Icahn School of Medicine at Mount Sinai

Translational & Molecular Imaging Institute

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Message from the Director

Hope you all had an exciting Summer with some time for rest and rejuvenation. My summer was great. Like all of you I love that time of the year, sun, beach, family time but also a time to reflect, learning new things and recharging. I keep learning that the "key to resilience is trying really hard, stopping, recovering and repeating" (https://hbr.org/2016/06/resilience-is-about-how-you-recharge-not-how-you-endure). It is apparent that all of us at TMII are practicing this routine with glimpses about this given in this Newsletter.

We look forward to the October 9 Brain Imaging Center Annual Symposium which promises again to be as stimulating and successful as in past years. Your hard work is also leading to top publications, patents, research grants, and new application such as the new AHA Scientific Development Grant by one of our junior faculty member Dr. Carlos Perez-Medina on PET imaging of atherosclerosis.

Other announcement such as the TMII seminar series, TMII 2nd Annual TMII Medical Imaging and Bioengineering lecture by Dr. Todd Constable from Yale and the TMII 2017 7th Annual Symposium (April 7, 2017). We also feature Dr. Venkatesh Mani and his clinical trial unit efforts and group, mentoring activities within TMII, one of your F31 fellow Benjamin Ely, and some quick updates from BIC and recent exciting developments and new services which we will feature in more details in an upcoming issue.

Again, I thank all of you for making all this possible and wish you a great TMII newsletter read. Finally, I cannot conclude this message without expressing all our best and wishes to our most resilient leader Dean Dennis Charney.

Zahi Fayad, PhD
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WHAT'S NEW?

TMII News & Updates

Congratulations to Carlos Perez-Medina, PhD on his recently awarded AHA Scientist Development Grant. This 3 year grant, of over $230,000, will help Dr. Perez-Medina study "Atherosclerosis phenotyping and targeted treatment by nanoreporter PET imaging"

TMII would like you to join us and welcoming Francesco Padormo, PhD to the group. Dr. Padormo obtained his PhD in MRI Physics from Imperial College London in 2012. He then undertook a postdoc at King's College London, working on Parallel Transmission at 3T and 7T in collaboration with Oxford University. Now working under Priti Balchandani, PhD, he will be developing imaging methods for 7T.

Dr. Fayad's graduate student Mootaz Eldib, PhD successfully defended his PhD distertation and has moved on to a biotech company upstate.

Don't forget the abstract submission deadline for the ISMRM 25th Annual Meeting & Exhibition, November 9, 2016.

Lastly, TMII has reached another major milestone, @TMIInyc has surpassed 100 followers on Twitter. Follow us and stay current on the latest happenings.

UPCOMING EVENTS

TMII Frontiers of Imaging Seminar Series

> Sept 27 2017 - 1pm - 2pm: CSM Davis Seminar Room B - *Hersh Chandarana, PhD* Associate Professor, Department of Radiology, NYU School of Medicine "Motion robust continuous comprehensive abdominal MR imaging"

TMII Seminar Series

> Oct 4, 2016 - 10am - 11am: CSM Davis Seminar Room A - *Mark Does, PhD,* Professor of Biomedical Engineering, Vanderbilt University "Advances in MRI Methods of Evaluating Bone Fracture Risk"

2nd Annual TMII Medical Imaging and Bioengineering Lecture

> Dec 16, 2016 - 2pm - 3pm: CSM Davis Auditorium - *R. Todd Constable, PhD,* Professor Radiology and Biomedical Imaging, Yale University Medical School "Connectome Predictive Models: Brain/Behavior Predictions and Extension to Clinical Variables"

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

FACULTY SPOTLIGHT

Leading Academic Research Organization in Cardiovascular Imaging

Venkatesh Mani, PhD

Venkatesh Mani is a Biomedical Engineer by training. His undergraduate education was completed in India and he graduated summa cum laude from the Manipal Institute of Technology; a college whose notable alumni include the current CEOs of Microsoft and Nokia. He then completed his graduate education also in Biomedical Engineering at Virginia Commonwealth University before joining Dr. Fayad's lab in Mount Sinai as a post-doctoral fellow in 2002. He is currently Assistant Professor of Radiology.

Dr. Mani's research interests include multimodality imaging of cardiovascular diseases, specifically focusing on atherosclerosis, thrombosis and their complications using PET, CT, ultrasound and MRI. Over the years, he has developed several novel imaging and analysis methodologies for cardiovascular MRI and PET/CT and has been instrumental in pioneering the widespread application of these imaging techniques all the way from pre-clinical studies to multi-center clinical drug development trials that use imaging as an endpoint. Some of the technical developments that Dr. Mani has pioneered include MRI methods for fast dark blood vessel wall imaging, methods to suppress flow signal for fast T1 species for optimized dark blood imaging, development of methods for positive contrast imaging of iron oxide particles and development of methods for dynamic contrast enhanced MRI. Additionally, he has developed methods for image analysis such as the use of spatially enhanced cluster analysis for quantifying images of atherosclerotic plaque, been involved in the development and validation of PET/MR as a modality for cardiovascular imaging.

Dr. Mani is Director of the Cardiovascular Imaging Clinical Trials Unit of TMII. It is a modern hybrid between a contract research organization (CRO) and an imaging core lab. It undertakes and manages all aspects; ranging from scientific conduct to administrative management of clinical trials with imaging endpoints led by the cardiovascular group of TMII. Typical services offered include but are not limited to trial design and consultation, imaging protocol development, site training and qualification, data repository and database management, data quality control and analysis, and publication support. In addition to Dr. Mani, the core members of this group (pictured above) are Sarayu Huang, data manager, Audrey Kaufman, radiologist/image analyst, Alison Pruzan, image analyst and Renata Pyzik, research coordinator. Drs. Fayad, Calcagno, Robson, Jacobi and Karakatsanis also currently provide scientific expertise to this unit, and Dr. Gilbert Aguinaldo and Catherine Ma provide help with budgets and contracts for the group. The group is currently overseeing 3 pharmaceutical-sponsored clinical trials examining vascular inflammation, atherosclerotic burden and pulmonary embolism with 2 more currently in the pipeline. Additionally, the group is also currently serving as the core laboratory for 3 NIH sponsored clinical trials with 2 more in the pipeline.

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SCIENCE SPOTLIGHT

Training the Future

The Translational Molecular Imaging Institute (TMII) and the Department of Radiology have an active joint mentoring program for imaging scientists ranging from graduate students and postdoctoral fellows to junior faculty. This program, which is chaired by the TMII director, Dr. Zahi Fayad, provides mentoring resources and promotes academic progress for young scientists, and is assessed annually by the institution and department leadership. As part of TMII, trainees have access to a variety of resources for training, spanning from one-on-one interactions with a diverse body of faculty members (experts in clinical and pre-clinical cardiovascular, body, and neuroimaging, as well as nanomedicine), to more formal training opportunities such as lectures, TMII Frontiers of Imaging seminar series, and the yearly TMII symposium.

Imaging is inherently interdisciplinary. New predoctoral and postdoctoral trainees at TMII have the opportunity to apply for various NIH T32 training programs in collaborating departments of neuroscience, oncology, pharmacology, or immunology. If accepted by these competitive T32 training programs, the T32 trainee will be exposed not only to laboratory research, but also the particular T32 educational program with formal course work, seminar series, journal clubs and work in progress meetings.

Whether or not participating in any T32 program at Mount Sinai, predoctoral and postdoctoral trainees at TMII are highly encouraged to apply for NIH NRSA F31 (predoctoral) or F32 (postdoctoral) fellowship, or similar foundation fellowship, as mentored by faculty advisors. The entire fellowship application process is a great opportunity to sharpen research hypothesis, gain experiences in grantsmanship, and foster maturation towards an independent career. The outstanding body of faculty members at Mount Sinai provides ample opportunities for co-mentoring (as in the case of Benjamin Ely's F31 predoctoral fellowship, featured in this issue). At the predoctoral level, the focus is on mentoring trainees to conduct fruitful and impactful dissertation research without significant delays in PhD defense. At the postdoctoral level, besides research productivity, additional focus is put on career independence, with protected time at the end of postdoctoral training for grant writing, networking, and faculty-level job search.

Should some postdoctoral fellows decide to develop his/her independent research career at Mount Sinai, TMII has instructor level positions open for qualifying candidates.

SCIENCE SPOTLIGHT

Training the Future - continued

Selected recent achievements of trainees in Dr. Junqian Xu's Neuroimaging laboratory

Benjamin Ely (graduate student in Neuroscience, co-mentored with Drs. Vilma Gabbay and Emily Stern)

1. NIMH F31 NRSA predoctoral fellowship [see below]
2. Open Science Grid (OSG) User School 2016: full travel stipend.

Joseph Borrello (graduate student in Biomedical Science, co-mentored with Dr. Kevin Costa)

1. 24th Annual Meeting of the International Society for Magnetic Resonance in Medicine (ISMRM): Summa cum laude Award and New Entrant educational stipend for his oral presentation, titled "Towards accurate spinal cord morphometry with in situ grid phantom calibrated gradient non-linearity correction".

Dr. Alan Seifert (post-doc) TMII

1. Gordon Research Conference (GRC) 2016: In-vivo Magnetic Resonance: outstanding poster award and travel stipend for his abstract, titled "Myelin density measurement by ZTE in the D2O-exchanged spinal cord is unaffected by tissue fixation".
2. Radiological Society of North America (RSNA) 2016: travel stipend for his Introduction to Academic Radiology for Scientists (ITARSc) program acceptance and his oral presentation, titled "Structural, functional, and diffusion MRI of the cervical spinal cord at ultra-high field".

Dr. Joo-won Kim (post-doc) TMII

1. 24th Annual Meeting of the ISMRM: Trainee educational stipend and the Diffusion & Perfusion study group selection of his poster, titled "Non-linear distortion correction in human optic nerve diffusion-weighted image".
2. 32nd Congress of the European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS): travel stipend for his poster, titled "Reproducible quantitative cervical spinal cord MRI for progressive MS".

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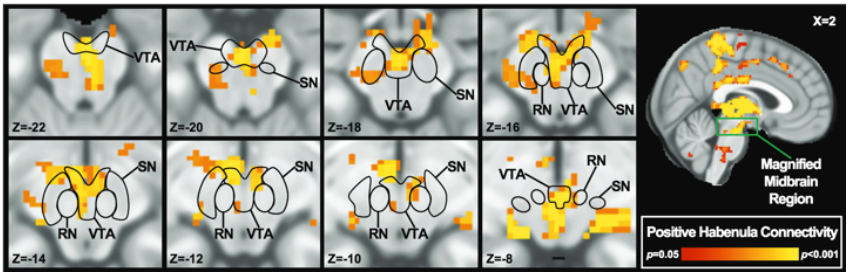
IMAGING SPOTLIGHT

Predoctoral Fellowship Award

Benjamin Ely, BS

I am a fourth year graduate student in neuroscience. My PhD dissertation project examines the role of reward circuitry in psychiatric disorders, particularly major depression, using high-resolution fMRI and high-fidelity analysis techniques. I am particularly interested in the habenula (Hb), a pair of small nuclei near the dorsomedial thalamus that inhibits dopaminergic reward signaling in a range of animal models. Mounting evidence implicates the Hb in depression; however, in vivo imaging research has been limited by its small size.



Building on the recent advances in fMRI resolution and the objective Hb segmentation methodology developed by our group (Kim J-W et al., NeuroImage, 2016), last year I conducted the first-ever whole-brain Hb resting-state functional connectivity study in a healthy adult population (25 with high and 25 with low subclinical depression scores) from the Human Connectome Project (Ely BA et al., Human Brain Mapping, 2016). My analyses revealed Hb connectivity with key reward regions, including the ventral tegmental area (VTA) and anterior cingulate. In addition, Hb connectivity with the amygdala and anterior insula differed between the subclinical depression groups.

This work served as the basis for my F31 NRSA predoctoral fellowship, which was awarded by NIH/NIMH earlier this year. Under the guidance of my mentorship team of Drs. Vilma Gabbay, Emily Stern, and Junqian (Gordon) Xu, I am now pursuing fMRI studies to examine reward processing in depressed patients, as well as refining the definition of small subcortical regions in functional image space, a key analysis step for further Hb fMRI research.

Benjamin Ely, BS
Emily Stern, Junqian (Gordon) Xu, Vilma Gabbay - Co-Mentors
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CORE SPOTLIGHT

TMII XNAT Database

TMII XNAT serves as the central point for research data transfer, archive, and sharing. TMII XNAT is built upon a secure database, supports automated pipelines for processing managed data, and provides tools for exploring the data. Only users authorized by the study investigators can access their data. TMII XNAT is fully HIPAA compliant and team provides support for data migration between various DICOM repositories, HIPAA de-identification,

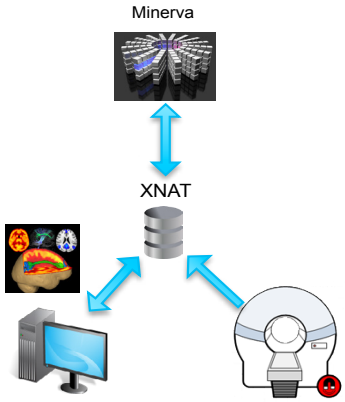


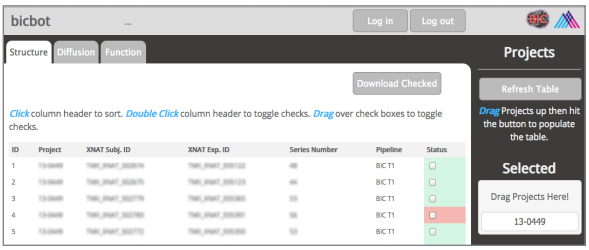
image preprocessing, image quality control, and other customized services. Currently TMII XNAT runs on two mirrored Linux servers with 60TB storage space on each. It can host more than 15,000 image sessions with backups. TMII XNAT user training, documentation, and imaging data management consultations are available by request (https://tmii.mssm.edu/xnat).

BIC CORNER

The Brain Imaging Center's (BIC) Third Annual Symposium is quickly approaching. This year's keynote address will be presented by Helen Mayberg MD, ahead of sessions on Computational Approaches to Neuropsychiatric Disease, Novel and Naturalistic fMRI Methods, and Brain Stimulation. This BIC DAY will be held on Wednesday October 19, so please be sure to register soon at https:\\bic.mssm.edu.

BIC is pleased to announce the new addition of Anna Zilverstand's baby daughter. Her expanded family is reported to be quite happily experiencing the very best neurofeedback nature provides.

BIC's Prantik Kundu and Rafael O'Halloran design and implementation of the web-based BIC. BOT service will be the topic of upcoming presentations at the Department of Psychiatry's Mood and Anxiety Program (9/7 at 2 pm) and BIC User venues this fall. The BICBOT integrates and automates user simplifications for organizing and executing study-wide pre-processing of MRI data. BIC. BOT will unify many of the presently separate operations between the XNAT study database and Minerva supercomputing platforms. Users will immediately benefit from simplification in defining and collecting datasets for processing. Streamlined and self-documenting pipeline operations will substantially increase processing efficiency while eliminating the need for users to operate the Minerva system directly. The system will better-enable BIC's vision for data analysis across multiple studies, leveraging the collection of data using the BIC standard protocol by many Mount Sinai investigators.



The BIC is also gearing towards supporting the NIH funded multi-site ABCD study, longitudinally tracking elementary level children for the study of brain development, to be launched at Sinai in September.

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