

Symposia

THEME A: DEVELOPMENT

Understanding Neural Circuits Through Dendrite Development and Function **CME**

Chair: Kang Shen, MD, PhD

Co-Chair: Joshua R. Sanes, PhD

Monday, Oct. 19, 1:30–4 p.m.

McCormick Place: S100A

The complex and diverse dendritic arbors have long been recognized as a critical feature of distinct neuronal cell types. The molecular knowledge on dendrite development and cell biology is critical for our understanding of neural circuit assembly and function. In this symposium, speakers will feature several major experimental systems for dendrite research and discuss key results on development, unique cell biology, and how dendrites shape intact neural circuits.

Synapse Formation and Neurodevelopmental Disorders **CME**

Chair: Lin Mei, MD, PhD

Co-Chair: Claire Legay, PhD

Tuesday, Oct. 20, 8:30–11 a.m.

McCormick Place: S100A

Neural transmission and plasticity are critical to how we perceive, think, and react to the world. This relies on synapses. Inappropriate formation of synapses has been implicated in neuropsychiatric disorders and loss of synaptic connection may lead to neurodegenerative disorders. This symposium will provide insights into mechanisms that govern synapse formation and stability in various model systems and shed light on pathophysiological mechanisms.

THEME B: NEURAL EXCITABILITY, SYNAPSES, AND GLIA: CELLULAR MECHANISMS

Dysregulation of Mechanistic Target of Rapamycin Signaling in Mouse Models of Autism **CME**

Chair: R. Suzanne Zukin, PhD

Saturday, Oct. 17, 1:30–4 p.m.

McCormick Place: S406A

Autism is a widespread disorder characterized by deficits in social interactions, communication, and repetitive/stereotypic behaviors. Despite the wide diversity of genes implicated in autism, they appear to converge on common biological pathways to give rise to autism-relevant behaviors. Ground-breaking discoveries in this area in the past 2–3 years implicate

over-activated mTOR signaling is a major player in impaired synaptic plasticity, neural networks, and behaviors in autism spectrum disorders.

New Frontiers in Understanding Glia **CME**

Chair: Ben A. Barres, MD, PhD

Sunday, Oct. 18, 1:30–4 p.m.

McCormick Place: S105

More than half of the cells in the mammalian nervous system are glia. Long thought to play a largely supportive role to neurons, exciting work in the past few years has overwhelmingly overturned this notion. This symposium will provide a cutting-edge view of our rapidly expanding understanding of the development and functions of glia: how they myelinate axons, control synapse formation and elimination, respond to neuronal injury, and their contribution to neurodegenerative disease.

Advanced Molecular Imaging of Synapses in Health and Disease **CME**

Chair: Thomas A. Blanpied, PhD

Co-Chair: Shigeo Okabe, MD, PhD

Monday, Oct. 19, 1:30–4 p.m.

McCormick Place: S406A

This symposium will present new developments in imaging and proteomic technology and discuss how they are changing the way researchers characterize synaptic function and dysfunction. Presentations will reveal new insights from multiple scales of synaptic observation including nanoscale super-resolution imaging, time-lapse *in vivo* imaging, and proximity tagging of endogenous proteins for mass spectrometric identification. From molecular screening to disease risk genes, speakers will propose new ways to understand disorders that alter neural circuit performance by disrupting synapses.

THEME C: DISORDERS OF THE NERVOUS SYSTEM

How Does the Brain Implement Adaptive Decision-Making to Eat? **CME**

Chair: Valérie Compañ, PhD

Saturday, Oct. 17, 1:30–4 p.m.

McCormick Place: S100B

Adaptive decision-making to eat is crucial for survival, but in anorexia nervosa, the brain persistently supports reduced food intake despite a growing need for energy. How

the brain persists in reducing food intake to the point of death despite the evolution of mechanisms to ensure survival by governing adaptive eating behaviors remains just as mysterious as the switch from anorexia to bulimia. Neural substrates belong to the reward-habit system and could differ from overeating-induced obesity.

Human iPSC Derived Cells for Modeling Neurodegenerative Disease and Drug Discovery **CME**

Chair: Eugenia M. Jones, PhD

Co-Chair: Eric Chiao, PhD

Sunday, Oct. 18, 1:30–4 p.m.

McCormick Place: S100A

Human induced pluripotent stem cells (iPSCs) provide unprecedented access to neurons and glia to study neurodegenerative disorders. For the first time, researchers have sufficient human material, derived from specific patient populations, to perform studies in the cell types of interest. This symposium will highlight research that demonstrates the broad utility of iPSC technology in developing better tools, models, and biomarkers for innate, induced, and infectious neurodegenerative disorders.

Rethinking Dogma in Thalamocortical Epilepsies **CME**

Chair: John R. Huguenard, PhD

Co-Chair: Hee-Sup Shin, MD, PhD

Monday, Oct. 19, 1:30–4 p.m.

McCormick Place: S100B

Generalized absence epilepsy has a unique EEG expression and behavioral correlate characterized by 3 Hz spike and wave discharge and a behavioral absence. The thalamocortical circuit is implicated in absence epilepsy, yet roles for thalamus vs neocortex remain controversial, as do roles of different regulators of thalamocortical activity such as calcium channels and GABA receptors. This symposium will present several unexpected findings that challenge existing dogma and provide a state of the art update.



EMPIRICAL APPROACHES TO NEUROSCIENCE AND SOCIETY SYMPOSIUM

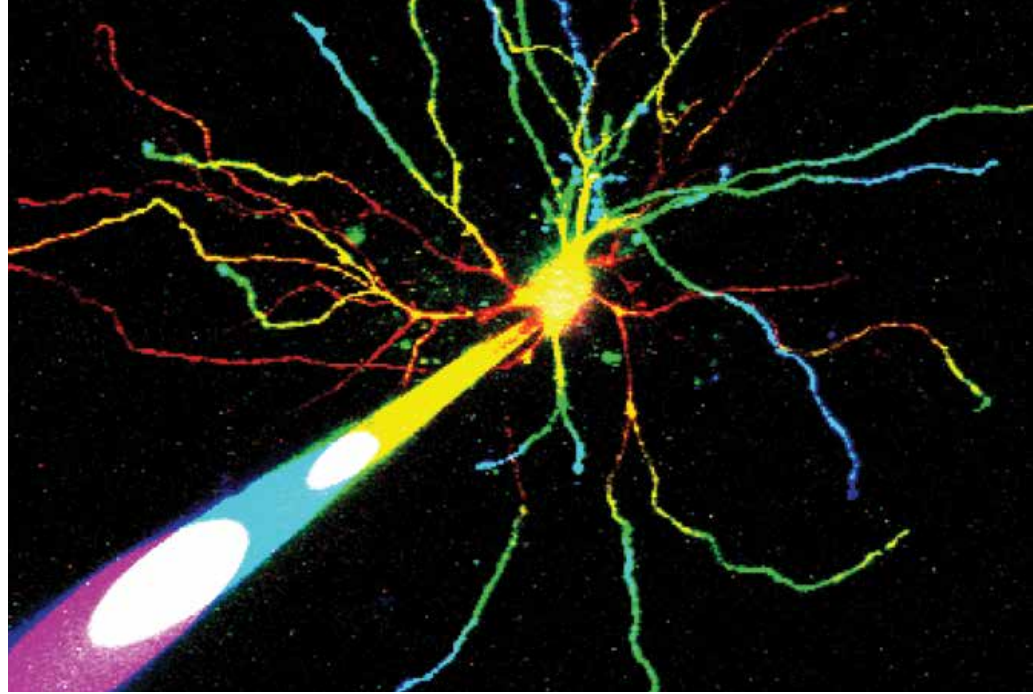
Statistics and Computation for an Increasingly Quantitative Scientific Future

Chair: Rita Balice-Gordon, PhD

Saturday, Oct. 17, 1:30–4 p.m.

McCormick Place: S100A

The replication of scientific studies is a widely-recognized challenge in neuroscience and requires practical solutions, which can impact research, funding, publishing, and training. Speakers will discuss best practices in experimental design, statistical rigor, impact on animal use, methodological descriptions, reagent validation and sharing, data sharing, and the impact these have on funding and publishing practices. This symposium will also explore the role of inherent scientific biases and how these might be mitigated to achieve higher standards of reproducibility.



Novel Ideas and Tools to Enhance the Neurobiological Study of Drug Addiction With an Eye Toward Intervention Development and Biomarker Identification CME

Chair: Rita Goldstein, PhD

Tuesday, Oct. 20, 1:30–4 p.m.

McCormick Place: S100B

This translational symposium presents exciting new scientific directions in the study of human drug addiction. Topics will include the use of integrated positron emission tomography (PET) scans and magnetic resonance imaging (MRI) to study abnormalities in blood perfusion of the brain in humans and test novel molecular targets, *in vivo*, as well as the development of cross-species analyses to guide systems-level explorations, and the potential use of brain-computer interfaces to enhance self-control in addiction.

Adolescent Alcohol Exposure: Long-Term Neurobiological and Behavioral Consequences CME

Chair: Soundar Regunathan, PhD

Co-Chair: Antonio Noronha, PhD

Wednesday, Oct. 21, 8:30–11 a.m.

McCormick Place: S105

Human studies show that morphological changes in the brain during adolescence contribute to attention, impulse control,

information processing, violence, and responses to rewards. Alcohol consumption during adolescence is highly prevalent, and yet very little is known about the long-lasting consequences. The four speakers in this symposium will describe recent findings on behavioral, cellular, molecular, and structural alterations in adult animals after alcohol exposure during adolescence.

THEME D: SENSORY AND MOTOR SYSTEMS Cellular and Circuit Mechanisms of Multisensory Integration and Plasticity CME

Chair: Hey-Kyoung Lee, PhD

Co-Chair: Patrick O. Kanold, PhD

Sunday, Oct. 18, 8:30–11 a.m.

McCormick Place: S406A

Multisensory integration occurs even at the early stages of sensory processing across diverse organisms. Such interactions also serve as substrates for cross-modal plasticity in the event of losing a sensory modality. This session will present recent evidence demonstrating synaptic and circuit mechanisms of multisensory interactions and cross-modal plasticity. Mechanisms underlying the development of multisensory circuits and their adaptive plasticity in adults will be highlighted.



Symposia

Retinal Microcircuits for the Computation of Motion Direction: Functional Organization, Development, and Behavior **CME**

Chair: H. Sebastian Seung, PhD

Monday, Oct. 19, 8:30–11 a.m.

McCormick Place: S100B

The retina has historically been a region of the mammalian central nervous system that is especially tractable. Two-photon imaging, serial electron microscopy, and genetic manipulations of specific cell types are revealing with unprecedented precision how the microcircuitry is functionally organized, emerges during development, and contributes to visually-guided behaviors. This symposium will survey recent progress using the example of retinal direction selectivity.

THEME E: INTEGRATIVE SYSTEMS: NEUROENDOCRINOLOGY, NEUROIMMUNOLOGY, AND HOMEOSTATIC CHALLENGE **New Approaches to Understanding How the Hypothalamus Controls Adaptive and Integrative Behavior **CME****

Chair: William Wisden, PhD

Wednesday, Oct. 21, 8:30–11 a.m.

McCormick Place: S100A

This symposium will present new genetic and ethological methods that are changing researchers' ideas about hypothalamic function. Presenters will explore how circuitry controlling the sleep-wake cycle has inbuilt local circadian clocks; how fast and slow signalling onto hypothalamic neurons allows metabolic integration; how such circuitry is also adapted to regulate emotion; and finally, speakers will examine some of the ion channels and receptors involved in governing the activity of these circuitries.

THEME F: COGNITION AND BEHAVIOR **Identifying and Manipulating the Synapses, Cells, and Circuits of Memory Engrams: Implications for Memory and Memory Disorders **CME****

Chair: Alcino J. Silva, PhD

Sunday, Oct. 18, 8:30–11 a.m.

McCormick Place: S100A

Ground-breaking technological developments in neuroscience have transformed efforts to identify, understand, and manipulate the engram at a synaptic, cellular and circuit level. This symposium will review these advances and discuss their implications for the understanding of memory as well as memory disorders.

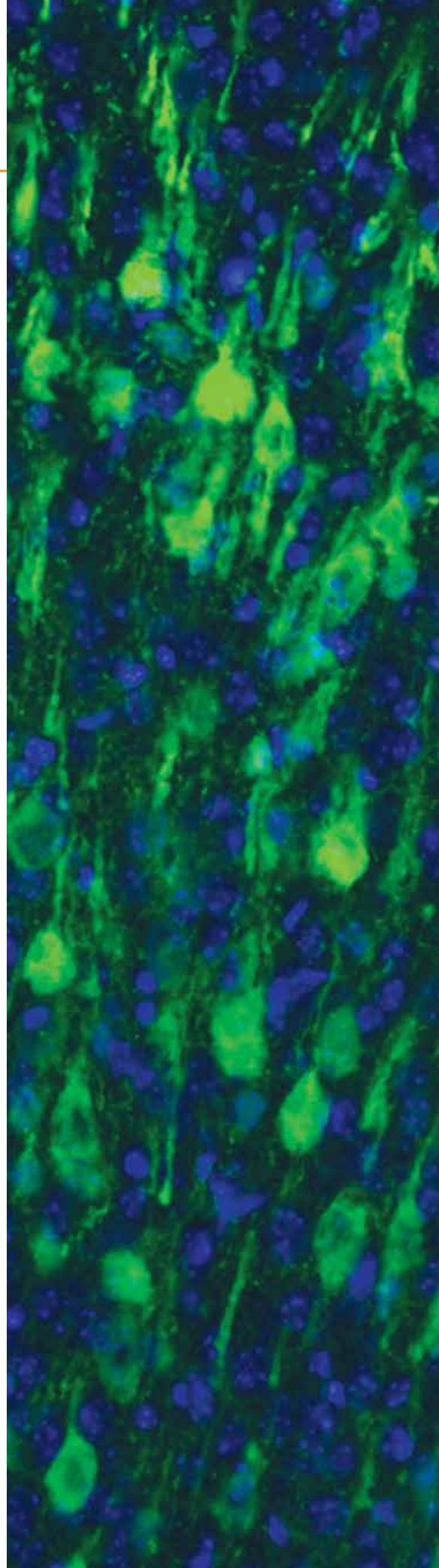
Hidden Variables of Behavior: Neuronal Parameters Underlying Brain States **CME**

Chair: Mark J. Schnitzer, PhD

Sunday, Oct. 18, 1:30–4 p.m.

McCormick Place: S100B

Technologies for observing and influencing large-scale neural circuit dynamics have illuminated how time-varying brain states shape vertebrate cognition and behavior. Highlighting recent work on spatial, emotional, and social forms of cognition, speakers will discuss factors acting over time scales of seconds to years — including neurophysiological dynamics, life experience, and epigenetics — to sculpt the internal dynamics and interactions of brain systems underlying brain and behavioral states.





Time in Cortical Circuits CME

Chair: Gerald T. Finnerty, PhD

Co-Chair: Dean V. Buonomano, PhD

Tuesday, Oct. 20, 1:30–4 p.m.

McCormick Place: S100A

Time is central to cognition. The relationship is complex. Cortical circuits function in the time domain. Yet, neural activity in cortical circuits is fundamental to our perception of time. This symposium will address how cortical circuits generate time-dependent cognition. Speakers will consider novel ways that cortical circuits use timing to enhance function and to tell time and will highlight progress in the understanding of how time perception expands the ability to anticipate stimuli and make decisions.

THEME G: NOVEL METHODS AND TECHNOLOGY DEVELOPMENT

Early Reports From the BRAIN Initiative Frontline: Advancing Technologies to Accelerate Our Understanding of Brain Function CME

Chair: Eve E. Marder, PhD

Co-Chair: Jane I. Roskams, PhD

Monday, Oct. 19, 8:30–11 a.m.

McCormick Place: S100A

The BRAIN Initiative was launched in 2013 to stimulate research in key areas of technology development, analysis, and big data research that will accelerate our understanding of brain function. The first funded BRAIN Initiative projects are creating new avenues to understand brain cell diversity, *in vivo* function, and connectivity. Based across a variety of organisms, this symposium will present some of the preliminary news from the first round of BRAIN-funded projects.

All-Optical Interrogation of Neural Circuits CME

Chair: Michael Hausser, PhD

Co-Chair: Valentina Emiliani, PhD

Tuesday, Oct. 20, 8:30–11 a.m.

McCormick Place: S100B

This symposium will describe the nexus of dramatic recent developments in optogenetic probes, genetically encoded activity sensors, and novel microscopies, which together allow the activity of neural circuits to be recorded and manipulated using entirely light. Such an “all-optical” approach promises to illuminate many fundamental challenges in neuroscience, including transforming our search for the neural code and the links between neural circuit activity and behavior.