measured a maximum of 14. The hope is then that these signatures can be examined for correlation to disease progression in ALS. Furthermore, by defining the subtypes of inflammatory cells circulating in the disease, we will not only potentially learn more about the process leading to motor neuron degeneration, but will likely discover novel targets for therapy.



Dr. Coral Ann Lewis, Post Doctoral Fellow in Rossi Lab.

"Mass cytometry is a very powerful, cutting edge technique that allows the distinction and enumeration of many more cell types than the ones commonly used as clinical markers. ALS Society/Brain Canada funding was critical in enabling its use to profile inflammatory cells in patient blood and detect any changes associated with ALS progression, with the goal to better understand how inflammation affects this disease and possibly to develop diagnostic and theranostic markers."

—Dr. Fabio Rossi



CENTRE FOR FUNCTIONAL AND METABOLIC MAPPING

2015 PLATFORM SUPPORT GRANT

PRINCIPAL INVESTIGATOR: RAVI MENON,
WESTERN UNIVERSITY

FUNDING PARTNERS: WESTERN UNIVERSITY,
THE GOVERNMENT OF CANADA

"The PSG supports the technical staff that allow world leading neuroscientists at Western and elsewhere to take advantage of some of the most sophisticated MRI technology in the world to map brain structure and function from mice to humans. Without the staff, neuroscientists can't leverage the full capabilities of these amazing MRI instruments. Brain Canada support is the difference between having a world-renowned Brain Observatory or just another imaging facility."

—Dr. Ravi Menon

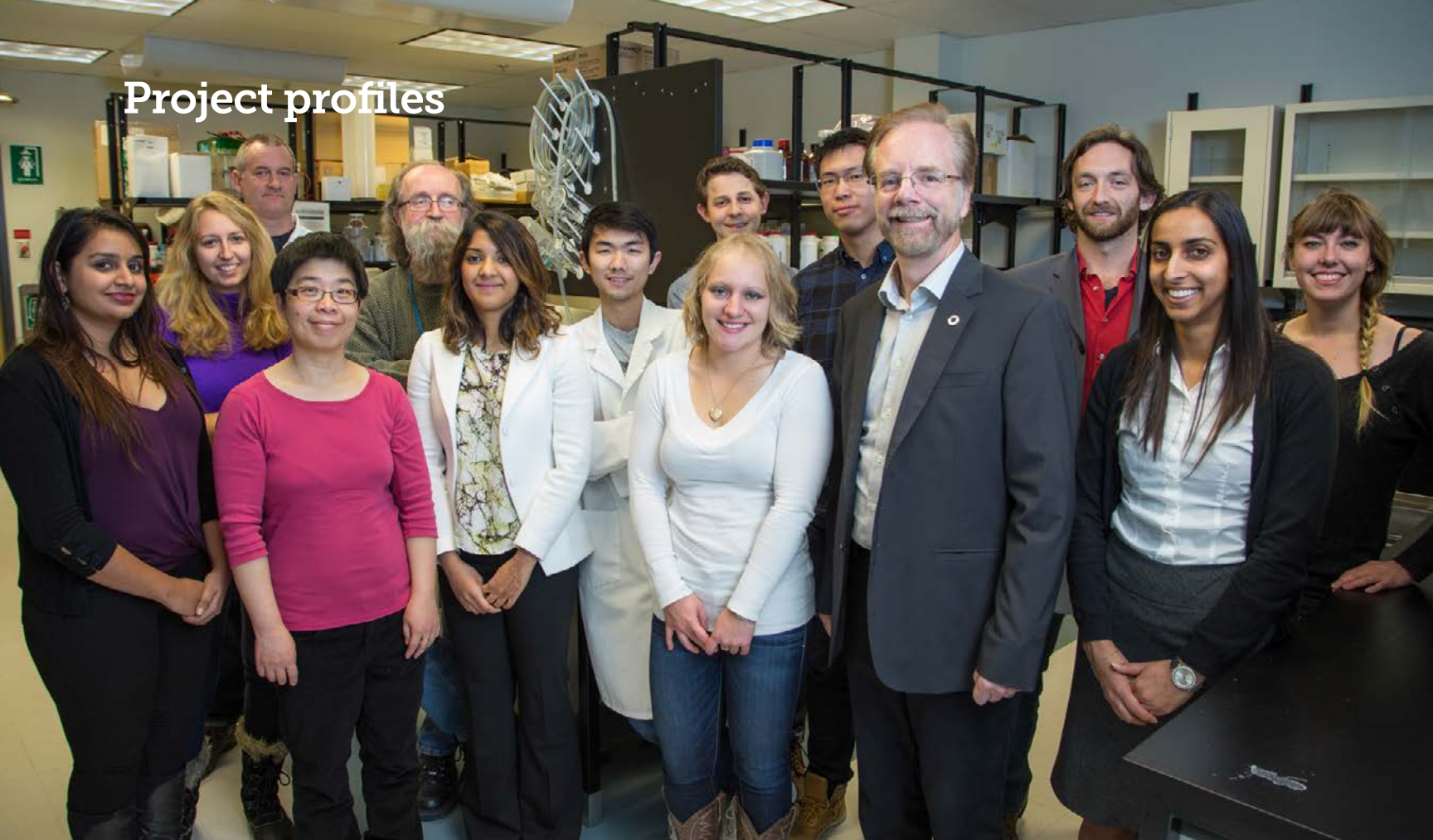
The Centre for Functional and Metabolic Mapping (CFMM) at Western's Robarts Research Institute houses Canada's only collection of ultra-high field magnetic resonance imaging and spectroscopy (MRI/MRS) systems. It operates some of the most sophisticated MRI instrumentation in the world, including the most cutting-edge 3T human MRI, the only human 7T MRI in Canada and the highest available magnetic field and bore size preclinical MRI scanner in Canada. MRI-compatible physiological monitoring equipment, power injectors, visual, auditory and sensory stimulation equipment, optogenetic excitation sources, EEG and electrophysiological equipment are located in and maintained by the facility, for the benefit of all animal and human neuroscience programs.

Users of the centre have exploited the unique instrumentation to answer neuroscience questions in areas as diverse as mouse models of disease, clinical neurology and risk taking in the stock market.

The PSG investment in the CFMM benefits the Canadian neuroscience community by providing effective access to imaging opportunities for all researchers and will also enable value-added collaborations between Canadian researchers and international scientists.

From left to right: Mr. Joe Gati, Associate Director and Department Manager; Dr. Ravi Menon, Director; Dr. Kyle Gilbert, Research Scientist; and Dr. Martyn Klassen, Research Scientist.

Project profiles



Dr. Jeffrey Dunn (fourth from right) and members of his lab.

THE EXPERIMENTAL IMAGING CENTRE: A LOCAL BRAIN CANADA PLATFORM FOR PRECLINICAL MR NEUROIMAGING

2014 PLATFORM SUPPORT GRANT

PRINCIPAL INVESTIGATOR: JEFFREY DUNN,
UNIVERSITY OF CALGARY

FUNDING PARTNERS: UNIVERSITY OF CALGARY,
THE GOVERNMENT OF CANADA

Basic neuroscience projects with high potential for clinical application require appropriate technologies to help transfer their results from the bench to the patient. Other imaging modalities cannot provide non-invasive multi-modal images that can investigate anatomy, physiology and pathology, all in the same imaging session. Thus, preclinical MR imaging is a key technology for bridging our basic discoveries in the laboratory to the clinic. Magnetic resonance (MR) imaging provides the neuroscientist with the same imaging options available clinically and a lack of access to such imaging will impede progress on knowledge transfer. This Platform Support Grant is a collaboration between the Experimental Imaging Centre (EIC) and the Hotchkiss Brain Institute (HBI) at the University of Calgary. It will provide access to state-of-the-art animal MR research infrastructure and expertise. The organization and technology is designed to provide access to neuroscientists regardless of their abilities to undertake MRI or surgeries. With highly-trained staff, pilot research funding and a collaborative environment, the EIC provides access for neuroscientists to an internationally recognized platform for preclinical MR imaging. By helping to bridge basic neuroscience discoveries to applications that will benefit humans and animals, it is anticipated that the research of the neuroscientists will have an accelerated impact on society and health care.

"The Experimental Imaging Centre (EIC), Cumming School of Medicine, University of Calgary specializes in custom designed MRI studies on animal disease models. There is a broad range of brain applications including stroke, multiple sclerosis (MS), cancer, epilepsy, concussion, diabetes neurotoxins and nutrition. Technical support was provided by the National Research Council Institute of Biomedical Diagnostics. The closure of this NRC institute threatened the existence of the EIC. The Brain Canada platform grant provided this centre with the financial bridging needed to continue operations, while expanding their research capacity to meet new neuroscience research goals."

—Dr. Jeffrey Dunn

A NATIONAL BIOBANK AND DATABASE FOR PATIENTS WITH TRAUMATIC BRAIN INJURY

2014 PLATFORM SUPPORT GRANT

PRINCIPAL INVESTIGATOR: JAMIE HUTCHISON, PRINCIPAL INVESTIGATOR, THE HOSPITAL FOR SICK CHILDREN

FUNDING PARTNERS: CHILDREN'S & WOMEN'S HEALTH CENTRE OF BC BRANCH, CHU SAINTE-JUSTINE FOUNDATION, GENOME BC, NOVA SCOTIA HEALTH AUTHORITY, ONTARIO NEUROTRAUMA FOUNDATION (ONF), PROVIDENCE HEALTH CARE SOCIETY, THE DJAVAD MOWAFAGHIAN CENTRE, THE HOSPITAL FOR SICK CHILDREN, UNIVERSITY OF BRITISH COLUMBIA, UNIVERSITY OF CALGARY, THE GOVERNMENT OF CANADA

Traumatic brain injury is the leading cause of death and disability in children and young adults in Canada. Despite huge developments in basic neuroscience, no new therapies or diagnostic tests have been introduced in clinical care over the past 30 years. In the acute setting, neither clinicians nor researchers are able to predict long term outcome, which makes it difficult to tailor care, rehabilitation interventions or support services.

Canadian scientists have previously been working separately, developing biobanks for studies of molecular biomarkers and studying mechanisms in laboratory models of TBI. The discovery and validation of molecular biomarker, in human, holds promise for diagnosis, outcome prediction and for monitoring response to new drugs or molecular therapies, rehabilitation and targeted psychotherapy.

To study these promising biomarkers, an integrated translational biology approach is needed.

The funding for this project will help link current and planned biobanks for traumatic brain injury, to a central state-of-the art neuroscience database at the Ontario Brain Institute. It will permit more rapid pilot studies with emerging laboratory technologies and novel approaches and will enable our scientists to be more competitive when applying for peer-reviewed funding. It will also position Canadian scientists to lead ground-breaking neuroscience research as part of the International Initiative for Traumatic Brain Injury Research. This Platform Support Grant provides an essential step to help Canadian scientists lead a paradigm shift in the care of these patients with traumatic brain injury.

"The Brain Canada Platform Support Grant has enabled the formation of a network comprised of Canadian traumatic brain injury (TBI) experts, who are collaborating effectively on the establishment of a national biobank and database. This collaborative effort will spearhead the advancement of TBI knowledge, enhance TBI management and improve long term outcome for patients and their families."

—Dr. Jamie Hutchison

Dr. Jamie Hutchison (left) and members of the PSG grant team at their first face-to-face working team meeting in Toronto in October of 2015.



Project profiles



From left to right: Dr. Teresa Bennett, Principal Investigator; Dr. Eric Duku; Dr. Stelios Georgiades; Dr. Ellen Lipman, co-PI; Dr. Andrea Gonzalez, co-PI; Dr. Michael Boyle; Dr. Magdalena Janus, co-PI; and Ms. Sofia Al Balkhi. Missing from photo, Dr. Kathy Georgiades, co-PI.

MAKING THE RACE FAIR FOR YOUNG CHILDREN AT RISK: A TARGETED PREVENTION APPROACH TO REDUCING CHILD EMOTIONAL AND BEHAVIOUR PROBLEMS

RBC – BRAIN CANADA RESEARCH PARTNERSHIP IN MENTAL HEALTH SERVICES FOR CHILDREN AND YOUTH MIRI GRANT
PRINCIPAL INVESTIGATOR: TERESA BENNETT, MCMASTER UNIVERSITY
FUNDING PARTNERS: RBC FOUNDATION, THE GOVERNMENT OF CANADA

The World Health Organization estimates that mental illness will pose the greatest health burden to affluent countries by the year 2030. One of the largest predictors of mental illness is childhood emotional and behavioural problems (EBP), e.g., aggression, anxiety, depression, which occur in 12-26% of children under age six years.

There is an urgent need for early interventions that prevent the onset and entrenchment of EBP in young children, whose brains and behaviour are more likely to be malleable to changes in parenting practice and environmental risk. Despite this sense of urgency, Canada lacks an infrastructure for prevention and early intervention in child mental healthcare.

The Family Check-Up (FCU) is a brief, evidence-based intervention that incorporates unique features such as individualized assessment, motivational interviewing and a tailored menu of services that may include engagement in an evidence-based curriculum focused on enhancement of family management skills. It is unique in its focus on multimodal assessment, tailored intervention, and emphasis on family engagement within a motivational interviewing framework. It has demonstrated robust effects across child and family outcomes in US studies, however, its impact within Canada is not known, given fundamental differences in health, social and educational systems.

This project will implement and study the FCU in a Canadian setting. If effectiveness is demonstrated within a Canadian context, community agencies may feasibly train front-line clinicians such as school social workers, family health team therapists, and community mental health workers with regular fidelity check-ins. This project will lay the foundation for an innovative and important evidence-based infrastructure of prevention and early intervention in early childhood mental health. This will fill the crucial health services gap faced by children at greatest risk of falling furthest behind due to childhood-onset mental illness.

"Making the Race Fair represents a new coalition involving McMaster Children's Hospital, Offord Centre for Child Studies and Hamilton community agencies, and the first Canadian demonstration project of the Family Check-Up. With the support of Brain Canada and RBC Foundation, we are developing a new, sustainable early childhood mental health system of evidence-based targeted prevention and research. We will pilot and evaluate the effects of Family Check-Up on biological and behavioural indices of child and family mental health, well-being and development."

—Dr. Teresa Bennett

Research programs review 2015

MULTI INVESTIGATOR RESEARCH INITIATIVE (MIRI) TEAM GRANTS

The purpose of the Multi-Investigator Research Initiative (MIRI) grants is to support multi-disciplinary teams and to accelerate novel and transformative research that will fundamentally change our understanding of nervous system function and dysfunction and their impact on health. MIRI grants are for three years and normally provide up to \$500,000 a year for a total of \$1.5 million. In December of 2014, the third MIRI competition was launched. After a rigorous peer review, Brain Canada's Board approved the four top-ranked applications representing \$4.8 million in research funding over a three-year funding term.

PLATFORM SUPPORT GRANTS (PSGs)

PSGs are designed to sustain and enhance the capabilities and accessibility of research platforms essential for tomorrow's brain research. The grants are intended to fill a funding gap for operations and maintenance of major research platforms that provide national or regional technical capability to multiple neuroscience investigators from a number of institutions. Examples of research platforms include brain banks, imaging facilities, data repositories, and data-sharing systems. The second PSG competition was launched in December of 2014. Thirteen letter of intent applications were invited to submit a full application. A total of seven projects were selected. Three were funded in 2015 and four were funded in 2016 for a total of \$12.6 million.

STRATEGIC PARTNERSHIP PROGRAMS

The partnered programs described below are programs that had funds awarded in 2015. A full list of donors and partners are listed on pages 36-37.

ALS Society of Canada

In November of 2014, a partnership between the ALS Society of Canada and Brain Canada resulted in the largest one-time investment in research in the history of the ALS Society of Canada - \$20-million investment in a national research program. The Brain Canada and ALS Society of Canada partnership encompasses three jointly-funded programs; Arthur J. Hudson Grants for Translational Research, Career Transition Grant and the Discovery Awards. The awardees of the Arthur J. Hudson Grants and Discovery Grants were announced by the ALS Society of Canada and Brain Canada at the Montreal Neurological Institute on November 19th, 2015. Five Hudson, eight Discovery and two Career Transition awards were announced.

ALS Society of Canada and Brain Canada have discussed allocating the remaining funds towards the same three programs for a 2016 competition given the success of the 2015 competition.



From left to right: Ms. Tammy Moore, CEO, ALS Society of Canada; Ms. Inez Jabalpurwala, President and CEO, Brain Canada Foundation; Dr. Christine Vande Velde, Scientist, Université de Montréal; Dr. Heather Durham, Professor, Montreal Neurological Institute; Dr. Peter McPherson, Professor, Montreal Neurological Institute; Ms. Carol Skinner, ALS advocate; Dr. Guy Rouleau, Director, Montreal Neurological Institute; Ms. Geneviève Bertrand, Chair, ALS Canada; Dr. Angela Genge, Director of the ALS Clinic, Montreal Neurological Institute; Ms. Claudine Cooke, Executive Director at the ALS Society of Quebec.

"Through funding from the ALS Canada Research Program and Brain Canada partnership, our research community can work together and tackle many different aspects of ALS to accelerate the discovery of treatments for ALS patients. ALS research has come a long way in the past decade, and these research investments can only help further explore answers to this complex disease."

– Dr. Christine Vande Velde,
Scientist and Associate Professor,
Université de Montréal

Alzheimer's Association (ALZ)

The Alzheimer's Association is a U.S.-based organization and the largest nonprofit funder of Alzheimer's research. Brain Canada has partnered with the Alzheimer's Association to co-fund three peer-reviewed applications submitted by Canadian principal investigators to the ALZ 2015 International Research Grant Program. Two applicants were awarded for the ALZ 2015 New Investigator Research Grant (NIRG) program and one applicant was awarded for the ALZ 2015 Investigator-Initiated Research Grant: Non-Pharmacological Strategies to Ameliorate Symptoms of Alzheimer's Disease and Related Dementia program (NPSASA). The NIRG program funds investigators who are less than ten years past their doctoral degree to support early-career development. The NPSASA program is aimed at identifying, validating, and investigating non-pharmacological approaches to improve the care of people living with Alzheimer's and dementia. The three applications total \$397,796.

Brain Canada is engaging the Alzheimer's Association in discussion about continuing this partnership into 2016-2017.



Dr. Maria C. Carrillo
and Ms. Inez Jabalpurwala

"Ending Alzheimer's and dementia is a global problem that requires global collaboration. Together, we need to do everything we can to make sure we have the best minds from every part of the world working toward understanding of these diseases and ultimately treatments to stop or slow their progression. The Alzheimer's Association and Brain Canada partnership allows us to come together to support leading Canadian researchers to advance global research efforts."

– Dr. Maria C. Carrillo,
Chief Science Officer of the Alzheimer's Association

Alzheimer's Society of Canada (ASC)

Brain Canada has partnered with the Alzheimer's Society of Canada for the Alzheimer Society Research Program (ASRP)/Brain Canada New Investigator & Career Change Grant program. This program is providing salary support to new investigators and investigators wishing to make a career change from other areas to Alzheimer's disease and related dementias. The program was launched on September 26th, 2014. Brain Canada is co-funding two New Investigator Grants and one Career Change Grant totalling \$673,992. The remaining funds in the amount of \$450,000 will be used for the 2016 competition.

The Azrieli Foundation

Brain Canada partnered with the Azrieli Foundation in 2012 to create the Azrieli Neurodevelopmental Research Program. The goal of this program is to develop new diagnostics, treatment and prevention strategies for neurodevelopmental disorders, to reduce their economic and social burden on Canadians, and to improve the quality of life for those affected by neurodevelopmental disorders and their families. In Phase 1 of the program, the partners jointly contributed \$8.5 million, with an additional \$200,000 donated by the National Bank. Four large Multi-Investigator Research Initiative (MIRI) projects with an emphasis on Autism Spectrum Disorders and Fragile X syndrome were funded.

For the second phase of the program, The Azrieli Foundation built on this significant research investment with a further \$3.25 million commitment, which, matched by Brain Canada and the CBRF, supported an additional \$6.5 million of research funding. In November of 2015, three applications were recommended with Government of Canada funding, totaling \$4,862,836 (two PSGs and one MIRI). Discussions are underway to strategize the allocation of the remaining \$1.5 million in research funds.

Barbara Turnbull Foundation for Spinal Cord Research

This award, in support of Canadian research on spinal cord injury, is funded by the Institute of Neurosciences, Mental Health and Addiction (INMHA) of the Canadian Institutes of Health Research (CIHR) in partnership with Brain Canada and the Barbara Turnbull Foundation, and is valued at \$50,000. From among CIHR-funded investigators, the award recipient is selected for conducting the most promising and exciting spinal cord research. The award was presented at the 14th annual Tator-Turnbull spinal cord injury symposium, on Friday, November 13th, 2015 at the Toronto Western Hospital. The event was bittersweet as it was the first award presented since the death of the inspiration for the award, Barbara Turnbull, who worked tirelessly to promote the need for research into spinal cord injuries. This year's recipient was Dr. Samuel David from the Research Institute of the McGill University Health Centre, whose research looks at mechanisms that control the delivery and release of iron in the nervous system.



From left to right: Mr. Gary Goldberg, Director, Barbara Turnbull Foundation for Spinal Cord Research; Dr. Elizabeth Theriault, Assistant Scientific Director, Institute of Neurosciences, Mental Health and Addiction (INMHA), Canadian Institutes of Health Research (CIHR); Dr. Sam David, Professor, Research Institute of the McGill University Health Centre (MUHC); Ms. Inez Jabalpurwala, President and CEO, Brain Canada.

"I am delighted to be the recipient of this year's Barbara Turnbull Award for Spinal Cord Research. Barbara Turnbull was, and continues to be, an inspiration to those living with spinal cord injury, as well as researchers who are striving to make medical advances in this field. I would like to thank Brain Canada for their contribution to this award and their strong support for neuroscience research. My sincere thanks also to CIHR for supporting this award, as well as biomedical research across Canada."

– Dr. Samuel David
Professor of Neurology and Neurosurgery,
Department and Faculty of Medicine
Centre for Research in Neuroscience,
Research Institute of the McGill University Health Centre

Canadian Cancer Society (CCS)

Brain Canada is collaborating with the Canadian Cancer Society to support more CCS Impact Grants focused on brain and nervous system cancer research. The Impact Grant program contributes to "pipeline" research by supporting significant progress of the various research stages continuum from basic high-impact discovery to translational work of direct relevance to the clinic.

On February 4th, 2015, in honour of World Cancer Day, the recipients of the Impact grants were announced. Four large research grants – valued at \$1.25 million each – were awarded to research teams in Vancouver, Toronto and Ottawa.

The second Impact Grant competition with the CCS was launched on December 16th, 2014. Following the evaluation of the nine brain-related letters of intent applications received, seven applicants were invited to submit a full application and five were received by the September 1st, 2015 deadline. One application was recommended for funding for a total of \$1.2 million.

"This partnership not only combined the strengths of our two organizations, it inspired Canadians to invest in change. Together, we funded five Impact Grants in brain cancer research, enabling some of Canada's most talented scientists to tackle new ways of diagnosing and treating the disease. Together, we rallied Canadians across the country to support this powerful partnership and bring about meaningful change for brain cancer patients and their loved ones."

– Ms. Pamela Fralick,
President and CEO, Canadian Cancer Society

Consortium Québécois sur la Découverte du Médicament (CQDM)

Brain Canada partnered with CQDM and the Ontario Brain Institute (OBI) to create the Focus on Brain program. The goals of the program are to link academia with industry to support pre-competitive research that enhances bio-pharmaceutical R&D productivity, and to accelerate the development of new, safe, and effective drugs in neuroscience.

On May 26th, 2015, the partners announced that \$8.5 million was awarded to six multi-disciplinary and multi-provincial research teams across Canada that addressed unmet needs in neuroscience.

The second Focus on Brain competition, in partnership with Brain Canada and CQDM, was launched on September 15th, 2015. The deadline for the letter of intent applications was December 15th, 2015. Forty-five letter of intent applications were submitted and were reviewed by a Pre-Screen Impact Assessment Selection Committee on February 5th, 2016. Letters of intent selected for further review were adjudicated in March 2016. Funded projects are expected to be announced in July of 2016.



From left to right: Dr. Keith Murai, Research Institute-McGill University Health Centre; Ms. Inez Jabalpurwala, Brain Canada, Dr. Mario Chevrette, CQDM; Dr. Timothy Murphy, University of British Columbia; Dr. Elizabeth Simpson, University of British Columbia; Dr. Rob Hutchison, biOasis Technologies Inc.; Dr. Nathan Yoganathan, KalGene Pharmaceuticals Inc.; Dr. Wilfred Jefferies, University of British Columbia; and Dr. Don Stuss, OBI.

"This is the first time that CQDM funds as many research projects at once, thanks to the partnerships we have established with Brain Canada and OBI. We joined forces to mobilize the best researchers in Canada. These projects reflect the pan-Canadian collaboration and talent, and capitalize on synergies in the public and private sectors, as well as interprovincial resources. We are proud to support true innovative translational research in Canada that will certainly make a difference in neuroscience"

– Dr. Mario Chevrette
Vice President, Scientific Affairs, CQDM.

CIFAR (Canadian Institute for Advanced Research)

A joint collaboration agreement was signed in April 2015 for the Brain Canada and CIFAR-partnered initiative to increase research capacity in Canada by co-funding three brain-related programs totalling up to \$20 million. Each of the three research programs consists of 10-40 leading researchers from around the globe who are answering fundamental questions about the brain and what it means to be human. The three programs are the *Learning in Machines and Brains program*; the *Brain, Mind and Consciousness program*; and the *Humans and the Microbiome program*.

“Our partnership with Brain Canada is a game changer. It is allowing CIFAR to support leading-edge research into some of the most important questions in brain science. Deepening our understanding of how the brain works is critical to future health and well-being.”

– Dr. Alan Bernstein,
President & CEO, CIFAR

Heart and Stroke Foundation

Brain Canada has partnered with the Heart and Stroke Foundation (HSF) to fund two career-support initiatives: 1) the Emerging Research Leaders Initiative (ERLI) program and; 2) the Grant-in-Aid (GIA) program. The ERLI program is for researchers transitioning from a post-doctoral fellowship to a junior professional position in the areas of cardiovascular, cerebrovascular, and/or respiratory health research. The GIA program provides operating funds to support important, pertinent, and novel research in the areas of heart disease and stroke. GIA funding promotes research discovery, exploration and innovation across all health research themes. Knowledge gained from scientific discovery contributes to the cardiovascular and cerebrovascular health of Canadians through prevention, treatment, and recovery. Brain Canada co-funded two ERLI awards and five GIA awards for the 2014/15 competition totalling \$1,612,747 in research funding.



Dr. Hubert van Tol Travel Fellowship

The fellowship enables Ph.D. students and post-doctoral fellows performing research as part of a Brain Canada MIRI team or Training Award to attend major international conferences, symposia, or training courses outside of Canada. The recipient for the 2015 Dr. Hubert Van Tol Travel Fellowship award is Dr. Pierre-Eric Lutz, a post-doctoral fellow under the supervision of Dr. Gustavo Turecki who was a recipient of a Brain Canada 2014 Platform Support grant. Dr. Lutz is currently completing his post-doctoral fellowship entitled “Epigenetic mechanisms of childhood maltreatment”, in which he investigates the strong relationship between childhood malnutrition and mental health outcomes. Dr. Lutz’s research focuses on epigenetic analysis of the human amygdala, the brain centre for stress and emotions. He uses post-mortem brain tissues available through the Douglas-Bell Canada Brain Bank, and has identified novel disruptions in DNA methylation linked to childhood malnutrition and suicidal behaviour. Dr. Lutz was awarded \$1,843 for a poster and oral presentation of these novel findings at the International Academy of Suicide Research (IASR)/American Foundation for Suicide Prevention (AFSP) 2015 International Summit on Suicide Research, October 11th-14th, 2015 in New York, USA. This conference brought together suicide researchers studying topics ranging from neurobiology and genetics to prevention and intervention.

Jewish General Hospital Foundation/Bell

Brain Canada partnered with the Jewish General Hospital Foundation and Bell Canada to co-fund the project titled “Evaluation of the Kids Write Network intervention with children of severely ill parents: a qualitative and quantitative pilot study,” led by Dr. Danielle Groleau, totaling \$190,385. The project was peer-reviewed by two international experts to ensure that the application met Brain Canada’s standards of excellence. The Kids Write Network intervention is a six-step program designed for children to help in self-expression, self-esteem, and self-confidence.

Huntington Society of Canada

On November 20th, 2015, Brain Canada and Huntington Society of Canada launched the Creating HD Clinician-Scientist-to-Patient Virtual Networks Multi-Investigator Research Initiative (MIRI). This joint initiative supports research projects that connect clinicians with scientists, and scientists with the HD (Huntington Disease) community, in a manner that can be demonstrated to create a collaborative HD Clinician-to-Scientist-to-Patient Virtual Network. The multi-disciplinary and multi-investigator approach emphasized in this initiative is expected to maximize the opportunity for discovery and translational research that will expedite the discovery-to-effective-treatment cycle, while expanding the overall understanding of HD therapy in humans. Brain Canada-Huntington Society of Canada MIRI research grants are for three years for up to \$300,000 per year for a total of \$900,000. A total of two multi-disciplinary/multi-institutional grants can be funded. Funded projects will be announced in August of 2016.



National Institutes of Health (NIH) BRAIN-Initiative

The Brain Research through Advancing Innovative Neurotechnologies® (BRAIN) Initiative is part of a US Presidential focus aimed at revolutionizing our understanding of the human brain. The ten NIH Institutes that are part of the NIH BRAIN Initiative announced a new partnership with Brain Canada to support the involvement of Canadian researchers in the NIH BRAIN Initiative. Both NIH and the Brain Canada Foundation believe that the ambitious goals of the BRAIN Initiative can best be attained by collaboration across disciplinary boundaries as well as geographic boundaries. After internal review, Brain Canada approved co-funding of two NIH-approved BRAIN Initiative applications, for the amount totaling \$234,010. This partnership enables Canadian scientists to establish collaborations with funded NIH BRAIN teams and to support BRAIN projects with existing Canadian components. Brain Canada is the only Canadian organization partnered on the BRAIN Initiative and Canada is one of only two countries partnered on the initiative. Ms. Inez Jabalpurwala, President and CEO of Brain Canada, sits on the BRAIN Multi-Council Working Group.

NeuroDevNet

Brain Canada has partnered with NeuroDevNet on the Developmental Neurosciences Research Training Awards program. The training award funds doctoral candidates and post-doctoral fellows performing research aimed at the origins, early detection, and effective treatment of brain development disorders. In addition to the award, the recipients will take part in the NeuroDevNet Training program, which endeavors to develop cross-disciplinary and collaborative skill sets for the next generation of scientists, clinicians, and health-service professionals. Brain Canada's financial commitment is \$1 million per competition. The program was launched May 15th, 2015, and 64 applications were received. Seventeen applications were approved for co-funding (eight graduate studentships and nine postdoctoral fellowships), totaling \$1.5 million in funding.

RBC Foundation

A targeted MIRI competition with the Royal Bank of Canada (RBC) Foundation was launched on April 3rd, 2015. The RBC – Brain Canada Research Partnership supports one multi-investigator three-year research project focused on improved delivery of mental health services through the identification and validation of innovative interventions and practices that are cost-effective, and delivered at the right place and time to support affected individuals and their families. Thirteen full applications were received for the RBC – Brain Canada Research Partnership in Mental Health Services for Children and Youth program. The Selection Committee met in-person on October 22nd, 2015. One application was selected for co-funding, totaling \$910,000 in funding. The funded project is "Making the Race Fair for Young Children at Risk: A Targeted Prevention Approach to Reducing Child Emotional and Behaviour Problems". The principal investigator is Dr. Teresa Bennett from McMaster University.

Canada Brain Research Fund grant recipients - Principal Investigators*

2012

Brain Repair Program

David Park

University of Ottawa
Uncovering the pathological processes underlying neuronal dysfunction and loss in models of Parkinson's disease

MIRI Team Grants

Neil Cashman

University of British Columbia
Propagated protein misfolding of SOD1 in ALS: Exemplar for neurodegeneration.

James Drake

The Hospital for Sick Children
Non-invasive treatment of pediatric neurological disorders using MR-guided focused ultrasound (MRgFUS)

Salah El Mestikawy

McGill University
Dissecting acetylcholine/glutamate co-transmission in the striatum: importance of individual neurotransmitter in addiction and movement disorders

Roman Melnyk

The Hospital for Sick Children
Carrier-mediated delivery of therapeutic proteins into the brain



Terry Snutch

University of British Columbia
Brain channelopathies: target validation and novel therapeutic strategies

The W. Garfield Weston Foundation – Brain Canada Foundation MIRI

Sandra Black

Sunnybrook Research Institute
Validation of ocular measures as potential biomarkers for early detection of brain amyloid and neurodegeneration

Michel Cayouette

Institut de Recherches Cliniques de Montréal
Neuronal polarity defects as an underlying cause of neurological diseases

Michael Meaney

McGill University
Epigenetics and mental health: the Canadian neuroepigenetics network

Freda Miller

The Hospital for Sick Children
Recruitment of endogenous neural stem cells to promote repair following acquired brain injury in children

Valerie Wallace

University Health Network
Restoration of visual function: a cellular reprogramming and bioengineering approach

Training Awards

Bell Mental Health Research Training Awards

Corey Baimel

University of British Columbia
The effects of optogenetically activated orexin/hypocretin neurons on the mesolimbic reward pathway

Nancy Butcher

University of Toronto
Antipsychotic treatment in a genetic subtype of schizophrenia: Novel insights from neuroimaging and pharmacogenetics

Steven Connor

University of British Columbia
Characterization of the role of LRRTMs in synaptic plasticity and memory formation



Jennie Pouget

Centre for Addiction and Mental Health
The role of immune genes in schizophrenia

Andrea Tyrer

Centre for Addiction and Mental Health
Season, light exposure and serotonin transporter binding

Cornelia Walther

University of Western Ontario
CRF receptor-mediated sensitization of 5-HT_{2A} receptor signalling

Guang Yang

The Hospital for Sick Children
The role of translational control in cortical dysgenesis in mammalian brain

Brain Canada - CIBC Brain Cancer Research Training Awards

Vincy Chan

University of Toronto
The profile and trajectory of brain tumours across the continuum of care in Ontario, Canada: a population based study

Deena Gendoo

The Hospital for Sick Children
Drug repurposing in medulloblastoma using integrated functional genomic, epigenomic, and transcriptomic approaches

Ian Gerard

McGill University
Nonlinear MR-US registration for image guided neurosurgery of brain tumours

*For a full list of team members for each project, please visit www.braincanada.ca

Nadine Richard

University Health Network
Validation of cognitive rehabilitation program adapted to the needs of adults with brain cancer and adult survivors of childhood brain cancer

Nishani Rajakulendran

University of Toronto
Wnt signalling circuits in glioma progression

Katherine Rowland

The Hospital for Sick Children
Role of YAP/Hippo and Wnt signaling in human gliomagenesis and glioma tumour-initiating cells

Mohini Singh

McMaster University
Identification of brain metastasis initiating cells and regulators of brain metastasis from lung cancer

2013

Chagnon Family and Brain Canada Interventions for Prevention of Alzheimer Disease and Related Disorders (ADRD) MIRI

Benoit Mulsant

Centre for Addiction and Mental Health
Prevention of Alzheimer's dementia in high risk populations: a randomized controlled trial of a combination of cognitive remediation and brain stimulation

Azrieli Neurodevelopment Research Program

Evdokia Anagnostou

University of Toronto
Co-clinical trials in mice and humans in autism

Laurie Doering

McMaster University
Correction of neuronal function in autism

Alan Evans

McGill University
Structural and functional networks in autism spectrum disorder and Fragile X Syndrome



Laurie Doering

Nahum Sonenberg

McGill University
Treatment strategies for Autism Spectrum Disorders and Fragile-X Syndrome using mouse models, via translational control modulators

2014

MIRI Team Grants

Jean Addington

University of Calgary
Adolescent mental health

Jaideep Bains

University of Calgary
Understanding stress to improve mental health

Rod Bremner

Lunenfeld-Tanenbaum Research Institute, Mount Sinai Hospital
Stimulating endogenous regeneration of photoreceptors as a potential cure for blindness

Ann Marie Craig

Brain Research Centre, University of British Columbia
Targeting the synaptic pathway in neurodevelopmental and psychiatric disorders

Zafiris Daskalakis

Centre for Addiction and Mental Health
Canadian rTMS Treatment and Biomarker Network in Depression (CARTBIND) Trial

Doris Doudet

University of British Columbia
Neurobiological correlates of TMS

Kari Hoffman

York University
Modulating memory circuits: focal DBS treatments to improve medial temporal lobe function

Brian Kwon

University of British Columbia
Biomarkers for crossing the translational divide in acute spinal cord injury

Jeffrey Mogil

McGill University
Distinct neuro-immune interactions drive sex differences in chronic pain

Laurie Morrison

University of Toronto
The Frontier Trial - Field Randomization of NA-1 Treatment In Early Responders

British Columbia Alzheimer's Research Award Program

Mirza Faisal Beg

Simon Fraser University
Novel retinal biomarkers for Alzheimer's disease

Neil Cashman

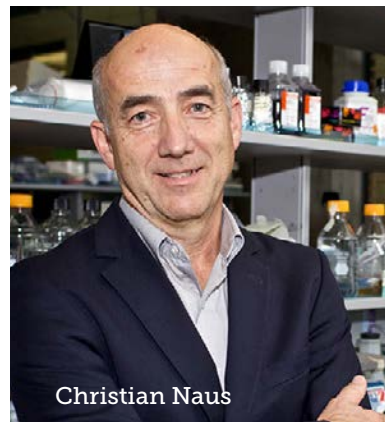
University of British Columbia
Targeting amyloid propagation in Alzheimer disease: structures, immunology and extracellular vesicle topology

James Johnson

University of British Columbia
Locally produced brain insulin in memory and Alzheimer's disease: A multi-disciplinary approach to a key question

Christian Naus

University of British Columbia
Validation of Connexins and Pannexins as a target for Alzheimer's Disease



Christian Naus

David Vocadlo

Simon Fraser University
Preclinical development of a disease modifying small molecule therapy for Alzheimer disease

Platform Support Grants

Christopher Anderson

University of Manitoba
Manitoba Neuroimaging Platform

Yves De Koninck

Université Laval
The Canadian Neurophotonics Platform

Jeff Dunn

University of Calgary
The Experimental Imaging Centre: a Local Brain Canada Platform for Preclinical MR Neuroimaging

Alan Evans

McGill University
CBRAIN: Canadian Brain Research and Informatics Platform

Chester Ho

University of Calgary
Building the Rick Hansen Alberta Spinal Cord Injury Registry

Jamie Hutchison

The Hospital for Sick Children
A National biobank and database for patients with traumatic brain injury

Deborah Kurrasch

University of Calgary
A Novel Zebrafish-Based Platform for Anticonvulsant Drug Development

Gregory Lodygensky

Sainte-Justine University Hospital Research Centre
The Canadian Neonatal Brain Platform

Art Petronis

Centre for Addiction and Mental Health
The Ontario Brain Epigenomics Platform

Jack Puymirat

Université Laval
Human inducible pluripotent stem cells (iPSC) platform

Amir Shmuel

McGill University
Montreal functional brain imaging platform

Karun Singh

McMaster University
A research platform to study animal and human cellular models of neurological disorders

Pascale Tremblay

Institut Universitaire en Santé Mentale de Québec
Quebec Neuroscience and Mental Health Imaging Consortium: The regional leader in human neuroimaging

Gustavo Turecki

Douglas Hospital Research Centre
Douglas-Bell Canada Brain Bank, an essential platform for brain research in Canada

Fidel Vila-Rodriguez

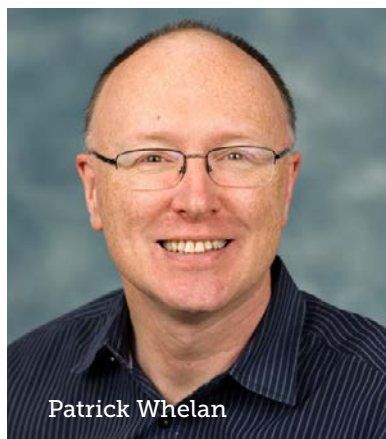
University of British Columbia
Integrated Neurostimulation Platform for Neuropsychiatric Research

Xiao-Yan Wen

St. Michael's Hospital
Z-BRAIN: A Zebrafish Drug Screening Platform Targeting Brain Disorders

Patrick Whelan

University of Calgary
Regeneration Unit in Neurology: A platform for research and training in advanced microscopy and behavioural approaches



Patrick Whelan

ALS Canada - Brain Canada Discovery Grants

Heather Durham

McGill University, Montreal Neurological Institute and Hospital
Epigenetic mechanisms underlying dendritic atrophy in ALS

Charles Krieger

Simon Fraser University
Use of bone marrow cells to deliver single chain antibodies in ALS

Alex Parker

Université de Montréal
Investigation of the innate immune system and motor neuron degeneration in genetic models of ALS

Janice Robertson

University of Toronto
Characterizing the C9ORF72 protein interactome for identifying novel pathogenic pathways in ALS

Melanie Woodin

University of Toronto
Synaptic inhibition in the motor cortex of an ALS mouse model

ALS Arthur J. Hudson Translational Team Grant

Lawrence Korngut

University of Calgary, Hotchkiss Brain Institute
The CANadiAn DynAmic Program of Translational Research for ALS (CAN-ADAPT-ALS)

CQDM - Brain Canada - OBI Focus on Brain

Janusz Pawliszyn

University of Waterloo
Solid phase microextraction-based integrated platform for untargeted and targeted in vivo brain studies

Elizabeth Simpson

University of British Columbia
Human minipromoters for restricted expression of ocular gene therapy

Jean-Paul Soucy

McGill University
Non invasive identification of A β Plaques in human retina for the diagnosis of Alzheimer's disease

Danica Stanimirovic

National Research Council of Canada
'Best in Class' platform for blood brain barrier delivery of therapeutics

Don van Meyel

McGill University, Research Institute of the McGill University Health Centre
Cyto-iGluSnFR: A glutamate biosensor platform for brain diseases

Nathan Yoganathan

KalGene Pharmaceuticals Inc
Drug delivery across the human blood-brain barrier

2015**MIRI Team Grants****Sébastien Jacquemont**

Sainte-Justine University Hospital Research Centre
Montreal integrated neuropsychiatric cohort: Identifying subtypes of Autism and Schizophrenia integrating genomics, endophenotypes, and cohorts of high-risk genetic variants

Marie-Hélène Milot

Université de Sherbrooke
Combining neurostimulation technique with tailored interventions for the affected upper extremity: can it promote better recovery in stroke survivors?



Marie-Hélène Milot

Ruth Slack

University of Ottawa
Reshaping mitochondrial efficiency and integrity to treat Parkinson's disease

Eric Smith

Alberta Innovates - Health Solutions
Novel blood and neuroimaging markers of Alzheimer's disease and cerebral amyloid angiopathy

Platform Support Grants**Mark Bayley**

Toronto Rehabilitation Institute
Canadian Partnership for Stroke Recovery Clinical Trials Platform



Mark Bayley

Morris Freedman

The Rotman Research Institute, Baycrest Centre
The Toronto Dementia Research Alliance (TDRA) Dementia Clinical Research Database: A Platform in Neurodegenerative Diseases

Ravi Menon

Western University
Centre for Functional and Metabolic Mapping

ALS Canada - Brain Canada Arthur J. Hudson Team Grants**Jean-Pierre Julien**

Université Laval
Preclinical and clinical studies with withanolides: Therapeutic effects, molecular signatures and biomarkers

Sanjay Kalra

University of Alberta
Novel MRI biomarkers for monitoring disease progression in ALS

Jiming Kong

University of Manitoba
Selective knockdown of misfolded SOD1 as a therapy for amyotrophic lateral sclerosis

Peter St George-Hyslop

University of Toronto
Discovery of therapeutic targets for FUS- and TDP43-dependent forms of ALS

Christine Vande Velde

Université de Montreal
Regulation of the stress granule proteome and transcriptome by tdp-43 in ALS: biomarkers and therapeutic targets

ALS Canada - Brain Canada Discovery Grants**Francois Berthod**

Université Laval
Study of the impact of glycation on ALS using an in vitro tissue-engineered model of spinal cord

Martin L. Duennwald

Western University
RGNEF modulates protein misfolding in ALS

Blair Leavitt

University of British Columbia
Muscle-targeted therapy for ALS

Pier Jr Morin

Université de Moncton
Identification of circulating non-coding RNAs with diagnostic relevance in ALS patients using a unique extracellular vesicle capture method

Amir Sanati Nezhad

University of Calgary
A novel microfluidic platform for investigating axonal sprouting in motor neurons

Peter McPherson

McGill University
Regulation of endosomal membrane trafficking by C9ORF72 in ALS

Fabio Rossi

University of British Columbia
The role of peripheral inflammation in ALS: an exploratory study

Christine Vande Velde

Université de Montreal
Misfolded SOD1 in ALS pathogenesis

ALS Canada-Brain Canada Career Transition Award

Gary Armstrong

Université de Montréal

Mechanisms of glutamatergic neuronal dysfunction in genetic models of ALS

Chantelle Sephton

Université Laval

Mechanisms of synaptic dysfunction in amyotrophic lateral sclerosis

Alzheimer's Society Research Program (ASRP)/Brain Canada New Investigator & Career Change Grants

Timothy Kennedy

McGill/Montreal Neurological Institute (TBC)

Novel cellular and molecular mechanisms regulating synapse dysfunction in Alzheimer's disease

Viviane Labrie

Centre for Addiction and Mental Health
The interplay of DNA regulatory elements and epigenetics in Alzheimer's disease



Viviane Labrie

Joel Watts

University of Toronto
Strains of A-beta aggregates in Alzheimer's disease

Alzheimer's Association 2015 International Grant Program

Regina Jokel

Baycrest Centre for Geriatric Care
Preventing language decline in dementia

Tim Storr

Simon Fraser University
Toxicity pathways and catalytic potential of Cu-Containing AB Oligomers

Babak Taati

Toronto Rehabilitation Institute – UHN
The automated monitoring of gait as a predictor of fall risk

Azrieli Neurodevelopmental Research Program

Alan Evans

McGill University
A national coordinating neuroinformatics framework for autism and related conditions

Jason Lerch

The Hospital for Sick Children
Mouse brain imaging for neurodevelopmental disorders



Jason Lerch

Lonnie Zwaigenbaum

University of Alberta
Novel approaches to early detection and treatment of ASD

CIFAR

Brain, Mind & Consciousness
Melvyn Goodale & Adrian Owen
Western University

Humans & the Microbiome

Brett Finlay
University of British Columbia, and
Janet Rossant
Hospital for Sick Children, University of Toronto

Learning in Machines & Brains

Yoshua Bengio
Université de Montréal

Canadian Cancer Society Impact Grants

Poul Sorensen

University of British Columbia
Deciphering eEF2K biological functions for therapeutic targeting of neural tumours

David Stojdl

Children's Hospital of Eastern Ontario
Oncolytic rhabdovirus immunotherapy for brain cancer

Uri Tabori

Hospital for Sick Children
Targeting the telomere maintenance pathway for cancer diagnostics and therapeutic

Michael Taylor

Hospital for Sick Children
Molecular heterogeneity drives the clinical behaviour of childhood medulloblastoma

Heart and Stroke Foundation Emerging Research Leaders Initiative (ERLI)

Liam Brunham

University of British Columbia
Genomic markers of cerebral small vessel ischemia

Christopher West

University of British Columbia
Habitual physical activity, exercise and cardiovascular function in spinal cord injury

Heart and Stroke Foundation Grant-in-Aid (GIA)

Jean-Claude Beique

University of Ottawa
Synaptic mechanisms in post-stroke depression

Sean Cregan

University of Western Ontario - Robarts Research Institute
ATF4 and P53 family transcription factors in the regulation of neuronal cell death

David Park

University of Ottawa
Mechanisms of delayed death in stroke

George Robertson

Dalhousie University
Mitochondrial calcium uptake and targeted therapeutics

Michael Woods

Memorial University of Newfoundland
Identification of novel genes causing intracranial aneurysms

Jewish General Hospital Foundation/Bell

Danielle Groleau

McGill University
Evaluation Study of the Kids Write Network (KWN)

NeuroDevNet-Brain Canada Training Awards

Emily Bremer

McMaster University
Movement skills, physical health, and behaviour in children with autism spectrum disorder

Lawrence Chen

McGill University
Maternal care and child neurodevelopment: A longitudinal gene x environment analysis of socio-emotional development with an integrated approach

Andrea Constantinof

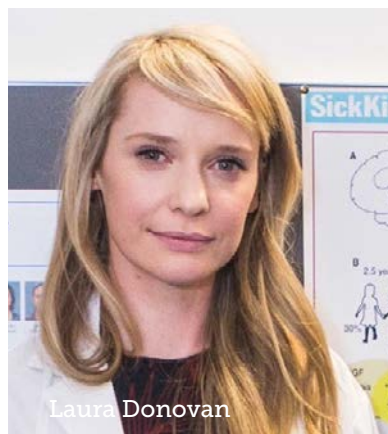
University of Toronto
The effects of glucocorticoids on the developing brain

Trish Domi

The Hospital for Sick Children
Investigating blood brain barrier permeability in an experimental model of juvenile stroke using advanced MR imaging

Laura Donovan

The Hospital for Sick Children
Immunotherapy as a targeted low-impact treatment of paediatric brain cancers



Sarah Hutchison

University of British Columbia
Prenatal serotonin reuptake inhibitor (SRI) antidepressant exposure on brain development, cognition and activity related risk for obesity: A longitudinal study with 10 year olds

Sara Izadi-Najafabadi

Brain Research Centre, University of British Columbia
Does rehabilitation improve brain structure/function and motor outcomes of children with developmental coordination disorder?

Kristin Kernohan

Children's Hospital of Eastern Ontario (CHEO) Research Institute
Application of RNA sequencing to elucidate disease etiology of novel rare neurodevelopmental disorders

Graham Little

University of Alberta
Combined analysis of brain magnetic resonance images towards patient specific diagnosis of Fetal Alcohol Spectrum Disorder

Alexandre Lussier

University Of British Columbia
DNA methylation signatures in a rat model of Fetal Alcohol Spectrum Disorder

Rebecca Merkley

University of Western Ontario
Uncovering early neurocognitive risk factors for mathematical learning disorders

Regula Neuenschwander

Child and Family Research Institute
Developmental origins of stress and self-regulation and implications for interventions to improve childhood behavior

Jelena Popic

McGill University
Impaired translational regulation of brain development in autism spectrum disorders

Kathryn Post

Brain Research Centre, University of British Columbia
A multi-platform approach to the functional assessment of ASD gene variants

Sarah Raza

University of Alberta
The role of attention control and emotional regulation in the emergence of autism spectrum disorder (ASD): Identifying early behavioral markers of ASD in at-risk infants

Kamila Szulc

The Hospital for Sick Children
Recruitment of Endogenous Neural Stem Cells to Promote Brain Repair Following Acquired Brain Injury in Children

Yicheng Xie

Brain Research Centre, University of British Columbia
In vitro and in vivo functional assessment of neuropsychiatric disease-related synaptic gene mutations

RBC - Brain Canada Research Partnership in Mental Health Services

Teresa Bennett

McMaster University
Making the race fair for young children at risk: a targeted prevention approach to reducing child emotional and behaviour problems

International Review Process

Brain Canada funding is allocated, first and foremost, on merit. The organization rewards excellence and innovation and is able to take risks to fund high-potential ideas. Funding recipients are selected through open and partnered competitions and rigorous international peer review. An exception is made

for training awards where knowledge of the Canadian context is essential. Only applications judged to be at or above the high standard of excellence set by the relevant selection committees are funded.

265 SCIENTISTS AND CLINICIANS have reviewed for Brain Canada competitions.

LEADING RESEARCHERS recognized by peers covering a range of fields.

IN-PERSON meetings.

International Review process is designed to:

REDUCE CONFLICTS OF INTEREST
which can result from a Canadian-only panel

ALLOW US TO BENCHMARK
against international standards of excellence and innovation

CREATE A NETWORK OF AMBASSADORS
and new connections for Canada

"I have been reviewing for Brain Canada since it was Neuroscience Canada in 2004. What has impressed me the most is the synergistic interaction of the various research groups that would likely otherwise have not collaborated without the financial support of Brain Canada. In my view, this has moved the science significantly forward. I have also been very impressed with the progress these investigators have made."

– Dr. Scott R. Whittemore
Henry D. and Marianna Garretson Endowed Chair
Professor and Vice Chair for Research,
Department of Neurological Surgery
Scientific Director, Kentucky Spinal Cord Injury Research Center
Director, Interdisciplinary Program in Translational
Neuroscience, University of Louisville School of Medicine

"It was a pleasure to work with Brain Canada to assist in awarding competitive grant funding in the important field of autism and developmental disabilities research. Brain Canada used their impressive review processes to ensure that the generous philanthropic donations they had received would be distributed to excellent scientists undertaking cutting-edge research. Throughout the process Brain Canada ensured decisions were based on the important principles of independent peer review, declarations of conflicts of interest, scientific excellence, and constructive criticism. I am honoured to have been able to serve the Canadian science and autism communities in this way."

– Professor Simon Baron-Cohen, FBA
Director, Autism Research Centre, Psychiatry Department,
Cambridge University

"It continues to be a pleasure to work with Brain Canada. First and foremost, the caliber of the reviews of the Brain Canada applications is simply outstanding. The Brain Canada team assembles a high profile and very talented group of reviewers who provide an exceptional level of scientific review. The administrative staff are professional and efficient and optimally support all aspects of the review process. The participation of Dr. Bisby (Science Programs Advisor, Brain Canada) has been critical to the overall success of the program and adds a level of professionalism and experience few other organizations have. I think that it goes without saying that Inez's leadership is superlative and is largely responsible for the success of the organization."

– Dr. Gary Landreth
The Riuko and Archie G. Co Professor of Neurosciences
Alzheimer Research Laboratory
Department of Neurosciences, School of Medicine, Case Western Reserve University

"Overall, I found the Brain Canada Review Process to be excellent. The Brain Canada staff members were very competent and efficient in supporting an efficient, fair, and thorough review process at each stage. I particularly appreciated the staff's clarity in communication, timeliness, and modeling of respectful communication regarding all applications as well as all reviewers. The experience I had with the Brain Canada Review stages was particularly positive as the staff members helped to create a context that assured integrity and serious scientific critique, while at the same time fostering a pleasant and mutually respectful review environment (both over the phone and in-person)."

– Dr. Ann Garland
Professor and Department Chair
Department of Counseling & Marital and Family Therapy
School of Leadership and Education Sciences, University of San Diego

"I have had the pleasure of chairing the Platform Support Grant panel for Brain Canada. Brain Canada clearly aims to review applications according to the highest international standards and in this the organisation admirably succeeds. Conflicts of interest are avoided by using only international scientists on the panel and as external reviewers. An initial triage ensures that the applications discussed are those with a good chance of success. The review panel therefore has adequate time to discuss the full applications thoroughly and in most cases a clear consensus emerged on those that were worthy of funding. The presence at the panel deliberations of senior members of the foundation ensures excellent communication between the panel members and Brain Canada on the aims of the grant program and allows queries from the reviewers to be cleared up immediately. The results of the review are transparent in that applicants receive the reports of external reviewers together with a short summary report from the Scientific Officer (approved by the Chair) on the main decisions of the panel members. Throughout the whole process I was impressed by the support provided to the committee by the Brain Canada staff; documents relating to the review were always provided in a timely manner. Brain Canada can be proud of the structure and implementation of its peer review process."

– Dr. Martin Reddington
International Research Consultant
Former Director of Scientific Affairs and Communications,
Human Frontier Science Program

Brain Canada reviewers around the world



International review process

STAGE 1

Letter of Intent (LOI)

Announce open call for researchers across Canada targeting research institutes, universities, hospitals and health charities.

Teams submit letters of intent (LOIs) briefly describing the project.

LOIs are evaluated and scored by an International Selection Committee, benchmarked against global standards of excellence and innovation.

LOIs scoring above a threshold and deemed meritorious are recommended to advance to the full application stage.

Feedback provided to all applicants.

STAGE 2

Full Application

Invited teams submit full applications.

Full applications are evaluated and scored for excellence, innovation and impact by the International Selection Committee as well as external reviewers with subject-matter expertise (as required).

Full applications deemed excellent are recommended to Brain Canada and its partners for funding.

All recommended applications are required to provide proof of institutional approval for safety, ethics and animal protocols prior to funding release.

Funding commences.

Grant recipients provide annual progress reports that are evaluated, and funding is released upon confirmation of satisfactory scientific progress and financial information.

Upon completion of the project, grant recipients submit a follow-up report to provide Brain Canada with a progress summary and feedback on the grant process.

Brain Canada in the world

Unraveling the mysteries of the brain is one of the last frontiers in human science. The challenge is complex and requires many disciplines to work together, and the development of new technologies. No single country has all of the resources required, and so brain research has become a global effort where countries are coordinating their major investments in this area, and working towards shared goals, with common purpose. A culture of sharing data and knowledge is emerging, and this is accelerating our ability to achieve breakthroughs.

Canada is a strong player in this global effort. Canada's contributions to brain research began in 1934 when Dr. Wilder Penfield founded the Montreal Neurological Institute and Hospital – which became the birthplace of neuroscience, the largest centre dedicated to the brain in Canada, and among the largest in the world. A seamless integration of research and patient care was and remains the vision, and is a model that has been adopted around the world. Since that time, brain research centres have been established across Canada and Canadian scientists have made some of the most important discoveries in this field.

Brain Canada is proud to add our voice to global forums, where we have the opportunity to connect with other country initiatives, to highlight Canada's contributions to brain research, to showcase the public-private partnership model, to seek opportunities to further leverage funds and ideas, and to ensure that Canadian researchers continue to make important contributions to advancing brain initiatives around the world.



Ms. Inez Jabalpurwala, Brain Canada President and CEO, speaking at the BrainTech2015 conference in Tel Aviv, Israel in March of 2015.



Dr. Catherine Zahn, President and CEO, CAMH and Brain Canada director; and Ms. Inez Jabalpurwala, President and CEO, Brain Canada, speaking on the "Unraveling the Brain" panel at the Corporate State Summit in Toronto on May 11, 2016.

- **BrainTech 2015** - Brain Canada participated at BrainTech 2015, a conference organized by Israel's brain initiative, Israel Brain Technologies, that was held in Tel Aviv on March 11th, 2015. The conference brought together international leaders in the field of brain research and innovation, to participate in the "Global Meeting of the Minds: Brain Initiatives Around the World" panel. Panelists included: Ms. Inez Jabalpurwala, President and CEO of Brain Canada; Representative Chaka Fattah, US Congress-man; Dr. John Jeans, Life Sciences Champion for MedTech; Dr. Henry Markram, the Blue Brain Project and the Human Brain Project; Dr. Rafi Gidron, Founder and Chairman, Israel Brain Technologies; and Dr. Allan Jones, CEO of the Allen Institute for Brain Science.
- **Dutch Consultation** - On March 19-20, 2015, Brain Canada's President and CEO, was asked to give a presentation to representatives of Dutch organizations seeking to develop a public-private partnership with their government, drawing from Brain Canada's partnership with the Government of Canada.
- **9th Annual Canadian Neuroscience Meeting** - Ms. Inez Jabalpurwala, President and CEO of Brain Canada participated on the Developing a Dialog about Brain Health panel at the 9th Annual Canadian Neuroscience Meeting that took place on May 24th, 2015 in Vancouver. Other panelists included Dr. Douglas Munoz, President of the Canadian Association for Neuroscience; Dr. Anthony Phillips, Scientific Director of the Institutes of Neuroscience, Mental Health and Addiction, CIHR; and Ms. Deanna Groetzing, Manager, Public Affairs & Partnerships, Neurological Health Charities Canada.
- **Women's International Forum World Leadership Conference** - Brain Canada's President and CEO Moderated the panel, "Understanding the Brain: Unlocking Human Potential," at the Women's International Forum World Leadership Conference in October of 2015 in Boston. The panel featured: Dr. Mina Teicher, Professor of Mathematics and Neural-Computation, Bar-Ilan University; Dr. Eve Marder, Victor and Gwendolyn Beinfeld Professor of Neuroscience, Department of Biology, Brandeis University; and Dr. Deborah Dunsire, President and CEO, FORUM Pharmaceuticals.

Advancing Canadian brain research

Brain Canada is proud to be a member of the following international initiatives: Global Action Against Dementia, Global CEO, Initiative on Alzheimer's disease Institute of Medicine, Forum on Neuroscience and Nervous System Disorders, The International Alzheimer's Disease Funders Consortium, The Multi-Council Working Group of the BRAIN Initiative.

In addition to international benchmarking, Brain Canada is committed to advancing Canadian brain science. To this end, we consult regularly with Canadian researchers and other stakeholders in the brain community.

Brain Canada's Science Advisory Council (SAC) met in Toronto, Ontario, on September 24th and 25th, 2015, to discuss: key trends and developments in the global landscape, including advances in technology; the commercialization gap and partnering with industry to advance the diagnosis and treatment of brain disorders; and the right balance between open programs and targeted programs (by theme and/or disease).

Additional feedback was provided about Brain Canada's programs, and areas where we may consider increasing investment, to complement other funders and address gaps where there is potential but inadequate funding.

Science members of the Brain Canada Board of Directors hosted four consultation dinners in 2015 with researchers in Vancouver, Calgary, Toronto, and Montreal. The primary goal of the consultation dinners was to gather feedback on the Canada Brain Research Fund programs and to help ensure that Brain Canada remains responsive to the needs and goals of the Canadian brain research community. Additional broad view questions included:

- Where are we now in brain research in Canada, relative to the broad international context?
- What are the gaps in funding for brain research in a Canadian context?
- How could we fill these gaps in Canada to ensure that Canadian scientists can make major contributions on the international stage?

The dinners were intimate in order to allow more meaningful feedback, and guests included researchers who have been or are being funded by Brain Canada, as well as those who have not received funding, in order to have more balanced views.

The outcome of these consultations have already, and will continue to, guide the development of our future programs.



A few of Canada's leading researchers and clinicians who were part of Brain Canada's Annual General Meeting in June 2016 in Montreal. From left to right: Dr. Tarek Rajji, Centre for Addiction and Mental Health (CAMH); Dr. Arkady Khoutorsky, McGill University; Dr. Benoit Mulsant, (CAMH); Dr. Christine Vande Veld, Université de Montreal; Dr. Gregory Lodygensky, Sainte-Justine University Hospital Research Centre.

Donors and Partners

With the launch of the Canada Brain Research Fund (CBRF) public-private partnership in 2011, Brain Canada embarked on a \$100-million, national fundraising campaign. All funds raised from private and non-governmental sources are being matched by Government on a 1:1 basis.

Brain Canada encourages all organizations raising funds for brain research to either contribute directly to the CBRF and have their donor dollars matched, or to partner on research programs to further leverage the public-private match. Brain Canada has always taken pride in keeping non-research related expenses to the minimum required for operational efficiency and good governance.

Donors

We would like to gratefully acknowledge the following individuals, foundations and corporations who made leadership contributions to the Canada Brain Research Fund.

| LEAD DONORS | CORPORATIONS |
|---|--|
| Individuals and Private Foundations The Azrieli Foundation - \$ 7.5 million The Chagnon Family - \$ 5 million The Krembil Foundation - \$3.25 million The W. Garfield Weston Foundation - \$ 3 million | \$620,500 RBC Foundation |
| \$100,000 - \$249,999 The Max Bell Foundation The Jim Pattison Foundation Michael H. Wilson | \$500,000 Bell Canada CIBC |
| \$20,000 – \$99,999 The Ira Gluskin & Maxine Granovsky Gluskin Charitable Foundation The Henry and Berenice Kaufmann Foundation Marianne Seger The Barbara Turnbull Foundation | \$200,000 National Bank of Canada |
| | \$100,000 Power Corporation |
| | In the past year, gifts were made to honour the following individuals: François Drouin Rachel Goulet Legaré Helen Lord Hans Meinzer Josie Reid Richard Roy Nancy Thompson Raymond George Vien |

We would also like to thank the other many donors who contributed, such as through CanadaHelps.org.

Partners

Partnerships are a central component of the Canada Brain Research Fund (CBRF) and Brain Canada is committed to working with funding partners with interests across the entire range of neurological diseases and injuries, mental illnesses and addictions. In 2015, Brain Canada continued efforts to partner with a range of institutions, agencies, and organizations, with a view of ensuring that the Canada Brain Research Fund broadly serves the brain research community.

We are proud to count 77 research institutions, provincial agencies and health charities as strategic, intellectual and financial partners—resulting in a more coordinated, collaborative brain community. Together we will have an impact on the lives of all Canadians by enabling our researchers and clinicians to make paradigm shifts that will benefit millions of people around the world.

HEALTH CHARITIES

Alberta Paraplegic Foundation
 ALS Society of Canada
 Alzheimer Society - Alberta and Northwest Territories
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 Alzheimer's Association US
 Canadian Cancer Society
 Heart and Stroke Foundation of Canada
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 Jewish General Hospital Foundation
 The Marigold Foundation

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 Canadian Stroke Network

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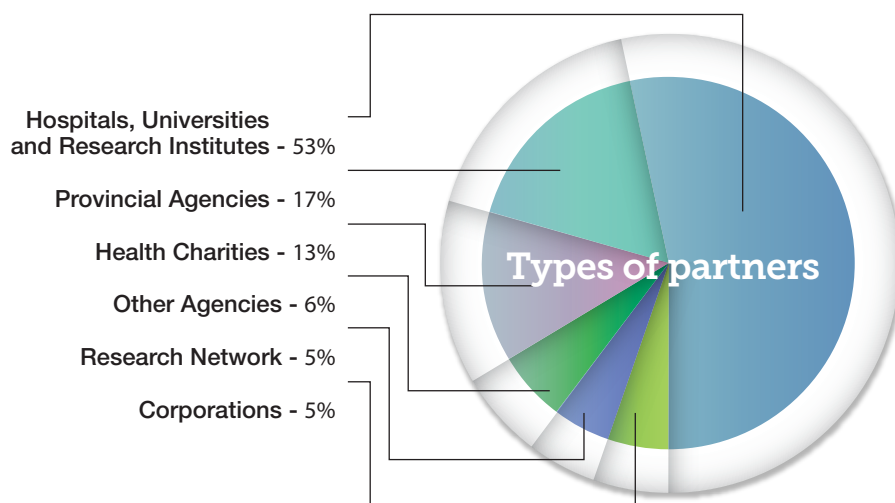
Age Well
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Alberta Children's Hospital Research Institute (ACHRI)
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 Centre for Heart Lung Innovation, UBC and St. Paul's Hospital
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 Children and Family Research Institute
 Children and Women's Hospital
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 Le Réseau québécois sur le suicide, les troubles de l'humeur et les troubles associés (RQSHA)
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H. Y. Louie Limited;
Chairman, President and CEO
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(Vancouver)

Allan R. Taylor, O.C. (until June 2015)

Retired Chairman and CEO
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President and Vice-Chancellor
University of Guelph
(Guelph)

Samuel Weiss, Ph.D.

Chair, Research Policy Committee
Professor and Director
Hotchkiss Brain Institute
University of Calgary
(Calgary)

Catherine Zahn, C.M., M.D., F.R.C.P.(C), M.HSc

President and CEO
Centre for Addiction and Mental Health
(Toronto)

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Senior Scientist, Neurosciences & Mental Health Program, Hospital for Sick Children Research Institute; Canada Research Chair in Molecular and Cellular Cognition. Associate Professor, Department of Physiology Institute of Medical Science University of Toronto (ON)

[Area of expertise: Cognition and Behaviour](#)

CANADIAN MEMBERS

Yves De Koninck, Ph.D.

Professor of Psychiatry & Neuroscience, Laval University

Adjunct Professor of Pharmacology & Therapeutics, McGill University
Director, Division of Cellular & Molecular Neuroscience, Institut universitaire en santé mentale de Québec (QC) Scientific Director, Quebec Pain Research Network
[Area of expertise: Neural Excitability, Synapses, and Glia: Cellular Mechanisms](#)

Jacques Drouin, D. Sc., MRSC

Director, Molecular Genetics research unit, IRCM Full Researcher Professor, Department of Biochemistry, Université de Montréal Adjunct Professor, Department of Anatomy and Cell Biology and Department of Biochemistry, McGill University (QC)
[Area of expertise: Integrative Systems: Neuroendocrinology, Neuroimmunology and Homeostatic Challenge](#)

Alan C. Evans, Ph.D.

Professor, departments of Neurology and Neurosurgery, Biomedical Engineering, Medical Physics, McGill University (QC)
[Area of expertise: Disorders of the Nervous System](#)

Lesley K. Fellows, M.D., D.

Phil Associate Professor, Department of Neurology & Neurosurgery Montreal Neurological Institute (QC)
[Area of expertise: Neurology](#)

Kurt Haas, Ph.D.

Associate Professor, Department of Cellular and Physiological Sciences University of British Columbia (BC)
[Area of expertise: Model organisms and systems International Members](#)

James L. Kennedy, MSc, M.D., FRCP(C),

FRSC Director of the Neuroscience Research Department and Head of the Psychiatric Neurogenetics Section, Centre for Addiction and Mental Health (CAMH) (ON)

[Area of expertise: Genetics](#)

Bryan E. Kolb, Ph.D.

Professor, Department of Neuroscience, University of Lethbridge (AL)
[Area of expertise: Cognition and behaviour](#)

Stan Kutcher, M.D., FRCPC, FCAHS

Sun Life Financial Chair in Adolescent Mental Health Professor, Department of Psychiatry, Dalhousie University (NS)
[Area of expertise: Cognition and behaviour](#)

Brian MacVicar, Ph.D.

Professor, Dept. of Psychiatry, University of British Columbia (BC)
[Area of expertise: Neural Excitability, Synapses and Glia, Cellular Mechanisms](#)

Doug P. Munoz, Ph.D.

Professor of Physiology, Psychology and Medicine Queen's University (ON) Director, Queen's Centre for Neuroscience Studies Canada Research Chair in Neuroscience
[Area of expertise: Sensory and Motor Systems](#)

Rachel F. Tyndale, Ph.D.

Professor, Department of Pharmacology & Toxicology University of Toronto Endowed Chair in Addictions, Department of Psychiatry University of Toronto Head Pharmacogenetics, Centre for Addiction and Mental Health (CAMH) (ON)
[Area of expertise: Addiction](#)

INTERNATIONAL MEMBERS

Karl Deisseroth, M.D., Ph.D. D.H.

Chen Professor of Bioengineering and of Psychiatry and Behavioral Sciences, Stanford University, Howard Hughes Medical Institute (CA, USA)
[Area of expertise: Psychiatry/Behavior/Leader in optogenetics](#)

Arnold Kriegstein, M.D., Ph.D.

Director, Eli and Edy, the Broad Center of Regeneration Medicine and Stem Cell Research, Department of Neurology, UCSF School of Medicine (CA, USA)
[Area of expertise: Development/photonic, Neural Stem Cells and Embryonic Cortical Development](#)

Lorne Mendell, Ph.D.

Distinguished Professor, Stony Brook University (NY, USA)
[Area of expertise: Pain, neuroplasticity of the mammalian spinal cord](#)

Klaus-Armin Nave, Ph.D.

Head Max-Planck Gottingen, Glial biology and neurodegeneration, Max Planck Institute for Experimental Medicine, Göttingen (GER)
[Area of expertise: Glial biology and neurodegeneration](#)

Bill Newsome, Ph.D.

Arman Family Provostial Professor and Professor of Neurobiology and, by courtesy, of Psychology, Stanford School of Medicine (CA, USA)
[Area of expertise: Visual perception and visually-based cognition, neural mechanisms of decision making](#)

Angela Roberts, Ph.D.

Professor of Behavioural Neuroscience, Department of Physiology, Development and Neuroscience, Cambridge (UK)
[Area of expertise: Prefrontal cortex/behavior/psychiatric diseases](#)

Bruce Rosen, M.D., Ph.D.

Professor of Radiology at the Harvard Medical School Professor of Health Science and Technology at the Harvard-MIT Division of Health Sciences and Technology, Director of the Athinoula A. Martinos Center for Biomedical Imaging at Massachusetts General Hospital (MA, USA)
[Area of expertise: World leading expert in functional neuroimaging](#)

Rosalind Segal, M.D., Ph.D.

Professor of Neurobiology, Dana Farber Cancer Institute, Harvard (MA, USA)
[Area of expertise: Cellular and molecular neuroscience/oncology](#)

D James Surmeier, Ph.D.

Chair, Department of Physiology, Nathan Smith Davis Professor of Physiology, Northwestern (IL, USA)
[Area of expertise: Basal ganglia/cell metabolism and neurodegenerative disease; Molecular Biology; Movement Disorders; Neuroscience; Parkinson's disease; Physiology; Schizophrenia](#)

Li-Huei Tsai, Ph.D.

Director, The Picower Institute for Learning and Memory, Picower Professor of Neuroscience, Department of Brain and Cognitive Sciences, Senior Associate Member, Broad Institute, Massachusetts Institute of Technology, Department of Brain and Cognitive Sciences, Picower Institute for Learning and Memory (MA, USA)
[Area of expertise: Neurodegeneration](#)

2015 Financial Report

Brain Canada Foundation

December 31, 2015, with comparative information for 2014

| | 2015 \$ | 2014 \$ |
|---|-------------------|-------------------|
| ASSETS | | |
| Current Assets | | |
| Cash and cash equivalents | 18 796 901 | 6 116 134 |
| Short term investments | 6 726 828 | 29 371 628 |
| Accrued interest receivable | 70 849 | 237 393 |
| Advance payments on grants and awards | 334 673 | 369 807 |
| Grants and awards reimbursement receivable | 274 850 | - |
| Other receivables | 80 872 | 47 769 |
| Prepays and deposits | 13 545 | 7 735 |
| Contributions receivable | - | 20 000 |
| | 26 298 518 | 36 170 466 |
| Capital assets | 129 332 | 101 183 |
| | 26 427 850 | 36 271 649 |

LIABILITIES AND NET ASSETS

Current liabilities

| | | |
|--|-------------------|-------------------|
| Accounts payable and accrued liabilities | 58 791 | 84 726 |
| Salaries and benefits payable | 178 527 | 102 550 |
| Current portion of deferred contributions | 12 618 404 | 26 699 113 |
| | 12 855 722 | 26 886 389 |
| Deferred contributions | 13 465 362 | 9 278 494 |
| | 26 321 084 | 36 164 883 |

NET ASSETS

| | | |
|--------------------------------------|-------------------|-------------------|
| Unrestricted net (deficiency) assets | (22 566) | 5 583 |
| Invested in capital assets | 129 332 | 101 183 |
| | 106 766 | 106 766 |
| | 26 427 850 | 36 271 649 |

Year ended December 31, 2015, with comparative information for 2014

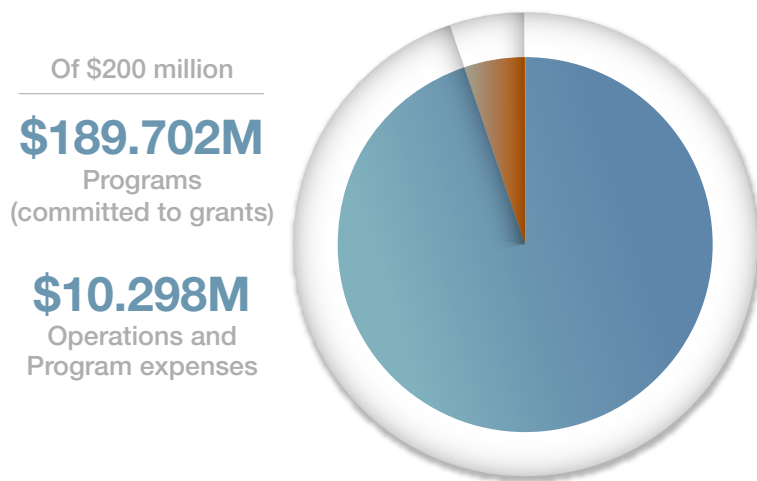
| | 2015 \$ | 2014 \$ |
|--|-------------------|-------------------|
| REVENUES | | |
| Restricted contributions | 33 599 542 | 10 180 524 |
| Unrestricted contributions | 83 560 | 92 072 |
| | 33 683 102 | 10 272 596 |
| Interest and investment income | 19 630 | 18 439 |
| | 33 702 732 | 10 291 035 |
| EXPENDITURES | | |
| Grants and awards | 31 228 434 | 8 498 432 |
| Operating expenses | 2 156 660 | 1 779 298 |
| Administrative expenses charged by other organizations | 283 107 | - |
| Amortization of capital assets | 34 531 | 13 608 |
| | 33 702 732 | 10 291 338 |
| Excess of over revenues expenditures (expenditures over revenues) | - | (303) |

The financial statements of Brain Canada Foundation are audited by KPMG LLP and are available upon request.

Directing the maximum funding to research

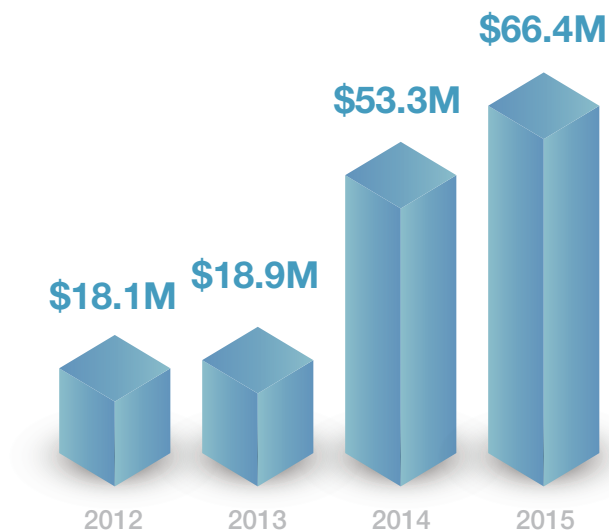
Of the total fund, just over 5% has been reserved for operating and program-related expenses.

Allocation of funding



Commitment to research has increased dramatically since the launch of the Canada Brain Research Fund.

Progression in funding committed annually



Milestones

- 1998**
 - NeuroScience Network transformed to NeuroScience Canada Partnership and Foundation.
 - Vision: to create a philanthropic organization to advance Canadian brain research.
- 2001 to 2010**
 - Developed—through consultation with research community— and launched Brain Repair Program to support brain research on cross-cutting themes.
 - Five projects funded at \$1.5 million each over three years; every project achieved a paradigm-changing breakthrough.
 - Established track record of funding excellent and innovative research with international peer review and rigorous annual progress reporting.
- 2006**
 - Published *The Case for Canada's Increased Investment in Brain Research*, which provided a calculation of the economic burden of brain disorders as one grouping.
- 2008**
 - Rallied health charities, which became Neurological Health Charities Canada, to speak with one voice to government for a brain strategy.
- 2010**
 - Approached the Government of Canada to form a partnership to support brain research.
- 2011**
 - Changed name to “Brain Canada Foundation” to better reflect the focus on brain and not only neuroscience.
 - Budget 2011 included establishing the Canada Brain Research Fund (CBRF), a public-private partnership with Brain Canada to match \$100 million over six years.
- 2015**
 - Reached \$100-million goal for a total investment of \$200 million, 18 months ahead of schedule.
 - Launched slogan One Brain. One Community.
- 2016**
 - Budget 2016 included an additional \$20 million in matching funds to the CBRF, bringing the total of the Fund to a potential \$240 million.

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; and
- 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.



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Brain Canada
Foundation

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



The front cover features Dr. Yves De Koninck from Université Laval, and principal investigator of a 2014 Brain Canada Platform Support grant titled "The Canadian Neurophotonics Platform". Neurophotonics is an emerging field of research that uses photons (units of lights) to non-invasively image, measure and control the nervous system. Applications of neurophotonics are far-reaching, from a better understanding of neurons and the brain as a whole, to the development of new therapeutics for neurological and mental health disorders. The goal of this project is to create, validate and disseminate cutting-edge neurophotonics tools across the neuroscience community and to facilitate the sharing of information to exploit innovative avenues of neurophotonics in neuroscience. Here Dr. De Koninck is standing behind the prototype of a system where laser beams are being manipulated by a series of special lenses and mirrors. Modifying laser beams is one of the critical areas of development in neurophotonics, opening a wide array of possibilities: from pushing further the resolution of microscopes to detect the smallest components of nerve cells in the live brain, to directly measure chemical contents in tissue; to capturing the entire wiring organization of the brain with great detail in record time.