Western

The Brain and Mind Institute

Western Interdisciplinary Research Building ~ Future Home for the Brain and Mind Institute

2015 Annual Report

Published October 2016

Western The Brain and Mind Institute

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DR. MELVYN GOODALE

- PhD, FRSC, FRS
- Distinguished University Professor
- Canada Research Chair in Visual Neuroscience
- Director , The Brain and Mind Institute
- Member, CFREF Executive Committee
- Program Co-Director and Ivey Fellow, CIFAR: Azrieli Program in Brain, Mind & Consciousness
- Fellow of the Royal Society of Canada
- Fellow of the Royal Society of London
- Hellmuth Prize for Scientific Achievement

Welcome from the Director

CONNECTING RESEARCHERS TO PROVIDE A CENTRALIZED AND VISIBLE PRESENCE FOR COGNITIVE NEUROSCIENCE AT WESTERN UNIVERSITY

The study of the human brain is one of the most rapidly growing scientific enterprises of the 21st Century. The explosion in research linking neurobiology of the brain to complex human activities is not simply confined to the laboratory and to clinical applications, but has begun to inform fundamental questions about the nature of human consciousness and what it means to be human. Research on the relationship between the human brain and mind even influences our understanding of world economies and the behaviour of the marketplace – and promises to give us new insights into why some children, and not others, fail to flourish in the classroom. Not a day goes by without some sort of brain-related story appearing in major newspapers or other media outlets. Western has been a major contributor to these news headlines. In fact, over the past decade, Western has emerged as a leader in research on the relationship between brain and mind – a field known as ***Cognitive Neuroscience***. All of this led to the creation of the Brain and Mind Institute (BMI).

THE BMI BRINGS RESEARCHERS TOGETHER

The Brain and Mind Institute (BMI) brings together 34 researchers from 8 faculties across the University, as well as the Robarts Research Institute, the Rotman Institute of Philosophy and hospitals across the city of London. The BMI has a highly visible presence internationally, and has been extremely competitive with respect to attracting research funds from both federal and provincial governments, and from international funding agencies.

Western's support for BMI research through its Cluster of Research Excellence in Cognitive Neuroscience program has resulted in 3 Western Research Chairs, the recruitment of world-renowned researchers. This investment led to recently securing the Canada First Research Excellence Fund for $66 million, enabling the institute to potentiate opportunities for knowledge translation, technological transfer, and commercialization as a leading Canadian hub for research in cognitive neuroscience.

Melvyn A. Goodale, PhD, FRSC, FRS

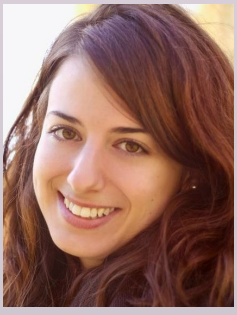
Western The Brain and Mind Institute

BMI STEERING COMMITTEE

2015- 2016 MEMBERS

The Brain and Mind Institute is governed by a Steering Committee that meets on a monthly basis to discuss the development of policies and procedures for the institute, space allocation and the optimization of research resources, the selection of student and postdoctoral awardees, application reviews for BMI membership, and the preparation of the annual report. This committee consists of the BMI Director, six Core Members, and a representative from each of the following constituencies: Associate Members, graduate students, postdoctoral fellows, and administrative/ technical staff.

MEL GOODALE DIRECTOR & CHAIR	DANIEL ANSARI CORE MEMBER	BRIAN CORNEIL CORE MEMBER	JODY CULHAM CORE MEMBER	JESSICA GRAHN CORE MEMBER	STEFAN KÖHLER CORE MEMBER
					
EMAIL:	EMAIL:	EMAIL:	EMAIL:	EMAIL:	EMAIL:
mgoodale@uwo.ca	dansari4@uwo.ca	bcorneil@uwo.ca	jculham@uwo.ca	jgrahn@uwo.ca	stefank@uwo.ca

ADRIAN OWEN CORE MEMBER	CHARLES WEIJER ASSOCIATE MEMBER	PATRICK CALLAGHAN FINANCIAL ADVISOR	LORINA NACI POSTDOCTORAL REPRESENTATIVE	EMILY NICHOLS GRADUATE REPRESENTATIVE	FLORENCE LOURDES STAFF REPRESENTATIVE
					
EMAIL:	EMAIL:	EMAIL:	EMAIL:	EMAIL:	EMAIL:
uwocerc@uwo.ca	cweijer@uwo.ca	pcallag@uwo.ca	lnaci@uwo.ca	enicho4@uwo.ca	flourdes@uwo.ca

BMI'S MISSION

To provide a centralized and visible presence for cognitive neuroscience at Western University. The Institute's primary functions are to promote research, to facilitate the training of highly qualified personnel, and to foster national and international collaborations in cognitive neuroscience.

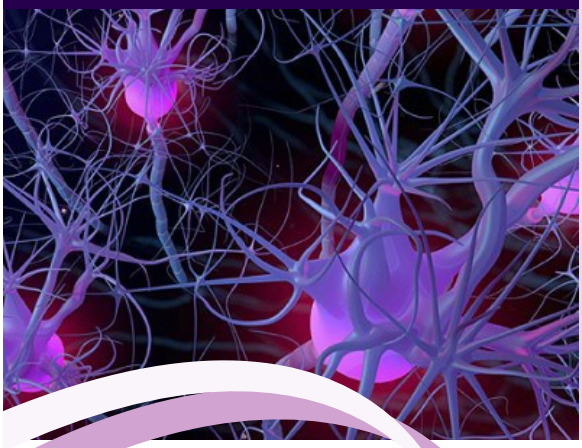
INTERGRATIVE APPROACH

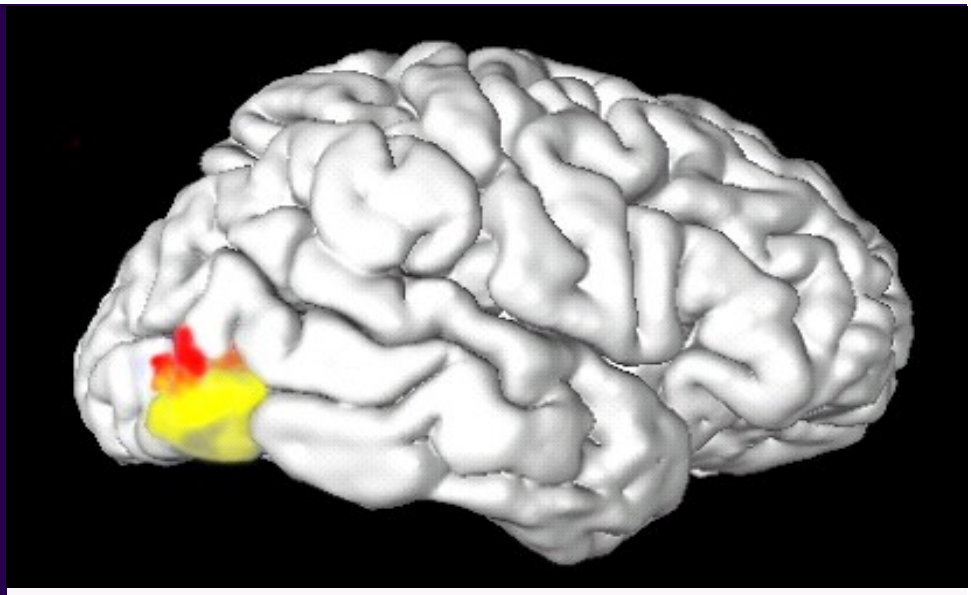
Cognitive neuroscience seeks an understanding of the neural bases of mental abilities such as perception, memory, reasoning, language, and more. Various disciplines, like the following, are brought to bear on common problems of the mind and brain: Psychology, Neurophysiology, Linguistics, Artificial Intelligence, Computational Theory, Philosophy, Anthropology, Imaging and more.

THE FUTURE

"Cognitive Neuroscience – with its concern about perception, action, memory, language and selective attention – will increasingly come to represent the central focus of all Neurosciences in the 21st century."

Eric R. Kandel, M.D. 2000 Nobel Laureate





OVERVIEW OF COGNITIVE NEUROSCIENCE

Cognitive neuroscience is a new interdisciplinary endeavour that seeks an understanding of how the brain gives rise to mind. A range of disciplines – including psychology, linguistics, neurophysiology, neuroanatomy, artificial intelligence, computational theory, philosophy, economics, and anthropology – are all brought to bear on common problems of mind and brain. The success of future research in this challenging area relies on an integrative approach that bridges these more traditional disciplines. The Brain and Mind Institute (BMI) plays a key role in making this happen by fostering interdisciplinary links amongst a number of departments, centres, and institutes based in different faculties across campus. By virtue of its collaborations with other successful research enterprises on campus, including the Rotman Institute of Philosophy, BMI is taking us even closer to solving one of nature's great mysteries: how the human mind emerges from the human brain.

PRIMARY FUNCTIONS OF BMI

Primary functions of the BMI are as follows:

- Accelerating research and research translation in cognitive neuroscience;
- Training highly qualified personnel;
- Forging national and international collaborations in cognitive neuroscience; and
- The facilitation of successful grant applications, both within the BMI and with other institutes and research groups at Western and beyond.

The BMI brings together research programs in cognitive neuroscience from across the campus -- programs that are already outstanding – and takes them to the next level by providing unparalleled research and training facilities. Indeed, the BMI serves as the flagship for the University's research in cognitive neuroscience – and signals Western's commitment to this signature area to the international research community. Since its inception, the BMI has been immensely productive; we have attracted substantial funding from provincial, federal, and international sources, and have been recognized as a successful research enterprise by both the scientific community and general public. We look forward to creating even more opportunities to foster research in cognitive neuroscience that is unmatched by any other research institute in the world.

BMI HISTORY

In 2005, BMI was established as a virtual centre of over 10 faculty members from across campus with a focus on furthering research in cognitive neuroscience. With its increasing visibility and impact on research outcomes world-wide, the Centre was eventually designated as the Brain and Mind Institute in November 2011. Today, BMI's research facilities are used by 34 core members and dozens of collaborative researchers.

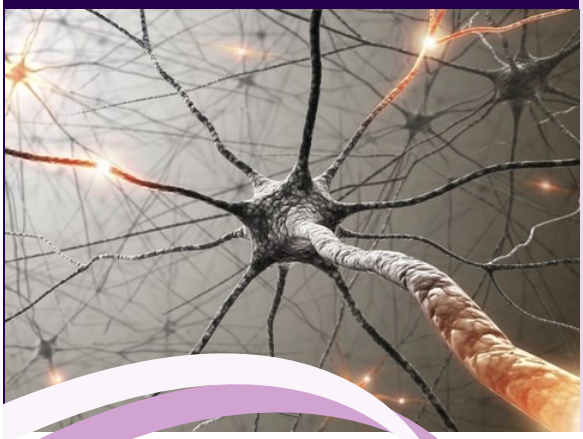
RESEARCH SUPPORT

The BMI has an enviable record of research and research support . As of 2015, our members collectively held more than $90 million in external funding (see page 23), including grants from the Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Brain Canada, Canada Foundation for Innovation and provincial agencies, such as the Ontario Research Fund.

A NEW ERA

"Cognitive neuroscience is entering an exciting era in which new technologies and ideas are making it possible to study the neural basis of cognition, perception, memory and emotion at the level of networks of interacting neurons, the level at which we believe many of the important operations of the brain take place."

John O'Keefe Ph.D. 2014 Nobel Laureate



BMI REPRESENTATION

The faculties, schools, and institutes at Western currently represented in the BMI include:

- **Arts & Humanities:** Philosophy
- **Education**
- **Engineering:** Electrical and Computer Engineering
- **Health Sciences**: Communication Sciences and Disorders, Kinesiology
- **Ivey Business School**: Marketing
- **Schulich School of Medicine & Dentistry:** Departments of Anatomy & Cell Biology, Clinical Neurological Sciences, Medical Biophysics, Ophthalmology, Physiology & Pharmacology, Psychiatry
- **Science**: Computer Science, Physics & Astronomy
- **Social Science:** Psychology

In addition, we draw a number of our core and associate members from other institutes including:

- **Robarts Research Institute**: Centre for Functional and Metabolic Mapping
- **Hospitals** across the city of London
- **Rotman Institute of Philosophy**

BMI SUCCESSES

One of the major reasons the BMI is successful is its interdisciplinary nature. By bringing together researchers from different disciplines to address fundamental questions about brain bases of human nature, the BMI has been able to move beyond typical research silos that characterize a significant portion of university -based research; moreover, the BMI has provided a clear focus for communicating Western's outstanding, and often ground-breaking, research in this field to the wider community – both in Canada and around the world. As well, a number of our members hold Canada Research Chairs, including Adrian Owen who holds the Canada Excellence Research Chair in Cognitive Neuroscience and Imaging.

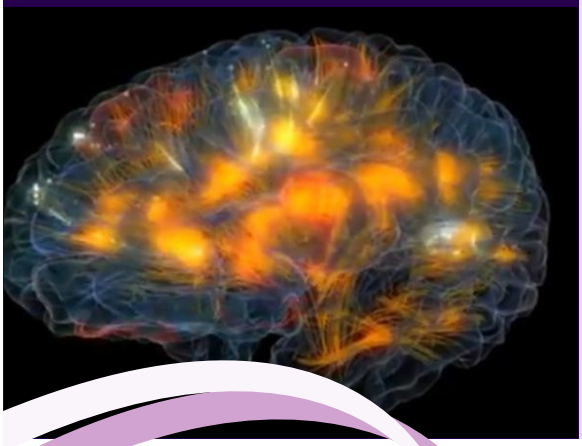
We have no shortage of stories to tell – and media interest is already considerable.

BMI RESEARCH

Research in the BMI aims to understand the neural bases of cognitive function and dysfunction. BMI's Core Members and their colleagues are investigating issues ranging from the brain basis of music to the development of reading and arithmetic. Research topics abilities, emotions, and so forth in order to study the neural underpinning of one's cognitive abilities, including:

- Perception
- Emotion
- Memory
- Reasoning
- Attention
- Self-awareness
- Motor control
- Language
- Consciousness

BMI scientists investigate how the brain allows us to interpret not only our own emotions and intentions but also those of others – in short, how the 1.5 Kg of wetware inside our skulls creates consciousness and allows us to think. Much of the research at the BMI is directed at understanding what goes wrong when our cognitive abilities are compromised by disease, injury, and addiction – in diseases like Parkinson's, Alzheimer's, stroke, and concussion – and why sometimes cognitive abilities fail to develop properly in disorders such as autism, dyslexia, and ADHD.



RESEARCH FACILITIES

Researchers at the Brain and Mind Institute have access to many research facilities that house specialized and cutting edge technology.

Magnetic Resonance Imaging (MRI): The Centre for Functional and Metabolic Mapping, which is partnered with the BMI, houses three state-of-the-art brain scanners: a 9.4-Tesla system for studies in small animals, a 7-Tesla system for human and animal research, and a 3-Tesla system that is exclusively for human research. With this equipment, BMI researchers can measure the functional activity and connectivity in both animals and humans, including newborns.

Transcranial Magnetic Stimulation (TMS): Researchers can investigate stimulate a local region of the brain in a non-invasive way, and measuring how this produces activity elsewhere in the nervous system or interferes with performance on a specific task.

Measuring Eye and Body Movements: BMI houses sophisticated equipment for tracking eye and limb movements, during activity such as grasping an object, walking, or reading. Researchers can also track eye and hand movements as someone reaches for real objects while in a brain scanner.

Neurobiology of Sleep and Sleep Disorders: The BMI houses a fully-equipped 3-bedroom sleep lab with three in-lab 32-channel EEG and polysomnographic systems for recording and analysis of overnight sleep studies.

Animal Models of Cognition and Behaviour: Nonhuman primates, mice, rats, and other animals are used as models for the study of complex cognition in humans. Indeed, a number of researchers have parallel programs in humans and animals.

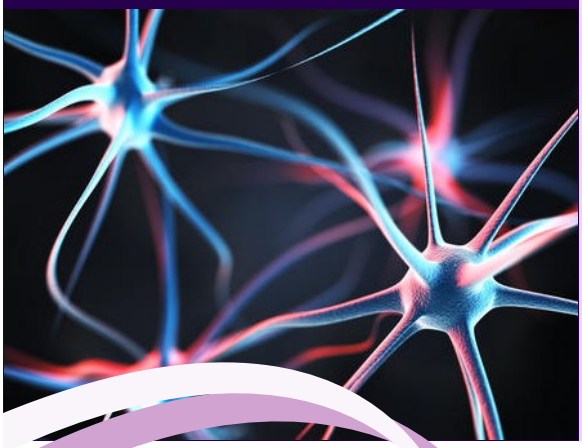
Computing Systems: Brain imaging technologies yield many terabytes of data each year. The BMI has access to the high performance computing resources that are becoming increasingly necessary to handle these data.

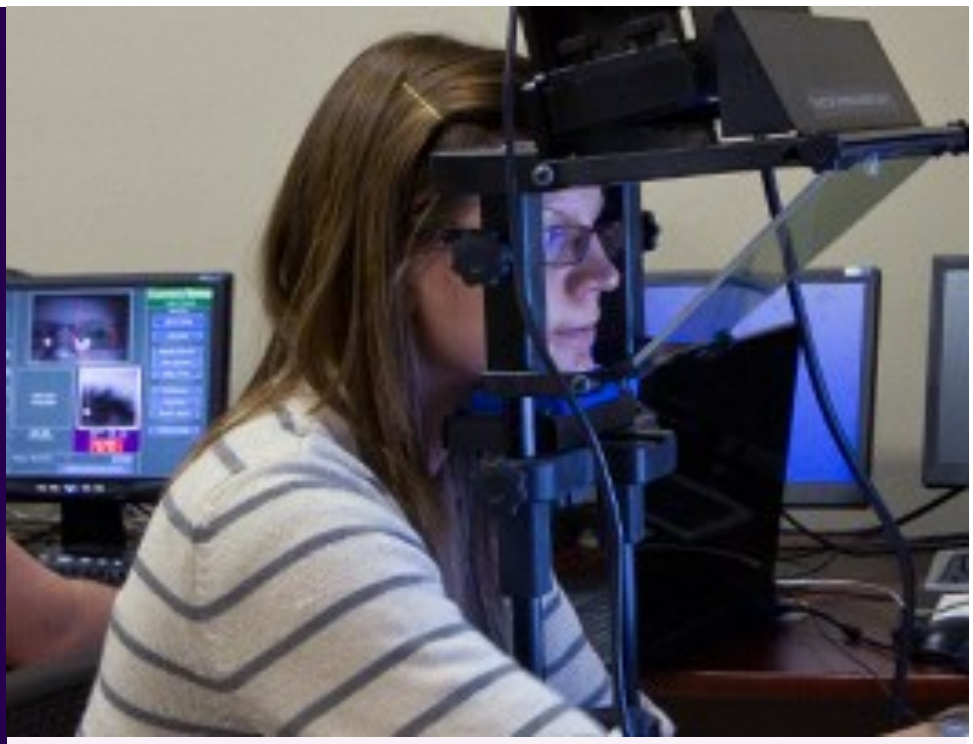
BMI RESEARCHERS

Advances in cognitive neuroscience require new technology, cross-disciplinary collaboration and innovative methods for measuring the brain and behaviour. Western is home to exceptional researchers who raise the bar for cognitive neuroscience research, including:

- **Physicists**, who develop new brain imaging protocols and equipment;
- **Mathematicians**, who create new analysis methods and computational models of brain function ;
- **Cognitive psychologists**, who construct models of the mind and design tasks that isolate particular mental processes;
- **Physicians** – from neurologists to neonatologists – who explore problems most commonly encountered by patients and integrate our growing knowledge of the brain into clinical practice;
- **Philosophers**, who answer new ethical questions and guide help guide the ontology of this new science;
- **Developmental psychologists**, who investigate how the brain grows and what can go wrong during childhood;
- **Cognitive physiologists**, who examine internal mental processes such as memory, perception learning and language; and
- **Computer scientists**, who run complex computer systems and engineers who build laboratory equipment to administer all manner of tasks.

Only by bringing all of these specialities together can the complexities of the brain and mind be better understood.





RESEARCH AND KNOWLEDGE TRANSFER

BMI core members have collectively published more than 2,500 peer-reviewed papers during their research careers, with an average of more than 70 papers per investigator. BMI researchers are remarkably collaborative, which has resulted in many papers authored by more than one BMI member. In addition to publishing work in peer-reviewed journals, BMI researchers regularly present their research at leading national and international conferences and are routinely invited to give keynote addresses at such gatherings. All of this ensures BMI research is communicated to others working in this field, including industry and clinical settings.

BMI researchers engage end-users directly. One effective example of this comes from research related to the relationship between brain plasticity and education. BMI researchers who study the neural substrates of arithmetic reasoning and reading, routinely meet with educational practitioners and researchers in Western's Faculty of Education and relevant experts in local school boards to seek advice about particular problems encountered in the schoolroom that can then be investigated in the laboratory. As new findings emerge, researchers meet with curriculum developers in the Ministry of Education and with representatives from companies who design digital tools for education. This iterative cycle, from the classroom to the laboratory and back again, is a highly effective way to enhance evidence-based approaches to education – and ultimately to develop sound educational policy and practice.

Similar approaches are being used to determine how best to teach second languages, critical thinking, and a host of other skills. The interplay between new research in cognitive neuroscience and problems identified by potential end-users is particularly relevant as we move into a digital age where education and workplaces rely increasingly on the Internet, mobile technology, and other digital media tools.

TRAINING OPPORTUNITIES

The BMI is committed to training the next generation of researchers in cognitive neuroscience. It has created a number of new initiatives as the Postdoctoral Fellowship, the International Graduate Student Scholarship and various exchange programs with other institutes worldwide.

The Western Cognitive Neuroscience Postdoctoral Fellowships program provides up to five annual awards of $25,000 (matched by the supervisor) for each of two years and was created to help attract the best and the brightest young minds to the BMI.

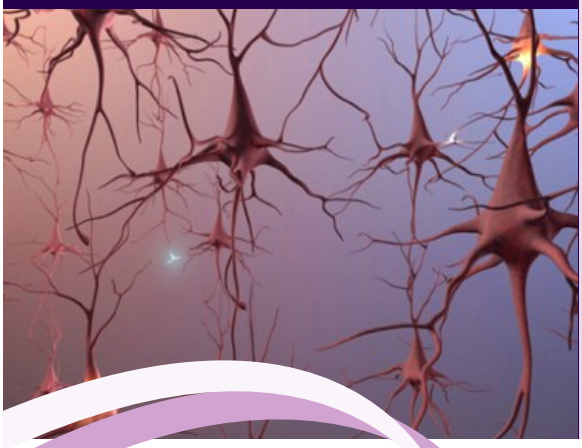
The Western International Graduate Student Scholarship offers research opportunities to international graduate student s wishing to be mentored by BMI PIs.

Lastly, BMI has been diligently working on various exchange programs, with universities around the world including as Radboud University, the University of Geneva and Monash University.

THE CHALLENGE

"The brain is a monstrous, beautiful mess. Its billions of nerve cells - called neurons - lie in a tangled web that displays cognitive powers far exceeding any of the silicon machines we have built to mimic it."

William F. Allman *Apprentices of Wonder. Inside the Neural Network Revolution*, 1989



MENTORING AND EDUCATION

Collectively, BMI researchers supervise more than 120 graduate students and 45 postdoctoral fellows, most of whom hold competitive salary awards, including Vanier Canada Graduate Scholarships and Banting Postdoctoral Fellowships awarded to Western. We have attracted talented graduate students and postdoctoral fellows from leading labs around the world, with backgrounds ranging from cognitive psychology to engineering. Part of the reason we have been successful is that we can provide trainees with access to state-of-the-art facilities for research in cognitive neuroscience, including imaging facilities that rank amongst the very best in the world. In addition to attracting young graduates from institutions across Canada, BMI researchers have recruited top talent from the United States, Australia, Israel, Spain, Albania, the UK, Italy, China, Japan, Taiwan, Lebanon, the Netherlands, and Germany. Our trainees routinely secure positions in leading universities across the globe.

As importantly, we have retained some of the best and the brightest of our trainees from overseas in Canada. Although the BMI is involved in supervision of graduate students across campus, the institute is not formally involved in undergraduate or graduate instruction. Nevertheless, we work closely with the Graduate Program in Neuroscience and other relevant graduate programs to develop new directions for graduate education geared towards trainees in cognitive neuroscience. The institute also works closely with departments across campus to ensure honors students have opportunities to do research at the BMI for their honors thesis. Many of these honors students and undergraduate student volunteers work closely with graduate students and postdoctoral fellows in the BMI.

INTERNATIONAL RESEARCH

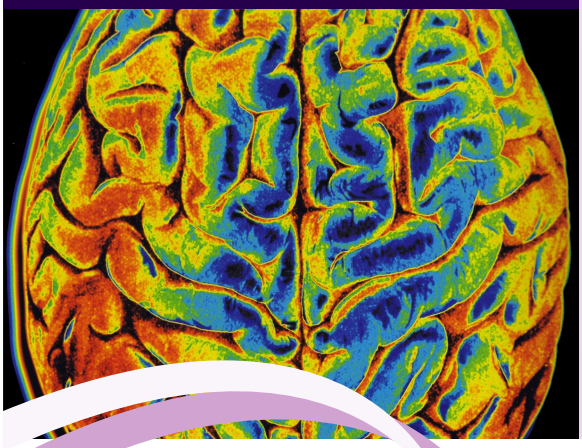
International collaborations are key to taking research to the next level. Both collectively and individually, researchers at the BMI have well-established collaborations with researchers in many countries around the world, including the UK, China, Brazil, Australia, Kenya, and many countries in the EU. We have exchange schemes with the Monash Institute for Cognitive and Clinical Neuroscience in Australia, the Donders Institute for Brain, Cognition, and Behaviour in the Netherlands, and the Cognitive Neuroscience Group at the University of Geneva.

The BMI regularly welcomes researchers and trainees from around the world and has sponsored a number of international scientific meetings at Western and elsewhere in Canada.

WORKING TOGETHER

"Science is a field which grows continuously with ever expanding frontiers. Further, it is truly international in scope. … Science is a collaborative effort. The combined results of several people working together is often much more effective than could be that of an individual scientist working alone."

John Bardeen 1956 /1972 Nobel Laureate



PARTNERSHIPS AND RESEARCH COLLABORATIONS

The BMI also has excellent relationships with industry partners, including IBM Canada, CISCO, Siemens Canada, and Northern Digital Inc. BMI researchers are developing new approaches to brain analyses, human-machine interfaces, visualization graphics, and other projects that are of significant interest to these companies, and others in the private sector. Indeed, it is worth emphasizing that the range of possible partners who have a stake in issues central to research at the BMI is very large. These include computer hardware and software companies, the entertainment industry, military, professional sports, automakers interested in development of intelligent and crashless cars, hotel chains (for whom sleep is an important commodity), medical equipment, and manufacturers of video games and educational software.

INTERNATIONAL RELATIONSHIPS

The BMI knows that advances in cognitive neuroscience can be accomplished only with strong international relationships and interactions. For this reason, the BMI established an International Scientific Advisory Board to provide an arms-length review of the BMI's progress both in research and training and in establishing productive international collaborations.

INTERNATIONAL SCIENTIFIC ADVISORY BOARD

The BMI has created an International Scientific Advisory Board, comprising some of the leading researchers in the field, to guide the institute in charting future directions for the development of cognitive neuroscience at Western. The following individuals have agreed to serve on this board and met for the first time on September 21, 2015, in concert with our first annual BMI Fall Symposium (held September 20, 2015).

David Burr, PhD
CNR Institute of Neuroscience, Pisa
Department of Psychology
University of Florence Stella Maris Foundation, Pisa, Italy

Alfonso Caramazza, PhD
Daniel and Amy Starch Professor of Psychology Department of Psychology
Harvard University Cambridge, MA 02138, USA

Stanislas Dehaene, PhD
Director, Inserm-CEA Cognitive Neuroimaging Unit Collège de France
75231 Paris Cedex 05, France

John Duncan, PhD
Programme leader, Executive processes group
MRC Cognition and Brain Sciences Unit
Cambridge, CB2 7EF, United Kingdom

Jeffrey Schall, PhD
E. Bronson Ingram Professor of Neuroscience
Professor of Ophthalmology and Visual Sciences
Director of Center for Integrative Cognition & Cognitive Neuroscience
Vanderbilt University, Nashville, TN 37235, USA

Irene Tracey, PhD
Nuffield Professor of Anaesthetic Science
Director of the Oxford Centre for fMRI
University of Oxford, United Kingdom

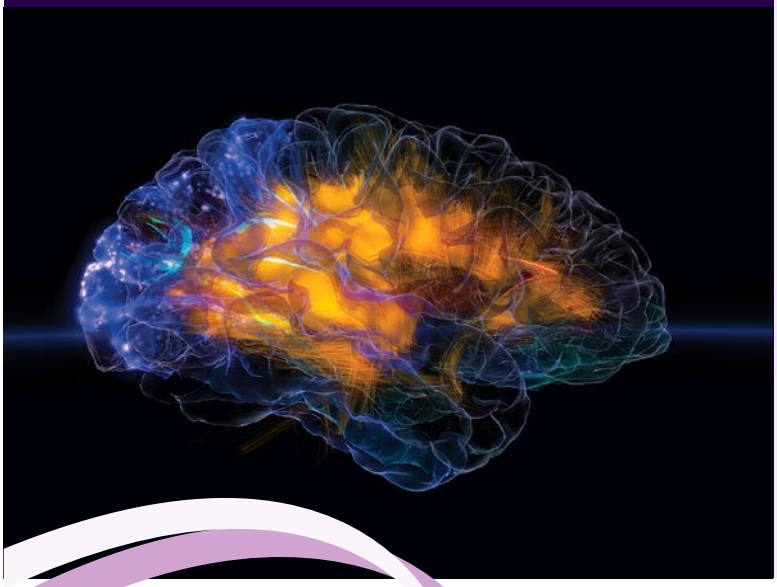
BMI CORE MEMBERS

LEADING RESEARCHERS IN COGNITIVE NEUROSCIENCE

Faculty members from Western University who are actively engaged in cognitive neuroscience, whether basic or applied, are considered for core membership at the Brain and Mind Institute.

In 2015, there were 34 faculty members from various disciplines across campus, leading research activities at the Institute as Principal Investigators. The research activities they oversee are providing a better understanding of the neural bases of a range of mental abilities and deficits. BMI's Core Members and their teams study areas related to music, cognitive development, perception, emotions — and the list goes on.

For more information on the terms of reference for core members and how to apply for core membership at the Brain and Mind Institute, please visit the BMI website at www.uwo.ca/bmi.



DANIEL ANSARI
Lab: Numerical Cognition Laboratory

Dr. Daniel Ansari is a Professor and Canada Research Chair in Developmental Cognitive Neuroscience in the Department of Psychology and the Brain and Mind Institute at the University of Western Ontario in London, Ontario, where he heads the Numerical Cognition Laboratory (www.numericalcognition.org).

Daniel and his team explore the developmental trajectory underlying both the typical and atypical development of numerical and mathematical skills, using both behavioral and neuroimaging methods. He has a keen interest in exploring connections between cognitive psychology, neuroscience and education and served as the President of the International Mind, Brain and Education Society (IMBES) from 2014-16.

ROBERT BARTHA
Lab: Bartha Group

Dr. Robert Bartha is the Bank of Montreal Chair in Neuroimaging and a Professor of Medical Biophysics and a Robarts Scientist. Robert's expertise includes high and ultra-high field MRI and MRS methods development in patient populations and in animal models, working at 4T since 1996, 7T since 1999 and 9.4T since 2005. He has an extensive background in short -echo time MR spectroscopy acquisition and quantification and volumetric imaging acquisition and analysis. He has publications and grants with various team members in the areas of Alzheimer's disease, MCI, dementia and epilepsy.

TIM BUSSEY
Lab: TCNLab

Dr. Tim Bussey was recently hired as a Professor in Physiology and Pharmacology with a joint appointment in Psychiatry. He also is a Western Research Chair under the Western Cluster of Research Excellence in Cognitive Neuroscience. His research in cognition, with Dr. Lisa Saksida, has him asking questions on how the healthy brain does it, what goes wrong in neurodegenerative and neuropsychiatric disease, and identifying targets for therapy. Tim also works on improving preclinical-to-clinical translation.

BLAINE CHRONIK
Lab: Chronik Group

Dr. Blaine Chronik holds an NSERC Industrial Research Chair and heads the Western MR Systems Development Lab and a Professor in Physics. His team investigates mathematical transform algorithms for detection and correction of phase artefact in MRI, non-image-encoding local gradient coils, and MRI System Development. Current projects include work in the areas of field-cycled MRI (fcMRI), specialized gradient coil inserts, peripheral nerve stimulation in the MR environment, and eddy current modeling.

ADAM COHEN
Lab: SocialBrainLab

Dr. Adam Cohen is an Assistant Professor in Psychology. Adam's research focuses on how theory of mind and attention work, develop and interface using behavioural and neuroimaging methods.

BRIAN CORNEIL
Lab: Gaze Control Lab

Dr. Brian Corneil is a Professor in the Physiology and Pharmacology with a joint appointment in Psychology. His team seeks to understand how the brain controls movement.

To understand such transformations, eye-head gaze shifts which rapidly change our line of sight are examined. In his lab, they combine neurophysiological and behavioural techniques in both humans and animal models.

JODY CULHAM
Lab: Culham Lab

Dr. Jody Culham is a Professor in the Psychology department and Neuroscience graduate program. Her lab uses neuroimaging (fMRI) and behavioral approaches to investigate how the human brain uses sensory information to perceive the world and guide hand actions such as reaching, grasping and tool use.

Jody was one of the first to use brain imaging techniques to discover and characterize human brain areas involved in hand actions. Her approach emphasizes using real-world stimuli (such as real objects instead of pictures) and real actions to better understand brain function under natural conditions, sometimes in contrast to artificial and virtual conditions.

RHODRI CUSACK

Lab: Cusack Lab

Dr. Rhodri Cusack is an Associate Professor in Psychology and Medical Biophysics. His research focuses on behavioural and cognitive neuroscience, auditory and visual attention, memory and imagery and new methods for neuroimaging. The Cusack lab studies the emergence of cognition in the first year following birth. Rhodri's team aims to address the pressing clinical need for better ways to detect when development is progressing abnormally following brain injury, and how to best correct it.

MARK DALEY

Lab: Daley Lab

Dr. Mark Daley is Western's Associate Vice President, Research and an Associate Professor in Computer Science, Biology, and Statistics & Actuarial Science. He is also the SHARCNET Research Chair in Biocomputing and the Chairman of the board of directors for Compute Ontario. Mark specializes in natural computing, computational and mathematical modelling of biological systems, theoretical computer science, high performance computing for biology and mathematics, molecular evolution and algorithmics of music and the visual arts.

JÖRN DIEDRICHSEN

Lab: Motor Control Group

Dr. Jörn Diedrichsen is a Western Research Chair under the Western Cluster of Research Excellence in Cognitive Neuroscience and a Professor in Computer Science. In his motor control group, robotic devices are used to investigate human motor behavior to study how the brain recalibrates well-learned motor skills or acquires new ones. Computational models are then developed to understand the underlying control and learning processes. These insights are used to design fMRI studies to investigate how these processes map onto the brain.

STEFAN EVERLING

Lab: Laboratory for Neural Circuits & Cognitive Control

Dr. Stefan Everling is a Professor in Physiology and Pharmacology with a joint appointment in Psychology. Stefan's research aims to understand how frontal brain areas influence cognitive functions in the primate brain. By better understanding which areas underlie which cognitive functions, he works towards identifying the brain areas that can serve as targets for future treatment of prefrontal strokes and trauma.

MELVYN GOODALE

Lab: Goodale Lab

Dr. Mel Goodale is the Director of the Brain and Mind Institute, the Canada Research Chair in Visual Neuroscience and a Professor in Physiology and Pharmacology with a joint appointment in Psychology. Mel is best known for his work on the functional organization of the visual pathways in the cerebral cortex, and was a pioneer in the study of visuo-motor control in neurological patients. His recent research uses functional magnetic resonance imaging (fMRI) to look at the activity in the normal human brain as it performs different kinds of visual tasks. He has also developed virtual-object technology to study the visual information used to program and control grasping movements.

JESSICA GRAHN

Lab: Music and Neuroscience Lab

Dr. Jessica Grahn is an Associate Professor in the Department of Psychology and has established herself as an emerging leader in the field of the neuroscience of music which combines her unique background as a classically trained concert pianist and her training as a neuroscientist.

Jessica conducts brain scanning studies examining how different motor areas in the brain respond to musical rhythm. She is also interested in how rhythm and music may be processed in the brains of those who have dysfunction in the brain areas that control movement, as happens in Parkinson's disease.

PAUL GRIBBLE

Lab: Human Sensory Motor Neuroplasticity and Motor Learning

Dr. Paul Gribble is a Professor in Psychology and holds a joint appointment in Physiology and Pharmacology . Paul's research focuses on how the brain controls voluntary movement, and the relationship between neuroplasticity in sensory and motor brain areas and motor skill learning.

Despite the significant mechanical complexities of multi-joint limb movement, humans are able to interact with the environment with remarkable ease. Research in the Gribble Lab is focused on understanding how the brain is organized to support motor learning, and how the central nervous system interacts with the complex peripheral neuromuscular plant to control skilled movement.

ELIZABETH HAYDEN

Lab: Personality and Emotion

Dr. Elizabeth Hayden is a Professor in the clinical area of Psychology. Her current research looks at characterizing the mechanisms by which temperament confers risk for mood disturbances, taking a perspective informed by developmental processes.

MARC JOANISSE

Lab: LRCN Lab

Dr. Marc Joanisse is a Professor in Psychology and the Neuroscience graduate program. He also holds an appointment as an Affiliated Scientist at Haskins Laboratories in New Haven Connecticut.

In the Language, Reading and Cognitive Neuroscience Lab, Marc's research examines the neural underpinnings of first- and second-language learning in children and adults, with a special focus on the interplay between spoken and written language. This includes studying the brain bases of reading ability and disability across the lifespan, using a wide variety of experimental techniques including fMRI, ERP and eye-tracking.

INGRID JOHNSRUDE

Lab: CoNCH Lab

Dr. Ingrid Johnsrude is a Western Research Chair under the Western Cluster of Research Excellence and holds joint Professor appointments in Psychology, and in the School of Communication Sciences and Disorders. In Ingrid's Cognitive Neuroscience of Communication and Hearing (CoNCH) lab, psychophysical and neuroimaging methods such as fMRI and EEG are used to study the neural basis of hearing; particularly how the brains of listeners transform the noisy and variable sounds of everyday conversations into meaningful language. The ultimate goal of this work is to make speech listening easier for people with hearing impairment. The group is also exploring novel functional-imaging based methods for evaluation of subtle brain abnormalities in epilepsy, concussion and other brain disorders.

STEFAN KÖHLER

Lab: Köhler Memory Lab

Dr. Stefan Köhler is a Professor in Psychology. The research in his Memory Lab in Cognitive Neuroscience focuses on the functional and neuroanatomical organization of memory in the human brain. Questions pursued by his lab include how memory systems interact with the visual system, how memory and affect interact, and whether different parts of the brain support memory for different types of information.

STEPHEN LOMBER

Lab: Cerebral Systems Lab

Dr. Stephen Lomber is a Canada Research Chair (Tier I) in Brain Plasticity and Development, and a Professor in Psychology, Physiology and Pharmacology. In addition, Steve holds an appointment as a principal investigator in the National Centre for Audiology in the Faculty of Health Sciences. Steve's lab uses an integrated approach of psychophysics, electrophysiological recording, neuro-anatomical techniques, and functional imaging to examine processing in auditory cortex. Work in the lab examines cortical plasticity in the presence and absence of acoustic input, and following the initiation of auditory processing through the means of cochlear prosthetics.

PENNY MACDONALD

Lab: MacDonald Lab

Dr. Penny MacDonald is a Canada Research Chair (Tier II) in Cognitive Neuroscience and Neuroimaging, as well as a Movement Disorders Neurologist and an Assistant Professor in Clinical Neurological Sciences. She is cross-appointed in Physiology and Pharmacology, and Psychology. Penny's research aims to understand the nature and causes of *cognitive* deficits such as learning, memory, and thinking problems that are increasingly recognized in more than 50% of PD patients. Deficits in cognition disproportionately cause a decline in quality of life for patients with PD, and are a frequent cause of institutionalization. Clarifying these deficits and the changes in brain function that underlie them is therefore critical.

JULIO MARTINEZ-TRUJILLO

Lab: Cognitive Neurophysiology

Dr. Julio Martinez-Trujillo is appointed to the position of Provincial Endowed Academic Chair in Autism, Schulich School of Medicine & Dentistry and is a Professor in Psychology and the Neuroscience graduate program. Julio's research aims to understand the mechanisms of cognition and behaviour in the normal brain and during disease, focusing on how the brain transforms visual signals into coordinated behaviour and how this process is influenced by cognitive functions, such as attention and memory.

KEN MCRAE

Lab: McRae Lab

Dr. Ken McRae is Associate Dean Research in the Faculty of Social Science and a Professor in Psychology. His research is focused on how people represent, understand, and use abstract concepts. Ken is investigating how such concepts are processed in the mind and brain. His most recent research approaches abstract concepts from the perspective that the real-life situations in which people experience these concepts are central to their representation and processing.

RAVI MENON

Lab: Menon Group

Dr. Ravi Menon is the Director of the Centre for Functional and Metabolic Mapping (CFMM), a Professor in Medical Biophysics, Medical Imaging, Neuroscience, and Psychiatry, and holds an appointment as the Canada Research Chair in Functional and Molecular Imaging.

Ravi's research centres around the application of ultra-high field MRI to problems in neuroscience. Towards this end, his group is developing new radio frequency coil hardware to improve the homogeneity of the images in conjunction with software techniques to speed up the image acquisition. Utilizing these advancements, his team are studying the biophysical basis of the functional MRI signal which is used in all modern day cognitive and clinical neuroscience as well as developing MRI methods such as quantitative susceptibility mapping for use in the early diagnosis and monitoring of multiple sclerosis.

PAUL MINDA

Lab: The Categorization Lab

Dr. John Paul Minda is an Associate Professor in Psychology. His innovative research works to answer questions about how and why humans organize information into categories and concepts and how the resulting conceptual structure influences thinking and behaviour. This work extends into research on expert performance, complex learning, and understanding the neuro-cognitive effects of mindfulness meditation practice.

DEREK MITCHELL
Lab: Emotional Cognition Lab

Dr. Derek Mitchell is an Associate Professor in Psychiatry, Anatomy and Cell Biology, and Psychology. One line of Derek's research focuses on how impairments in the way the brain processes emotions of others may be associated with antisocial behaviours such as aggression. Other laboratories have found that directing attention to critical social cues alleviates the emotional expression recognition deficits often found in populations of individuals with high levels of antisocial behaviour. It remained unclear, however, whether this improvement in recognition is accompanied by elevated feelings of empathy (likely a more important determinant of rehabilitation and prosocial behaviours).

J. BRUCE MORTON
Lab: Cognitive Development and Neuroimaging Laboratory

Dr. Bruce Morton serves as an Associate Professor in Psychology and is a faculty member of the graduate programme in Neuroscience. Bruce's research interests concern the development of cognitive control and its association with changes in prefrontal cortex function.

One of the foremost challenges for young children is organizing their thoughts and actions in the service of achieving long-term goals. Children find it difficult to defer small immediate rewards in favor of larger future rewards for example, or to switch the focus of their attention from one feature of a stimulus to another. The development of such self-regulatory capacities is an important foundation for later academic, social, and health-related outcomes, and is therefore the focus of many basic and applied research programs.

ADRIAN OWEN
Lab: Owen Lab

Dr. Adrian Owen is the Canada Excellence Research Chair in Cognitive Neuroscience and Imaging and a Professor in Psychology, Anatomy and Cell Biology, Physiology and Pharmacology. His research combines neuroimaging (MRI and EEG), with cognitive studies in brain-injured patients and healthy participants.

His team studies patients who have sustained brain injuries that result in disorders of consciousness. They also study patients with neurodegenerative diseases in order to understand more about the causes and consequences of the memory, perception and reasoning problems that many of them experience. Finally, they develop web-based tools for the assessment of cognitive function, both in healthy participants and in patients with disorders of the brain.

DANTE PIROUZ
Lab: Pirouz Lab

Dr. Dante Pirouz is an Assistant Professor of Marketing at the Ivey Business School. Dante is interested in the "dark side" of risky consumer behaviour. She applies both neuroscience and cognitive science tools and theories to examine this important research area.

ANDREW PRUSZYNSKI
Lab: Pruszynski Lab

As Canada Research Chair (Tier II) in Sensorimotor Neuroscience and an Assistant Professor in Physiology and Pharmacology and Psychology, Dr. Andrew Pruszynski studies the neural mechanisms or reaching, grasping and object manipulation. By learning how various parts of the nervous system work together when generating skilled movement of the arm and hand, Andrew's team strive to find better treatments for recovering hand and arm function following peripheral nerve injury, spinal cord injury, and stroke.

LISA SAKSIDA
Lab: TCNLab

Dr. Lisa Saksida was recently hired as a Professor in Physiology and Pharmacology with a joint appointment in Psychology. Her research in cognition, with Dr. Tim Bussey, has her asking questions on how the healthy brain carries out cognitive operations, what goes wrong in neurodegenerative and neuropsychiatric disease, and identifying targets for therapy. Lisa also works on improving preclinical-to-clinical translation.

ANDREA SODDU
Lab: Soddu Lab

Dr. Andrea Soddu is an Assistant Professor in Physics, where he investigates spontaneous brain activity using fMRI, global metabolism and structural connectivity using diffusion tensor imaging in patients with disorders of consciousness, hypnosis, anesthesia, tinnitus and dementia.

RYAN STEVENSON
Lab: Stevenson Lab

Dr. Ryan Stevenson was recently hired as an Assistant Professor in Psychology. His lab's research focuses on how visual and auditory perception influence high-order cognitive processing, whether in the autism spectrum or in cochlear implant users.

BRIAN TIMNEY
Lab: Timney Lab

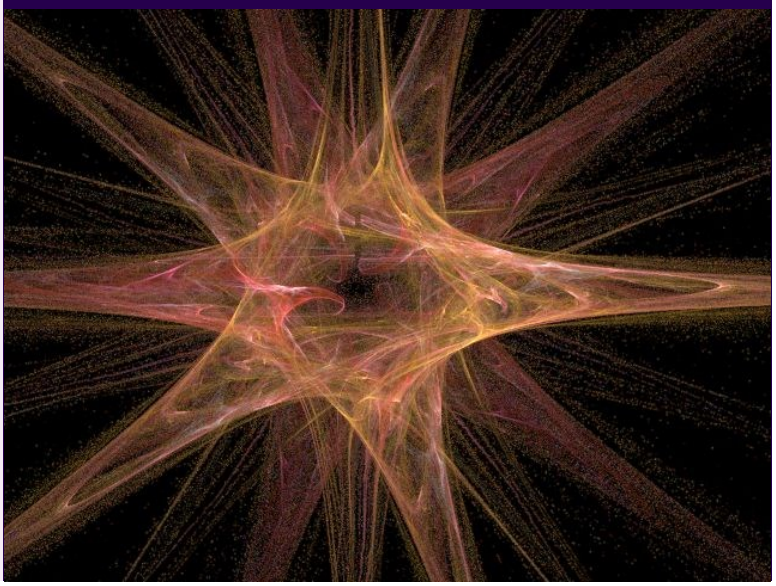
Dr. Brian Timney is a Professor Emeritus in Psychology and recently oversaw the Faculty of Social Science as Dean. There are three areas of research conducted in his lab:

1. The effect of alcohol on vision,
2. The temporal characteristics of human binocular vision, and
3. Comparative studies of vision in horses and camels.

TUTIS VILIS
Lab: Vilis Lab

As Professor Emeritus, Dr. Tutis Vilis explores the function of two important cortical areas—the ventral stream, which specializes in the perception of visual objects and the dorsal stream, which specializes in directing motor actions. He has been a pioneer in the development of on-line teaching modules in physiology and neuroscience.

For more information on the BMI Core Members, including contact information, please visit:
http://www.uwo.ca/bmi/members/core_members.html.



BMI ASSOCIATE MEMBERS

The BMI also engages with other members of the Western community, including research scientists and Principal Investigators in clinical departments. For more information on current associate members, visit www.uwo.ca/bmi/members/associate_members.html.

Lisa Archibald	Communication Sciences and Disorders
Tim Bayne	Rotman Institute of Philosophy
Janis Cardy	Communication Sciences and Disorders, National Centre for Audiology
Sandrine de Ribaupierre	Clinical Neurological Sciences
Neil Duggal	Clinical Neurological Sciences
Roy Eagleson	Electrical & Computer Engineering
Elizabeth Finger	Clinical Neurological Sciences
Stuart Fogel	Psychology
Alexander Fraser	Clinical Neurological Sciences, Ophthalmology
Matthew Heath	Kinesiology
Erin Heerey	Psychology
Kevin Johnston	Psychology, Physiology & Pharmacology
Ali Khan	Medical Biophysics, Medical Imaging, Biomedical Engineering
Angela Mendelovici	Rotman Institute of Philosophy
Lindsay Nagamatsu	Kinesiology
Lena K. Palaniyappan	Psychiatry, Medical Biophysics, Neuroscience
Terry Peters	Medical Imaging, Medical Biophysics, Biomedical Engineering
David Purcell	Communication Sciences & Disorders
Kevin Shoemaker	Kinesiology, Physiology & Pharmacology
Rob Stainton	Rotman Institute of Philosophy
Jackie Sullivan	Rotman Institute of Philosophy
Jennifer Sutton	Psychology, Brescia University College
Chris Viger	Rotman Institute of Philosophy
Charles Weijer	Rotman Institute of Philosophy

ADMINISTRATIVE AND TECHNICAL CORE

Florence Lourdes	Administrative Officer
Denise Soanes	Secretary and Receptionist
Haitao Yang	Systems Manager and Software Engineer

HIGHLIGHTS FROM 2015

SHOWCASING OUR INDUSTRIOUS RESEARCHERS AND THE CUTTING-EDGE RESEARCH TAKING PLACE AT WESTERN UNIVERSITY

The BMI will soon have a new home in the **Western Interdisciplinary Research Building** (WIRB), which is scheduled to be completed by early 2018. In addition to the BMI, WIRB will house the Rotman Institute of Philosophy, potentiating the already active collaborations between our two institutes. Learn more

Lorina Naci was honoured by the Albanian Society of Canada for her "distinguished contribution to science". Showcasing prominent Albanian contributions to Canada, Naci was recognized among 11 other individuals at the Legislative Assembly of Ontario when they declared November the Albanian Cultural Heritage Month.

The BMI and the Don Wright Faculty of Music have started a new partnership. The collaborative program, called **Musical Learning Across the Lifespan** (MLAL), is more about brain development than it is about Grammy nominations. But if you're at all curious about how music and the brain intertwine, you'll want to keep an eye on this new super group. Learn more

For years, Canadian parents and educators have engaged in passionate debate over how kids learn math. The math wars, have pitted "old" math versus "new," or "discovery," math. But BMI researcher, **Daniel Ansari** says it's time to end the wars. Instead, Ansari argues, educators and researchers in education need to adopt an evidence-based and developmental perspective on how to teach math. CBC Radio - Article Education Canada - Article

A study published this year by **Jody Culham** and her team in *The Journal of Neuroscience* challenges the more traditional scientific belief that using touch to recognize objects depends on visual circuitry in the human brain. The team showed that individuals with brain damage to visual areas of the brain show essentially normal recognition of objects from touch. Read More

HIGHLIGHTS FROM 2015

SHOWCASING OUR INDUSTRIOUS RESEARCHERS AND THE CUTTING-EDGE RESEARCH TAKING PLACE AT WESTERN UNIVERSITY

Adrian Owen and his team together with **Charles Weijer** from the Rotman Institute of Philosophy have developed the first-ever ethical framework for researchers and research ethics committees to design, conduct and review functional magnetic resonance imaging (fMRI) studies for severely brain injured patients being treated in intensive care units. The framework was published in Brain. Read More

A generous gift of $65M given to Western in 2012 by IBM (later matched by both the provincial and federal governments) is now helping BMI researchers to tackle the brain bases of a range of neurological and psychiatric disorders. As **Mark Daley** explains, technology and computers are changing the way researchers are approaching problems ranging from conversing with someone in a vegetative state to detecting a neurological problem long before it erupts, find out how. Read More

Adrian Owen and **Mel Goodale** have been appointed Co-Directors of a new program on Brain, Mind, and Consciousness at the Canadian Institute for Advanced Research. The nature of consciousness remains a mystery. The program grapples with the fundamental underpinnings of consciousness, and relates the findings to biology on the one hand and to philosophical questions on the other. The Brain, Mind, and Consciousness program was selected from more than 260 applications world-wide.

This past year, **Ravi Menon** became one of only six Canadians ever selected as a senior fellow by the International Society for Magnetic Resonance in Medicine (ISMRM). Menon was recognized for his significant contributions to advancements in fMRI and ultra-high field MRI at the ISMRM's 23rd Annual Meeting and Exhibition in Toronto. Find out More

HIGHLIGHTS FROM 2015

SHOWCASING OUR INDUSTRIOUS RESEARCHERS AND THE CUTTING-EDGE RESEARCH TAKING PLACE AT WESTERN UNIVERSITY

BMI Researcher, **Robert Bartha** was awarded the Alzheimer Foundation London and Middlesex Premier Research Grant to support research, personnel and supportive infrastructure. Bartha and his team are developing a sensitive test for early Alzheimer's Disease using the most powerful magnetic resonance imaging (MRI) equipment in Canada at the Centre for Functional and Metabolic Mapping, a BMI partner. Read more

In recognition of his outstanding research, **Daniel Ansari** was awarded a 2015 NSERC Steacie Fellowship. Up to six Steacie Fellowships are awarded annually to enhance the career development of outstanding and highly promising scientists and engineers who are faculty members of Canadian universities. Ansari joins past Steacie award winners at the BMI, Jody Culham and Ingrid Johnsrude. Read More

Elizabeth Hayden was named APS Fellow by the Association for Psychological Science (APS). Fellow status is awarded to APS Members who have made sustained outstanding contributions to the science of psychology in the areas of research, teaching, service, and/or application. Hayden's research focuses on relationship between temperament and mood, particularly in terms of how individual differences in emotional experience confer risk for the development of mood disorders. View the APS page.

Dr. Melanie Kok was awarded the 2015 Governor General Gold Medal for her PhD thesis research. Professor Stephen Lomber, Melanie's thesis supervisor, considers her to be "one of the most promising and creative young scientists" whom he has had the pleasure to work with." Read more

For more BMI 2015 news stories, see:

http://www.uwo.ca/bmi/news/bmi_news/2015.html.

GRANTS HELD

BY BMI MEMBERS IN 2015

Funding Source	Core Members	Associate Members	Total *
Alzheimer's Society	200,000	142,609	$342,609
Cdn Consort. on Neurodegeneration in Aging	674,842	0	$674,842
CERC	10,000,000	0	$10,000,000
CFI IOF	1,187,007	840,721	$2,027,728
CFI LEF	846,784	0	$846,784
CFI NIF	705,911	0	$705,911
CHRP	545,139	0	$545,139
CIFAR	360,000	0	$360,000
CIHR Foundation Scheme	0	2,274,483	$2,274,483
CIHR Operating	14,701,260	3,264,771	$17,966,031
CIHR Team	0	2,787,935	$2,787,935
CIHR Other	863,334	595,000	$1,458,334
CRC	5,700,000	2,800,000	$8,500,000
Federal Economic Development Agency	1,242,000	0	$1,242,000
NSERC CREATE	1,355,739	0	$1,355,739
NSERC Discovery	5,304,753	1,527,000	$6,831,753
NSERC RTI	370,994	0	$370,994
NSERC Other	1,835,000	74,350	$1,909,350
OBI	640,836	100,000	$740,836
Ontario Institute for Cancer Research	230,950	0	$230,950
Ontario Ministry of Res. & Innovation	140,000	280,000	$420,000
ORF	6,953,631	2,965,420	$9,919,051
Parkinson's	185,902	0	$185,902
SSHRC	56,800	72,850	$129,650
Other	16,718,608	3,187,147	$19,905,755
Total	**$70,819,490**	**$20,912,286**	**$91,731,776**

*Total amount over all tenure years of grants held in 2015 at Western University by lead PI

PUBLICATIONS IN 2015

BMI MEMBERS IN BOLD

Peer-reviewed Papers

1. Lyons, I.M. and **Ansari, D.** (2015). Numerical Order Processing in Children: From Reversing the Distance-Effect to Predicting Arithmetic. *Mind, Brain and Education*, 9, 207-21.

2. Lyons, I.M., Nuerk, H.C. and **Ansari, D.** (2015). Rethinking the implications of numerical ratio effects for understanding the development of representational precision and numerical processing across formats. *Journal of Experimental Psychology: General*, 144, 1021-35.

3. Holloway, ID., Atteveldt, N., Blomert, L. and **Ansari, D.** (2015). Orthographic dependency in the neural correlates of reading: evidence from audiovisual integration in English readers. *Cerebral Cortex*, 25, 1544-53.

4. Lyons, I.M., **Ansari, D.** and Beilock, S.L. (2015). Qualitatively different coding of symbolic and nonsymbolic numbers in the human brain. *Human Brain Mapping*, 36, 475-488.

5. Matejko, A.A. and **Ansari, D.** (2015). Drawing Connections between White Matter and Numerical and Mathematical Cognition: A Literature Review. *Neuroscience and Biobehavioral Reviews*, 48C, 35-52.

6. Nikolova, S., **Bartha, R.,** Parrent, A.G., Steven, D.A., Diosy, D. and Burneo, J.G. ----(2015). Functional MRI of Neuronal Activation in Epilepsy Patients with Malformations of Cortical Development. *Epilepsy Research*, 116 1-7, October. PubMed ID: 26354161.

7. Suchy, M., Milne, M., Elmehriki, A., McVicar, N., Li, A., **Bartha, R.** and Hudson, R. (2015). Introduction of peripheral carboxylates to decrease the charge on Tm3+ DOTAM-alkyl complexes: Implications for de-tection sensitivity and in vivo toxicity of PARACEST MRI contrast agents. *Journal of Medicinal Chemistry*, 58(16) 6516-6532, August. PubMed ID: 26214576.

8. Snir, J.A., Suchy, M., St. Lawrence, K., Hudson, R.H.E., Pasternak, S.H. and **Bartha, R.** (2015). Prolonged in-vivo retention of a Cathepsin D targeted optical contrast agent in a mouse model of Alzheimer's disease. *Journal of Alzheimer's Disease*, 48(1) 73-87, August. PubMed ID: 26401930.

9. Farag, A., Peterson, J.C., Szekeres, T., Bauman, G., Chin, J., Romagnoli, C., **Bartha, R.** and Scholl, T.J. (2015). Unshielded asymmetric transmit-only and endorectal receive-only radiofrequency coil for (23) Na MRI of the prostate at 3 tesla. *Journal of Magnetic Resonance Imaging,* 42(2) 436-445, August. P-ubMed ID: 26354161.

10. Penner, J. and **Bartha, R.** (2015). Semi-LASER H-1 MR spectroscopy at 7 Tesla in human brain: Metabolite quantification incorporating subject-specific macromolecule removal. *Magnetic Resonance in Medicine*, 74(1) 4-12, July. PubMed ID: 25081993.

11. Annweiler, C., **Bartha, R.**, Goncalves, S., Karras, S.N., Millet, P., Feron, F. and Beauchet, O. (2015). Vitamin D-related changes in intracranial volume in older adults: A quantitative neuroimaging study. *Maturitas,* 80(3) 312-317, March. PubMed ID: 25614220.

PUBLICATIONS IN 2015

BMI MEMBERS IN BOLD

12. Annweiler, C., **Bartha, R.**, Karras, S.N., Gautier, J., Roche, F. and Beauchet, O. (2015). Vitamin D and white matter abnormalities in older adults: A quantitative volutmetric analysis of brain MRI. *Experimental Gerontology,* 63 41-47, March. PubMed ID: 25645292.

13. Lewis, M., Milne, M., **Bartha, R.** and Hudson, R.H.E. (2015). Dysprosium(III) and thulium(III) complexes of DO3A-monoanilides: an investigation of electronic effects on their relaxometric and amide-based PARACEST properties. *Canadian Journal of Chemistry*, 93(2) 244-252, February.

14. Penner, J., Wells, J.L., Borrie, M.J., Woolmore-Goodwin, S.M. and **Bartha, R.** (2015). Reduced N-Acetylaspartate to Creatine Ratio in the Posterior Cingulate Correlates with Cognition in Alzheimer's Disease following Four Months of Rivastigmine Treatment. *Dementia and Geriatric Cognitive Disorders*, 39(1-2) 68-80, January. PubMed ID: 25358336.

15. McVicar, N., Li, A.X., Meakin, S. and **Bartha, R.** (2015). Imaging chemical exchange saturation transfer (CEST) effects following tumor-selective acidification using lonidamine. *NMR in Biomedicine*, 28(5) 566-575, May. PubMed ID: 25808190.

16. Charier, D., Beauchet, O., Bell, M., Brugg, B., **Bartha, R.** and Annweiler, C. (2015). Memantine plus vitamin D prevents axonal degeneration caused by lysed blood. *ACS Chemical Neuroscience*, 6(3) 393-397, March. PubMed ID: 25587803.

17. Annweiler, C., Annweiler, T. and **Bartha, R.** (2015). Vitamin D and white matter abnormalities in older adults: a cross-sectional neuroimaging study. *European Journal of Neurology*, 21(12) 1436-47, December.

18. Kent, B.A., Beynon, A.L., Hornsby, A.K., Bekinschtein, P., **Bussey, T.J.**, Davies, J.S. and **Saksida, L.M.** (2015). The orexigenic hormone acyl-ghrelin increases adult hippocampal neurogenesis and enhances pattern separation. *Psychoneuroendocrinology*, 51:431-9.

19. Kim, C.H., Heath, C.J., Kent, B.A., **Bussey, T.J.** and **Saksida, L.M.** (2015). The role of the dorsal hippocampus in two versions of the touchscreen automated paired associates learning (PAL) task for mice. *Psychopharmacology (Berl)*, November;232(21-22):3899-910. doi:10.1007/s00213-015-3949-3.

20. Kim, C.H., Romberg, C., Hvoslef-Eide, M., Oomen, C.A., Mar, A.C., Heath, C.J., Berthiaume, A.A., **Bussey, T.J.** and **Saksida, L.M.** (2015). Trial-unique, delayed nonmatching-to-location (TUNL) touchscreen testing for mice: sensitivity to dorsal hippocampal dysfunction. *Psychopharmacology,* 232:3935-3945.

21. Heath, C.J., **Bussey, T.J.** and **Saksida, L.M.** (2015). Motivational assessment of mice using the touchscreen operant testing system: effects of dopaminergic drugs. *Psychopharmacology,* 232:4043-4057.

22. Nithianantharajah, J., McKechanie, A.G., Stewart, T.J., Johnstone, M., Blackwood, D.H., St Clair, D., Grant, S.G, **Bussey, T.J.** and **Saksida, L.M.** (2015). Bridging the translational divide: identical cognitive touchscreen testing in mice and humans carrying mutations in a disease-relevant homologous gene. *Scientific Reports,* 2015 Oct 1;5:14613. DOI:10.1038/srep14613. PubMed PMID: 26423861.

PUBLICATIONS IN 2015

BMI MEMBERS IN BOLD

23. El Bannan, K., **Chronik, B.A.** and Salisbury, S.P. (2015). Development of an MRI-compatible, compact, rotary-linear piezoworm actuator. *Journal of Medical Devices,* 9(1):014501.1-7 doi: 10.1115/1.4028943.

24. Goodrich, K.C., Hadley, J.R., Kim, S., Kaggie, J.D., Handler, W.B., **Chronik, B.A.**, Bolster, B.D. and Parker, D.L. (2015). Peripheral nerve stimulation measures in a composite gradient system. *Concepts in Magnetic Resonance Part B,* 44B(3):66-74 doi: 10.1002/cmr.b.21269.

25. Zhao, Y., Zhao, T., Raval, S.B., Krishnamurthy, N., Zheng, H., Harris, C.T., Handler, W.B., **Chronik, B.A.** and Ibrahim, T.S. (2015). Dual optimization method of radiofrequency and quasistatic field simulations for reduction of eddy currents generated on 7T radiofrequency coil shielding. *Magnetic Resonance in Medicine,* 74(5):11461-1469 doi: 10.1002/mrm.25424.

26. Snir, J.A., Suchy, M., Bindseil, G.A., **Chronik, B.A.,** Hudson, R.H.E., Pasternak, S.H. and **Bartha, R.** (2015). A novel positron emission tomography contrast agent targeting cathepsin d shows preferential in vivo retention in an alzheimer's disease mouse model. *Alzheimer's and Dementia,* 11(7):p26-27. [DOI: 10.1016/j.jalz.2015.06.044].

27. **Cohen, A.S.**, Sasaki, J.Y. and German, T.C. (2015). Specialized mechanisms for theory of mind: Are mental representations special because they are mental or because they are representations? *Cognition*, 136, 49-63.

28. Goonetilleke, S.C., Katz, L., Wood, D.K., Gu, C., Huk, A.C. and **Corneil, B.D.** (2015). Cross-species comparison of anticipatory and stimulus-driven neck muscle activity well before saccadic gaze shifts in humans and non-human primates. *Journal of Neurophysiology*, 114: 902-913.

29. Wood, D.K., Gu, C., **Corneil, B.D.**, **Gribble, P.L.** and **Goodale, M.A.** (2015). Transient visual responses reset the phase of low-frequency oscillations in the skeletomotor periphery. *European Journal of Neuroscience*, 42: 1919-1932.

30. Quinlan, D.J. and **Culham, J.C.** (2015). Direct comparisons of hand and mouth kinematics during grasping, feeding and fork-feeding actions. *Frontiers in Human Neuroscience*, 9: 580.

31. Stöttinger, E., Filipowicz, A., Valadao, D., **Culham, J.C.**, **Goodale, M.A.**, Anderson, B. and Danckert, J. (2015). A cortical network that marks the moment when conscious representations are updated. *Neuropsychologia*, 79, 113-122.

32. Monaco, S., Sedda, A., Cavina-Pratesi, C. and **Culham, J.C.** (2015). Neural correlates of object size and object location during grasping actions. *European Journal of Neuroscience,* 41(4), 454-465.

33. Macdonald, S.N. and **Culham, J.C.** (2015). Do human brain areas involved in visuomotor actions show a preference for real tools over visually similar non-tools? *Neuropsychologia*, 77, 35-41.

34. Barnett-Cowan, M., Snow, J.C. and **Culham, J.C.** (2015). Contribution of bodily and gravitational orientation cues to face and letter recognition. *Multisensory Research*, 28(5-6), 427-442.

PUBLICATIONS IN 2015

BMI MEMBERS IN BOLD

35. Hutchison, R.M., **Culham, J.C.**, Flanagan, J.R., **Everling, S.** and Gallivan, J.P. (2015). Functional subdivisions of medial parieto-occipital cortex in humans and nonhuman primates using resting-state fMRI. *NeuroImage,* 116, 10-29.

36. Gallivan, J.P. and **Culham, J.C.** (2015). Neural coding within human brain areas involved in actions. *Current Opinion in Neurobiology,* 33, 141-149.

37. Farrugia, N., Jakubowski, **Cusack, R.** and Stewart, L. (2015). Tunes stuck in your brain: the frequency and affective evaluation of Involuntary Musical Imagery correlate with cortical structure. *Consciousness and Cognition,* 35 66-77.

38. **Cusack, R.**, Wild, C., Linke, A.C., Arichi, T., Lee, D.S.C. and Han, V.K. (2015). Optimizing stimulation and analysis protocols for neonatal fMRI. *PLOS ONE,* doi: 10.1371/journal.pone.0120202.

39. Linke, A.C. and **Cusack, R.** (2015). Flexible information coding in human auditory cortex during perception, imagery and short-term memory of complex sounds. *Journal of Cognitive Neuroscience,* 27(7), 1322-33.

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All peer-reviewed publications listed above were submitted by BMI core members. Publications and other research details about the associate members can be found at: http://www.uwo.ca/bmi/members/associate_members.html.

BMI'S INDEX

Percent of body weight represented by the brain: **2**

Number of Banting Awards held by postdoctoral fellows in the BMI since the inception of the award: **3**

Number of former NSERC E.W.R. Steacie Award winners: **4**

Number of BMI Core Members who are CIHR New Investigators: **7**

Estimated number of months until the BMI moves in the Western Interdisciplinary Research Building: **14**

Average amount of power in Watts generated by an awake human brain: **16**

Percent of energy used by the body that is consumed by the brain: **20**

Average number of cups of coffee consumed at a BMI coffee break: **42**

Number of times the word "brain" appears in the plays of William Shakespeare: **66**

Lifetime joint publications by BMI Core Members: **441**

Lifetime individual publications by BMI Core Members: **2407**

Number of neurons in the human brain: **86,000,000,000**

Total number of dollars in funding held by BMI members in 2015 (over the lifetime of grants): 91,731,776

Total number of citations of publications by BMI Core Members: **220,000**

Estimated number of metres a rapid neuronal signal can travel in one second: **100**

Percent of brain mass that is water: **75**

Number of gel tubes used for EEG testing in Sleep Lab: **60**

Average h-index for BMI Core Members: **34**

Number of nationalities represented in the BMI: **17**

Number of BMI members who are former Premier's Research Excellence Awards (PREA) and Early Research Awards (ERA) winners: **16**

Number of babies produced by the BMI (Baby Making Institute) since inception: **16**

Number of years the BMI has been an Institute: **5**

Number of CIHR Foundation Award winners in the BMI: **4**

Number of BMI event performances each year by the Untidy Naked Dilemma (the BMI House Band): **2**

The Brain and Mind Institute

"Every aspect of thought and emotion is rooted in brain structure and function, including many psychological disorders and, presumably, genius."

Steven Pinker

"On Einstein's Brain" The New York Times (June 24, 1999)

BMI Annual Report

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The Brain and Mind Institute

The Brain and Mind Institute

Tel: 519-661-2111 ext. 86057
Fax: 519-661-3613
Email: bmiwestern@uwo.ca
Web: www.uwo.ca/bmi/

Many thanks to everyone who contributed photos and their time to help prepare and review this annual report.