Icahn School of Medicine a Mount Sinai

Translational & Molecular Imaging Institute

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Message from the Director

I write this as we are well into the brand new year after I hope for all of you some great December break celebrating the holidays with your loved ones and families. Indeed, here at TMII we continue to have reasons to celebrate. One of our TMII family members, Dr. Willem Mulder has been promoted to Full Professor with Tenure in the Department of Radiology. I cannot be happier to announce this wonderful achievement from of my best colleagues and friends. You can read about his journey with us at TMII and about some of his accomplishments.

As always we also have reasons to celebrate all the progress being made by our wonderful TMII members as exemplified by one of our recent trainees, Alan Seifert from the Gordon Xu's laboratory, showing the exiting work with our 7T whole body MRI scanner in cervical spinal cord and brainstem imaging.

We also are looking forward to celebrate two exiting upcoming events, April 8 the BIC 1st annual 10k run, I know many of how have been training hard for this event and I look forward to a great and fun run from all of you. In addition, the April 22 6th Annual TMII Symposium, which as usual has a superstar speakers line up: Bruce Fischl from MGH; Mark Griswold from Case Western; Anna Moore from MGH; Julie Price from the University of Pittsburgh; and Debiao Li from Cedars Sinai. Please don't forget to register for both events asap and also submit your abstracts for the TMII Symposium. We look forward for a continued robust participation.

Finally, I need one big favor from you. Mount Sinai is putting together a new Strategic Plan in advance of a capital campaign that will be launched in early 2017. TMII and Radiology were charged with formulating a Strategic Plan (SP) that encompasses basic and clinical imaging research and education. We have already started the planning for the SP and we will reaching to all of you for input and help. Meanwhile, please feel free to email me with any thoughts on this topic or any topic. I wish you a great TMII newsletter read.

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WHAT'S NEW?

TMII News & Updates

Congratulations to Rebecca Feldman, PhD, from Priti Balchandani's High Field Imaging lab, for her recent publication "A Semi-Adiabatic Spectral-Spatial Spectroscopic Imaging (SASSI) Sequence for Improved High Field Magnetic Resonance Spectroscopic Imaging". An early view of the paper was published online in Magnetic Resonance in Medicine.

In addition to all the great conferences coming up, don't miss the ISMRM workshop on Molecular & Cellular MRI: Focus on Integration, June 8-11 in Amsterdam, chaired by TMIIs own, Willem Mulder, PhD.

Lastly, the 2016 TMII calendar is now available on Shutterfly. Thank you to all those in TMII who contributed and Rebecca Feldman for putting it all together.

UPCOMING EVENTS

TMII Frontiers of Imaging Seminar Series

> Thurs Feb 25, 2016 1 - 2pm: J. Thomas Vaughan, PhD - Professor, Univeristy of Minnesota "*The future of MRI: More power for research and more utility for diagnostics*" - Hess Center Seminar Room B

TMII Seminar Series

> Tues Feb 9, 2016 12 - 1 pm: Satish Viswanath, PhD - Research Assistant Professor, Case Western Reserve University "*TBA*" - Hess TMII Conference Room s1-117

> Thurs Feb 11, 2016 11am - 12 pm: Joao Cavalcante, PhD - Assistant Professor, University of Pittsburgh "*Risk Profiling in Aortic Stenosis Using Multimodality Imaging*" - Hess Center TMII Conference Room s1-117

> Fri Feb 19, 2016 11am - 12pm: Naeim Bahrami, MS, PhD Canididate, Wake Forest University "*DTI Imaging and structural network connectivity changes associated with Subconcussive Impacts in Youth Football Players*" - Hess Center TMII Conference Room s1-117

> Fri Feb 26, 2016 10 - 11am: Malgorzata Marjanska, PhD - Associate Professor, Univeristy of Minnesota "*Itered Neurochemical Profile in the Healthy Elderly Brain Measured via 7 T ^{1}H MRS*" - Hess Center TMII Conference Room s1-117

> Thurs Apr 7, 2016 1 - 2pm: Elena Aikawa, MD, PhD - Associate Professor, Harvard Medical School/Brighman and Women's Hospital "*TBA*" - Hess Center TMII Conference Room s1-117

> April 22, 2016 8am - 5pm: 6th Annual TMII Symposium - REGISTRATION AND ABSTRACT SUBMISSION OPEN!

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

FACULTY SPOTLIGHT

Captivated by MR: TMII Faculty Awarded Full Professor and Tenure

Willem Mulder, PhD

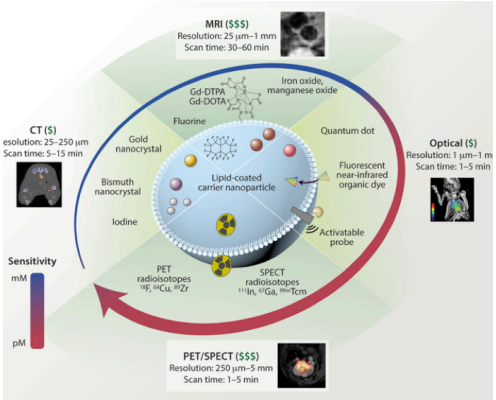
Captivated by an MR image of a circular structure on the cover of Circulation, one of the top cardiovascular research journals, Dr. Willem Mulder decided to investigate the publication's first author Zahi Fayad. At the time, early 2002, Dr. Mulder freshly started his Ph.D. trajectory in Professor Klaas Nicolay's newly founded MRI lab at the Department of Biomedical Engineering of the Eindhoven University of Technology in The Netherlands. The initial focus of Dr. Mulder's project was on MR phenotyping of atherosclerosis in mice. He soon discovered Dr. Fayad was clearly a leader in this field, after publishing a series of high profile papers on vessel wall MRI in mice, rabbits and humans. Dr. Fayad was the rising star in cardiovascular imaging, which prompted Dr. Mulder to closely monitor his lab's output.

Driven by increasingly growing frustrations, the result of doing research in a new lab that still lacked permits for work in live mice, Dr. Mulder decided to exploit his undergraduate experience in therapeutic nanoparticle synthesis. Instead of trying to replicate Dr. Fayad's work, he decided to develop nanoparticle MRI contrast agents that could be employed for vessel wall imaging. In retrospect, this was a decision that would determine Dr. Mulder's scientific career.

At a molecular imaging conference in Cologne (Germany) in 2005, Dr. Mulder had the pleasure meeting Dr. Fayad in person. Dr Fayad invited him to spend a month in his lab later that year. "In April 2006, with a heavily sunburned head (I didn't realize a New York April sun could be this relentless) I met with Drs. Drayer and Charney, and was offered the opportunity to establish my own lab by Dr. Fayad, who was recently promoted to full professor. In October 2006 some of my family, friends and very recently acquired girlfriend Marielle, gathered at Amsterdam Airport to escort me into this new journey. "

After arriving in New York Dr. Mulder was immediately productive, writing two reviews. Experimentally, he was very fortunate to get along very well with Dr. Fayad's new postdoc David Cormode, who now heads his own lab at UPenn. Together, they invigorated Dr. Fayad's atherosclerosis molecular imaging agent program, while Dr. Mulder's own research focused on cardiovascular nanomedicine. He aspired to explore the application of nanoparticle therapy to treat inflammatory atherosclerosis, for which his first student Mark Lobatto laid important groundwork.

In 2009, Dr. Fayad expressed his desire to apply for the National Heart Lung and Blood Institute's Program of Excellence in Nanotechnology to Dr. Mulder at a dinner meeting in a SOHO restaurant. They then outlined a strategy and put in an application for a $16.5 million program, which was awarded to Dr. Fayad in 2010. This considerably elevated the nanomedicine effort and allowed Dr, Mulder establish a topnotch nano team at Mount Sinai. At the same time, Dr. Mulder started submitting his own R01 applications, the first one being awarded in 2011, the second and third in 2014.



Nanoparticles can be labeled with a variety of imaging agents to enable their detection in plaque cells with CT, MRI, optical methods, or nuclear imaging, such as PET and SPECT. The relative costs, sensitivity, scan time range, and resolution range are indicated.

Today, the Nanomedicine Lab resides at the seventh floor of Mount Sinai's Hess Center for Science and Medicine. The lab's research efforts revolve around the development and application of nanomedicine to diagnose and treat cardiovascular disease and cancer. Additionally, the lab works to develop innovative technologies to understand nanoparticle in-vivo behavior to translational studies in pig models and nonhuman primates. The network is extensive and internationally oriented, formalized by Dr. Mulder's secondary Professor appointment at the Academic Medical Center (AMC) of the University of Amsterdam. This arrangement allows the exchange of students and intellectual capital, exemplified by the first in human cardiovascular nanotherapy trials at the AMC; technology that was developed in the Mount Sinai lab.

"The nanomedicine team members make me particularly proud. They are diligent, collaborative and very hardworking individuals, but they are also fun, mischievous at times. Zahi [Fayad] taught me to create a family-like mentality of trust, generosity and loyalty. I took this advice to heart and consider it one of the forces behind our success. I am very grateful for the school's support and its leadership's vision, and feel the responsibility to keep on elevating the level of innovation and quality of my lab's output. To become a tenured professor at one of America's top medical schools was the last thing on my mind when hugging my friends and family goodbye at Amsterdam Airport's international terminal, a little over 9 years ago."

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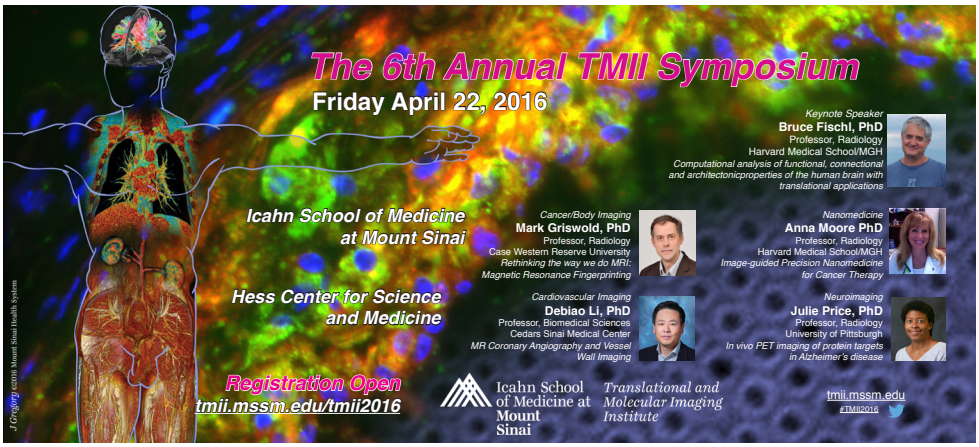
SCIENCE SPOTLIGHT

6th Annual TMII Symposium

The TMII Symposium is a full day educational event where faculty, staff and trainees from Mount Sinai and outside institutions present their current or future research in the field of medical imaging. The sessions throughout the day are a mix of internationally recognized invited speakers and attendee-submitted poster and oral presentation. Each session, cardiovascular imaging, neuroimaging, cancer & body imaging and nano medicine, will have one invited speaker give a talk and one oral presentation chosen from the submitted abstracts. Registeration and abstract submittions open now!



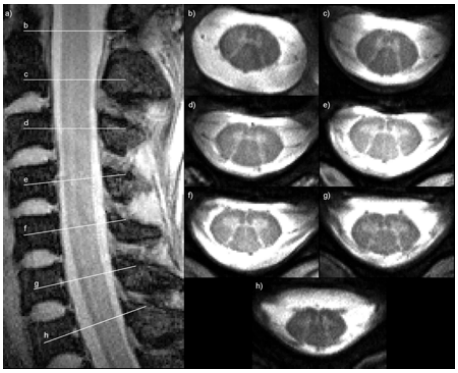
IMAGING SPOTLIGHT

Cervical Spinal Cord and Brainstem Imaging at 7 T

Alan C. Seifert, PhD - Xu Lab

The spinal cord houses circuits which modulate pain signals based on both descending input from the brainstem and concurrent vibrotactile stimuli from the periphery. Loss of modulatory input and preservation of sensory pathways may set the stage for neuropathic pain. Greater understanding of these circuits would improve our knowledge of chronic pain after spinal cord injury.

Functional MRI is more difficult to perform in the brainstem and spinal cord than in the cortex because of the small size of these structures and, due to their proximity to the heart, lungs, and vertebrae, their greater vulnerability to motion and magnetic field inhomogeneities. TMII's new 22-channel 7 T head and neck RF coil provides excellent B1+ transmit efficiency and SNR throughout the entire brainstem and cervical spine, leading to improved image resolution. This new RF coil, in combination with suppression of flowing CSF, advanced shimming, and the enhanced BOLD signal at ultra-high field will enable us to investigate these subcortical structures with fMRI.



Axial MEDIC images with 300 µm in-plane resolution from C1 to C7 vertebral levels, demonstrating excellent gray-white matter contrast. Image courtesy of Joo-won Kim, PhD

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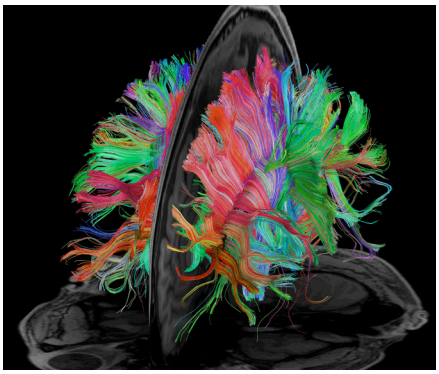
CORE SPOTLIGHT

Siemens MAGNATOM Skyra 3T

This is an FDA approved 3 Tesla human MRI scanner. Its wide bore design (173 cm system length with 70 cm) can accommodate subjects with larger body compositions compared to the 60 cm bore of a typical clinical 1.5T & 3T. A newly deigned RF system and coil architecture integrates (Tim 4G) with all digital-in/digital-out technology. The scanner has an actively shielded water-cooled gradient system and zero helium boil-off. Specialized RF distribution increases uniformity in all body regions. On-board software is available for: neuro, angio, cardiac, body, onco applications. A variety of coils for all body parts and configuration are available including; a 32 channel head coil, 18 channel body matrix array, and an integrated 32 channel spine coil.

The TMII Skyra is equipped with the state of the art peripherals for functional imaging including LCD goggles, integrated eye-tracking, fiber optic subject response gloves, pneumatic computerized headphones with microphones as well as a full spectrum of physiological recording probes for ECG, GSR, pulse-Ox etc.



BIC CORNER

Please add two dates to your calendar for Brain Imaging Center (BIC) events. The first Annual BIC 10k run/walk/biking event will begin at 3:30pm on April 8 2016, following the course on the attached map. Over 40 of our colleagues have already registered- please join by registering at https://bic.mssm.edu/bic-1st-annual-10k-event/. Planning for the 3rd Annual BIC Symposium is underway. Please save the date- October 19 2016, with Helen Mayberg as the keynote speaker. BIC has also begun the 2016 User Workshop sessions, with presentations for 'How to Look at Your Data' on January 12, and additional workshops being planned. The BIC User Workshops are recorded and can be accessed from the website at https://bic.mssm.edu/events/bic-user-workshops/. Website content provides such technical areas only to registered users who login. Members of the BIC community can self-register directly from the website using the 'Sign up' button above the Twitter feed at https://bic.mssm.edu, or directly from this link: https://bic.mssm.edu/accounts/signup/. BIC's resources and development rely on user support. As NIH submission deadlines approach, please remember the importance of including BIC in applications for funding. A document with reference language for justifications of support is available for use in grant preparations, at https://bic.mssm.edu/blog/including-bic-in-upcoming-nih-grant-submissions/. The website itself is constantly undergoing development, so please make use of it when searching for information about brain imaging at Mount Sinai.

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