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## Theme A: Development

### *Axon Regeneration in the CNS:*

#### *New Models and Insights* **CME**

*Chaired by:* Binhai Zheng, PhD

The capacity to regenerate axons after CNS trauma, such as a spinal cord injury, is extremely limited. Despite rapid progress, the molecular control of CNS axon regeneration remains elusive. Six speakers will share new experimental approaches and molecular insights in the study of axon regeneration. Laser ablation and optic imaging in *C. elegans* and mice, neuron intrinsic mechanisms, physiological roles, and downstream signaling of myelin inhibitors, and the role of the glial scar will be discussed.

### *Epigenetics in the Nervous System* **CME**

*Chaired by:* Andrea C. Beckel-Mitchener, PhD

*Co-Chaired by:* Joni Rutter, PhD

This minisymposium will present findings on the role of epigenetic processes in nervous system function. Epigenetics is broadly defined as the study of stable changes in gene regulation and expression that are not dependent on DNA sequence. In the “post-genomic” era, understanding how changes in the transcriptional potential of a cell can result in long-lasting, yet reversible changes in cellular and behavioral phenotypes is relevant to understanding many aspects of nervous system function.

### *New Methods to Study New Neurons* **CME**

*Chaired by:* Adi Mizrahi, PhD

*Co-Chaired by:* Kirsty Spalding, PhD

The adult brain maintains few neurogenic niches which continuously supply new and functional neurons to existing circuits. But the “why,” “where,” and “to what extent” adult neurogenesis persists in adulthood remain open questions. New methods to study new neurons have recently been developed across disciplines and allow unprecedented observational and manipulative power. This symposium will discuss some exciting developments and findings in the field, focusing primarily on the mammalian brain.

## Theme B: Neural Excitability, Synapses, and Glia: Cellular Mechanisms

### *Homeostatic Plasticity in Intact Neural Circuits* **CME**

*Chaired by:* Carlos D. Aizenman, PhD

*Co-Chaired by:* Hey-Kyoung Lee, PhD

Homeostatic plasticity of synaptic and intrinsic neuronal properties has emerged as an important mechanism by which neurons functionally adapt to changes in activity. Until recently, homeostatic plasticity was mostly described at the level of single neurons in reduced preparations. Here we will present exciting recent evidence from intact preparations suggesting homeostatic plasticity as a universal principle by which neurons adapt to developmental and sensory changes across diverse brain areas.

### *mRNA Transport and Local Protein Synthesis in Development, Plasticity, and Regeneration* **CME**

*Chaired by:* Gary Bassell, PhD

*Co-Chaired by:* Jason Dictenberg, PhD

This minisymposium will highlight the regulation of mRNA transport and localized translation in various aspects of neuronal function, including axon guidance, regeneration, and synaptic plasticity. In addition, Fragile X Syndrome will be discussed as a cognitive disorder resulting from dysregulation of mRNA transport and local protein synthesis. The topics will range from developing to adult systems, invertebrate to mammalian systems, and will consider both CNS and PNS.

## Theme C: Disorders of the Nervous System

### *Adult Neurogenesis, Mental Health, and Mental Illness: Hope or Hype?* **CME**

*Chaired by:* Amelia J. Eisch, PhD

Research suggests that regulation of adult hippocampal neurogenesis is a promising approach to treating and perhaps preventing mental illness. This minisymposium will provide a forum for rigorous evaluation of the relationship between adult neurogenesis, mental health, and mental illness. After highlighting vital advances in our understanding of “normal” neurogenesis, the evidence for a causative, not just correlative, role for new neurons in addiction, depression, epilepsy, and schizophrenia will be evaluated.

### *Chemokines in the Nervous System* **CME**

*Chaired by:* Richard J. Miller, PhD

*Co-Chaired by:* William Rostene, PhD

Chemokines are small secreted proteins belonging to the chemoattractant cytokine family. Recent work has established that chemokines and their receptors are expressed by various cells in the brain, including neurons, glia, and microglia. Chemokines can act as neuromodulators and influence the course of various neurodegenerative diseases and the establishment of chronic pain syndromes. This minisymposium highlights these recent advances and questions arising from this emerging field in neuroscience.

### *Contribution of TRP Channels to Neurological Disease* **CME**

*Chaired by:* Robert A. Cornell, PhD

Transient Receptor Potential (TRP) channels are a large family of non-selective cation channels mostly studied for their role in transducing sensation of many modalities (pain, temperature, taste). By contrast, this minisymposium will include studies from a number of new labs emphasizing ways that TRP channels contribute to disease-relevant processes, including pain and excitotoxic neuronal death. Other talks will survey evidence that mutant forms of TRPs can result in neurological TRPopathies.

### *Integrative Approaches to Candidate Gene Models of Schizophrenia: Exploring the Neuregulin/ErbB4 Pathway* **CME**

*Chaired by:* Joshua A. Gordon, MD, PhD

*Co-Chaired by:* Amelia L. Gallitano-Mendel, MD, PhD

Characterizing cellular pathways that incorporate multiple schizophrenia candidate genes may help elucidate the pathophysiology of this devastating illness. Multiple components of the signaling pathway acting downstream of the candidate gene, neuregulin-1, and its receptor, ErbB4, have been linked to schizophrenia. This minisymposium will explore the consequences of manipulating individual elements of this pathway, addressing their functional and clinical relevance.



### **Mouse Models of Autism and Related Disorders: Molecules, Mechanisms, and Treatment CME**

*Chaired by:* Craig M. Powell, MD, PhD  
*Co-Chaired by:* Lisa M. Monteggia, PhD  
 This minisymposium will highlight recent advances in the molecular/genetic basis of autism by exploring four genetic models of autism, including molecular, synaptic, and microcircuit level mechanisms. Models to be discussed include Fragile X (*fmr1*), Autism (Neurologin-3), Angelman Syndrome (*Ube3a*), and Rett Syndrome (*MeCP2*). Once thought of as essentially irreversible neurodevelopmental disorders, new advances are paving the way for novel therapeutics, as autism-related abnormalities are proving to be reversible.

### **Paths of Convergence: Sirtuins in Aging and Neurodegeneration CME**

*Chaired by:* Li Gan, PhD  
*Co-Chaired by:* Tiago F. Outeiro, PhD  
 Aging is the unifying risk factor for neurodegenerative diseases. Pathways that slow aging may provide a broad strategy to prevent or treat these conditions. Sirtuins extend the lifespan of diverse organisms. Recent studies revealed that sirtuins regulate several fundamental mechanisms in aging-dependent neurodegeneration. This minisymposium will discuss these recent discoveries and examine the therapeutic potential/challenges of targeting these pathways in treating neurodegenerative diseases.

### **Role of MicroRNAs in Neurological Disorders and Neuroprotection CME**

*Chaired by:* Julie A. Saugstad, PhD  
*Co-Chaired by:* Raghu Vemuganti, PhD  
 MicroRNAs regulate gene expression and development in animals by repression of messenger RNA translation. Recent evidence shows that microRNAs repress translation in proliferating cells, but up-regulate translation during cell cycle arrest. This finding underscores the importance of delineating the roles of microRNAs in the brain, which is comprised of terminally differentiated neurons and quiescent glial cells that can proliferate upon stimulation. This minisymposium will present current studies focused on the role of microRNAs in brain disorders and in neuroprotection.

## **Theme D: Sensory and Motor Systems**

### **A New Framework for Understanding the Effector Side of the Oculomotor System CME**

*Chaired by:* Linda K. McLoon, PhD  
*Co-Chaired by:* Francisco H. Andrade, PhD  
 Vision depends on voluntary and reflexive eye movements initiated by the oculomotor system. The effector arm of this motor system includes the extraocular muscles and their motor neurons. This minisymposium will highlight novel findings on the development of extraocular muscles and oculomotor neurons, metabolic design of the extraocular muscles, functional consequences of their structural organization, and potential reasons for their differential response to some neuromuscular diseases.

### **Fine-Scale Spatial Organization of Face and Object Selectivity in the Temporal Lobe: Do fMRI, Optical Imaging, and Electrophysiology Agree? CME**

*Chaired by:* Hans P. Op De Beeck, PhD  
 The spatial organization of the brain's object and face representations is intriguing, but poorly understood. This minisymposium brings together recent, exciting progress using advanced imaging and physiology methods in humans and non-human primates. The overarching goal is to understand how neuronal activity, optical imaging, and fMRI signals are related within the temporal lobe, and to uncover the fine-grained spatial organization of object and face representations in the primate brain.

### **New Directions in Chemical Senses CME**

*Chaired by:* Rachel I. Wilson, PhD  
*Co-Chaired by:* Kristin Scott, PhD  
 In the last two decades, enormous progress has been made in identifying olfactory and gustatory receptor genes, and mapping their expression patterns. This minisymposium will focus on the next major challenge: understanding how chemosensory signals are processed by the brain. Speakers will explore the relationship between receptor genes and perception, highlight the role of dynamic networks in processing chemical stimuli, and discuss how active behavioral sampling shapes chemosensory processing.

### **New Perspectives on the Role of the Inferior Colliculus in Sensory Coding CME**

*Chaired by:* Didier A. Depireux, PhD  
*Co-Chaired by:* Monty A. Escabi, PhD  
 Understanding the functional architecture and role of the inferior colliculus

has progressed rapidly in the last few years. Spectro-temporal processing involves ascending auditory projections from the brainstem, but also descending projections, particularly from the cerebral cortex, a complex local functional anatomy, and a modulation by multi-sensory input. Recent results on the role of these components and the effect of disrupting some components on the generation of tinnitus will be reviewed.

### **Sensory TRP Channels: Molecular and Cellular Signal Integration CME**

*Chaired by:* Sven E. Jordt, PhD  
 This minisymposium will present recent progress in the understanding of the molecular and cellular integration of physical and chemical stimuli by Transient Receptor Potential (TRP) ion channels in sensory neurons. Presentations will focus on molecular and structural aspects of thermal and chemical gating by TRP channels, cellular specificity of TRP channel signaling in neurons and peripheral fibers, and multiple chemical sensitivity of TRP channels and its implications for analgesia and irritant sensation.

### **The Cortical Motor Map in Stroke Rehabilitation CME**

*Chaired by:* George F. Wittenberg, MD, PhD  
 Maps are powerful explanatory tools, particularly in motor neuroscience. The geometry of motor maps and the effect of timing on changes in the motor map are important factors in the recovery of motor function after stroke. This symposium will demonstrate structural-functional relationships in an animal model of stroke and through the use of multimodal imaging of human brains recovering from stroke. This knowledge will enhance our ability to design new treatments for this common condition.

## **Theme E: Homeostatic and Neuroendocrine Systems**

### **New Developments in Sleep Research: Molecular Genetics, Gene Expression, and Systems Neurobiology CME**

*Chaired by:* Thomas S. Kilduff, PhD  
 Understanding the mechanisms underlying the control of sleep and wakefulness are a central theme in neuroscience. This minisymposium will discuss the interaction between the sleep homeostatic and circadian systems in timing the occurrence of sleep and wakefulness, the effects of sleep deprivation, and recovery sleep on brain gene expression, the recent discovery



of a “sleep active” neuronal population in the cortex, and the role of the hypocretin/orexin system in sleep and wakefulness.

### Theme F: Cognition and Behavior

#### *Functional Interactions among Multiple Brain Areas during Flexible Associative Learning* **CME**

*Chaired by:* Mark Laubach, PhD

This minisymposium will review the neuronal basis of flexible associative learning. Neuropsychological studies will be reviewed by Yogita Chudasama. Learning-related changes in neuronal activity (spike trains and local field potentials) will be reviewed by Earl Miller (prefrontal cortex and striatum), Wendy Suzuki (medial temporal lobe), Daniel Salzman (orbitofrontal cortex and amygdala), Matthew Roesch (orbitofrontal cortex and dopamine neurons), and Mark Laubach (dorsal and ventral striatum).

#### *Neuronal Development in the Context of Behavior: The Power of Birdsong* **CME**

*Chaired by:* Teresa A. Nick, PhD

This minisymposium examines recent advances in birdsong development, a prominent model for human speech. Novel findings reveal fundamental mechanisms of forebrain development in the context of a quantifiable behavior and similarities between mammalian and avian brain development. These talks will discuss the impact of new data on accepted and emerging hypotheses of neural development and vocal learning. Topics will highlight new breakthroughs and their broader implications for neurobehavioral development.

#### *Reconsolidation, the Next Generation: From Phenomenology to Mechanisms* **CME**

*Chaired by:* Karim Nader, PhD

The initial experiments on reconsolidation probed how extensive this phenomenon was and tested alternative interpretations of the deficit. This minisymposium showcases many of the new issues being addressed in this second generation of studies on reconsolidation. These include studies

examining the neurobiological mechanisms mediating destabilization of consolidated memories, new paradigms to test the nature of amnesia, constraints on when reconsolidation occurs, and the first report to target reconsolidation of traumatic memory as a treatment for mental illness.

#### *The Evolution of Numerical Cognition: From Number Neurons to Linguistic Quantifiers* **CME**

*Chaired by:* Edward M. Hubbard, PhD

*Co-Chaired by:* Vanessa Troiani, BS  
Symbolic number systems build on an evolutionarily conserved ability to compare non-symbolic quantities of items, giving rise to number words, symbols, and linguistic quantifiers. This minisymposium will present findings from single-unit physiology, cross-species behavioral experiments, computational modeling, and functional neuroimaging studies that have provided exciting insights into the neural mechanisms in the parietal cortex, frontal cortex, and hippocampus that underlie these abilities.

#### *The Progression toward Excessive Drug Choice in Addiction: Multidisciplinary Approaches toward Neurobiological Mechanisms* **CME**

*Chaired by:* Christelle Baunez, PhD

*Co-Chaired by:* Serge H. Ahmed, PhD  
Repeated use of drugs of abuse is thought to increase the relative value of drug in comparison to non-drug rewards. This minisymposium will describe computational, behavioral, and neural mechanisms underlying drug overvaluation in addiction in both human addicts and drug-dependent animals. Behavioral, neurobiological, clinical, and computational data will be presented.

### Theme G: Novel Methods and Technology Development

#### *High-Throughput Microscopy and Computational/Theoretical Challenges in the Analysis of Neural Circuit Structure* **CME**

*Chaired by:* Louise C. Abbott, PhD, DVM

*Co-Chaired by:* Yoonsuck Choe, PhD

This minisymposium will survey the latest advances in high-throughput microscopy methods that enable the imaging and analysis of neural microcircuits on the scale of whole small animal brains. The massive amounts of data produced by these microscopy instruments pose serious computational challenges. These computational issues, together with emerging solutions that enable a truly quantitative science of brain networks, will be discussed at this minisymposium.

