**Message from the Director**

I write this as we are well into the brand 2018 new year. We have had an exceptional first quarter with many achievements by all of our faculty, trainees and staff as highlighted in this issue. We are celebrating this month TMII’s top 20 ranking in NIH research funding in 2017 which is one of the most important metrics of research excellence by our faculty and their groups. We also feature in this issue the great achievement of one of our trainees, Dr. Alan Seifert (Dr. Gordon Xu mentor) who was just awarded an NIH K01 grant for his very exciting work in brainstem and spinal cord imaging. Moreover, we introduce the Advanced Neuroimaging Research Program (ANRP) who is directed but our own Dr. Priti Balchandani. Exciting collaborative work by Dr. Chiara Giannarelli is also featured in this issue. We are thrilled by the very strong showing from our TMII members at the upcoming ISMRM meeting in Paris. On April 25-26 we present the 2nd Windows to Our Body Art and Medicine TMII Exhibit and the 8th Annual TMII Symposium with a focus on Machine Learning and big data with speakers such as Yann LeCun (Facebook/NYU), Russell Poldrack (Stanford), Dorin Comaniciu (Siemens Healthineers), Olivier Gevaert (Stanford) and James Moon (University of Michigan). We look forward to seeing all of you at both events for some great Science and Entertainment. Finally, we continue to make great progress in implementing our TMII part 2 Strategic Plan to elevate TMII to next level of Science and Medicinal discovery for our patients. More details on this will follow in the next issues. I wish you a great TMII newsletter read.

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**TMII News & Updates**

TMII has many new members to welcome this season. Dr. Stephanie Brown is a new post doc who joins by way of the Patrick Wild Centre and Division of Psychiatry at the University of Edinburgh, where she carried out a research project on the FMR1 premutation, using task-based fMRI in addition to clinical measurements and molecular biomarkers to investigate manifestation of neurodegeneration pre-diagnosis. Dr. Brown’s research here will be with Priti Balchandani’s group and Zahi Fayad’s group, primarily focussing on neuroimaging analysis, including resting-state fMRI and diffusion MRI, in psychiatric disorders.

Dr. George Soultanidis, was at the University of Hull, School of Health Sciences, where he was in charge of designing and creating a realistic mouse phantom for preclinical radiotherapy purposes. His current position is under Zahi Fayad’s group and it is about the investigation, improvement and implementation of motion correction algorithms for cardiovascular Positron Emission Tomographic imaging, using a clinical PET-MR system.

Dr. Daniela Said is a new post doc in Bachrir Taouii’s lab. Dr. Said is from Santiago, Chile and will be research in body imaging, especially liver, prostate, renal cell carcinoma and also doing RECIST.

Dr. Ki Sueng Choi has also jointed TMII as assistant professor in radiology & neurosurgery. He was previously at Emory University where he was an assistant professor of psychiatry working with Dr. Helen Mayberg on the development and implementation of treatment selection imaging biomarkers, individualized multimodal surgical targeting methods for deep brain stimulation, longitudinal outcome metrics across a wide range of neuropsychiatric disorders including Depression, OCD, Movement Disorders, and Epilepsy.

Lastly, TMII will again have the art exhibition, “Windows to Our Body” at the Grady Alexis Gallery at El Taller from April 26 to May 3, 2018. The opening of the exhibition will on April 25 and coincide with the welcome reception for the 8th Annual TMII Symposium. For more details: [https://tmii.mssm.edu/symposium/wtob2/](https://tmii.mssm.edu/symposium/wtob2/)

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**8th Annual TMII Symposium**

> April 26, 2018 8am - 5pm, Hess Davis Conference Center: [tmii.mssm.edu/TMII2018](http://tmii.mssm.edu/TMII2018) for more details

**PPG Seminar Series**

> May 15, 2018 - : Jiangyang Zhang, PhD - Associate Professor of Radiology at NYUSM - *What we learned about time-dependent diffusion MRI in a mouse model of neonatal hypoxia ischemia*

**TMII Frontiers of Imaging Seminar Series**

> May 25, 2018 12pm - 1pm, Hess Seminar Room B: David Saloner, PhD - Professor of Radiology at UCSF *Image-based assessment of hemodynamics and inflammation in the evolution of vascular disease*

For more information on these and other events go to: [http://tmii.mssm.edu/blog](http://tmii.mssm.edu/blog)
Single-cell driven drug repositioning approaches to target inflammation in atherosclerosis.

Chiara Giannarelli, MD, PhD

Chiara Giannarelli is an Assistant Professor of Medicine (Cardiology), Genetics and Genomics and she has a scientific appointment at the Precision ImmunoMune Institute (PrIsm) of the Icahn School of Medicine at Mount Sinai.

She trained as Internist specializing in vascular disease and in 2008 she obtained her PhD in Pharmacology and Pathophysiology at the University of Pisa, Italy. After a post-doctoral fellowship in vascular biology and atherosclerosis (2008-2011, supported by grants from the Italian Society of Hypertension and T32HL070824), she was recruited as Instructor of Medicine at the Cardiovascular Institute of the Icahn School of Medicine at Mount Sinai and in 2013 as Assistant Professor of Medicine (Cardiology). Working as physician scientist in the area of imaging, she has contributed to the design and development of new platforms for the operator-independent, non-invasive measurement of pre-clinical and clinical vascular parameters, including flow-mediated dilatation, carotid stiffness, intima-media thickness and vessel wall perfusion. Chiara has extensive experience in measuring the effect of molecular perturbations via gene therapy or drugs in hypertensive and atherosclerotic mice and the rabbit model of atherosclerosis using MRI.

In 2013, Chiara was awarded a Career Development Award NIH-National Heart, Lung, and Blood Institute (NHLBI) grant (K23HL111339) to conduct translational and patient-oriented research using multimodality approaches to define new mechanisms and molecular targets for atherosclerotic plaque growth and instability.

As Faculty of the Cardiovascular Research Center, Chiara is leading a clinical study enrolling patients who had recent cerebrovascular event or no events undergoing surgical (CEA) or percutaneous revascularization (CAS). Chiara is now using innovative systems biology approaches using cutting-edge single-cell technologies like CyTOF mass-cytometry and RNAseq analysis to infer the cellular and molecular mechanisms that govern the immune response in the atherosclerotic arterial wall leading to cardiovascular events like myocardial infarction and stroke (supported by the NHLBI, R03HL135289 and a Multidisciplinary Research Development Award of the Department of Medicine).

Leveraging high-dimensional RNA seq and single-cell data generated in her lab and other human datasets, she is now applying network and single-cell driven computational approaches to predict new use of existing drugs for reducing the inflammatory burden of atherosclerosis in the arterial wall. Her laboratory is now testing the preclinical efficacy of promising selected top-candidate compounds in large animals in a collaborative effort using in vivo imaging methods (PET-MR) with Drs. Fayad and Calcagno. This work is supported by the National Center for Advancing Translational Sciences, R21TR001739 and UH2TR002067.

**FACULTY SPOTLIGHT**

**CORE SPOTLIGHT**

**Bruker 9.4T Micro MRI**

This is a high-resolution rodent only MRI scanner allowing for high-resolution in-vivo imaging of mice and smaller, ex-vivo specimens. It is a 9.4 Tesla 89-mm bore MRI system operating at a proton frequency of 400 MHz (Bruker, Billerica, MA).

The 9.4T is equipped with a mouse respiratory and cardiac sensor connected to a monitoring and gating system (SA Instruments, Inc., Stony Brook, NY). Sedation is administered by an isoflurane/O2 gas mixture delivered through a nose cone and placed in a 30 mm birdcage coil with an animal handling system. Additionally, a temperature controller is available in the bore of the magnet, to maintain the animal in the RF coil at a selected temperature. Recent upgrades (Bruker Paravision 4) have enabled the use of navigator pulses to allow for cardiac and/or respiratory gating without the use of electrodes.

Chiara Giannarelli, MD, PhD
Assistant Professor of Medicine and Genetics and Genomic Sciences
chiara.giannarelli@mssm.edu

Icahn School of Medicine at Mount Sinai | Translational & Molecular Imaging Institute | 1470 Madison Avenue | New York, NY 10029-6574 | tmii.mssm.edu
For more details about these & other positions: https://tmii.mssm.edu/about/open-positions/

**ASSISTANT PROFESSOR**

TMII has an opening for a tenure track position in human neuroimaging at the Assistant Professor level. The ideal candidate will build an independent research program in next generation imaging technology at the Assistant Professor level. The ideal candidate will build an independent research program in next generation imaging technology and translation of this technology to the clinic. We are seeking a wide range of research areas including machine learning as applied to imaging, novel acquisition techniques for MRI, new hardware development for high field MRI, novel multi-modality imaging, and methods to bridge the gap between imaging and surgical therapy. Individuals working on innovative new imaging technology designed to shift clinical paradigms are encouraged to apply.

**INSTRUCTOR**

TMII is seeking an MR physics Instructor level faculty member to develop and translate new neuroimaging acquisition and analysis methods and provide technical support for new and existing MR imaging projects. As part of the TMII, the candidate will have access to cutting-edge instrumentation, including multiple research-dedicated systems including the Siemens: 7T, 3T, 1.5T, MR/PET, PET/CT, MDCT, among other instruments. They will have the opportunity to interact with a diverse team of investigators with complementary expertise in neuroimaging, cardiovascular imaging, neurosurgery, and neuroscience.

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<th>Session Name</th>
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<td>Dynamic contrast-enhanced MRI</td>
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<td>MRI/CT</td>
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<td>Application of Molecules</td>
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In the recently released rankings of 2017 NIH medical research funding, the Icahn School of Medicine at Mount Sinai (ISMMS) broke the top 20 radiology departments in medical imaging research funding with over $7M. Among the 4 faculty contributing to this, Dr. Zahi Fayad is ranked 5th among all faculty in radiology across the country with over $4.5M in funding. The other faculty include, Dr. Willem Mulder ($1.2M, 83rd), Dr. Priti Balchandani ($804k, 145th) and Dr. Bachir Taouli ($485k, 286th).

Over the past years ISMMS Radiology and its faculty have steadily risen in the rankings. Much of the that success is owed to the leadership and vision of ISMMS Dean Dr. Dennis Charney and Radiology Chairman Dr. Burton Drayer who have been strident supporters of medical imaging research ISMMS and the work of the Translational and Molecular Imaging Institute (TMII) director, Dr. Zahi Fayad.

Dr. Fayad, Mount Sinai Chair of Medical Imaging and Bioengineering and professor of Radiology and Medicine, has been doing imaging science research at Mount Sinai since 1997. Since 2013 TMII, now at over 50 faculty, staff and trainees, has been housed over 4 floors in the Hess Center for Science and Medicine where 4 research programs drive imaging science research in state of the art Human Imaging and Small Animal Imaging Centers.

The Cardiovascular Imaging Research Program, directed by Dr. Fayad, is focused on developing and using noninvasive imaging methods that allow the early detection, prevention, and treatment of cardiovascular disease. The Cancer and Body Imaging Research Program, directed by Dr. Taouli, uses imaging for the early detection and treatment assessment of primary liver cancer and liver damage in patients with chronic hepatitis and to visualize the expression and activity of specific molecules that influence tumor behavior and/or response to therapy.

Dr. Balchandani directs the Advanced Neuroimaging Research Program, which focuses on the development of novel imaging technologies and their application to diagnosis, treatment and surgical planning for a wide range of diseases, including epilepsy, brain tumors, psychiatric illnesses, multiple sclerosis and spinal cord injury. The Nanomedicine Program, directed by Dr. Mulder, develops and advances nanomedicinal approaches to allow a better understanding, identification and treatment of the most detrimental pathologies today: cardiovascular disease and cancer. The research projects range from fundamental, including nanotechnologies to better understand lipoprotein biology, to translational, with one of the developed nanotherapies being in clinical trials.

The future holds much promise to climb further in the rankings as TMII looks to focus on precision imaging and the next generation of imaging technologies.
Postdoctoral Career Development Award

Alan C Seifert, PhD

Dr. Alan Seifert, a third-year postdoctoral fellow in TMII, has been awarded a Postdoctoral Career Development Award (K01) by NIH/ NINDS. In this three-year project, co-mentored by Professors Junqian (Gordon) Xu and Zahi Fayad, he will develop and translate structural, functional, and diffusion MRI techniques to image the integrity of a neurocircuit spanning the brainstem and spinal cord that is responsible for the modulation of pain.

Painful stimuli cause firing of primary sensory neurons, which synapse on secondary neurons in the dorsal horns of the spinal cord gray matter. Further transmission via the spinothalamic tract (STT) is modulated in the dorsal horn by a descending inhibitory pathway arising from the periaqueductal gray (PAG) and the rostral ventromedial medulla (RVM) of the brainstem. If modulatory control of nociception is damaged, pain can be experienced without an appropriate cause, profoundly affecting quality of life. This neuropathic pain is a common but poorly-understood consequence of many neurological disorders, including multiple sclerosis and cervical spondylitic myelopathy.

The overall hypothesis of this project is that dysfunction of this nociception modulation circuit, mediated by the loss of microstructural integrity in spinal cord white matter tracts, is a root cause of neuropathic pain. To investigate this, Alan will optimize functional and diffusion magnetic resonance imaging (fMRI and dMRI) methods for use in the brainstem and spinal cord at 7 T, quantify the blood oxygenation level-dependent (BOLD) signal in the cervical spinal cord gray matter in response to noxious thermal stimuli delivered to the arm, and identify white matter tracts in which abnormalities in diffusion MRI parameters (indicating microstructural degradation) correlate with abnormal pain modulation, as measured by quantitative neurosensory testing, clinical examination, and fMRI. This combination of functional and diffusion MRI measurements and quantitative neurosensory testing in subjects with multiple sclerosis and cervical spondylitic myelopathy (recruited through collaborations with Drs. Matilde Inglese and John Caridi, respectively) will provide new insight into the location of the white matter tracts carrying modulatory information between the brainstem to the spinal cord, and allow us to investigate whether and how damage to these tracts impacts pain levels.

As part of the training plan in this K01 grant, Alan will be spending two months at the University of Oxford’s Centre for Functional MRI of the Brain (FMRIB) training under Professors Irene Tracey and Karla Miller, both world-renowned pain and neuroimaging researchers.

Introducing the Advanced Neuroimaging Research Program

Over the last three decades, there has been unprecedented progress in the study of the brain. State-of-the-art brain imaging has allowed a first-time glimpse into the structure, functioning, and connectivity of the human and animal brain in both healthy and disease states—findings of broad relevance across medical research and clinical programs.

The Translational and Molecular Imaging Institute (TMII) and The Friedman Brain Institute are working to accelerate use of these cutting-edge imaging tools to further research into the workings of the brain. One of these tools, the Advanced Neuroimaging Research Program (ANRP) Program has a scientific mission to develop advanced imaging technologies and apply them to improve diagnosis, treatment and surgical planning for neurological diseases, ultimately leading to a deeper understanding of the brain in the normal and diseased state.

As the director of ANRP, Dr. Balchandani envisions a growing number of ANRP-affiliated laboratories, spanning multiple departments in the Icahn School of Medicine at Mount Sinai (ISMMS), including Neuroscience, Neurosurgery, Psychiatry, Radiology and Neurology. She will be investing in and facilitating the most innovative brain imaging research which also leverages the technical and clinical advantages of ISMMS. This includes developing new acquisition methods, hardware, and analysis tools to provide advanced multi-modal imaging of the brain. She is also working towards ensuring that infrastructure for image acquisition and pre-processing is robust and seamless. Her goal is to increase overall NIH grants submissions and success rates within neuroimaging and to foster a cohesive set of core research projects to optimally position the ANRP for center and program grants.

ANRP Profile

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Director, ANRP
Director, High Field Imaging Research
Associate Professor
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Irene Tracey and Karla Miller, both world-renowned pain and neuroimaging researchers.
Zahi A. Fayad, PhD  
Director, Translational and Molecular Imaging Institute  
Director, Cardiovascular Imaging Program  
Professor of Radiology and Medicine (Cardiology)  
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Priti Balchandani, PhD  
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