

BIOGRAPHICAL SKETCH

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NAME Randy McIntosh	POSITION TITLE Director, Rotman Research Institute of Baycrest Senior Scientist, Rotman Research Institute of Baycrest		
eRA COMMONS USER NAME (credential, e.g., agency login)			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	MM/YY	FIELD OF STUDY
University of Calgary	B.Sc.	08/87	Psychology
University of Calgary	M.Sc.	08/89	Psychology
University of Texas at Austin	Ph.D.	12/92	Behavioral Neuroscience

A. Personal Statement

Dr. McIntosh is a pioneer in the study of how different parts of the brain work together to bring about the wide range of human mental operations. He has combined modern functional neuroimaging methods with mathematical modeling to characterize the changes in brain network dynamics related to awareness and learning, and shown how these dynamics change in normal aging and different clinical conditions. He also has extensive experience with most neuroimaging technologies, including MRI, PET, EEG and MEG. As the leader of the project, Dr McIntosh brings considerable organization skills to the table, having managed a collaboration of 13 Canadian universities in as part of the Ontario Research & Development Fund, and most recently the 5 year collaborative network of 17 investigators Brain NRG. As Vice President of Research and Director of the Rotman Research Institute, Dr McIntosh also leverages the scientific expertise at his home institute to contribute to the next five years of Brain NRG. In particular, the research in stroke recovery done through the Ontario Heart & Stroke Centre for Stroke Recovery will provide access to patient data that will be part of the database to build the Virtual Brain. Indeed, the database at the Rotman Research Institute, which covers healthy individuals from 18-85 yrs, and a variety of patient populations, is a tremendous asset for the NRG.

B. Positions and Honours**Professional History (in chronological order)**

- Vice President of Research – Baycrest, 10/2010 – present
- Director, Rotman Research Institute of Baycrest Centre, 07/2008 – present
- Associate Director, Rotman Research Institute of Baycrest Centre, 08/2005 – 07/2008
- Professor, Department of Psychology, University of Toronto, 07/2005.
- Associate Professor, Department of Psychology, University of Toronto. 08/01 – 07/2005
- Assistant Director; Rotman Research Institute of Baycrest Centre, 04/99 – 08/2005
- Assistant Professor, Department of Psychology, University of Toronto, 01/95 – 08/01
- Scientist, Rotman Research Institute of Baycrest Centre, University of Toronto, 10/94 - present.
- Guest Researcher, Lab. of Neurosciences, National Institute on Aging, National Institutes of Health, 09/92 - 09/94, Supervisor: B. Horwitz, PhD.

Prizes, Awards and other Honours:

- Scientist Award, Canadian Institutes of Health Research (formerly MRC), *Towards a Network Theory of Human Cognition*, \$70,000 annually, 2002-2007.
- Scholar, Medical Research Council of Canada, *Exploration of Neural Interactions using Functional Neuroimaging*, \$50,000 annually, 1997-2002.
- Postdoctoral Fellowship, Natural Sciences and Engineering Research Council, *Covariance analyses of neuroimaging data*, 27,900 annually, 1992-1994.
- Award for Leadership, Baycrest Centre for Geriatric Care, 2001.

C. Selected Peer-reviewed publications (from total of ##)

Most relevant to the current application

Rubinov M, **McIntosh AR**, Valenzuela MJ, Breakspear M. (2009) Simulation of neuronal death and network recovery in a computational model of distributed cortical activity. *Am J Geriatr Psychiatry* 17:210-217.

McIntosh AR, Kovacevic N, Itier RJ. (2008): Increased brain signal variability accompanies lower behavioral variability in development. *PLoS Comput Biol* 4:e1000106.

Deco G, Jirsa V, **McIntosh AR**, Sporns O, Kotter R. (2009): Key role of coupling, delay, and noise in resting brain fluctuations. *Proc Natl Acad Sci U S A* 106:10302-10307.

Ghosh A, Rho Y, **McIntosh AR**, Kotter R, Jirsa VK. (2008): Cortical network dynamics with time delays reveals functional connectivity in the resting brain. *Cogn Neurodyn* 2:115-120.

Ghosh A, Rho Y, **McIntosh AR**, Kotter R, Jirsa VK. (2008): Noise during Rest Enables the Exploration of the Brain's Dynamic Repertoire. *PLoS Comput Biol* 4:e1000196.

Additional recent publications relevant to the application (in chronological order)

Burianova H, **McIntosh AR**, Grady CL. (2010) A common functional brain network for autobiographical, episodic, and semantic memory retrieval. *Neuroimage*, 49:865-874.

Diaconescu AO, Menon M, Jensen J, Kapur S, **McIntosh AR**. (2010) Dopamine-induced changes in neural network patterns supporting aversive conditioning. *Brain Res*, 1313:143-161.

Garrett DD, Kovacevic N, **McIntosh AR**, Grady CL. (2010) Blood oxygen level-dependent signal variability is more than just noise. *J Neurosci*, 30:4914-4921.

Poppenk J, **McIntosh AR**, Craik FI, Moscovitch M. (2010) Past experience modulates the neural mechanisms of episodic memory formation. *J Neurosci*, 30:4707-4716.

Poppenk J, Moscovitch M, **McIntosh AR**, Ozcelik E, Craik FI. (2010) Encoding the future: successful processing of intentions engages predictive brain networks. *Neuroimage*, 49:905-913.

Vakorin VA, Ross B, Krakovska O, Bardouille T, Cheyne D, **McIntosh AR**. (2010) Complexity analysis of source activity underlying the neuromagnetic somatosensory steady-state response. *Neuroimage*, 51:83-90.

Vakorin VA, Kovacevic N, **McIntosh AR**. (2010) Exploring transient transfer entropy based on a group-wise ICA decomposition of EEG data. *Neuroimage*, 49:1593-1600.

den Ouden HE, Friston KJ, Daw ND, **McIntosh AR**, Stephan KE. (2009) A dual role for prediction error in associative learning. *Cereb Cortex* 19:1175-1185.

- Grady CL, Protzner AB, Kovacevic N, Strother SC, Afshin-Pour B, Wojtowicz M, Anderson JA, Churchill N, **McIntosh AR**. (2009) A Multivariate Analysis of Age-Related Differences in Default Mode and Task-Positive Networks across Multiple Cognitive Domains. *Cereb Cortex*, 20:1432-47.
- Lippe S, Kovacevic N, **McIntosh AR**. (2009) Differential maturation of brain signal complexity in the human auditory and visual system. *Front Hum Neurosci*, 3:48.
- Rubinov M, **McIntosh AR**, Valenzuela MJ, Breakspear M. (2009) Simulation of neuronal death and network recovery in a computational model of distributed cortical activity. *Am J Geriatr Psychiatry*, 17:210-217.
- Vakorin VA, Krakovska OA, **McIntosh AR**. (2009): Confounding effects of indirect connections on causality estimation. *J Neurosci Methods*, 185:152-160.
- Alain C, McDonald KL, Kovacevic N, **McIntosh AR**. (2009): Spatiotemporal analysis of auditory "what" and "where" working memory. *Cereb Cortex*, 19:305-314.
- Vallesi A, **McIntosh AR**, Alexander MP, Stuss DT. (2009): fMRI evidence of a functional network setting the criteria for withholding a response. *Neuroimage*, 45:537-548.
- Protzner AB, Cortese F, Alain C, **McIntosh AR**. (2009) The temporal interaction of modality specific and process specific neural networks supporting simple working memory tasks. *Neuropsychologia*, 47:1954-1963.
- Protzner AB, **McIntosh AR**. (2009) Modulation of ventral prefrontal cortex functional connections reflects the interplay of cognitive processes and stimulus characteristics. *Cereb Cortex*, 19:1042-1054.
- McIntosh AR**, Korostil M. (2008) Interpretation of Neuroimaging Data Based on Network Concepts. *Brain Imaging and Behavior*, doi: 10.1007/s11682-008-9031-6.
- McIntosh AR**, Kovacevic N, Itier RJ. (2008) Increased brain signal variability accompanies lower behavioral variability in development. *PLoS Computational Biology*, 4:e1000106.
- Rajah MN, **McIntosh AR**. (2008) Age-related differences in brain activity during verbal recency memory. *Brain Res*, 1199:111-125.
- Caplan JB, **McIntosh AR**, De Rosa E. (2007) Two distinct functional networks for successful resolution of proactive interference. *Cereb Cortex*, 17: 1650-63.
- Kovacevic N, **McIntosh AR**. (2007) Groupwise independent component decomposition of EEG data and partial least square analysis. *Neuroimage*, 35: 1103-12.
- Protzner AB, **McIntosh AR**. (2007) The interplay of stimulus modality and response latency in neural network organization for simple working memory tasks. *J Neurosci*, 27: 3187-97.
- Protzner AB, **McIntosh AR**. (2006) Testing effective connectivity changes with structural equation modeling: What does a bad model tell us? *Hum Brain Mapp*, 27(12): 935-947.
- Caplan JB, Luks TL, Simpson GV, Glaholt M, **McIntosh AR**. (2006) Parallel networks operating across attentional deployment and motion processing: A multi-seed partial least squares fMRI study. *Neuroimage*, 29:1192-1202.
- Grady CL, **McIntosh AR**, Craik FI. (2005) Task-related activity in prefrontal cortex and its relation to recognition memory performance in young and old adults. *Neuropsychologia*, 43:1466-1481.
- McIntosh AR**, Lenartowicz A. (2005) The Role of Anterior Cingulate Cortex in Working Memory is Shaped by Functional Connectivity, *J Cognitive Neurosci*, 17(7): 1026-1042.
- Chau W, **McIntosh AR**. (2005) The Talairach coordinate of a point in the MNI space: how to interpret it. *Neuroimage*, 25(2): p. 408-416.
- Della-Maggiore, V, **McIntosh AR**. (2005) Time course of changes in brain activity and functional connectivity associated with long-term adaptation to a rotational transformation. *J Neurophysiol*, 93(4): p. 2254-2262.
- McIntosh AR**. (2000) Towards a network theory of cognition. *Neural Networks*, 13: 861-876.
- McIntosh AR**. (1999) Mapping Cognition to the Brain Through Neural Interactions. *Memory*, 7(5/6): 523-548.

Tononi G, **McIntosh AR**, Russell DP, Edelman GM. (1998) Functional clustering: Identifying strongly interactive brain regions in neuroimaging data. *Neuroimage* ,7:133-149.

McIntosh AR, Nyberg L, Bookstein FL, Tulving ET. (1997) Differential functional connectivity of prefrontal and medial temporal cortices during episodic memory retrieval. *Hum Brain Mapp*, 5(4): 323-327.

D. Research Support

Ongoing Research Support

Principal Investigator: Research Grant, Canadian Institutes of Health Research, *Brain noise and variability in sensory and cognitive function*, \$160,894 annually, 2010-2015.

Project Leader, JS McDonnell Foundation (USA), Network mechanisms underlying cognition and recovery of function in the human brain, \$1,362,000 annually, 2005-2010.

Completed Research Support

Co-investigator (NJ Lobaugh, PI, Sunnybrook Health Sciences Centre, Toronto, Ontario), Canadian Institutes of Health Research, *Quantitative Imaging of Brain White Matter*, \$99,301 annually, 2004-2009.

Principal Investigator: Research Grant, Canadian Institutes of Health Research, *Linking brain and behaviour through neural context*, \$142,989 annually, 2005-2009.

Principal Investigator: Research Grant, Natural Sciences and Engineering Research Council of Canada, *Spatiotemporal Modeling of Human Cognitive Function*, \$39,500 annually, 2003-2007.

Lead Investigator: Research Grant, New Emerging Teams Program, Canadian Institutes of Health Research (formerly MRC), *Development of an integrative computational neuroscience program to understand human mental function*, \$242,000 annually, 2002-2007.

Lead Investigator: Ontario Research & Development Fund – Infrastructure Support, *Behavior Research And Imaging Network: A Provincial Consortium for Neuroimaging*, \$3,240,082, 2002-2007.

Co-investigator (B Levine PI, Rotman Research Institute). Research Grant: NICHD, NIH, The functional neuroanatomy of cognition in traumatic brain injury: Executive functioning, memory, and rehabilitation, \$269,643 annually, 2002-2007.

Co-investigator (GV Simpson PI, Univ California, San Francisco) Research Grant: NIH/NSF Joint Initiative in Computational Neuroscience, *Interdisciplinary network in dynamic imaging of the human brain*, \$275,000 annually, 2002-2005.

Co-investigator (NJ Lobaugh, PI, Sunnybrook Health Sciences Centre, Toronto, Ontario), Canadian Institutes of Health Research, *Understanding age-related changes in brain communication: Relations to white matter alterations*, \$67,284, 2004-2008.