When citing an abstract from the 2017 annual meeting please use the format below.

[Authors]. [Abstract Title]. Program No. XXX.XX. 2017 Neuroscience Meeting Planner. Washington, DC: Society for Neuroscience, 2017. Online.

Lecture

001. DIALOGUES BETWEEN NEUROSCIENCE AND SOCIETY

Location: Hall D

Time: Sat, Nov. 11, 2017, 11:00 AM - 1:00 PM

Support: Elsevier

Speakers: S. MUKHERJEE;
Columbia Univ., Columbia, NY

Abstract: Mukherjee, a physician and researcher, wrote the Pulitzer Prize-winning book *The Emperor of All Maladies: A Biography of Cancer*, which explores the disease that has plagued humans for thousands of years. His new book, *The Gene: An Intimate History*, examines the quest to decipher how human heredity combines with life experiences to control our lives. In this lecture, Dr. Mukherjee will engage in a conversation with SfN President Eric Nestler about the excitement and importance of communicating the promise of scientific inquiry to the public.

Disclosures: S. Mukherjee: None.

Lecture

002. From Mechanisms of Neurogenesis to Neural Repair: Turning Scar-Forming Glia Into Neurons

Location: Hall D

Time: Sat, Nov. 11, 2017, 2:00 PM - 3:10 PM

Grant Support: advanced ERC grant ChroNeuroRepair 340793

DFG Collaborative Research Center 870 project A06

DFG Excellence Cluster Synergy

DFG Priority Research program 1757

DFG Priority Research program 1738

Bavarian Network FORIPS

Speakers: M. GÖTZ;
Ludwig Maximilian Univ. and Helmholtz Center’s Inst. of Stem Cell Res., Munich, Germany

Abstract: Much is known about molecular and cellular mechanisms of neurogenesis, but it is not clear how to trigger these mechanisms after brain injury. This lecture will review some of the

key regulators of neurogenesis and discuss to what extent neurogenesis in the adult mammalian brain differs from neurogenesis in development. The lecture will also address our knowledge about scar formation, direct *in vivo* reprogramming that turns glia into neurons after brain injury, and the state-of-the-art efficiency and maturity of neurons. The lecture will close with data on how new neurons can functionally integrate and connect in brain regions that normally never integrate new neurons.

Disclosures: M. Götz: None.

Lecture

009. PRESIDENTIAL SPECIAL LECTURE: Insights From Nonhuman Animals Into the Neurobiology of Language

Location: Hall D

Time: Sat, Nov. 11, 2017, 5:15 PM - 6:30 PM

Support: Tianqiao & Chrissy Chen Institute

Grant Support: Howard Hughes Medical Institute

NIH Director's Pioneer Award DP1OD000448

National Science Foundation EDGE award

Rockefeller University

Speakers: *E. D. JARVIS;
The Rockefeller Univ. and Howard Hughes Med. Inst., New York City, NY

Abstract: Understanding language can be considered a final frontier towards understanding brain mechanisms of complex behaviors. A challenge is that language was considered unique to humans. However, the last several decades has seen a surge in non-human animal studies that inform us about language. This lecture will present a modern synthesis of these studies, from molecular, circuit, to behavior levels. A key new concept is that components of language, such as vocal learning, are continuous among species, and therefore can be used to gain insight into mechanisms and evolution of language.

Disclosures: E.D. Jarvis: None.

Lecture

094. Molecular Architecture of the Circadian Clock in Mammals

Location: Hall D

Time: Sun, Nov. 12, 2017, 8:30 AM - 9:40 AM

Grant Support: Howard Hughes Medical Institute

NIH Grant R01AG045795

NIH Grant U01 MH61915

NIH Grant P50 MH074924

NIH Grant R01 MH078024

Speakers: *J. S. TAKAHASHI;
Chair, Dept. of Neuroscience, Univ. of Texas Southwestern Med. Ctr. and Howard Hughes Med. Inst., Dallas, TX

Abstract: Circadian rhythms are an adaptation to the cyclic environment on Earth. In animals, circadian behavior can be analyzed as an integrated system, beginning with genes and ultimately leading to behavioral outputs. The mechanism of circadian clocks in mammals is cell-autonomous and generated by a set of genes forming a transcriptional autoregulatory feedback loop. The cellular autonomy of clocks has raised a number of questions concerning synchronization and coherence of rhythms at the cellular level as well as circadian organization at the systems level.

Disclosures: J.S. Takahashi: E. Ownership Interest (stock, stock options, royalty, receipt of intellectual property rights/patent holder, excluding diversified mutual funds); co-founder, Reset Therapeutics, Inc.. F. Consulting Fees (e.g., advisory boards); AB, Reset Therapeutics, Inc.

Lecture

101. Using Memory to Guide Decisions

Location: Hall D

Time: Sun, Nov. 12, 2017, 10:00 AM - 11:10 AM

Grant Support: McKnight Foundation Memory and Cognitive Disorders Award

NSF Career Award #0955494

NIH Grant R01NS079784

NIH Grant CRCNS R01DA038891

Speakers: D. SHOHAMY;
Psychology, Columbia Univ., New York, NY

Abstract: From robots to humans, the ability to learn from experience turns a rigid response system into a flexible, adaptive one. This lecture will discuss the neural and cognitive mechanisms by which learning shapes decisions. The lecture will focus on how multiple brain regions interact to support learning, what this means for how memories are built, and the consequences for how decisions are made. Results emerging from this work challenge the traditional view of separate learning systems and advance understanding of how memory biases decisions in both adaptive and maladaptive ways.

Disclosures: D. Shohamy: None.

Lecture

102. Carving the World Into Useful Task Representations

Location: Hall D

Time: Sun, Nov. 12, 2017, 11:30 AM - 12:40 PM

Grant Support: NIH grant R03DA029073

NIH grant R01MH098861

Army Research Office award W911NF-14-1-0101

Sloan Research Fellowship

Ellison Medical Foundation Research Scholarship

NSF Graduate Student Research Fellowship

Intel Corporation

Speakers: *Y. NIV;
Neurosci. Inst. & Dept. of Psychology, Princeton Univ., Princeton, NJ

Abstract: Studies in reinforcement learning have famously explained the role of dopamine in learning. However, reinforcement learning relies on representations of tasks as a sequence of "states." Where do these states come from? This lecture will first demonstrate that by learning the latent structure of a task, animals and humans form a state of space through experience. The lecture will then show that the frontoparietal attention network interacts with valuation in the basal ganglia to learn these representations. Finally, the lecture will suggest that the orbitofrontal cortex represents a cognitive map of learned states for decision-making.

Disclosures: Y. Niv: None.

Lecture

177. Genetic Dissection of Neural Circuit Assembly and Organization

Location: Hall D

Time: Sun, Nov. 12, 2017, 1:00 PM - 2:10 PM

Grant Support: NIH R01-DC005982

NIH R01-NS050835

NIH TR01MH099647

Howard Hughes Medical Institute

NSF BRAIN EAGER 1546612

SFARI Research Award 345098 (Simons Foundation)

Speakers: *L. LUO;
Stanford Univ. and Howard Hughes Med. Inst., Stanford, CA

Abstract: This lecture will discuss recent work on the development and function of neural circuits in flies and mice. Discussion of development will focus on cellular and molecular mechanisms that mediate the establishment of wiring specificity between pre- and postsynaptic partners. Discussion of function will focus on applications of viral-genetic tracing and TRAP methods we developed to interrogate circuits involved in neuromodulation and remote memory.

Disclosures: L. Luo: None.

Lecture

184. PETER AND PATRICIA GRUBER LECTURE: Assembling Neural Circuits: Cells and Synapses

Location: Hall D

Time: Sun, Nov. 12, 2017, 2:30 PM - 3:40 PM

Support: The Gruber Foundation

Speakers: *J. R. SANES;
Harvard Univ., Cambridge, MA

Abstract: The retina is emerging as a leading model system for elucidating mechanisms that govern neural circuit assembly and function. Visual information is passed from retinal photoreceptors to interneurons to retinal ganglion cells (RGCs) and finally to the rest of the

brain. Each of the more than 40 types of RGCs responds to specific visual features, and the features to which each RGC type responds depend on which of the more than 70 types of interneurons synapse on it. This lecture will describe genetic, morphological, and physiological studies that have led to identification of some molecules and mechanisms that underlie assembly of these circuits. The lecture will then discuss new molecular methods that are enabling a comprehensive cataloging of neuronal cell types and the recognition molecules they use.

Disclosures: J.R. Sanes: None.

Lecture

185. PRESIDENTIAL SPECIAL LECTURE: Illuminating Neurobiology at the Nanoscale and Systems Scale by Imaging

Location: Hall D

Time: Sun, Nov. 12, 2017, 5:15 PM - 6:30 PM

Support: Janssen Research & Development LLC

Grant Support: HHMI

NIH

Army Research Office

Speakers: X. ZHUANG;
Depts. of Chem. & Chem. Biol. & Physics, Harvard Univ. and Howard Hughes Med. Inst., Cambridge, MA

Abstract: Imaging has helped to advance many areas of neurobiology. This lecture will describe super-resolution imaging methods that allow fluorescence imaging of cells and tissues with nanometer-scale resolution, as well as discoveries of novel cellular structures in neurons enabled by this approach. The lecture will also highlight a single-cell transcriptome imaging approach that allows the expression of thousands of genes to be profiled *in situ* in a spatially resolved manner. The application of this method to neurobiology studies will also be discussed.

Disclosures: X. Zhuang: None.

Lecture

261. Neural Circuits Controlling the Selection and Persistence of Sensory Information

Location: Hall D

Time: Mon, Nov. 13, 2017, 8:30 AM - 9:40 AM

Grant Support: NIH Grant EY014924

Speakers: *T. MOORE;
Neurobio., Stanford Univ. and Howard Hughes Med. Inst., Stanford, CA

Abstract: The processing and retention of sensory input is influenced by a number of endogenous factors, such as arousal, motivation, and cognitive control. These factors appear to constrain the sensory information guiding adaptive behavior. This lecture will discuss recent evidence on the neural circuits involved in the modulation, filtering, and persistence of sensory information and their relation to basic cognitive functions such as attention and working memory. The lecture will include evidence from a range of model systems and approaches as well as a discussion on the relevance to mental disorders.

Disclosures: T. Moore: None.

Lecture

269. DAVID KOPF LECTURE ON NEUROETHICS: The Fallacy of Fairness: Diversity in Academic Science

Location: Hall D

Time: Mon, Nov. 13, 2017, 10:00 AM - 11:10 AM

Support: David Kopf Instruments

Grant Support: Sloan Foundation Grant Number 2013-3-05

Speakers: J. HANDELSMAN;
Univ. of Wisconsin-Madison, Madison, WI

Abstract: Scientists strive for truth and objectivity in their research. And yet, it is broadly recognized that our biases can creep into the collection of data, particularly when there is subjective judgments to be made rather than numbers read from an instrument. Research biases can arise from affection for a hypothesis, expectations based on past findings, or a blind spot in our own perceptions. To prevent the incursion of personal bias in findings, we blind and randomize samples. Why then, should our judgments about people not be subject to bias? There is strong evidence that we are carry and apply biases from various cultural sources. The field of cognitive and social psychology have studied the impact of people's biases about race and gender on judgments about people and their work. In 2012, my collaborators and I published a study of academic scientists showing that they too are influenced by gender bias. As found with essentially all previous studies of bias, there was no difference in biases among men and women, junior and senior faculty, or members of different disciplines. Several studies since have

reinforced these results and demonstrated behaviors among real academic scientists that demonstrated clear, but likely unintended biases dramatically shape how we respond to, hire, evaluate, and pay male and female students and employees. In this talk I will explore the evidence for unintended bias and interventions that have mitigated its effects.

Disclosures: J. Handelsman: None.

Lecture

270. CLINICAL NEUROSCIENCE LECTURE: Insights Into Neural Degeneration From *Drosophila* Genetics

Location: Hall D

Time: Mon, Nov. 13, 2017, 11:30 AM - 12:40 PM

Grant Support: Glenn Award for Research in the Biological Mechanisms of Aging

NIH Grant R35-NS097275

NIH Grant R01-NS078283

Speakers: *N. M. BONINI;
Univ. of Pennsylvania, Philadelphia, PA

Abstract: Generating models of key human neurodegenerative diseases in *Drosophila* is leading to discoveries about the molecular genetic pathways that modulate neural integrity. This lecture will illustrate how using the fly as a model for disease provides insight into modifier pathways. This lecture will also highlight the fundamental biological pathways of neural maintenance as well as reveal the weak links and processes that can serve as protective players. This research highlights the importance of proper protein folding and stress pathways and identifies new players critical for protection of the brain for the long term.

Disclosures: N.M. Bonini: None.

Lecture

353. ALBERT AND ELLEN GRASS LECTURE: On Balance: Fine-Tuning Protein Levels for Neurological Health

Location: Hall D

Time: Mon, Nov. 13, 2017, 3:15 PM - 4:25 PM

Support: The Grass Foundation

Grant Support: HHMI

NIH NS027699

NIH NS057819

NIH HD024064

Belfer Neurodegeneration consortium

Rett syndrome Research Trust

Keck

Speakers: *H. Y. ZOGHBI;
Molec Human Genetics/ Neurosci, Baylor Col. of Med. and Howard Hughes Med. Inst., Houston, TX

Abstract: When we think of the genetics of neurodevelopmental and neurodegenerative disorders, we tend to think about mutations that alter a protein's function. An emerging theme among both classes of disorders, however, is the vulnerability of neurons to modest increases or decreases in protein levels — even when those proteins are wild type. This sensitivity to protein levels provides a new avenue to understanding pathogenesis and suggests we should search for regulators of disease-driving proteins that could provide therapeutic entry points for various neuropsychiatric disorders.

Disclosures: H.Y. Zoghbi: A. Employment/Salary (full or part-time): HHMI. C. Other Research Support (receipt of drugs, supplies, equipment or other in-kind support); UCB. E. Ownership Interest (stock, stock options, royalty, receipt of intellectual property rights/patent holder, excluding diversified mutual funds); intellectual property Rett diagnostic. F. Consulting Fees (e.g., advisory boards); Regeneron, Denali, Biopontis.

Lecture

354. PRESIDENTIAL SPECIAL LECTURE: The Gut Microbiota and Childhood Undernutrition: Looking at Human Development From a Microbial Perspective

Location: Hall D

Time: Mon, Nov. 13, 2017, 5:15 PM - 6:30 PM

Speakers: J. I. GORDON;
Washington Univ. Sch. of Med., St. Louis, MO

Abstract: Human postnatal development is typically viewed from the perspective of our "human" organs. As we come to appreciate how our microbial communities are assembled

following birth, there is an opportunity to determine how this microbial facet of our developmental biology is related to healthy growth as well as to the risk for and manifestations of disorders that produce abnormal growth. This lecture will describe how this hypothesis is being examined in the context of childhood undernutrition.

Disclosures: J.I. Gordon: None.

Lecture

438. Bridge Over Troubled Synapses: C1q Proteins, GluD Receptors, and Beyond

Location: Hall D

Time: Tue, Nov. 14, 2017, 8:30 AM - 9:40 AM

Grant Support: The Japan Society for the Promotion of Science (15H05772, 16H06461).

The Human Frontier Science Program (RGP0065/2014).

Speakers: *M. YUZAKI;
Keio Univ. Sch. of Med., Tokyo, Japan

Abstract: The C1q complement family has emerged as a new class of synaptic organizers. C1q is shown to regulate synapse elimination. In the cerebellum, Cbln1 binds to its pre- and postsynaptic receptors neurexin (Nrx) and the δ2 glutamate receptor (GluD2), respectively. The Nrx/Cbln1/GluD2 tripartite complex across the synaptic gap is essential not only for synapse formation but also for synaptic plasticity. Similar mechanisms are beginning to be revealed for other Cbln- and C1q-like proteins in various circuits in the forebrain.

Disclosures: M. Yuzaki: None.

Lecture

446. Processing Gustatory Information in *Drosophila*

Location: Hall D

Time: Tue, Nov. 14, 2017, 10:00 AM - 11:10 AM

Grant Support: NIH Grant DK098747

NIH Grant DC013280

Speakers: K. SCOTT;
Dept. of Mol. and Cell Biol., Univ. of California, Berkeley, Berkeley, CA

Abstract: The gustatory system is intimately associated with feeding decisions, allowing animals to identify food that is caloric and to avoid toxic substances. *Drosophila melanogaster* detects many of the same taste compounds as do mammals and provides an excellent model system for comparative studies of gustatory processing. This lecture will discuss how taste information is encoded in neural circuits and how activity in taste circuits is modulated by internal states to regulate feeding behavior.

Disclosures: K. Scott: None.

Lecture

447. Diversified Spinal and Brain Circuits for Locomotor Behavior

Location: Hall D

Time: Tue, Nov. 14, 2017, 11:30 AM - 12:40 PM

Grant Support: European Research Council 693038 - LocomotorIntegration

R01 NS090919

Swedish Medical Research Council

Hjärnfonden

European Research Council - NeuronsInMotion

Novo Nordic Laureate Program

Speakers: *O. KIEHN;
Dept. Neurosci, Karolinska Institutet and Univ. of Copenhagen, Stockholm, Sweden

Abstract: The capacity for movement is at the center of most behaviors. Of movements, locomotion is one of the most fundamental. It requires complex coordination, temporal alteration, and dynamic control. This lecture will focus on recent work that has elucidated the functional diversification of locomotor circuits needed to perform these roles. The lecture will show that spinal locomotor networks are composed of molecularly defined circuit modules adapted to produce changes in timing and coordination of locomotion. The lecture will also address the role of designated brainstem circuits involved in gating or context-dependent selection of the motor behavior.

Disclosures: O. Kiehn: None.

Lecture

533. Artificial Intelligence and Imagination: Exploring the Frontiers of Knowledge

Location: Hall D

Time: Tue, Nov. 14, 2017, 1:00 PM - 2:10 PM

Speakers: *D. HASSABIS;
DeepMind, London, United Kingdom

Abstract: Artificial intelligence (AI) research has been advancing at an incredible pace. Neuroscience plays a big role in both inspiring and validating AI architectures and algorithms. This lecture will look at the deep connection between AI and neuroscience and how both fields can help each other, drawing on examples of work in areas such as imagination, memory, and planning.

Disclosures: D. Hassabis: None.

Lecture

540. HISTORY OF NEUROSCIENCE LECTURE: Neuronal Migration and Brain Map Formation During Evolution, Development, and Disease

Location: Hall D

Time: Tue, Nov. 14, 2017, 2:30 PM - 3:40 PM

Grant Support: R01DA023999

R01EY002593

R01NS014841

Kavli Institute for Neuroscience at Yale

Speakers: *P. RAKIC;
Dept. of Neurosci. and Kavli Inst. For Neurosci., Yale Sch. of Med., New Haven, CT

Abstract: I have attended 47 SFN meetings and have witnessed enormous advances made in methods, levels of analyses and understanding various conceptual and biomedical issues in the neurosciences. I will review the progress in research on the cerebral cortex - the biological substrate of human cognitive abilities. I will focus on cortical development and evolution and the history of this subject in the context of the latest results. It was suspected since the end of the 19th century that cortical neurons may not be generated locally and have to migrate from the place of origin to increasingly distant final positions in the developing neocortex. The introduction of new experimental methods, which allowed us to follow neuronal lineage and destiny, provided evidence that the place and time of their origin determines proper neuronal in

the “protomap” of the embryonic neocortex. It was also shown that the transient radial glial cells serve both as neural progenitors as well as a guide for neuronal migration, enabling the creation of the complex three-dimensional laminar and modular organization of the cortex from initially simple, two-dimensional layers of neural stem cells in the embryonic proliferative zones. Proper migration depends also on ion channel activity that regulates Ca2+ influx into the migrating neurons and affects cytoskeletal and contractile proteins that control the rate of nuclear translocation. Recent use of advanced methods identified genes, regulatory non-coding DNA elements and molecular pathways involved in regulation of these multifactorial cellular events. It has become evident that although the basic principles of cortical development in all mammals are similar, the modification of developmental events during evolution produces not only quantitative but also qualitative changes. Comparative studies in rodents, non-human primates and humans using in vitro and in vivo assays, including genetic manipulations in animals and parallel RNA-sequencing of a whole-transcriptome profiling in human embryonic brain slices, uncovered species-specific genetic differences, some of which are expressed at the time of the neural stem cell’s exit from the mitotic cycle. I will describe how slowing of the rate of neuronal migration by either genetic or environmental factors disrupts their settling pattern and can induce severe congenital cortical abnormalities. In addition, much more subtle neuronal malpositioning - undetectable by neuropathologic examination - can affect the pattern of synaptic circuits and cause late-onset neuropsychiatric disorders and intellectual disabilities.

Disclosures: P. Rakic: None.

Lecture

541. PRESIDENTIAL SPECIAL LECTURE: Polymorphous Polygenicity: The Story of the Genome in Schizophrenia

Location: Hall D

Time: Tue, Nov. 14, 2017, 5:15 PM - 6:30 PM

Speakers: P. SKLAR;
Icahn Sch. of Med. at Mount Sinai, Chevy Chase, MD

Abstract: Advances in human genetics are reshaping the way we understand many mental illnesses, including schizophrenia. We know infinitely more about the DNA changes that are part of the risk of becoming ill, with a key finding being their overall number, type, and pleiotropy. This lecture will explore the genetic factors leading to schizophrenia, their biological follow-up, and implications for neuroscientists.

Disclosures: P. Sklar: None.

Lecture

627. Tools for Optically Monitoring Neural Activity and Signaling Pathways

Location: Hall D

Time: Wed, Nov. 15, 2017, 8:30 AM - 9:40 AM

Grant Support: Howard Hughes Medical Institute, Janelia Research Campus

Speakers: *L. LOOGER;
Howard Hughes Med. Institute, Janelia Res. Campus, Ashburn, VA

Abstract: This lecture will discuss recent progress in reagents for the study of neural circuit structure and function. Topics will include genetically encoded calcium indicators (GECIs) like GCaMP; red GECIs like RCaMP and RGECO; and neurotransmitter sensors for glutamate (iGluSnFR), GABA, acetylcholine, serotonin, norepinephrine, dopamine, etc. The lecture will also show reagents and techniques for connectomic mapping and sequencing, and for construction of whole-brain atlases.

Disclosures: L. Looger: None.

Lecture

635. Spontaneous Activity in Developing Sensory Systems

Location: Hall D

Time: Wed, Nov. 15, 2017, 10:00 AM - 11:10 AM

Grant Support: NIH Grant DC008060

NIH Grant DC009464

Hearing Research Foundation

Speakers: *D. E. BERGLES;
Johns Hopkins Univ. Sch. of Med., BALTIMORE, MD

Abstract: Spontaneous electrical activity within developing sensory systems promotes the maturation and survival of neurons as well as the refinement of nascent circuits. This sensory-independent activity is initiated within immature sensory organs, providing a highly structured version of sensory experience with features that ensure propagation of activity from the periphery to the cortex. This lecture will describe the diverse mechanisms used to initiate this stereotyped activity, highlighting the unexpected role of glial cells in stimulating sensory neurons.

Disclosures: D.E. Bergles: None.

Lecture

636. Building Models of the World for Behavioral Control

Location: Hall D

Time: Wed, Nov. 15, 2017, 11:30 AM - 12:40 PM

Grant Support: Wellcome Trust WT104765MA

James S McDonnell Foundation JSMF220020372

Speakers: *T. BEHRENS;
Univ. of Oxford, Oxford, United Kingdom

Abstract: This lecture will discuss how basic models of the world might be stored in the brain to allow flexible control of behavior. Relevant studies try to investigate neural codes and mechanisms that are used to organize this knowledge into a form that can be used efficiently and flexibly. The lecture will mostly focus on interactions between the frontal cortex and the medial temporal lobe. The neuronal codes and mechanisms discussed are often measured in both humans and model species, so there may be methodological interest in how to measure these mechanistic types of signals in humans.

Disclosures: T. Behrens: None.

Lecture

722. Neuroepigenetic Pathways in Learning and Memory in Mouse and Ant

Location: Hall D

Time: Wed, Nov. 15, 2017, 1:00 PM - 2:10 PM

Speakers: S. L. BERGER;
Departments of Cell and Developmental Biology, Genetics, Biol., Perelman Sch. of Medicine, Univ. of Pennsylvania, Philadelphia, PA

Abstract: Epigenetic pathways are important in the brain to control learning and memory. Epigenetics encompasses mechanisms that alter chromatin structure, comprised of DNA and packaging proteins called histones, and these alterations in turn regulate gene expression. Both the DNA and histones are modified by small chemical groups, including acetyl and methyl groups. In particular, histone acetylation is a key modification that is dynamically altered during

consolidation of learning and memory. We are studying neuroepigenetics in model systems. In mouse, we are investigating a novel pathway of nuclear metabolic production of acetyl-CoA, the key cofactor for histone acetylation. We have discovered that a metabolic enzyme generating acetyl-CoA (ACSS2) is directly bound to chromatin at critical immediate early neuronal genes, and directly fuels the enzyme that catalyzes histone acetylation (CBP). We show that this pathway is critically important to hippocampal-mediated cognitive plasticity. Our findings reveal a novel paradigm of transcriptional regulation in which ACSS2 functions as a chromatin-bound coactivator that locally provides acetyl-CoA to promote histone acetylation and neuron-specific transcription for learning and memory[1]. In a second model system for neuroepigenetics, we utilize ants, a eusocial insect living in complex societies. Ants organize themselves into behavioral castes whose regulation has been proposed to involve epigenetic processes, including histone modification. In the carpenter ant Camponotus floridanus, morphologically distinct worker castes called minors and majors exhibit pronounced differences in foraging and scouting behaviors. We found that these behaviors are regulated by histone acetylation likely catalyzed by the conserved acetyltransferase CBP. Transcriptome and chromatinanalysis in brains of scouting minors fed pharmacological inhibitors of CBP and histone deacetylases (HDACs) revealed hundreds of genes linked to hyperacetylated regions targeted by CBP. Majors rarely forage, but injection of a HDAC inhibitor or small interfering RNAs against the HDAC Rpd3 into young major brains induced and sustained foraging in a CBP-dependent manner. Most recently, we have discovered that this reprogramming of behavior is restricted to a window early after the majors emerge from pupation. Our results suggest that behavioral plasticity in animals may be regulated in an epigenetic manner via histone modification[2].

[1] Mews et al., Nature, 2017 [2]Simola, Graham et al., Science, 2015

Disclosures: S.L. Berger: None.