

# 2017 HIGHLIGHTS



# ROTMAN RESEARCH INSTITUTE



## A GREAT BIG THANK YOU TO ALL OUR RESEARCH DONORS

Baycrest has been led and supported by visionary thinkers who, at critical junctures, have had the courage to make bold decisions to move the organization forward. They have helped develop a unique spectrum of seniors' care, create a specialized geriatric care hospital, and build a world-class cognitive neuroscience institute on the site of a nursing home.

Donations to Baycrest's Rotman Research Institute (RRI) have helped our world-renowned scientists discover and explore new potential predictors and targeted interventions for neurodegenerative diseases, purchase new equipment and train the next generation of research professionals.

Thank you!

We are grateful to **all** our donors, for **every** donation of **any** amount. This report recognizes donors who have made a cumulative contribution of \$1,000 or more between January 2014 and February 2017\*.

Please enjoy this report. It shows you all the ways our scientists are striving to better understand the human brain - to keep older adults healthy longer, diagnose illnesses earlier, and stop or slow declining brain function.

None of our work would be possible without your support.

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## ROTMAN RESEARCH INSTITUTE SCIENTISTS STUDY:

- Brain rehabilitation
- Brain health and wellness
- Dementia care

## BAYCREST'S ROTMAN RESEARCH INSTITUTE

A single gift in 1988 from Joseph<sup>21</sup> and Sandra Rotman helped launch a revolution in brain science at Baycrest. Fast forward almost 30 years, and our thousands of donors have helped transform the Rotman Research Institute into a world-leading centre for cognitive neuroscience.

Thank you!

This work has never been more important.

Our rising life expectancy is a very welcome trend, but with it comes increases in Alzheimer's disease and other age-related forms of dementia - among the most devastating and difficult-to-manage conditions for families. Governments and healthcare institutions are struggling to meet the demands for services to care for and support this demographic.

- **An estimated 564,000 Canadians have Alzheimer's or another form of dementia.**
- By 2031, this figure is expected to rise to 937,000, an increase of 66%.
- The combined health-care system and out-of-pocket costs of dementia is estimated at \$10.4 billion.
- By 2031, this figure is expected to increase by 60% to \$16.6 billion.



# ROTMAN RESEARCH INSTITUTE: HISTORY AT A GLANCE



**1989** Baycrest establishes the Rotman Research Institute.

**1999** A Rotman study shows for the first time that younger and older adults use different parts of the brain to complete the same task.

**2000** The Baycrest-Kaplan Assessment of Neuropsychological Status (B-KANS), a comprehensive screening test for cognitive impairment associated with dementia, is developed and adopted around the world.

**2001**

Rotman scientists discover link between high-fat diets and poorer brain health.

**2004** Researchers discover that different depression treatments show different changes in the brain.

**2005**



Dr. Endul Tulving receives a 2005 Gairdner International Award, one of the world's highest scientific honours, in recognition of his landmark research to distinguish different types of human memory.

The Rotman leads the first study to surgically implant electrodes into the brains of severely depressed patients who had not responded to other treatments. Results show a "striking and sustained remission of depression."

Baycrest scientists discover that damage to a person's cognition lingers after drinking alcohol, even after they sober up and recover their motor performance.

Baycrest launches landmark study exploring the effectiveness of a health information technology system, a computerized physician order entry system (CPOE), in reducing adverse drug events in long-term care.

**2006**

Baycrest leads an international project to develop the world's first functional, "Virtual Brain" that will allow physicians to test potential treatments in a virtual simulation. The Virtual Brain is an integrated computer model of a fully functioning human brain. It simulates how the brain is functioning under various normal conditions, how it changes with the aging process and how it responds to damage from trauma or disease. In the future, the Virtual Brain model can be used to test experimental brain therapies on a computer before being tested on humans.

Researchers demonstrate that chemobrain (cognitive impairment that occurs after cancer treatment) is caused by drugs used during chemotherapy.

**2007**

Groundbreaking Rotman study shows bilingualism has a protective effect in delaying the onset of dementia.

**2008**

Baycrest scientists present new notion that lots of brain activity is a sign of a healthy brain.

Researchers demonstrate that people with more severe traumatic brain injuries lose more brain tissue, which explains why some patients never fully recover.

A Baycrest study finds that older adults with type 2 diabetes can take antioxidant vitamins to minimize memory slumps after unhealthy, high-fat meals.

Researchers discover that older dementia patients using antipsychotic medication face a higher risk of hospitalization or death.

## 2010

Scientists find more evidence in support of bilingualism delaying symptoms of Alzheimer's disease.

Baycrest launches unique Air Transat flight study exploring PTSD and the passengers' memories.

Researchers find that older adults with depression don't respond normally to emotional stimuli, which explains why late-life depression is more difficult to treat.

Rotman study finds promising evidence that the older brain's weakened ability to filter out irrelevant information may actually give aging adults a memory advantage over their younger counterparts.



## 2011

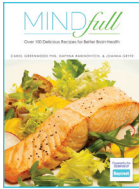
Researchers discover that lifelong musicians experience less age-related hearing problems than non-musicians.

Rotman embarks on the first study tracking the brain health of retired professional ice hockey players.



## 2012

Baycrest releases the world's first science-based cookbook, *Mindfull*, to maintain brain health during aging.



## 2014

Scientists unveil free online brain health test for adults worried about memory changes.

For the first time, researchers identify anxiety as a risk marker for Alzheimer's disease in adults with mild cognitive impairment.

Baycrest-led study finds that older adults who volunteer are happier and healthier.

## 2015

The groundbreaking Canadian Centre for Aging and Brain Health, a national hub dedicated to the commercialization of brain health and seniors care products and services, is established with a historic \$123.5 million investment, the largest ever commitment in brain health and aging from the assistance from the federal and provincial governments, the Baycrest Foundation and 40 organizational partners.

## 2016

Researchers identify missing link between memory and eye movements that could lead to eye-tracking tests to detect dementia.

Rotman researchers identify part of the brain that compensates for hearing loss in older adults.

Rotman Research Institute Associate Scientist, Dr. Ellen Bialystok, is named to the Order of Canada (O.C.) for her groundbreaking work on bilingualism and memory.

## 2017

Rotman Research Institute Founding Director, Dr. Donald Stuss, is named an Officer of the Order of Canada (O.C.).

Researchers identify connection between what we see and how we remember.

## THE PROBLEM

By the time memory issues related to brain disorders are discovered in older adults, there are limited treatments available.



## THE FIX: EARLY DIAGNOSIS

Actress, filmmaker, and human rights activist Angelina Jolie made headlines in 2013 by announcing that she had undergone a preventative double mastectomy. The reason: A family history of breast cancer (her mother had died of it) and what she called a “faulty gene,” referring to the BRCA gene (BRCA 1).

For years, scientists and the worldwide pharmaceutical industry have been searching for similar, genetic early warning signs of dementia. But it is proving elusive.

## PHARMA LATER. OTHER METHODS NOW.

While pharmacological interventions exist for a myriad of other health concerns, we still have a long way to go before a cure for Alzheimer disease and other dementias is discovered. But our scientists are on the case.

In fact, researchers at the Rotman Research Institute were instrumental in creating and scientifically validating one of the current, most accurate technologies for assessing the onset of dementia. The Cogniciti™ Online Brain Health Assessment went live in 2014 and was created to answer the question: “Is my memory normal or should I see my doctor?”

The Cogniciti test and website has had more than 200,000 adults visit the page with more than 50,000 visitors completing the brain health assessment. Many of those who complete the assessment also choose to add their names to Cogniciti’s important Research Registry, which allows test data to be used in both ongoing and future research in the quest to discover a cure for Alzheimer’s disease and other forms of dementia. Cogniciti is a critical step on the path toward the cure - and Rotman scientists are playing a key role.

**“There are no medications that can reverse the atrophy that goes along with dementia. The reality is, over 99% of drugs that have entered the really pivotal, clinical trials - what are called the ‘phase three’ clinical trials - have failed. There is still much to be learned about why this disease occurs in the first place and what the right brain targets are for treatment.”**

**– Dr. William Reichman,  
President & CEO,  
Baycrest Health  
Sciences**

## THE BRAIN: DRAW THE MAP, FIND THE CURE

Today scientists can point to regions involved in language, vision, hearing, memory, planning and emotions. Every time we learn something new, play a fast game of hockey or utter a sentence, scientists have a front row seat to the electromagnetic maelstrom taking place between our ears.

If we hope to preserve or repair functions such as memory, attention, language acquisition and use, learning, problem-solving and decision-making, scientists must first figure out how all the pieces work together.

Our Rotman scientists are pursuing bold new approaches to early diagnosis and treatment with promising results.

We are pleased to introduce you to some of the Rotman scientists who are dedicated to improving brain health and discovering interventions that can one day prevent or further delay the onset of dementia.

## USING fMRI IN NEW WAYS

Dr. Jean Chen's work is focused on fluctuations in blood flow and oxygen in the brain. Why?

Scientists have shown that blood flow to our brain declines with age, and that vascular disease is present in over 90 per cent of patients with dementia on autopsy. Nearly six years ago, Dr. Chen was the first scientist to use magnetic resonance imaging (MRI) to investigate the link between blood flow decline and brain shrinkage during aging. She wants to know why blood flow to the brain decreases over time.

- Does the aging brain slow down and need less blood? Or,
- Do the blood and oxygen needs of an aging brain stay unchanged while the blood vessels have a harder time delivering?

To answer these questions, Dr. Chen has pioneered the use of resting-state functional magnetic resonance imaging (fMRI) to examine vascular changes in the brain that could underlie various forms of dementia. This includes studying the elasticity of blood vessels in the brain. It is such a unique approach that it has resulted in a patent application and attracted interest from leading clinical researchers around the world.

The answers she finds will lead to a way of measuring how various treatments and therapies could impact the brain. Once our scientists can do that, we can focus on the treatments and therapies that benefit patients the most.



DR. JEAN CHEN

Filed a patent application for her fMRI technique to investigate the link between the loss of vascular elasticity (a measurement linked to vascular health) in the brain and dementia.

## EARLY WARNING

Typical studies on aging compare brain changes between younger and older adults. Dr. Cheryl Grady is one of the few researchers studying the entire adult lifespan in order to understand the natural changes in brain function that occur during middle-age and if these changes become more noticeable during older age.

Her work could one day allow doctors to use brain scans to differentiate between healthy and unhealthy brains during aging and establish early warning signs for when a person's brain health is headed down an unhealthy path.

## RELIABLE PREDICTION

Dr. Rosanna Olsen is conducting the first ever study examining the brain region that is first affected by Alzheimer's disease – the entorhinal cortex – in older adults who live in their homes and have no noticeable memory problems.

Through her work, she hopes to discover a reliable predictor for the disease.



DR. CHERYL GRADY

Awarded the Justine and Yves Sergent Award for Women in Neuroscience which recognizes the contribution of a female researcher in cognitive neuroscience who has achieved an international reputation.

One of the first scientists to explore the differences in brain activity among younger and older adults when performing the same task.

DR. ROSANNA OLSEN

“Once a definitive biomarker is discovered for early dementia, researchers can use it to better assess the impact of potential treatments and develop personalized drug therapies targeting those specific brain regions.”





## PRESERVING INDEPENDENCE

If you or your loved one is worrying about possible cognitive changes related to age, you are not alone. Between 25 to 50 per cent of older adults living in the community report minor cognitive issues and everyday life difficulties, such as struggling to keep up with technological changes and maintaining an active social life. These individuals face a higher risk of developing dementia.

Dr. Deirdre Dawson is using Real World Strategy Training (RWST) to help older adults preserve their independence for longer.

“We believe RWST can support people before their ability to perform everyday tasks significantly declines,” says Dr. Dawson. “RWST helps people learn an overall strategy to manage specific tasks in their everyday life. This strategy can then be expanded to new difficulties when they arise.”

This intervention has shown promising results and could potentially be scalable. In a recent pilot study using RWST on adults aged 65+ who self-identified with cognitive decline, Dr. Dawson found that 61.5% of participants’ goals were achieved through use of the intervention.

Thanks to support from a Canadian Institutes of Health Research Project Grant, Dr. Dawson has launched a clinical trial in collaboration with Baycrest’s Wagman Centre staff and community members to evaluate RWST among older adults with self-identified minor cognitive issues.



DR. DEIRDRE  
DAWSON

Awarded the Mitchell Rosenthal Mid-Career Award by the American Congress of Rehabilitation Medicine for significant contributions to brain injury rehabilitation research.



## DIFFERENCES IN MEMORY ABILITIES AND DEMENTIA

How good (or bad) is your memory? While most people know where they stand compared to friends and family, no one has examined how these differences in memory ability might relate to memory changes during aging and neurodegenerative diseases.

“Having a good memory may protect one from changes due to neurodegenerative disease, but it is also possible that those with worse memory have already developed skills to compensate for pathological changes,” says Dr. Brian Levine. “If this is the case, these individuals may be more resilient to memory changes caused by dementia.”

The knowledge gained from how people with different memory abilities cope with brain changes can be used to design interventions to improve memory. Dr. Levine was recently awarded a Canadian Institutes of Health Research Project Grant to answer that question.



DR. BRIAN LEVINE

Discovered a new memory syndrome, Severely Deficient Autobiographical Memory, when people are “living life in the third person”.

Launched a landmark study tracking the brain health of retired NHL players and university hockey alumni over several years.

Awarded the Benton Mid-Career Award for Research by the International Neuropsychological Society.



## THE POWER OF MUSIC

Many people over the age of 65 have trouble understanding what others are saying, particularly in noisy venues and especially when everyone is talking at once. The brain's ability to comprehend speech in noisy environments weakens during aging and reduces the quality of life for older adults. Fortunately, there is hope to offset this decline in current and future generations.

Dr. Claude Alain and his team are studying whether short-term musical interventions could help older adults maintain their ability to distinguish speech from background noise. The work is based on his team's recent findings that musical training during childhood preserved this brain function in older adults.

Older adults who had formal musical training before the age of 14 and played a musical instrument during their adulthood performed much better than non-musicians on tests to identify speech sounds. Those with musical backgrounds bought themselves 20 years of good hearing skills by enhancing areas of the brain that support speech recognition. These benefits provided a cognitive boost during old age, when the brain needs it the most.

“There's been a dramatic shift in the way we think about hearing problems in older adults and researching cognitive hearing changes how we treat these issues.”

- Dr. Claude Alain

So the next time an older adult expresses concerns about hearing problems, she/he could be asked to participate in a musical training program to rehabilitate these issues and help maintain their ability to socialize.



DR. CLAUDE ALAIN

Launching the first study combining music therapy with brain stimulation to improve memory among patients with Mild Cognitive Impairment.



# ROTMAN RESEARCH INSTITUTE BY THE NUMBERS



**23**

full-time  
scientists

**1**

Canada  
Research  
Chair

**89**

trainees

**443**

ongoing  
research  
studies



**\$6.4M**

research  
funding  
awarded

**143**

grants  
received



**6,900**

research  
participant  
volunteer  
hours



Among the top **10**  
research hospitals  
in Canada for  
Researcher Intensity  
(\$/Researcher)



If we could find a way to delay the onset of dementia by just five years, it would reduce the total number of future cases by 33%<sup>1</sup>

<sup>1</sup>From Alzheimers Research UK's 2014 Report *Defeat Dementia: The evidence and vision for action.*

We greatly appreciate your generosity in supporting the work of our scientists in their quest to better understand and treat the human brain during aging.

**Thank you for your kind gift and support over these last few years.**

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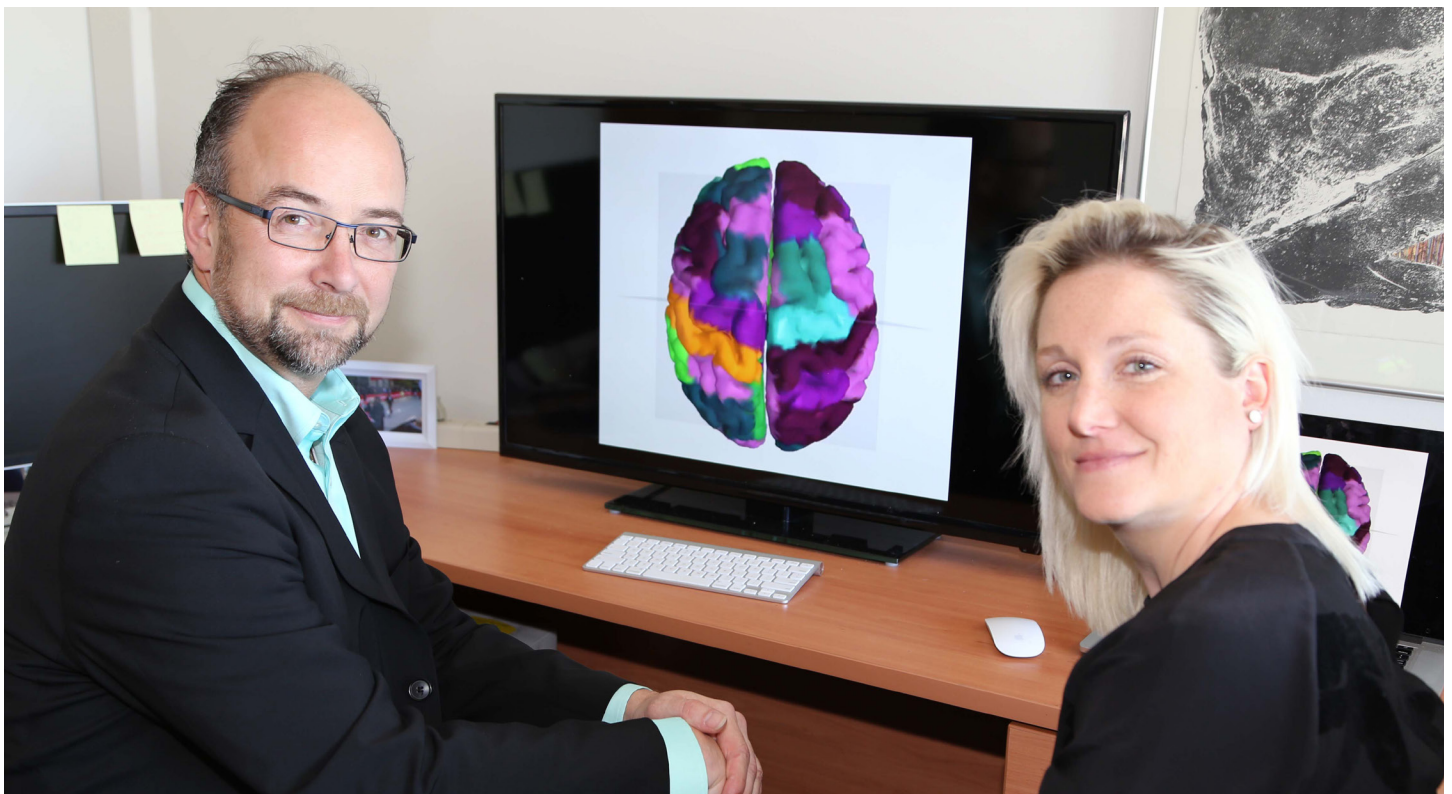
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