

Brain Mapping Center SEMINAR SERIES

Sponsored by the UCLA Brain Mapping Center Faculty

The focus of these talks is on advancing the use of brain mapping methods in neuroscience with an emphasis on contemporary issues of neuroplasticity, neurodevelopment, and biomarker development in neuropsychiatric disease.

Hosted By: Danny JJ Wang, PhD, Neurology, UCLA

Research insights in MRI and their application to neurovascular imaging



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Imaging has been called one of the top ten discoveries in the last 1000 years. One of the many imaging modalities, magnetic resonance imaging (MRI), has been catapulted to the leading role in both diagnosing and studying the human body in vivo. Although it doesn't have the highest resolution, it has the most flexibility for probing structure and function of any imaging modality ever invented. In this sense, it has become the umbrella to all other human imaging methods. In this presentation, I will discuss the intertwining of research, insight and determination in driving this field forward. With the right tools, we can use MRI and Radiology along with partnering physicians to not just better diagnose disease, but also to discover the etiology of disease. This can be accomplished by continuing to develop new and better technology and by using clinical research collaborations, large data bases, data mining, image processing and pattern recognition. With the tolerance of the audience, I will use my own experience in the field to demonstrate many of these points.

My own focus has been in the area of vascular imaging. My first foray in this area was to develop the concept of MR angiography to remove ghosting artifacts and make vessels visible in MRI. This was a great technical start for a young physics researcher. The impact was that it immediately opened the door to not just clinical translational research, but to clinical applications. Still, research into improving the methodology has continued for 30 years as we push for higher resolution and faster data acquisition. The exciting developments have been the realization that the vascular system plays a key role not just as a set of pipes, but rather as part of the "neurovascular unit" that can impart the initial signals for creating new tissue to its interaction with the cerebral spinal fluid through the "glymphatic" system. Some of these questions are as old as our efforts to study the human brain, and only today with MRI can we do this "in vivo" even if it is to validate other animal studies or better imaging methods like two-photon imaging.

In this presentation, I will show how insight into new methods can lead to not only new applications, but also the discovery of the etiology of the disease as mentioned above. This will include concepts such as MRA, susceptibility weighted imaging (SWI), iron measurements in vivo, measuring conductivity in vivo, etc. More than just the introduction of new ideas, the importance of "quantification of data" will be addressed. These methods will be applied to the vascular system from the fetus to dementia. Diseases such hypoxic ischemic injury in the fetus, Sturge-Webber syndrome, traumatic brain injury (TBI), multiple sclerosis (MS), stroke, atherosclerosis, Parkinson's disease and dementia to name a few. Finally, the role of future collaborations and collecting large data bases will be considered.

January 13, 2016 4:00 pm - 5:00 pm

**Ahmanson-Lovelace Brain Mapping Center Conference Room (221)
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