

# Individualized Mapping and Causal Manipulation of Human Brain Circuits

## Organizers:

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Over the past two decades, neuroimaging studies have defined a set of distributed brain systems that contribute to cognition, emotion, mood and other mental processes. Perturbations in these circuits have been identified in different ways across psychiatric and neurological disorders when comparing groups of patients to healthy individuals. The challenge ahead of us is how to use these insights to: 1) elucidate the nature of neural circuit deficits in individual patients and their relevance for treatment, and 2) establish the causal mechanisms regulating circuit function in health and illness, and 3) develop non-invasive circuit-based therapeutics. This symposium brings together research in healthy individuals as well as patients with psychiatric or neurological disorders, along with multi-site neuroimaging data analyses and circuit manipulation using transcranial magnetic stimulation (TMS) concurrent with neuroimaging, to identify paths forward on each of these challenges. Speakers will show how large-scale neuroimaging data analyses can discover and validate brain circuitry-defined subtypes of major depression, demonstrate how a circuit perspective can explain diverse lesion syndromes even when they do not converge on single anatomical locations, elucidate causal mechanisms for normal prefrontal control of amygdala activity and its dysfunction in post-traumatic stress disorder using concurrent TMS and functional magnetic resonance imaging (TMS/fMRI), and establish a neurophysiological basis for repetitive TMS-mediated treatment for depression using concurrent TMS and electroencephalography (TMS/EEG). Together, these data suggest that we are now on the brink of innovations in "rational" circuit-based diagnosis and treatments for neuropsychiatric disorders, as well as a far greater mechanistic understanding of these circuits in health and disease.

## Symposia Schedule:

8:00-8:15

### **Resting State Connectivity Biomarkers Define Neurophysiological Subtypes of Depression**

*Conor Liston, MD, PhD, Cornell University, New York, NY, United States*

8:15-8:30

### **Mapping neuropsychiatric symptoms to brain circuits based on causal brain lesions**

*Michael Fox, Harvard Medical School, Boston, MA, United States*

8:30-8:45

### **Causal amygdala control by the prefrontal cortex in humans**

*Amit Etkin, MD, PhD, Stanford University, Stanford, CA, United States*

8:45-9:00

### **Intracortical inhibition underlies the antidepressant effect of repetitive transcranial magnetic stimulation**

*Corey Keller, MD PhD, Stanford University, Stanford, CA, United States*

9:00-9:15

## **Questions and Answers**