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Mount
Sinai

WHAT'S NEW

FACULTY SPOTLIGHT

SCIENCE SPOTLIGHT

IMAGING SPOTLIGHT

CORE SPOTLIGHT

BIC CORNER

Translational & Molecular Imaging Institute

Spring, 2015
Issue 6

tmii.mssm.edu

Message from the Director

We kick off this year with plenty of TMII news from student graduating and staff leaving to new ventures. We also welcome a new financial and administrative team. Many of our faculty and trainees continue to receive new grant and recognition for their work. We feature in this issue work by two of our neuroimaging faculty Dr. Gordon Xu on CNS imaging and the High-Field Imaging Program of Dr. Priti Balchandani.

We also report on some the contributions from

TMII and collaborators at some upcoming imaging conferences.

In the Core Spotlight we provide some information on preclinical ultrasound system and what can this improve of our work in animal models. We finally feature news and announcements from BIC.

Don't forget to spread the word about the 5th Annual TMII Symposium scheduled for

July 24, 2015. We look forward to all of your participation.

I wish all a great read of the TMII Newsletter and plenty of warm weather!



Zahi Fayad, PhD
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WHAT'S NEW?

TMII News & Updates

5th Annual TMII Symposium registration and abstract submission is now open. For more information visit <https://tmii.mssm.edu/symposium/2015/>.

Congratulations to Jason Bini, PhD of the Fayad lab. This winter, Dr. Bini, successfully defended his thesis entitled "Validation and Improvement of Quantitative Positron Emission Tomography of Atherosclerotic Plaque Metabolic Activity with Combined PET/MR". In March, Dr. Bini began his postdoctoral fellowship with Dr. Richard Carson, Director of the Yale University PET Center.

Well done to Dr. Fayad and his team were **awarded** a 5 year, \$1.5 million competitive renewal on his R01 - "MR/PET Imaging of Coronary Atherosclerosis"

Sara Lewis, MD, Bachir Taouli, MD and co-authors were **awarded** the 2015 SAR Morton A. Bosniak Research Award (\$15,000) for the work titled: Multiparametric MRI for Assessment of Renal Transplant Dysfunction.

The NIMH called, BIC faculty, Dr. Prantik Kundu's new **publication**, "Elegant New fMRI Methodology Eliminates Noise, Brings Brain into Focus". Read more about his cutting edge

work here: <http://content.govdelivery.com/accounts/USNIMH/bulletins/f69587>.

TMII say farewell and thank you to Ayana Haynes and Inna Gurewitz. Ayana will remain at MSSM in the department of Social Services and, after more the five years with TMII, Inna will be moving to the NYU Langone Medical Center as a departmental administrator.

TMII welcomes the following new members to the administrative staff; Catherine Ma, MPH will be the new Administrative Coordinator and Taja Ferguson, MPH who will be taking over as Financial Manager for TMII.

UPCOMING EVENTS

- TMII Seminar Series

> Monday April 20th, 11:00-12 pm, Hess Center - Davis Auditorium (2nd Floor): Eric Barnhill, PhD; University of St. Andrews - "Super-Resolution MR Elastography with the Elastography Software Library (ESL)"

- BIC Meetings

> Technical Group Meetings - Every Monday 12 - 1 pm Hess 10-101

> 2nd Annual BIC Day - October 7th, 2015

> 5th Annual TMII Symposium July 24, 2015. 8 am - 5 pm Davis Auditorium Hess Center for Science and Medicine

> **Keynote** - Roderic I. Pettigrew, PhD, MD - Director, National Institute of Biomedical Imaging and Bioengineering - National Institutes of Health

> **Neuroimaging** - Susumu Mori, PhD - Professor, Radiology - Johns Hopkins University School of Medicine

> **Cardiovascular Imaging** - Matthias Stuber, PhD - Professor, Center of Biomedical Imaging (CIBM) -University Hospital of Lausanne

> **Nanomedicine** - Chrit Moonen, PhD - Professor, Radiotherapy - University Medical Center Utrecht

> **Cancer & Body Imaging** - Richard L. Ehman, MD - Professor, Radiology - Mayo Clinic

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

Neuroimaging of the Central Nervous System - Brain Optic Nerve and Spinal Cord

Junqian "Gordon" Xu, PhD

As a neuroimaging faculty at TMII, Dr. Xu has been engaged in both collaborative team science and independent research.

Before joining Mount Sinai, Dr. Xu was a key member of the WU-Minn Human

Connectome Project (HCP) Operational Team 1 (OT1 -- MR hardware, pulse sequences, pre-processing) at the Center for Magnetic Resonance Research (CMRR), University of Minnesota. Since joining Mount Sinai in 2012, Dr. Xu has been leading the efforts in disseminating the latest advances in multiband acquisition, image pre-processing, analyses, and informatics, developed within the HCP consortium, through the neuroimaging community at Mount Sinai.

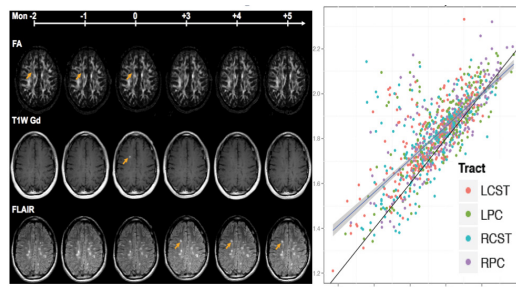


Figure: Quantification of CNS tissue microstructure and function

fellowship at Washington University (WU) School of Medicine. Working with longtime collaborators at WU, the optic nerve imaging research (Dr. Xu as site-PIs) has recently been funded by NINDS (R21) and NEI (U01). The spinal cord imaging research is currently supported by pilot funding from the Radiological Society of North America (RSNA) and International Progressive Multiple Sclerosis Alliance (IPMSA). Building upon these technical development and pilot studies, Dr. Xu's lab is poised to advance spinal cord imaging acquisition

Dr. Xu's independent research has been focusing on optic nerve and spinal cord imaging since his National Multiple Sclerosis Society (NMSS) supported postdoctoral

and analyses techniques at both 3T and 7T, with applications to multiple sclerosis and spinal cord injury.

Dr. Xu's lab currently has one post-doc (Joo-won Kim), focusing on advanced image analysis and one graduate student (Benjamin Ely, co-mentored with Dr. Emily Stern) from the Neuroscience PhD program. Recent part-time members in the lab include Jamilur Reja and Joe Borrello (both CCNY BME graduates), whom has recently been accepted by the Mount Sinai MD and PhD program, respectively; and Sudeep Pisipaty (undergraduate at NYU).



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SCIENCE SPOTLIGHT

High-Field Imaging Program

Priti Balchandani, PhD

The infrastructure of the ultrahigh field MRI program at TMII has been established and the 7 Tesla magnet is now producing high-resolution images of human brain. The 7T team is performing cutting-edge technical development to perform anatomical, diffusion and spectroscopic imaging at unprecedented spatial resolutions. They are applying these methods to improve diagnosis, treatment and surgical planning for neurological diseases such

as epilepsy, psychiatric illnesses and brain tumors. The team has recently grown to include Judy Alper, MS, an engineering student from CCNY. The team has been very productive. They have generated three peer-reviewed papers:

- "Semi-adiabatic shinnar le-roux pulses and their application to diffusion tensor imaging of humans at 7T.", Balchandani, et.al., *Magnetic Resonance Imaging* (2014)

- "Ultra-High-Field MR Neuroimaging." Balchandani, P, et.al. *American Journal of Neuroradiology* (2014)
- "A Semi-Adiabatic Matched-phase Spin echo (SEAMS) Power Independent of the Number of Slices Pulse-pair for B1-Insensitive Simultaneous Multi-Slice Imaging" Feldman R, et.al. *Magnetic Resonance in Medicine* (2015)

Additionally, the group has one submitted manuscript, 7 accepted International Society for Magnetic Resonance in Medicine (ISMRM) abstracts for the 2015 annual meeting, two educational talks at the 2015 ISMRM meeting (see Imaging Spotlight for details), one filed provisional patent and 2 additional invention disclosures. Dr. Balchandani recently gave Neurosurgery Grand Rounds here at ISMMS with collaborator Dr. Raj Shrivastava entitled, "Exploring new ways to visualize the brain through 7T MRI". The TMII High Field have created a website containing an overview of research and new tools developed: <http://tmiihighfield.com/>. Going forward, the team plans to continue technical development at a rapid pace, while maintaining focus on clinical translation.



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Figure: High-Field Group from left to right; Bei Zhang, PhD, Rebecca Feldman, PhD, Priti Balchandani, PhD, Jason Bini, PhD, Hadrien Dyvorne, PhD

TMII & BIC on the Road

International Society for Magnetic Resonance in Medicine - 23rd Annual Meeting & Exhibition May 30 - June 5, 2015 - Toronto, Canada

Researcher	Title	Format	Session	Day	Time	PI	TMII Program
Temel Kaya Yasar	Interplatform Variability of Liver and Spleen MR Elastography	Talk	Hepatobiliary 1	1-Jun	14:15	Taouli	Cancer/Body
Temel Kaya Yasar	Optimal Motion Encoding Scheme for MR Elastography	Talk	Elastography	5-Jun	8:00	Taouli	Cancer/Body
Temel Kaya Yasar	MR Elastography of the Liver: Qualitative and Quantitative Comparison of GRE and EPI Sequences	E-poster	Hepatobiliary 1	3-Jun	11:00	Taouli	Cancer/Body
Sara Lewis	Qualitative and quantitative assessment of intrahepatic cholangiocarcinoma using diffusion weighted imaging with histopathologic correlation: preliminary results from a bi-center series.	E-poster	Hepatobiliary 2	3-Jun	10:00	Taouli	Cancer/Body
Cecilia Besa	Metastatic Hepatic Neuroendocrine Tumors: Correlation of Quantitative Diffusion and Dynamic Contrast Enhanced MRI with Tumor Grade	E-poster	Gastrointestinal MRI, Diabetes, Nutrition, Metabolism, Hepatobiliary	3-Jun	10:00	Taouli	Cancer/Body
Cecilia Besa	DCE-MRI of prostate cancer: perfusion quantification with Tofts model vs. shutter-speed model. Initial experience	E-poster	Cancer: Others	2-Jun	16:00	Taouli	Cancer/Body
Bachir Taouli	MR Contrast Agents Overview	Talk	Body MRI: Optimize Your Clinical Practice - Educational Course	31-May	9:00	Taouli	Cancer/Body
Bachir Taouli	Predictive MRI Biomarkers to Assess Therapeutic Outcome in Cancer	Talk	Cancer Therapeutics & Monitoring Therapy with MRI - Educational Course	1-Jun	14:15	Taouli	Cancer/Body
Bachir Taouli	Power - Pitch	Session Moderator	Cancer	3-Jun	16:00	Taouli	Cancer/Body
Claudia Calcagno	Self-gated dynamic contrast enhanced (DCE) MRI with compressed sensing acceleration to quantify permeability in the aortic root of atherosclerotic mice	Talk	Vessel Wall Imaging	3-Jun	10:00	Fayad	Cardiovascular
Claudia Calcagno	Ultra-high field MRI of aortic plaques in a rabbit model: initial experience and comparison between 1.5T, 3T and 7T	Poster	Vessel Wall Imaging	4-Jun	10:30	Fayad	Cardiovascular
Mootaz Eldib	MR Guided Motion Correction for Yttrium 90 Imaging using a Simultaneous PET/MRI Scanner	E-poster	Hybrid Systems, Gradients & Monitoring	1-Jun	14:15	Fayad	Cardiovascular
Mootaz Eldib	Feasibility of 18F-FDG Radio-Tracer Dose Reduction in Simultaneous Carotid PET/MR Imaging	E-poster	Hybrid Systems, Gradients & Monitoring	1-Jun	14:15	Mani	Cardiovascular
*Francois Fay	Multimodal in vivo evaluation of a surface-switching nanoparticle platform	Talk	Imagine Drug Delivery & Drug Function	2-Jun	13:30	Mulder	Nanomedicine
Priti Balchandani	High Field Imaging	Educational Talk	MR Physics & Techniques for Clinicians - Educational Course	4-Jun	17:20	Balchandani	Neuro
Hadrien Dyvorne	Diffusion-Weighted Matched-phase Adiabatic Spin Echo (DW-MASE) Sequence for Ultrahigh Field Brain Diffusion-Weighted Imaging	E-poster	Diffusion Sequences & Sampling	1-Jun	10:45	Balchandani	Neuro
Hadrien Dyvorne	Improved Abdominal Diffusion-Weighted Imaging at 3T using Optimized Shinnar-Le Roux Adiabatic Radiofrequency Pulses	Poster	Body DWI, Technical Development & Contrast	2-Jun	10:00	Balchandani	Neuro
Hadrien Dyvorne	Slice-selective adiabatic T2 preparation using a modified STABLE pulse	Poster	RF Pulse Design	3-Jun	16:00	Balchandani	Neuro
Rebecca Feldman	7T MRSI using Semi-Adiabatic Spectral-spatial Spectroscopic Imaging (SASSI) for improved B1-insensitivity in refocusing and reduced chemical shift artifact	E-poster	UHF Acquisitions: Neuro	1-Jun	15:15	Balchandani	Neuro
Rebecca Feldman	7T Imaging of patients with focal epilepsy who appear non-lesional in diagnostic 1.5T and 3T MRI scans: first results	Power-Pitch	High Field Applications	4-Jun	10:30	Balchandani	Neuro
Bei Zhang	Evaluating the SNR performance of using dielectric pads with multiple channel RF coils at 7T	Poster	RF Engineering	2-Jun	16:00	Balchandani	Neuro
Bei Zhang	RF Modeling	Educational Talk	RF Engineering: Coils - Educational Course	31-May	11:30	Balchandani	Neuro
Rafael O'Halloran	Correction of Artifacts Caused by Transient Eddy Currents in Simultaneous Multi-Slice dMRI	E-poster	Diffusion Acquisition	1-Jun	10:45	O'Halloran	Neuro
Rafael O'Halloran	Widespread White Matter Integrity Abnormalities in Cocaine Use Disorder Assessed by High Resolution dMRI and Tractography	E-poster	Addiction, Drug Exposure, Pain, Sleep	2-Jun	10:00	O'Halloran	Neuro
Victoria Wang	A Pilot Study of Early Cognitive And Brain Imaging Changes Associated With Risk Factors for Cardiovascular Disease	Poster	New Insights & Innovations in Cardiovascular MRI	4-Jun	10:00	Tang	Neuro
Bei Zhang	7T 22ch Wrap-around Coil Array for Cervical Spinal Cord Imaging	Talk	RF Coil Arrays	3-Jun	13:30	Xu	Neuro
Joo-won Kim	ISMRM New Entrant Stipend Award	-	-	-	-	Xu	Neuro

*Recipient of a highly competitive Trainee Educational Stipend of \$1020

Organization for Human Brain Mapping - 2015 Annual Meeting - June 14-18, 2015 - Honolulu, Hawaii

Researcher	Title	Format	Session	Day	Time	PI	TMII Program
Benjamin Ely	Extent of Myelination in the Habenula Correlates with Human Behavior	Poster	Disorders of the Nervous System	16-Jun	12:45	Xu/Stern	Neuro
Joo-won Kim	In Vivo Human Habenula Segmentation Using Subcortical Myelin Content	Poster	Modeling and Analysis Methods	17-Jun	12:45	Xu	Neuro
Avisha NessAiver	FBIRN-X: an Updated FBIRN Quality Assurance Protocol for Slice Accelerated fMRI	Poster	Imaging Methods	15-Jun	12:45	Xu	Neuro
Junqian Gordon Xu	Session Chair	Oral	MRI Acquisition	17-Jun	10:30	Xu	Neuro
OHBM HCP Course : Exploring the Human Connectome - June 8-12, 2015 - Honolulu, Hawaii							
Junqian Gordon Xu	HCP Acquisition Basics	Educational Lecture	Lecture 1	8-Jun	8:00	Xu	Neuro
Junqian Gordon Xu	Using 7T Multimodal HCP Data	Educational Lecture	Lecture 4	11-Jun	17:00	Xu	Neuro

CORE SPOTLIGHT

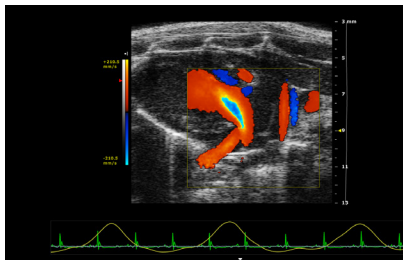
Micro Ultrasound

Vevo2100 Imaging System

This micro-ultrasound system is for small animal models (mice to rabbits) of disease, located in the Small Animal Imaging Center. This scanner is capable of all imaging modes found in clinical US scanners

- B-Mode (2D) imaging for anatomical visualization and quantification, with enhanced temporal resolution with frame rates up to 740 fps (in 2D for a 4x4 mm FOV)
- M-Mode for visualization and quantification of wall motion in cardiovascular research
- Anatomical M-Mode for adjustable anatomical orientation in reconstructed M-Mode imaging
- Pulsed-Wave Doppler Mode (PW) for quantification of blood flow
- Color Doppler Mode for detection of blood vessels including flow directional

- information and mean velocities
- Power Doppler Mode for detection and quantification of blood flow in small

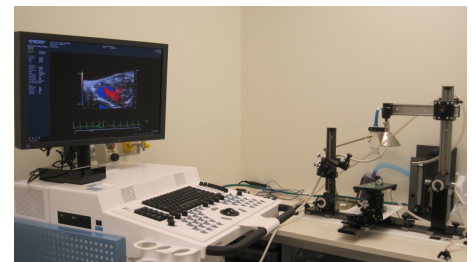


- vessels not visible in B-Mode
- Tissue Doppler Mode for quantification of myocardial tissue movement; for example
- Vevo MicroMarker® Nonlinear Contrast Agent Imaging – for quantification of relative perfusion & molecular expression of endothelial cell surface markers
- 3D-Mode Imaging for anatomical and

vascular visualization

- Digital RF-Mode for the acquisition and exportation of radio frequency (RF) data in digital format for further analysis
- ECG and Respiration Gating are used to suppress imaging artifacts due to respiration and cardiac movements

For more information contact Cheuk Tang (cheuk.tang@mssm.edu), Director of the Small Animal Imaging Center.



BIC CORNER

The BIC website (<https://bic.mssm.edu>) is available to promote Mount Sinai neuroimaging BIC users who can login to obtain technical information to enhance their research. Pages provide a self-service login request on the right-side of each web page (or from <https://bic.mssm.edu/accounts/signup/>). Logging in provides additional links to BIC services including the XNAT study management tools, SOMA and PYRAMID reconstruction and processing servers and the MINERVA supercomputer. Minerva now hosts the BIC image pre-processing pipeline, MITK and BrainSuite binaries for tractography and network analyses and a pre-configured installation of the Nipype interface and pipeline system providing a Python language workflow engine for multiple toolsets including SPM, FSL, and FreeSurfer. Comprehensive descriptions of facilities, resources and protocols are also available on the BIC website to support study designs and grant preparations. A survey to solicit feedback from the BIC Technical group,

and details for starting projects are available from the panel of quick links on each page.

BIC now offers the Human Connectome Project (HCP) 500 Subjects MRI Data Release to Mount Sinai. Local access will speed downloads of these Very Big Data. Neuroimaging at Sinai is also expanding. Anaesthesia equipment for the Skyra 3 Tesla scanner has been installed, and audio-visual equipment to extend the Siemens 7 Tesla scanner's range of functional MRI capabilities will arrive in May. An automated pipeline for diffusion-weighted 7 T connectivity has been developed and tested on Nipype scripts. These scripts will join the loadable module of packages on MINERVA. A high-resolution 7 T imaging protocol including structural, diffusion and functional MRI is being piloted. Similarly to the 3T, combined with developing customized pipelines, the 7T protocol, hardware and software will facilitate use of this state-of-the art scanner.

Please join in congratulating: Daniela Schiller

PhD for receiving the Klingenstein-Simons Fellowship Award in the Neurosciences 2014 (<http://www.klingfund.org/index.php>); Anna Zilverstand PhD for receiving two years' postdoctoral RUBICON funding from the Dutch government to implement 3T fMRI neurofeedback with the NARC lab; and BIC researcher James Murrough MD and collaborators in the Psychiatry MAP group for their recent [publication](#) on ketamine's antidepressant effects on emotion perception.

BIC Faculty:

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[Rafael O'Halloran, PhD](#)
Chief, Imaging
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