

Translational & Molecular Imaging Institute

March, 2014
Issue 2

tmii.mssm.edu

Message from the Director

Already three months of the year have passed. Nevertheless we hope you had a great and successful start in 2014 and I would like to introduce our 2nd newsletter for this year. Very exciting events are being planned this Spring at TMII.

Please read below about some of the work being presented at the upcoming premier MRI meeting, the ISMRM in Milano. Very strong showing and Science from TMII members and their collaborators. Moreover, we are very excited to host another TMII symposium on May 29th with a wonderful list of speakers featuring the latest in fast imaging, big data, and novel ways to deliver drugs in the

context of neurological, oncological and cardiovascular diseases. As in previous years I encourage you to submit abstracts featuring your work to be presented as a poster and for the selected winners as a short talk.

Finally, on a personal note I want to thank all of you who supported me in the NYC Half Marathon last month. Even with the cold weather this year it was and still is a wonderful event and a great celebration of our beloved New York City. In the spirit of Promoting Health I want to encourage you all to participate in the upcoming 2014 American Heart Association Wall Street Run and Heart Walk (5K) on June 18 (<http://alturl.com/pha6d>).

This is another great event, great cause and one of the best way to remain healthy, sharp and creative. Speaking of creativity, check out the TMII - Custom Phantom by one of our recent faculty member Rafael O'Halloran.

To all keep up the good work and reach out to me for any ideas or suggestions to continue to build and make TMII strong.



Zahi Fayad, PhD

Director, Translational & Molecular Imaging Institute
Professor of Radiology and Medicine
zahi.fayad@mssm.edu

WHAT'S NEW?

TMII News & Updates

Save the date

The Translational and Molecular Imaging Institute presents the 4th Annual TMII Symposium. This will be a day-long event on Thursday May 29, 2014 and held at the New York Academy of Medicine. The TMII Symposium offers an opportunity for researchers and medical professionals to gain

insight into the current translational imaging research at Mount Sinai and other institutions in and outside the New York metropolitan area. Local and international invited speakers will speak about their work in the fields of big data in imaging, cardiovascular imaging, neuroimaging, cancer & body imaging and

nanomedicine. Any research currently involved in these fields are encourage to submit their work for the accompanying poster sessions.

For more information and registration:
<http://tmii.mssm.edu/symposium/>





Translational and Molecular Imaging Institute

4th Annual TMII Symposium - 2014



May 29th, 2014

Location:
New York Academy of Medicine

**Abstract Deadline:
May 8th, 2014**

For open registration and more information visit:
tmii.mssm.edu/symposium

<p>Opening Remarks Zahi A. Fayad, PhD Director, TMII Icahn School of Medicine at Mount Sinai</p> <p>Dennis Charney, MD Dean, Icahn School of Medicine at Mount Sinai</p> <p>Keynote John Darrell Van Horn, PhD The Mapping of Structural and Connectomic Alteration in Traumatic Brain Injury University of Southern California</p> <p>Neuroimaging Jon Shah, PhD Multimodal Simultaneous Imaging: Advances in MR-PET-EEG 3T and 9.4T in Humans RWTH Aachen University</p>	<p>Cardiovascular Imaging Sebastian Kozerke, PhD Beyond Nyquist – Accelerated Cardiovascular Magnetic Resonance Imaging University of Zurich</p> <p>Cancer & Body Imaging Andrew Rosenkrantz, MD Prostate Cancer: Defining a New Clinical Paradigm Through Multi-parametric MRI New York University</p> <p>Nanomedicine C. Shadi Thaxton, MD, PhD Therapeutic Opportunities for High Density Lipoprotein Nanoparticles Northwestern University</p> <p>Closing Remarks Burton Drayer, MD Chair, Radiology Icahn School of Medicine at Mount Sinai</p>	
---	--	--

Exploring new ways to visualize the brain through high field MRI

Priti Balchandani, PhD

As the Director of the High Field MRI program at TMII, Dr. Balchandani focuses on developing novel techniques to exploit the power of high-field MR magnets to visualize the brain in unprecedented detail. She leads a team of 7T scientists to devise creative engineering methods to overcome some of the main limitations of operating at high magnetic fields, thereby enabling high-resolution whole-brain anatomical, spectroscopic and

diffusion imaging as well as unlocking new contrast mechanisms and sources of signal. In order to achieve these goals, Dr. Balchandani's team focuses on novel radio frequency (RF) pulse and pulse sequence design as well as specialized hardware solutions such as parallel transmission. These techniques are ultimately applied to improve diagnosis, treatment and surgical planning for a wide range of neurological diseases and disorders. Some clinical areas of focus

for Dr. Balchandani's team are: improved localization of epileptogenic foci; imaging to reveal the neurobiology of depression; and development of imaging methods to better guide neurosurgical resection of brain tumors.



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

SCIENCE SPOTLIGHT

TMII at ISMRM

Researcher	Title	Format	Session	Day	Time	PI	Program
Guido Jajamovich	Combined DWI and DCE-MRI of hepatocellular carcinoma: correlation of perfusion and diffusion parameters. Initial experience.	E-poster	Body DWI/ MRS/ Female Pelvis Pregnancy	12-May	5:30pm	Taouli	Body/Cancer
Yong Cui	IVIM DWI of the Liver: Inter-platform variability between 1.5T and 3T	E-poster	Body DWI/ MRS/ Female Pelvis Pregnancy	12-May	5:30pm	Taouli	Body/Cancer
Hadrien Dyvorne	Highly Accelerated 4D Flow using Spiral Sampling and Dynamic Compressed Sensing for Flow Quantification in Abdominal Vessels	Talk	Velocity & Flow	13-May	10am	Taouli	Body/Cancer
Guido Jajamovich	DCE-MRI of hepatocellular carcinoma: perfusion quantification with Tofts model vs. shutter-speed model. Initial experience.	E-poster	Perfusion & Permeability	14-May	2:30pm	Taouli	Body/Cancer
Cecilia Besa	Comparison of Free-Breathing Radial 3D T1 VIBE to Standard Breath-hold 3D T1 VIBE During Hepatobiliary Phase Imaging after Gadoteric Acid Injection for Image Quality and HCC Detection	E-poster	Hepatobiliary 1	12-May	4:30pm	Taouli	Body/Cancer
Cecilia Besa	Usefulness of a 3D Dual-Flip-angle T1 mapping technique pre and post Gadoteric acid administration for the Assessment of Diffuse Liver Disease	E-poster	Hepatobiliary 1	12-May	4:30pm	Taouli	Body/Cancer
Octavia Bane	Feasibility and Reproducibility of R2* Measurement Under Oxygen and Carbogen Challenge in Healthy Subjects and Patients with Hepatocellular Carcinoma at 1.5 T and 3T	E-poster	Hepatobiliary 1	12-May	4:30pm	Taouli	Body/Cancer
Wei Huang (Oregon Health & Science Univeristy)	Variations in DCE-MRI Assessment of Breast Cancer Therapy Response: A Multicenter Data Analysis Challenge	Talk	Tumor Therapy Response: Preclinical & Clinical	15-May	4pm	Taouli (co-PI)	Body/Cancer
Claudia Calcagno	Delayed gadolinium enhanced MRI reveals nanotherapy-induced normalization of the vessel wall endothelium in atherosclerotic mice	E-poster	Vessel Wall Imaging & Emerging Technologies	13-May	2:30pm	Fayad	Cardiovascular
Claudia Calcagno	3D dynamic contrast enhanced (DCE) MRI of atherosclerotic plaques: image quality, temporal stability and ex vivo validation in a rabbit model	E-poster	Vessel Wall Imaging & Emerging Technologies	13-May	2:30pm	Fayad	Cardiovascular
Philip Robson	Optimal Sequence Weighting for 3D Dynamic Contrast Enhanced Imaging	E-poster	Vessel Wall Imaging & Emerging Technologies	13-May	2:30pm	Fayad	Cardiovascular
Venatesh Mani	A Multicenter MRI Protocol for the Evaluation and Quantification of Deep Vein Thrombosis	E-poster	CE & Non-CE MRA	13-May	1:30pm	Fayad	Cardiovascular
Venatesh Mani	Quantification of abdominal subcutaneous and visceral adipose tissue using a 3D CAIPIRINHA DIXON VIBE acquisition and automated segmentation	Poster	Hepatobiliary/ Abdominal Imaging Techniques	14-May	10am	Fayad	Cardiovascular
Jason Bini	Quantitative Carotid MR/PET Imaging: Comparisons to PET/CT and clinical evaluation of MR-Attenuation Correction versus CT-Attenuation Correction in MR/PET Emission data	E-poster	Stroke 1	15-May	11:30a	Fayad	Cardiovascular
Jason Bini	Wavelet-based Partial Volume Effect Correction for Simultaneous MR/PET of the carotid arteries	E-poster	Stroke 1	15-May	11:30a	Fayad	Cardiovascular
Mootaz Eldib	Attenuation Correction for Flexible MRI Coils Using the Ultra-short Echo Time Sequence in MR/PET Imaging	Talk	Advances in Human PET-MR	15-May	10:30a	Fayad	Cardiovascular
Pedro Ramos-Cabrer (University of Santiago de Compostela)	The effect of loading nascent HDL with gadolinium phospholipids in the structural stability of the particles	Poster	Molecular Imaging: MEMRI, Cell Tracking, etc.	15-May	10:30a	Mulder	Nanomedicine
Line Hansen (Aarhus Univeristy)	Development of a surface-switching theranostic lipid-PLGA hybrid nanoparticle platform	Poster	Stroke	13-May	4pm	Mulder	Nanomedicine
Rebecca Feldman*	Implementation of a self-refocused adiabatic spin echo pulse-pair modulated using the power independent of the number of slices (PINS) technique for simultaneous B1-insensitive multi-slice imaging	Poster	RF Design and Mapping	13-May	10am	Balchandani	Neuro
Rafael O'Halloran (Stanford University)	Prospective Phase Correction for Diffusion-Weighted SSFP Imaging In Vivo	Talk	Diffusion: Novel Acquisition	14-May	4pm	O'Halloran	Neuro
Rafael O'Halloran (Stanford University)	Diffusion-Weighted SSFP at 7T	Talk	Novel & Early High Field Human Imaging	16-May	8am	O'Halloran	Neuro
Matilde Inglese	Global and regional brain concentration of intra- and extra- cellular sodium in MS: a 7 Tesla MRI study	Talk	MS in White Matter	15-May	4pm	Inglese	Neuro

*Recipient of a highly competitive Travel Award of \$500 from the ISMRM

Table: TMII members and its collaborators had 22 abstract accepted to this year's joint annual meeting of the International Society of Medical Resonance in Medicine and the European Society for Magnetic Resonance in Medicine and Biology in Milan, Italy.

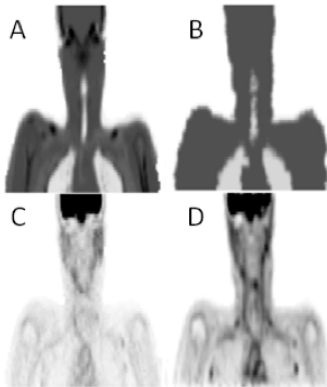
Technical Advances for Improved Quantitative PET in Combined MR/PET systems

Fayad Lab - Cardiovascular Imaging

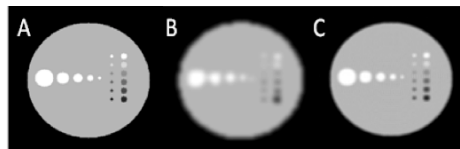
In combined MR/PET systems, the replacement of CT with MR still allows acquisition of high spatial resolution anatomical images but with superior soft tissue contrast and without delivering additional ionizing radiation. However, there are still unmet challenges to be overcome prior to translating these techniques into clinical practice, such as the development

of reliable and accurate attenuation correction methods. In PET imaging, the variable distribution of photon attenuation in different tissues must be corrected for in order to permit accurate quantitative evaluation of the final reconstructed image. CT images are directly related to electron density and can easily be transformed into a linear attenuation map at PET energy levels for use in PET reconstruction algorithms. MRI, in comparison, has no direct information about photon attenuation but rather measures proton densities and magnetic relaxation times. Attenuation correction therefore becomes a non-trivial exercise of deciding how to assign MR signal intensities voxel-by-voxel to empirical photon attenuation

coefficients. We have begun validating and exploring improvements for current MR-based attenuation correction (MRAC) methods for MR/PET against the current clinical standard CT-based attenuation correction (CTAC) implemented for PET/CT. In addition, the detailed anatomical information from MR may be used for correction of partial volume effects and improved quantification. We are currently developing post-reconstruction partial volume effect correction methods to improve PET quantification. These methods are typically very challenging since they require accurate coregistration between MR and PET. A combined MR/PET scanner is therefore naturally suited for developing novel PVE correction methods.



Attenuation correction for PET/CT and MR/PET A) CT attenuation map B) MR attenuation map C) PET from PET/CT D) PET from MR/PET



Partial Volume Effect (PVE) correction A) simulated MRI B) simulated PET C) PVE corrected PET



Jason Bini MSE
PhD Candidate
Biomedical Engineering
The City College of New York
Clinical Research Coordinator
TMII
jason.bini@mountsinai.org

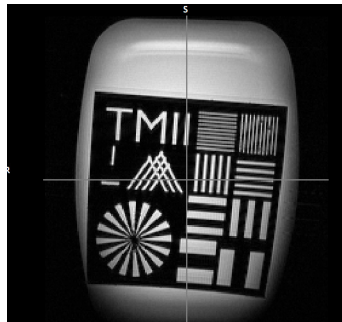
CORE SPOTLIGHT

New Tools

TMII - Custom Phantom

Rafael O'Halloran, PhD has designed a new, custom phantom for evaluating the resolution accuracy of new imaging sequences. After building the model in CAD software, Dr. O'Halloran enlisted the help of the Zahn Center at CCNY to print the phantom on their Project 3D printer.

Below is the first image of the phantom acquired at 7 Tesla. This T1 weighted scan was acquired at 700 microns isotropic resolution.



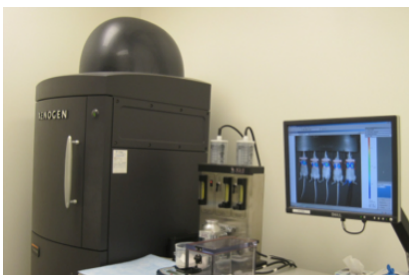
BIC - Corner

- Weekly tech meeting:
Mondays 12pm CSM 10fl, rm 101
- Next users meeting:
May 6th @ 3pm CSM 2fl, rm B
- BIC Funding Opportunity
\$30k in pilot funds for neuroimaging studies
Deadline for submission: April 25
Contact Anita Kalaj for details

For more info: anita.kalaj@mssm.edu

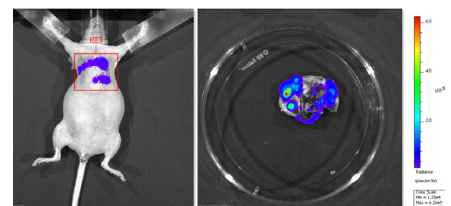
Core Equipment

Biophotonic IVIS-Spectrum



This is a rodent bioluminescent and fluorescent imaging device for in-vivo imaging of cellular processes and proliferation in mouse or rat models. This unit has integrated anesthesia for live imaging experiments. For fluorescent imaging it has both epi-excitation as well as scanning transillumination excitation options for more selective excitation to reduced background fluorescence signals. This scanner has excitation filters ranging from 420nm to

760nm and emission filters from 450nm to 860nm allowing imaging of near IR probes.



UPCOMING LECTURES

Date	Location	Lecture / Event	
Mon, April 28th 11:00-12:00pm	Hess Building TMII Large Conf. Room 117	Sebastian Furst, PhD Dipl.-Phys., Department of Nuclear Medicine, Technische Universität München	"Attenuation and Motion Correction in Integrated PET/MR"
Wed, May 28th 8:00 – 5:00pm	New York Academy of Medicine	TMII 2014 Annual Symposium	

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

UPCOMING EVENTS

- ISMRM - May 10-16, 2014 Milan, Italy - Registration and Housing Open
- HBM - June 8-12 2014 Hamburg, Germany - Early registration rates available until March 13
- TMII 2014 Symposium - May 29, 2014 New York Academy of Medicine. Abstract deadline: May 8th. Registration open: <http://tmii.mssm.edu/symposium/>
- BIC Day - Tuesday October 28th. More details to follow.

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

Venkatesh Mani, PhD

Cardiovascular Imaging

Associate Professor of Radiology
venkatesh.mani@mssm.edu

Willem J. M. Mulder, PhD

Director, Nanomedicine Program

Associate Professor of Radiology
willem.mulder@mssm.edu

Rafael O'Halloran, PhD

Chief, Imaging Acquisition Core

Associate 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

Junqian Gordon Xu, PhD

Neuroimaging

Associate Professor of Radiology
junqian.xu@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>
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