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Lecture

002: Special Lecture: Sleep for Cognition, Memory, and Mental Health in Females and Males Across the Lifespan - Gina R. Poe

Location: SDCC Ballroom 20

Time: Saturday, November 12, 2022, 1:00 PM - 2:00 PM

Moderator: M. G. TANSEY
University of Florida, FL

Speakers: G. R. POE;
UCLA, Los Angeles, CA

Disclosures: G.R. Poe: None.

Abstract: Every animal sleeps or dies. We will review essential features of sleep that make it irreplaceable for cognition, memory, and mental health, exploring how sleep changes across the hormonal cycle and the lifespan. We will discuss cleaning, growth, and repair functions of slow wave sleep, memory transfer mechanisms during sleep spindles, the potentiation power of P-waves, and circuit remodeling during REM sleep. Finally, we will talk about neurological and mental health conditions affected by variations in sleep features.

Grant Support: MH6070

Lecture

010: Special Lecture: Adult Neurogenesis, Circuit Remodeling, and Hippocampal Function - Alejandro F. Schinder

Location: SDCC Ballroom 20

Time: Saturday November 12, 2022, 3:00 PM - 4:00 PM

Moderator: *L. ANDREAE
King's Col. London, London, United Kingdom

Speakers: *A. F. SCHINDER
Leloir Inst., Buenos Aires, Argentina

Disclosures: A.F. Schinder: None.

Abstract: The generation and integration of new neurons awakens powerful mechanisms of activity-dependent remodeling in preexisting hippocampal circuits of the adult and aging brain. This talk will explore transient functional states displayed by developing granule cells as they evolve towards a mature phenotype. Neurons undergoing the successive transitions exhibit unique molecular identity, morphology, intrinsic properties and synaptic partners, and play distinct roles in the recruitment of target networks.

Grant Support: NIH Grant R01NS103758

Argentinean Agency Grant ANPCyT PICT2016 # 0675

Argentinean Agency Grant ANPCyT PICT2015 # 3814

Lecture

012: Presidential Special Lecture: How Do You Feel? The Molecules That Sense Touch - Ardem Patapoutian

Location: SDCC Ballroom 20

Time: Saturday, November 12, 2022, 5:15 PM - 6:30 PM

Moderator: *G. TURRIGIANO
Brandeis Univ., Waltham, MA

Disclosures: G. Turrigiano: None.

Speakers: *A. PATAPOUTIAN
Scripps Res. Institute/Howard Hughes Med. Inst., La Jolla, CA

Disclosures: A. Patapoutian: None.

Speakers: *M. E. WOLF
Oregon Hlth. & Sci. Univ., Portland, OR

Disclosures: M.E. Wolf: Founder and Sole Member/Manager of Eleutheria Pharmaceuticals LLC - this is a brand-new company. I do not draw salary and we have no IP.

Speakers: *I. MAZE
Howard Hughes Med. Institute/Icahn Sch. of Med. At Mount Sinai, New York, NY

Disclosures: I. Maze: None.

Speakers: *I. R. FIETE
MIT, Cambridge, MA

Disclosures: I.R. Fiete: None.

Speakers: *R. MALENKA;
Nancy Pritzker Laboratory, Dept. of Psychiatry and Behavioral Sci., Stanford, CA

Abstract: Our sense of touch holds the capacity to connect us with the world and warn us of harm and hurt. These senses depend on mechanotransduction, the conversion of pressure into chemical signals. Dr. Patapoutian will discuss work from his laboratory that identified and characterized PIEZO1 and PIEZO2, pressure-activated cation channels. Genetic studies

established that PIEZO2 is the principal mechanical transducer for touch, proprioception, baroreception, and bladder stretch, and that PIEZO1 mediates many mechanosensory roles throughout the body.

Grant Support: Howard Hughes Medical Institute

NIH Grant R35 NS105067

NIH Grant R01 HL43297

Lecture

089: Special Lecture: Idling Brain: From Engram to Behavior - Kaoru Inokuchi

Location: SDCC Ballroom 20

Time: Sunday, November 13, 2022, 9:00 AM - 10:00 AM

Moderator: *B.-K. KAANG
Seoul Natl. Univ., Seoul, Korea, Republic of

Speakers: *K. INOKUCHI
Univ. of Toyama, Toyama, Japan

Disclosures: K. Inokuchi: None.

Abstract: Neurons in the brain are active even when animals sleep or rest, denoted here by “idling brain state”. Flexible reorganization of previously acquired knowledge underlies many brain functions such as inference, assimilation, decision making, and creative thinking. This lecture will discuss new insights into how memory engram cells contribute to cognitive process during idling state, thereby highlighting the power of the idling brain in cognition.

Grant Support: JSPS KAKENHI Grant JP18H05213

JST CREST JPMJCR13W1

Lecture

097: Special Lecture: Mechanisms of Axon Growth and Regeneration - Frank Bradke

Location: SDCC Ballroom 20

Time: Sunday, November 13, 2022, 10:30 AM - 11:30 AM

Moderator: *B. ZHENG
Univ. of California San Diego, La Jolla, CA

Speakers: *F. BRADKE
Senior group leader, Deutsches Zentrum Für Neurodegenerative Erkrankungen E.V. (DZNE), Bonn, Germany

Disclosures: F. Bradke: None.

Abstract: Neurons in the adult nervous system lose their capability to regenerate their axon. And still, neurons are experts in axonal growth and extension at a very specific point in time: during development. This lecture will set forth how neurons initially polarize and form an axon. Exploiting the underlying mechanisms of this process enables activating neuronal regenerative programs under pathological conditions, such as spinal cord injury.

Grant Support: SFBs 1089 and 1158

International Research in Paraplegia

Wings for Life

ERANET AXON REPAIR

ERANET RATER SCI

Roger de Spoelberch Prize

ImmunoSensation2

Lecture

165: Special Lecture: Gene Delivery Across the Blood-Brain Barrier for Precise and Minimally-Invasive Study and Repair of Nervous Systems - Viviana Gradinaru

Location: SDCC Ballroom 20

Time: Sunday, November 13, 2022, 12:00 PM - 1:00 PM

Moderator: *C. LUSCHER
Univ. Geneva, Geneva, Switzerland

Speakers: *V. GRADINARU
Caltech, Pasadena, CA

Abstract: Protein engineering and data science have helped overcome challenges in optogenetics and gene delivery, with microbial opsins tolerated by mammalian cells and viral capsids that cross the blood–brain barrier. These tools are applied to neurodevelopmental and

neurodegenerative disorders, for example to understand circuits underlying locomotion and sleep for Parkinson's disease. By understanding how engineered capsids work and leveraging them as vehicles for targeted gene delivery via the vasculature, we are now closer to precise noninvasive study and repair of nervous systems.

Lecture

167: SfNova Lecture: Michael D. Burton; Akiko Hayashi-Takagi

Location: SDCC Ballroom 20

Time: Sun, Nov. 13, 2022, 1:30 PM - 2:30 PM

Moderator: *E. LUMPKIN
UC Berkeley, Berkeley, CA

Speakers: M. D. BURTON
Univ. of Texas at Dallas, Richardson, TX

Disclosures: M.D. Burton: None.

Speakers: *A. HAYASHI-TAKAGI
RIKEN, Wako/Saitama, Japan

Abstract: The Sex- and Cell-Specific Role of TLR4-Induced Pain States: The Communication Between the Nervous and Immune System
Michael D. Burton, PhD
University of Texas at Dallas
The Burton Lab focuses on the conversation between the immune and nervous systems to regulate adaptive behaviors (pain, depression, anxiety, and sickness). Toll-like receptor (TLR)-4 is a pattern recognition receptor that is expressed in several cell types in the immune and nervous systems and mediates various physiological cascades. The lecture will highlight how this protein mediates whole body behavior in a cell and sex-specific fashion with data from multiple groups utilizing pharmacological and genetic approaches.

Multi-Scale Synaptic Analysis for Psychiatric Disorders
Akiko Hayashi-Takagi, MD, PhD
RIKEN Center for Brain Science
Despite the accumulating evidence of synaptopathy in various psychiatric disorders, it is unknown whether synaptopathy is pathogenesis or a secondary consequence. To address this question, we performed a multi-scale synaptic analysis and examined the relationship among synaptic inputs, neuronal computation, and working memory of schizophrenia model mice. Together with the analysis of the postmortem brains of schizophrenia, we offer a new concept for schizophrenia pathomechanism.

Grant Support: Rita Allen Foundation

NIH Grant DK130015-0A1

UT System Rising STAR

UT Dallas SPire Program

Advanced Neuromodulation Award

NIH TR003149

Lecture

174: Peter and Patricia Gruber Lecture: Expanding Horizons in Theoretical and Computational Neuroscience: Larry Abbott, Emery N. Brown, Terrence Sejnowski, Haim Sompolinsky

Location: SDCC Ballroom 20

Time: Sunday, November 13, 2022, 3:00 PM - 4:30 PM

Sponsor: The Gruber Foundation

Moderator: *G. TURRIGIANO
Brandeis Univ., Waltham, MA

Disclosures: G. Turrigiano: None.

Speakers: *L. ABBOTT
Columbia Univ., New York, NY

Speakers: *E. N. BROWN
Massachusetts Inst. of Technology/Massachusetts Gen. Hospital/Harvard Med. Sch., CAMBRIDGE, MA

Speakers: *T. SEJNOWSKI
Computat. Neurobio., Salk Institute/University of California, San Diego, La Jolla, CA

Speakers: *H. SOMPOLINSKY
Hebrew Univ. of Jerusalem/Harvard Univ., Jerusalem, Israel

Abstract: A joint presentation of four topics in theoretical/computational neuroscience: How precise is synaptic plasticity? (TS); Neural manifolds in sensory, motor, and cognitive systems (HS); Transforming sensory and motor information between body and world coordinates (LA); How anesthetics alter conscious processing as studied in humans, non-human primates, rodents and circuit models (EB).

Lecture

175: Presidential Special Lecture: The Basis of Sleep: What We Are Learning From Small Animal Models - Amita Sehgal

Location: SDCC Ballroom 20

Time: Sunday, November 13, 2022, 5:15 PM - 6:30 PM

Moderator: *G. TURRIGIANO
Brandeis Univ., Waltham, MA

Disclosures: G. Turrigiano: None.

Speakers: *A. SEHGAL
HHMI/Chronobiology and Sleep Institute/Perelman Sch. of Med. At the Univ. of Pennsylvania, Philadelphia, PA

Disclosures: A. Sehgal: None.

Speakers: *R. HUGANIR
John Hopkins Univ. Sch. of Medici Training Program In Neurosci., Baltimore, MD

Abstract: Studies of sleep have now expanded to diverse species, including invertebrates with very simple nervous systems. Mechanistic analyses in such models have identified molecules that regulate sleep as well as cellular functions served by sleep. Basic principles underlying sleep appear to be conserved across organisms, underscoring the relevance of an evolutionary approach. The lecture will focus largely on advances made in *Drosophila* and the extent to which these inform our understanding of sleep.

Grant Support: HHMI

NIH Grant NS048471

NIH Grant DK-120757

Lecture

247: Special Lecture: *Drosophila* Reveals Operational Principles of Memory Systems - Scott Waddell

Location: SDCC Ballroom 20

Time: Monday, November 14, 2022, 9:00 AM - 10:00 AM

Moderator: *K. KAUN;
Brown Univ., Barrington, RI

Speakers: *S. WADDELL
Univ. of Oxford, Oxford, United Kingdom

Abstract: Genetic studies of *Drosophila* memory began in 1970. The field has implicated hundreds of genes and defined the detailed architecture of a mnemonic neural network. Subpopulations of dopaminergic neurons operate in parallel and opposition to tune output connections in the mushroom body network. This plasticity underlies valence learning, appropriate expression of goal-directed memory, memory update, and forgetting. This lecture will discuss findings that may illuminate general principles of memory systems.

Grant Support: Wellcome Principal Research Fellowship 200846/Z/16/Z

ERC Advanced Grant 789274 — SCCMMI

Lecture

255: David Kopf Neuroethics Lecture: Open Neuroscience and the Meaning of FAIR - Maryann E. Martone

Location: SDCC Ballroom 20

Time: Monday, November 14, 2022, 10:30 AM - 11:30 AM

Sponsor: David Kopf Instruments

Moderator: *G. TURRIGIANO
Brandeis Univ., Waltham, MA

Speakers: *M. E. MARTONE
UCSD, La Jolla, CA

Disclosures: M.E. Martone: None.

Speakers: *D. PUZZO
Univ. of Catania, Catania, Italy

Abstract: Neuroscience is undergoing a revolution as new technologies for data generation combine with data science to understand the brain. The revolution is occurring within a shift towards making open all products of research-articles, data, and code. This lecture will consider the technical, cultural and ethical challenges of open from a fair perspective: as in making our research products Findable, Accessible, Interoperable, and Reusable and in our societal obligations for how and why we must do so.

Lecture

333: Special Lecture: Understanding Brain Cell Type Diversity - Hongkui Zeng

Location: SDCC Ballroom 20

Time: Monday, November 14, 2022, 12:00 PM - 1:00 PM

Moderator: *H. BITO
Univ. Tokyo Grad Sch. Med., Tokyo, Japan

Speakers: *H. ZENG
Allen Inst. for Brain Sci., Seattle, WA

Disclosures: H. Zeng: None.

Abstract: To understand the function of the brain and how its dysfunction leads to brain diseases, it is essential to uncover the cell type composition (the “parts list”) of the brain. We have built multiple platforms to characterize the transcriptomic, physiological, morphological, and connectional properties of brain cell types in a systematic manner, towards a multi-modal cell atlas for the mouse and human brain. These studies reveal extraordinary cellular diversity and underlying rules of brain organization and lay the foundation for unraveling mechanisms of circuit function.

Grant Support: NIH Grant U19MH114830

NIH Grant U01MH105982

NIH Grant R01EY023173

NIH Grant R01AG066027

NIH Grant RF1MH121274

Allen Institute for Brain Science

Lecture

341: Albert and Ellen Grass Lecture: Circuits for Body Movements - Silvia Arber

Location: SDCC Ballroom 20

Time: Monday, November 14, 2022, 3:00 PM - 4:30 PM

Sponsor: The Grass Foundation

Moderator: *G. TURRIGIANO;
Brandeis Univ., Waltham, MA

Disclosures: G. Turrigiano: None.

Speakers: *S. ARBER
Biozentrum, Univ. Basel, Basel 4056, Switzerland

Speakers: *M. CHIAPPE
Champalimaud Fndn. PT507131827, Lisboa, Portugal

Abstract: Movement is the behavioral output of the nervous system. This lecture will focus on recent work elucidating the organization and function of neuronal circuits central to the regulation of distinct forms of body movements, including locomotion and skilled forelimb movements. It will show that dedicated circuit modules in different regions of the brainstem and their interactions within the motor system play key roles in the generation of diverse actions.

Grant Support: ERC Advanced Grant 692617

Swiss National Science Foundation

Louis Jeantet Prize for Medicine

Lecture

342: Presidential Special Lecture: The Neurobiology of Escaping From Predators - Tiago Branco

Location: SDCC Ballroom 20

Time: Monday, November 14, 2022, 5:15 PM - 6:30 PM

Moderator: *G. TURRIGIANO
Brandeis Univ., Waltham, MA

Disclosures: G. Turrigiano: None.

Speakers: *T. BRANCO
UCL Sainsbury Wellcome Ctr., London, United Kingdom

Disclosures: T. Branco: None.

Abstract: Running away from threat is an ethological behavior that is universal across the animal kingdom. At one end, escape can be a simple reflexive action implemented across a few synaptic connections. At the other, evading predators might rely on coordinating sensory, motor and memory systems to rapidly navigate to a known safe place. This lecture will discuss the components of escape at the behavior level and highlight how cellular and neural circuit mechanisms work together to implement the underlying computations.

Grant Support: Wellcome Senior Research Fellowship 214352/Z/18/Z

Sainsbury Wellcome Centre Core Grant from the Gatsby Charitable Foundation and Wellcome 090843/F/09/Z

ERC Consolidator Grant 864912

Lecture

415: Special Lecture: Organization of Neuronal Activity Across the Brain - Matteo Carandini

Location: SDCC Ballroom 20

Time: Tuesday, November 15, 2022, 9:00 AM - 10:00 AM

Moderator: *L. OSBORNE;
Duke Univ., Durham, NC

Speakers: M. CARANDINI;
Univ. Col. London, London, United Kingdom

Disclosures: M. Carandini: None.

Abstract: New techniques that record the activity of thousands of neurons reveal surprising results: signals related to engagement, movements, and navigation, which were thought to be localized, are distributed across the entire cortex or even the entire brain. Mathematical and transcriptomic techniques help understand how these brainwide signals interact with local signals such as those representing sensory stimuli, but it is still unclear why the brain broadcasts certain signals so widely.

Grant Support: Wellcome Trust

Simons Foundation

UKRI – BBSRC

European Research Council

Lecture

422: Special Lecture: Mapping and Rewiring Neural Circuits Underlying Emotions - Kafui Dzirasa

Location: SDCC Ballroom 20

Time: Tue, Nov. 15, 2022, 10:30 AM - 11:30 AM

Moderator: *J. JOHANSEN
RIKEN Ctr. for Brain Sci., Wako-Shi, Japan

Speakers: *K. DZIRASA
Duke Univ. Med. Ctr., Durham, NC

Abstract: The coordination of activity between brain cells is a key determinant of neural circuit function; nevertheless, approaches that selectively regulate communication between two distinct cellular components of a circuit, while leaving the activity of the presynaptic brain cell undisturbed remain sparse. To address this gap, we developed a novel class of electrical synapses. We then validated these electrical synapses *in vivo* using *C. elegans*, and deployed them in mice to modify emotional behavior.

Lecture

502: Special Lecture: Myelin Plasticity in Health and Disease - Michelle Monje

Location: SDCC Ballroom 20

Time: Tuesday, November 15, 2022, 2:00 PM - 3:00 PM

Moderator: *S. JOSSELYN
The Hosp. For Sick Children, Toronto, ON, Canada

Speakers: *M. MONJE
Stanford Univ., Stanford, CA

Disclosures: M. Monje: E. Ownership Interest (stock, stock options, royalty, receipt of intellectual property rights/patent holder, excluding diversified mutual funds); MapLight Inc. F. Consulting Fees (e.g., advisory boards); Cygnal Therapeutics.

Abstract: Activity-dependent plasticity of myelin can adaptively tune neural circuit function in health, contributing to learning and memory. Dysregulation or dysfunction of myelin plasticity can play important roles in neurological disease. Deficient myelin plasticity can contribute to impaired cognition, subversion of myelin plasticity mechanisms robustly promotes progression of glial malignancies, and maladaptive myelination can contribute to circuit dysregulation and disease pathogenesis in epilepsy.

Grant Support: NIH Director's Pioneer Award (DP1NS111132)

National Institutes of Health (R01NS092597)

Lecture

509: History of Neuroscience Lecture: Neuroscience Redefines the Stress Concept: From "Fight or Flight" to Neuroplasticity and Affective Disorders - Huda Akil

Location: SDCC Ballroom 20

Time: Tuesday, November 15, 2022, 3:30 PM - 4:30 PM

Moderator: *G. TURRIGIANO
Brandeis Univ., Waltham, MA

Disclosures: G. Turrigiano: None.

Speakers: *H. AKIL
Univ. of Michigan Med. Sch., Ann Arbor, MI

Speakers: A. SAHAY
Ctr. For Regenerative Med., Boston, MA

Abstract: The stress response was originally defined as a "fight or flight response" to an acute stressor. Neuroscience has redefined the concept more broadly as an ongoing, adaptive process of assessing the environment, coping with it, and enabling the individual to anticipate and deal with future challenges. Neuroscientists have identified molecules and neural circuits critical to the stress response and highlighted the impact of stress on neuroplasticity. The evolution of the stress concept and its relevance to affective vulnerability and resilience will be discussed.

Grant Support: Office of Naval Research (ONR) 00014-19-1-2149

NIDA U01DA043098

Hope for Depression Research Foundation

Pritzker Neuropsychiatric Research Consortium.

Lecture

510: Presidential Special Lecture: The Macaque Face Patch System: A Turtle's Underbelly for the Brain - Doris Tsao

Location: SDCC Ballroom 20

Time: Tuesday, November 15, 2022, 5:15 PM - 6:30 PM

Moderator: *G. TURRIGIANO
Brandeis Univ., Waltham, MA

Disclosures: G. Turrigiano: None.

Speakers: D. TSAO
UC Berkeley, HHMI, Berkeley, CA

Disclosures: D. Tsao: None.

Abstract: Research on the macaque face patch system has given us a remarkable window into the processes underlying visual object perception. This lecture will discuss the anatomy, coding principles, and behavioral role of this system.It will also tell how face patches, together with modern deep networks, reveal a unifying principle for inferotemporal organization in terms of 'object space'. Finally, the lecture will discuss work exploiting feedback in this system to test if the brain encodes a generative model of reality.

Grant Support: HHMI

NEI R01EY030650

Simons Foundation

ONR grant S549278

Lecture

588: Special Lecture: From Atoms to Behavior: Creating Tools to Probe Neurobiological Complexity - Polina Anikeeva

Location: SDCC Ballroom 20

Time: Wednesday, November 16, 2022, 10:30 AM - 11:30 AM

Moderator: *E. BRADBURY
Kings Col. London, London, United Kingdom

Speakers: *P. ANIKEEVA
Materials Sci. and Engineering/Brain and Cognitive Sci., McGovern Inst. for Brain Research/Massachusetts Inst. of Technol., Cambridge, MA

Abstract: Billions of neurons across the nervous system are continuously exchanging electrical, chemical, and mechanical cues. This symphony of activity governs physiology and behavior in health and disease. This lecture will review the progress in the field of neural engineering from its beginnings in electronics, its evolution toward multifunctional interfaces mimicking neurobiological complexity, and opportunities offered by nanotechnology to connect molecular function to circuit dynamics and behavior.

Grant Support: DARPA Grant HR0011-15-C-0155

DARPA Young Faculty Award D13AP00043

NIH Grant NS086804-01A1

NIH Grant MH111872-01

NSF Grant EEC-1028725

NSF Grant CAREER CBET-1253890

NSF Grant DMR-1419807

Lecture

669: Clinical Neuroscience Lecture: Searching for Words: The New Neuroscience of Speech - Edward F. Chang

Location: SDCC Ballroom 20

Time: Wednesday, November 16, 2022, 12:30 PM - 1:30 PM

Moderator: *L. COLGIN
Univ. of Texas at Austin, Austin, TX

Speakers: *E. F. CHANG
Univ. of California, San Francisco, San Francisco, CA

Abstract: Speaking is a unique and defining human behavior. Over the past decade, tremendous progress has been made in deciphering the basic neural code that underlies our ability to speak fluently. During speech production, vocal tract movement gestures for all speech sounds are encoded by highly specialized neural activity, organized as a map, in the human motor and premotor cortices. A major effort is now underway to translate these discoveries towards developing an articulatory-based speech neuroprosthetic device for people who cannot communicate.

Grant Support: R01DC012379

U01 NS117765

U01DC018671