The 'Dys-Connectome": effects of focal injury on the brain's functional organization and behavior

Co-Organizers:
Maurizio Corbetta
Dept. Neurology, Radiology, and Anatomy and Neurobiology, Washington University School of Medicine
St. Louis, MO

Michel Thiebaut de Schotten
Institute of Brain and Spine, Paris, France

In the US alone, every year, more than 795,000 people suffer from a stroke. Stroke is the third cause of mortality and the leading cause of disability in the Western world. Despite advances in diagnosis and treatment, little is known on how focal injury induced by stroke impacts the local and large-scale functional organization of the brain, and, correspondingly, whether recovery of function is associated with reorganization or compensation of network-level interactions. This symposium is organized around four young researchers (all post-docs or junior faculty) who have carried out important studies on this important topic using a variety of methodologies (voltage gated signals; optical imaging; fMRI; DTI) in both humans and rodent models. The four lectures will show that: (1) synaptic networks are damaged and recover from stroke-induced damage in mice; (2) functional and structural connectivity reorganize after experimental stroke and hemispherectomy in rats; (3) focal injury in patients and transcranial magnetic inactivation in healthy subjects can affect global, regional, and local indices of large-scale network interactions that inform us about the normal connectivity; and, finally, (4) multi-network changes in functional connectivity correlate with the severity of attention deficits post-stroke independently of structural damage. Together these studies indicate the importance to understand not only the local neural processes affected by stroke, but also the global physiological effects of stroke on brain networks.

Learning Objectives:

1. Learn about the application of functional and structural connectivity methods to the study of stroke and its recovery;
2. Understand the relationship between systems and synaptic measures of connectivity.
3. Learn the effect of stroke on brain functional networks.

Effect of focal stroke on spontaneous cortical activity patterns reveals novel intracortical mechanisms in mouse

Majid Mohajerani, Canadian Centre for Behavioural Neuroscience The University of Lethbridge Lethbridge, Canada

Characterization of neural network remodeling in experimental focal brain injury models using structural and functional MRI

Wim Otte, Rudolf Magnus Institute of Neuroscience, Utrecht, Netherlands

Changes in the magnitude and organization of large-scale network interactions after focal disruption, as measured in humans with resting state fMRI

Caterina Gratton, Helen Wills Neuroscience Institute, University of California, Berkeley, CA, USA

Large-scale changes in network interactions as a physiological signature of Spatial Neglect

Antonello Baldassarre, Washington University in St. Louis, St. Louis, United States