

## Part I: Magnetic Resonance Technologies *fMRI and MRS in the Clinic*

Over the past several decades, *Magnetic Resonance Imaging* (MRI) has become an essential modality in Canadian health care to detect and diagnose a variety of diseases, as well as to monitor response to therapy. Interestingly, MRI is an extremely adaptable technique, and new applications continue to be developed. One particularly promising application is the sub-field of functional MRI (fMRI), which enables indirect visualization of neurons that become active in the brain associated with specific human behaviours. Functional MRI has become a ubiquitous tool in basic neuroscience research, and clinical applications are beginning to emerge in areas such as neurosurgical planning, stroke and epilepsy.

*Magnetic Resonance Spectroscopy* (MRS), or *in vivo* nuclear magnetic resonance (NMR) can also be performed using many types of MRI systems. This technique allows one to directly probe the biochemical and metabolic makeup of tissues. Proton, or hydrogen ( $^1\text{H}$ ) MRS has become popular in clinical brain scanning to aid in evaluating brain hypoxia and tumour characterization. In addition this technique can be used to quantify some neurotransmitters and pharmaceuticals in brain tissue. While the  $^1\text{H}$ -MRS method has become clinically popular, few people realize that this spectroscopic method is not limited to only probing molecules with  $^1\text{H}$  nuclei. Rather, any atomic nucleus that has the property 'spin' can in theory be detected with multinuclear MRS. Biologically relevant nuclei include carbon ( $^{13}\text{C}$ ), fluorine ( $^{19}\text{F}$ ), sodium ( $^{23}\text{Na}$ ), and phosphorous ( $^{31}\text{P}$ ). With a host of available nuclei for MRS, evaluation of neurodegenerative diseases, cancer therapies, and metabolic disorders, to name a few, has become easier and safer.

Join us on **Thursday April 5<sup>th</sup>** at the **Living Arts Centre** in Mississauga for the first seminar in a three part imaging series. This first seminar will discuss the current state of *fMRI* and *MRS*, and advances in these magnetic resonance technologies.

**Date:** Thursday April 5, 2007

**Time:** 6:00pm - 6:30pm—Registration and Networking  
6:30pm—8:00pm—Magnetic Resonance Technology Presentations and Open Discussion  
*refreshments & hors d'oeuvres will be provided*

**Location:** The Living Arts Centre Mississauga—Bank of Montreal Room  
4141 Living Arts Drive, Mississauga ON L5B 4B8

To register, please e-mail [bcip@utm.utoronto.ca](mailto:bcip@utm.utoronto.ca). Space is limited.

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## Part I: Magnetic Resonance Technologies *fMRI and MRS in the Clinic*

### Speakers

#### Simon J. Graham, PhD, P Eng

Dr. Graham is an Associate Professor in the Department of Medical Biophysics, University of Toronto, Senior Scientist at the Rotman Research Institute, Baycrest Centre for Geriatric Care in Toronto, and a founding member of the Heart and Stroke Foundation of Ontario Centre for Stroke Recovery. The author of 50 scientific papers and 4 patents, he has extensive research experience in MRI and fMRI technology spanning basic signal biophysics, sensory and cognitive neuroscience, development of fMRI-compatible devices, and technology transfer. His research is funded by the Canadian Institutes of Health Research, the Heart and Stroke Foundation of Ontario, the Natural Sciences and Engineering Research Council, and the Ontario Research and Development Challenge Fund.

#### Michael D. Noseworthy, Ph.D.

Dr. Noseworthy received a M.Sc. from the University of Guelph for work in the evaluation of anaesthetic hepatotoxicity using MRI and *in vivo*  $^{31}\text{P}$ -NMR. Obtained a PhD from University of Guelph (1997) specializing in applications of MRI/MRS methods to assess free radical induced brain damage. From 1997-1999 was a postdoctoral fellow with Dr. Graham Wright, Imaging Physics, Sunnybrook Health Sciences Centre. From January 2000 to August 2003 worked as a MRI physicist at The Hospital for Sick Children, Toronto, and Assistant Professor in Medical Biophysics and Medical Imaging, University of Toronto. Currently Dr. Noseworthy is an Assistant Professor at McMaster University in Medical Physics, Radiology, and Biomedical Engineering. He is the director of MRI research at the Imaging Research Centre, Brain-Body Institute, St. Joseph's Healthcare, Hamilton. In addition Dr. Noseworthy is an Adjunct Professor in Medical Imaging at The University of Toronto and Adjunct Professor in Clinical Studies, University of Guelph, Ontario Veterinary College. His research interest is the assessment of tissue microstructure and metabolism using MRI and multinuclear *in vivo* nuclear magnetic resonance (NMR) spectroscopy.

Presentation: *Assessing the Brain Biochemical Environment using Magnetic Resonance Spectroscopy (MRS)*

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