Summer is here and I am excited about the nice weather, the outdoor fun, the TMII Summer Camp and all the current TMII initiatives presented in this 3rd TMII 2014 newsletter.

We continue to have a fantastic 2014. We just wrapped up the TMII annual symposium which continues to be a great success as you will be able to read below. Some of us came back from attending the ISMRM meeting in Milan with new innovative ideas in MRI techniques and some TMII members came back happy with awards in recognition for their work and service.

I am happy to announce the initiation of a seminar series focused on preclinical micro-imaging and the appointment of Dr. Gustav Strijkers from the Academic Medical Center in Amsterdam as TMII Visiting Professor with extensive expertise in preclinical imaging. We expect that this new initiative and the appointment of Gustav will demonstrate to our Sinai community the impact that these preclinical imaging tools and expertise available within TMII can have on biomedical science and discovery.

Finally, with the help of Dr. Bachir Taouli, Director of Cancer and Body Imaging within TMII and a collaboration with Siemens Healthcare Ultrasound, we acquired a state of the art ultrasound system that is available to all researchers within the TMII Imaging Core, check the details below.

I wish all of you a fun and productive Summer and thanks again for your commitment and support. I look forward to hearing your comments and suggestions.

---

**WHAT’S NEW?**

**TMII News & Updates**

**News**

Highlights from ISMRM: Hardien Dyvorne, PhD was given the summa cum laude award for his submission, “Highly Accelerated 4D Flow using Spiral Sampling and Dynamic Compressed Sensing for Flow Quantification in Abdominal Vessels”

Claudia Calcagno, MD PhD won second place in the Great Italian Art & Food Challenge for her submission, “The Last Supper- An Homage to da Vinci & Warhol”. For more information visit: mriscanart.com

---

Figure: Great Italian Art & Food Challenge submission by Rebecca Feldman, PhD. “Firefly Trails” was inspired by both a time of flight MRI image and the art of Italian Futurist Giacomo Balla whose abstract work captured the essence of motion and urgency as well as dynamic depictions of light.

---

**Updates**


Also from the Nanomedicine program, on June 4, 2014, Willem Mulder PhD, Zahi Fayad PhD and two renowned MGH investigators published a state of the art review about promising bioengineering and drug delivery approaches aimed at treating atherosclerotic disease in Science Translational Medicine. In this Special Issue about cardiovascular disease renowned investigators in the field also contributed perspectives, editorials and reviews. Dr. Mulder’s state of the art review entitled “Imaging and Nanomedicine in Inflammatory Atherosclerosis” served as the cover story for this Special Issue.

Lastly, Dr. Fayad has been recognized by ISMRM for his distinguished service as reviewer for the journal Magnetic Resonance in Medicine from 2012-2013.
Dr. Strijkers is associate professor at the Academic Medical Center (AMC) in Amsterdam, the Netherlands. At the AMC he leads a team of researchers, which develop novel cardiovascular MRI protocols to study the remodeling processes in the heart as a consequence of myocardial pathology.

As of January 2014, Dr. Strijkers regularly visits the Translational and Molecular Imaging Institute. During these 3 to 4 one-week visits per year he joins the research team of Prof. Fayad, Prof. Mulder and Dr. Calcagno to provide lectures, expert advice, and hands-on training on preclinical cardiovascular MRI.

Dr. Strijkers specializes in the use of advanced acceleration techniques to speed up the MRI acquisition and enable dynamic cardiovascular imaging with higher temporal and spatial resolution. Traditionally cardiac MRI is a slow technique because it requires the repeated acquisitions of a small portion of the image or movie distributed over multiple heartbeats.

Accurate synchronization to the heartbeat via ECG triggering in the high magnetic field of the MR scanner and suppression of breathing artifacts pose a challenge. Moreover, high blood velocities in the heart and its great vessels may lead to image artifacts.

For more reliable synchronization the team of Dr. Strijkers has developed self-gating technology, which derives synchronization from the MRI signals themselves instead of ECG leads. Scans can be accelerated by the use of mathematical reconstruction techniques that require less acquisition data (undersampling) while still providing similar or even improved image quality. The use of radial sampling techniques considerably reduces the echo time of the cardiac MRI sequence leading to less flow-related artifacts.

An example of this approach is in figure 1 with still cardiac images from a 15-frame movie at end diastole and end systole of a rat heart with myocardial infarction. The movies were acquired using a 2D self-gated center-out radial CINE acquisition. The fully sampled non-accelerated acquisition is shown on the left, and from left to right movie frames with varying degrees of acceleration and total acquisition times. Artifact free cardiac CINE MRI could be acquired in these rats with a scan time of 3 minutes and 47 seconds for the fully sampled acquisition.

Figure 1: Images from a 15-frame cardiac CINE acquisition at end systole and end diastole. The left column is the full non-accelerated acquisition. Columns 2-4 are images from accelerated acquisitions with varying degree of undersampling and scan time per slice.
Every summer TMII runs a summer science camp where 8 high school and college students are selected from a group of applicants from across the country to work in TMII. TMII Science Camp mainly focuses on neurological or psychiatric disorders and related technologic developments in imaging. There is a strong emphasis on technology development in the lab including principles of Magnetic Resonance Imaging (MRI) on human as well as animal models of disease.

The first year that a summer student comes, he/she mainly learns about the technology, and principles of the science behind a number of imaging modalities. The program consists of lectures and quizzes as well as training on animal handling and running imaging experiments.

Students help out with various projects that are ongoing and they will learn how to acquire and analyze data.

All students are asked to do a presentation on a topic of their choice at the end of the session to the group. For those students who have computer skills and interests, TMII also has a programming group where they can help with software development.

Students who have mastered the basics and return the second year, have a strong background to be able to devote their time to one dedicated project.

The program can only receive students who can commit full time, i.e. m-f/9-5 to maximize the training in a short amount of time. The program usually starts around the first week of July and runs through end of summer. It is critical that interested students attend full time during the first 6 weeks but by the end of summer they tend to be working more independently.

The program is flexible and nothing is fixed, the above is just a rough description what we have been doing for the past several years.

For more information contact Dr. Cheuk Tang.

---

**IMAGING SPOTLIGHT**

**Training the Next Generation of Imaging Scientists**

**TMII Science Camp**

---

**New Tools**

**Siemens Acuson S3000 Ultrasound**

A new method for the evaluation of the elastic properties of tissues is now available in the Cancer/Body Core. Acoustic radiation force impulse elastography is performed with a Siemens Acuson S3000TM (Siemens AG, Erlangen, Germany) ultrasound system. The principle of this method is that of the shearing of the examined tissue, which induces a smaller strain in hard tissues than in soft ones. The ultrasound probe automatically produces an acoustic ‘push’ pulse that generates shear-waves, which propagate into the tissue. Using image-based localization and a proprietary implementation of ARFI technology, shear wave speed may be quantified, in a precise anatomical region, focused on a region of interest, with a predefined size, provided by the system. Measurement value and depth are also reported, and the results of the elasticity are expressed in m/s. Clinical applications of ARFI imaging include: liver fibrosis quantification, breast, colorectal and prostate tumor imaging.

Right: ARFI imaging measurement in liver of 56-year-old man with liver cirrhosis. ROI = region of interest.

---

**Core Equipment**

**Bruker Biospec 7T MRI**

This is a high-resolution MR scanner for small animals. The maximum bore diameter for imaging is 15.4cm. This system is equipped with two gradient choices, a large built-in gradient system with up to 200 mt/m and a slew rate of 640 T/m/s. This gradient in combination with a large circular polarized coil will allow imaging of animals up to 15.4cm in diameter. The system is also equipped with a high performance gradient insert with 440mT/m and slew rate of 3,440 T/m/s for high-resolution imaging. The system has 2 transmit and 4 receive channels.

There is a 35mm ID circular polarized coil for in-vivo mouse imaging as well as a 4-channel phased array for mouse brain and a 4 channel phased array for mouse cardiac imaging. There are also 3 other dual tuned 20mm surface coils for 31P, 13C and 19F. The 7T Bruker is equipped with the Autopac system, a fully integrated animal handling, laser guided positioning system. Animal warming holders are available for rats and mice as well as a full spectrum of monitoring peripherals for ECG, triggering and respiratory monitoring etc.

---

For more information contact Dr. Cheuk Tang.

---

Cheuk Tang, PhD
Associate Professor, Radiology
Director, Imaging Core
cheuk.tang@mssm.edu

---

Icahn School of Medicine at Mount Sinai | Translational & Molecular Imaging Institute | One Gustave L. Levy Place, Box 1234 | New York, NY 10029-6574 | tmii.mssm.edu
BIC CORNER

BIC wants to thank all applicants of the 14 proposals, and all the reviewers, for their excellent contributions to the inauguration of the Brain Imaging Center pilot research funding awards. Based on the commendably thoughtful and thorough reviewers’ recommendations, the BIC science steering committee selected the three best scored projects to receive support. Congratulations to the awardees:

1) Effect of Methadone Maintenance Therapy on Neuroinflammation in HIV: A Pilot Study. (PI: Susan Morgello, MD; Co-Investigators: Matilde Inglese, MD, PhD, Desiree Byrd, PhD, Thomas Kraus, PhD)

2) Virtual tract tracing in the non-human primate brain using high field-strength MRI. (PI: Paula Croxson, PhD; Co-Investigators: Rafael O’Halloran, PhD, Priti Balchandani, PhD)

3) Using Oxytocin to Increase Self-Awareness in Drug Addiction. (PI: Scott Moeller, PhD; Co-Investigators: Mercedes Perez-Rodriguez, MD, PhD)

All others are encouraged to reapply to the next round (TBD). Please also keep reading our BIC tech meetings minutes for weekly updates.

Other news: Natalie S. Massenburg, M.A., joined the BIC team in mid-April. Natalie is BIC’s new Senior Clinical Research Coordinator. Natalie has a Master’s degree in Sociology with an emphasis on Women’s Health. Her background includes years at Mount Sinai working in the Department of Pathology as a Project Manager for the Manhattan HIV Brain Bank. She has also worked as a Clinical Coordinator in the Department of Health Evidence and Policy on Mount Sinai’s CHIPRA Centers of Excellence Collaboration for Advancing Pediatric Quality Measures (CAPQuaM).

UPCOMING EVENTS

- TMII Micro-Imaging Seminar Series, third Thursday of the month
- BIC Day - Tuesday October 28th. More details to follow

For more information on these and other events go to: http://tmii.mssm.edu/events/

CONTACTS

Zahi A. Fayad, PhD
Director, Translational and Molecular Imaging Institute
Director, Cardiovascular Imaging Program
Professor of Radiology and Medicine (Cardiology)
zahi.fayad@mssm.edu

Priti Balchandani, PhD
Director, High-Field MRI Program
Assistant Professor of Radiology
priti.balchandani@mssm.edu

Rafael O’Halloran, PhD
Chief, Imaging Acquisition - Brain Imaging Core
Assistant Professor of Radiology and Psychiatry
rafael.ohalloran@mssm.edu

Cheuk Y. Tang, PhD
Director, Imaging Core
Associate Professor of Radiology and Psychiatry
cheuk.tang@mssm.edu

Bachir Taouli, MD
Director, Cancer and Body Imaging Program
Professor of Radiology and Medicine
bachir.taouli@mountsinai.org

Venkatesh Mani, PhD
Cardiovascular Imaging
Assistant Professor of Radiology
venkatesh.mani@mssm.edu

Junqian Gordon Xu, PhD
Neuroimaging
Assistant Professor of Radiology
junqian.xu@mssm.edu

Willem J. M. Mulder, PhD
Director, Nanomedicine Program
Associate Professor of Radiology
willem.mulder@mssm.edu

Christopher J. Cannistraci, MS
Program Manager
Technical Operations Manager
christopher.cannistraci@mssm.edu

Ways to keep in touch

Website: http://tmii.mssm.edu
Youtube: http://www.youtube.com/watch?v=IbVJMsUmin0
Twitter: @TMIIincy
Numbers: Tel: (212) 824-8466 Fax: (646) 537-9589

Address: Leon and Norma Hess Center for Science and Medicine
1470 Madison Avenue (between 101st and 102nd St) - 1st floor
New York, NY 10029