Icahn School of Medicine a Mount Sinai

Translational & Molecular Imaging Institute

Fall, 2015
Issue 8
tmii.mssm.edu

Message from the Director

Hope you all had an exciting summer with some time for rest and rejuvenation. I write this at the eve of a special day for me. As featured in the issue, tomorrow I will receive an Endowed Professorship designated as the Mount Sinai Professor of Medical Imaging and Bioengineering. I could not be happier with this honor and designation that features two passions I share in my career, Medical Imaging and Engineering. However, the source of my biggest joy and gratitude comes from all the people who joined in the past and join everyday in this wonderful adventure. This goes to all you as mentors, trainees, colleagues, friends and family. None of this would have been possible without you. I am also so proud of all the current TMII members and their achievements, some of which are shared with you in this Newsletter. Your hard work again, led to a most successful and stimulating TMII Annual Symposium. We look forward to the October 7 Brain Imaging Center Annual Symposium which promises to be as stimulating and successful. Your hard work is also leading to top publications, patents, research grants, and new application such as the ultra hight field 7T MRI work all featured in this Newsletter. Other announcement such as the TMII lectures series, 6th Annual TMII Symposium (April 22, 2016), and the 3rd New York Metro Imaging Research Consortium meeting (November 18, 2015). Again, I thank all of you for making all this possible and wish you a great TMII newsletter read.

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WHAT'S NEW?

TMII News & Updates

The 6th Annual TMII Symposium was another resounding success. There we 47 exceptional abstracts submitted (up from 39 last year) and 244 registered attendees - a 50% increase from last year! See the Imaging Spotlight feature for more information on the meeting

There are many congratulations to give out this quarter; namely to TMII director Zahi Fayad who is receiving the Medical Imaging and Bioengineering Endowed Chair on Oct 1 (see Faculty Spotlight feature for more details). TMII would also like to congratulation Drs. Claudia Calcagno - Mani and Hadien Dyvorne on their new faculty appointments to the department of Radiology.

TMII would also like to welcome two new post-doctoral fellows. Alan Seifert, PhD comes to TMII by way of Dr. Felix Wehril's lab at Univeristy of Pennsylvania. At TMII, Dr. Seifert will be studying the processing and transmission of pain in the spinal cord and brainstem using fMRI at 3T and 7T, and assisting with RF hardware-related projects. Nikolaos Karakatsanis, PhD has joined us from the University of Geneva to work on the development of efficient motion compensation strategies for the delivery of quantitative and early diagnostic information from cardiovascular PET/MR imaging scans.

Lastly, TMII user Sophia Frangou, MD, PhD and colleagues recently publish a paper (HBM 36, 10, 4158-4163, Oct 2015) reporting on the interaction between personality and short-term plasticity during working memory. The paper was picked up in July by the Smithsonian magazine.

UPCOMING EVENTS

> Thurs, Oct 1, 2015 1:15pm - 2:15pm - Hess Center, Seminar room B - Inaugural Medical Imaging and Bioengineering Lecture

Jeff W.H. Bulte, MS, PhD - Professor, Johns Hopkins Medical - "Imaging cell delivery near the bed: Are we there yet?"

> Wed Oct. 7, 2015 8:15am - 5:3pm - Hess Center, Davis Auditorium - BIC 2nd Annual Symposium

Registration is open: https://bic.mssm.edu/blog/bicday/bicdayregistration/

> Fri, Oct 23, 2015 11am-12pm - Hess Center, TMII Large Conference Room s1-117 - TMII Lecture Series

Charalampos (Harry) Tsoumpas, PhD - Lecturer, University of Leeds - "PET Imaging Reconstruction in a Nutshell"

> Fri, Oct 30, 2015 11am-12pm - Hess Center, TMII Large Conference Room s1-117- TMII Lecture Series

Irene Polycarpou, MSc, PhD - Lecturer, European University of Cyprus - "The importance of motion and attenuation correction in establishing PET/MR imaging as the new technique for early diagnosis and therapy monitoring"

> Wed, Nov 18, 2015 10am - 2pm - Nathan S. Kline Institute for Psychiatric Research - 3rd New York Metro Imaging Research Consortium (NYMIRC)

Abstract deadline October 18, 2015 - contact Tina Bermudez (bermudex@nki.rfmh.org) or https://tmii.mssm.edu/nymirc/ for more details

> April 22, 2016 8am - 5pm - 6th Annual TMII Symposium - Save the Date!

More details to follow

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

FACULTY SPOTLIGHT

Mount Sinai Professor in Medical Imaging and Bioengineering
New Endowed Chair in Medical Imaging and Bioengineering

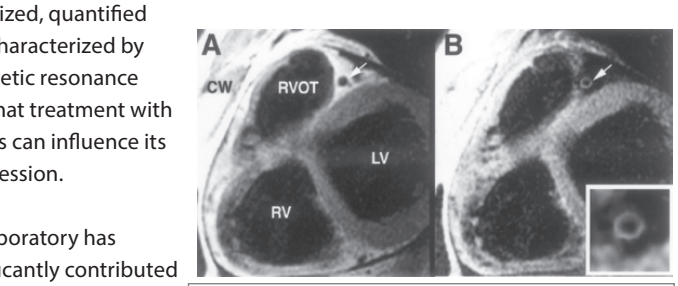
Zahi A. Fayad, PhD

Dr. Zahi Adel Fayad was born in Beirut Lebanon and raised there and in France. He had his training in Electrical and Biomedical Engineering at Bradley University, the Johns Hopkins University and at the University of Pennsylvania. In 1997 he joined the faculty as Assistant Professor at Mount Sinai School of Medicine where he was recruited by Drs. Valentin Fuster and Burton Drayer from the Department of Radiology.

Dr. Fayad now serves as Professor of Radiology and Medicine (Cardiology). He is the founding Director of the Translational and Molecular Imaging Institute (TMII) and Vice chair for Research in the Department of Radiology.

His interdisciplinary and discipline bridging research - from engineering to biology and from pre-clinical to clinical investigations - has been dedicated to the detection and prevention of cardiovascular disease with many contributions in the field of multimodality biomedical imaging and nanomedicine. He, his team and collaborators including Valentin Fuster, helped pioneer, validate and disseminate several novel imaging techniques and strategies for the noninvasive detection and the treatment of atherosclerosis.

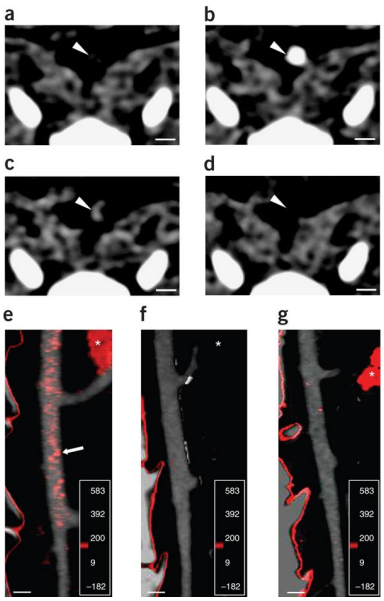
His group introduced the use of noninvasive multimodal for the assessment of atherosclerosis, with first demonstrations of in vivo plaque in transgenic mice and humans. They were first to demonstrate that atherosclerosis of the aorta and carotid arteries can be clearly visualized, quantified and characterized by magnetic resonance and that treatment with statins can influence its progression.



In vivo cross-sectional Black Blood-MR images of lumen (A) and wall (B) of proximal LAD from normal subject (see arrow). Fayad et al. Circulation. 2000;102:506-510

His laboratory has significantly contributed to the field of vascular positron emission tomography or PET imaging where he recently showed the results of the 1st noninvasive (MRI and FDG-PET) multicenter clinical trial evaluating atherosclerosis using a new treatment.

In the field of molecular imaging, his group was the first to describe the use of a targeted iodine and gold based computed tomography nanoparticles for imaging atherosclerosis. With his long-term collaborator Dr. Edward Fisher who was initially in the department of Cardiology at Mount Sinai and now at NYU, and Dr. Willem Mulder from Mount Sinai they described the use of lipid multimodal (MR, CT, optical, etc.) nanoparticles for nanomedicine - molecular imaging and drug delivery. From this work, 1st in man clinical studies were recently conducted for targeted nanotherapy of atherosclerosis.



Axial views of the same atherosclerotic plaque (white arrowheads) in the aorta of a rabbit, obtained by CT before (a), during (b) and 2 h after the injection of N1177 (c) or a conventional contrast agent (d). Fayad senior author (Nature Medicine 13, 636 - 641 (2007)

He holds over 12 US and Worldwide patents and/or patent applications. He has authored more than 300 well-cited publications in the field of cardiovascular medicine. He continues to be extremely well funded by the NIH and the American Heart Association. All this supplemented by several pharmaceutically funded multicenter clinical trials for the evaluation of novel cardiovascular drugs.

He received several honors and prestigious awards from the American Heart Association, American College of Cardiology, Radiological Society of North America, International Society of Magnetic Resonance in Medicine and recently received the highest distinction award from his alma matter.

He is a caring mentor and teacher. He is passionate about his work, his Institute and its members. Moreover, he is very passionate about high intensity exercise; sailing and enjoys running and racing in Central Park. He is married to Monique P. Fayad, MBA and is the proud father of Chloé (13 year old) and Christophe (9 year old) and after spending seven years in Manhattan now lives in Larchmont.

Dr. Fayad will be awarded the new endowed Chair in Medical Imaging and Bioengineering on Thursday October 1, 2015 at 5pm in the Goldwurm Auditorium at the Icahn School of Medicine.

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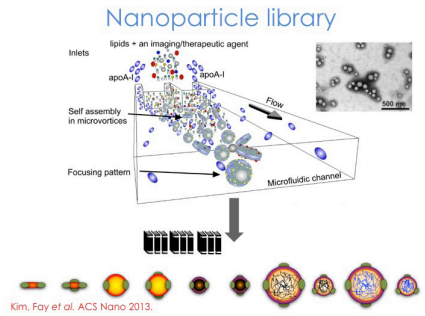
SCIENCE SPOTLIGHT

Recent Discoveries Lead to New Patents

Doctors Zahi Fayad and Willem Mulder were recently awarded a patent (WO 2013192310 A1) for "Mass production and size control of nanoparticles through controlled microvortices". Methods for making particles, such as nanoparticles, devices useful in the methods, and particles made by the method are described herein. The methods involves the use of a microfluidic device, such that upon mixing solutions of the materials to form the particles (or a solution of the material or materials to form the particles and a non-solvent for the material or materials), at least two symmetrical microvortices are formed simultaneously. The method can be used to prepare polymeric or non-polymeric particles and hybrid particles, such as lipid-polymer hybrid particles, as well as such particles containing one or more agents associated with the particles.



IMAGING SPOTLIGHT

5th Annual TMII Symposium - Highlights

Bright Stars

In addition to the outstanding keynote lecture, invited speakers and selected oral presentations, four posters stood out from the rest and were awarded top poster in their session. In the Cardiovascular imaging session, Mootaz Eldib (Fayad Lab) was given the award for his poster "Feasibility of 18F-Fluorodexyglucose Radiotracer Dose Reduction in Simultaneous Carotid PET/MR Imaging."

In the Neuroimaging section Dr. Emma Sprooten (Frangou Lab) was awarded for her poster "A comprehensive probabilistic tractography study in sibling pairs discordant for bipolar disorder."

The best poster in the Nanomedicine section was awarded to Dr. Constantinos Hadjipanaysis (Neurosurgery) for "Radiosensitivity enhancement of radioresistant glioblastoma by epidermal growth factor receptor antibody-conjugated iron-oxide nanoparticles."

Lastly the best poster in the Cancer and Body Imaging section was award to Dr. Sean Carlin (MSKCC) for "Kinetic modeling of PET data for the characterization of tumor perfusion and hypoxia in response to VEGF signaling blockade."

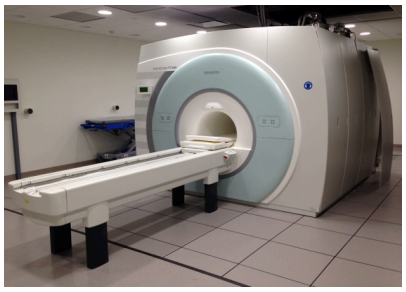
CORE SPOTLIGHT

Ultra High Field Imaging at 7 Tesla

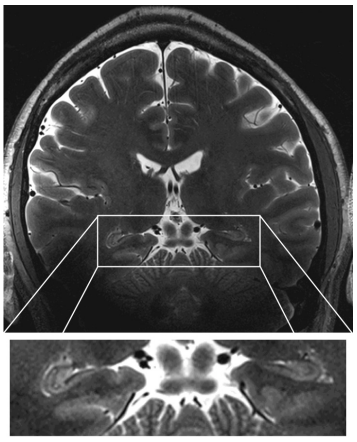
Siemens Magnetom 7T

This is an ultrahigh field 7.0 Tesla actively shielded whole body MRI scanner. The super-conducting magnet is self-shielded, reducing its overall footprint and making it compact and lightweight by 7T standards, weighing 24-tons.

With less then 40 system across the globe, this system provides investigators the ability to get unparalleled resolution and reductions in scan time.



The (warm) inner bore of the magnet is 82 cm, which houses the 60 CM inner patient bore. The dimensions of the magnet without covers is approximately 2.5 m in length, 2.6 m in width, and 2.65 m in height. The 5-Gauss line extends slightly further than for a 3T scanner with 5.6 m radial and 7.8 m axial dimension. A whole-body gradient system provides gradient amplitude of up to 70 mT/m per axis, and a maximum slew rate of up to 200 T/m/s. The RF transmit system comes with 8 parallel transmit channels; 8 individually shaped RF pulses can be prescribed simultaneously and independently in amplitude and phase. The multi-nuclei package allows for imaging and spectroscopy at non-proton frequencies, i.e. detection of e.g. 19F, 31P, 7Li, 23Na, 13C, 17O. Our 7T/820AS is configured to accommodate an 8-channel Tx-array and 48-channel Rx receivers. Several coils are currently available such as the 1- channel Tx and 32-channel Rx head coil and the 8-channel Tx and 8-channel Rx head coil.

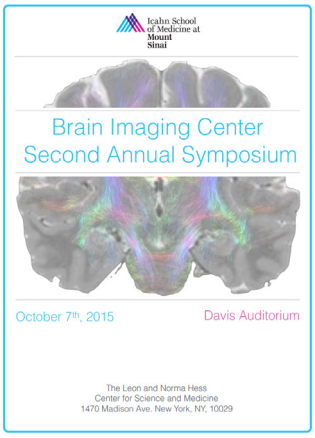


Ultra high resolution T2 of a subject with epilepsy showing structural abnormalities in the hippocampus (inset). Courtesy of R. Feldman

BIC CORNER

There is still time to register for the Brain Imaging Center's Second Annual Symposium- please visit https://bic.mssm.edu/blog/save-the-date-2nd-annual-bic-symposium/ to let us know you plan to attend. The symposium program will include presentations on Technical Innovations, Cognitive Interventions and Connectivity and Multimodal neuroimaging with opening remarks by Drs Rita Goldstein, Zahi Fayad and Mount Sinai Health System CEO and President Kenneth Davis, and will include a keynote presentation by Dr. Nora Volkow, Director of NIDA. Refreshments, lunch and a wine and cheese reception will follow, so please let your colleagues know, and make plans to attend!

BIC offers congratulations to the users who have recently received funding from the NIH (Daniela Schiller: R03 and R01; Emily Stern: R21/R33; Scott Moeller: K01 and R21; Bryan Denny: F32), clearly demonstrating NIH's substantial support for the neuroimaging work being developed by Mount Sinai's BIC faculty. Of particular note is a landmark study that has been launched by the NIH, the Adolescent Brain Cognitive Development (ABCD) Study that will follow approximately 10,000 children beginning at ages 9 to10, before they initiate drug use, through the period of highest risk for substance use and other mental health disorders. This study, encompassing a Coordinating Center and a Data Analysis and Informatics Center in addition to 11 Research Project Sites, will track exposure to substances (including nicotine, alcohol, and marijuana), academic achievement, cognitive skills, mental health, and brain structure and function using advanced research methods. BIC's Rita Z. Goldstein will lead this study at Sinai.



The neuroimaging facilities available through TMII continue to develop - the installation of the behavioral stimulation and response recording apparatus to extend functional MRI opportunities at the human 7 Tesla high-field MRI scanner is nearing completion For other news, be sure to attend the BIC symposium next week (Oct 7)

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