

# State of the Brain: Genetic Dissection of Brain Circuits and Behavior in Health and Disease

January 14 –18, 2018 | Keystone Resort | Keystone, Colorado | USA

## Scientific Organizers:

**Sean Hill**, École Polytechnique Fédérale de Lausanne, Switzerland

**Hongkui Zeng**, Allen Institute for Brain Science, USA

**Z. Josh Huang**, Cold Spring Harbor Laboratory, USA

**György Buzsáki**, New York University, Langone Medical Center, USA

*Identifying and understanding the building blocks of the nervous system and how they interact is a central focus of international efforts to understand the brain. Modern genetic approaches hold the promise of establishing an inventory of cell types, exploring mechanisms of cellular identity, developing tools for experimental manipulations, building a brain-wide cell type atlas, and providing the basis of establishing brain-wide connectivity atlases at cellular resolution. Understanding how diseases and disorders impact cells, synapses and circuitry is essential to guide the development of treatments and therapies. Creating such an atlas of genetically identified cell types and their connectivity will provide key data and knowledge for developing in silico reconstructions of brain circuitry and developing theories of brain structure and function. This conference brings together leading scientists from around the world to present the latest tools, techniques and discoveries in using genetic approaches to understand the cell types of the brain and their role in cognition, behavior, and brain diseases and disorders.*

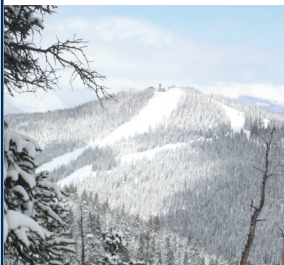
## Session Topics:

- Tools and Techniques for Genetic Dissection
- Towards a Census of Cell Types
- Genetic Dissection of Microcircuitry
- Genetic Dissection of Meso and Macrocircuitry
- Data, Modeling, Informatics
- Genetic Dissection of Behavior
- Genetic Dissection of Brain Disorders and Diseases
- From Genetic Dissection to the Clinic

**Scholarship Application & Discounted Abstract Deadline: September 21, 2017**

**Abstract Deadline: October 19, 2017**

**Discounted Registration Deadline: November 20, 2017**



Note: Scholarships are available for graduate students and postdoctoral fellows and are awarded based on the abstract submitted. Submitting an abstract is an excellent opportunity to gain exposure for your work. Abstracts submitted by the abstract deadline will also be considered for short talks on the program.

Upper image of MRI scan of a fixed cerebral hemisphere from a person with multiple sclerosis courtesy of Govind Bhagavatheeshwaran, Daniel Reich, NINDS, NIH.

Meeting Hashtag: #KSbrain

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### SUNDAY, JANUARY 14

#### Arrival and Registration

### MONDAY, JANUARY 15

#### Welcome and Keynote Session

\***Sean Hill**, Centre for Addiction and Mental Health, Canada

**Catherine C. Dulac**, Harvard University, USA  
*Molecular and Cellular Architecture of Social Behavior Circuits*

**Walter J. Koroshetz**, NINDS, National Institutes of Health, USA  
*From Genetic Dissection to Neuromodulation: The Promise of the BRAIN Initiative*

#### Tools and Techniques for Genetic Dissection

\***Edward S. Boyden**, Massachusetts Institute of Technology, USA

**Anthony Zador**, Cold Spring Harbor Laboratory, USA  
*Sequencing the Connectome*

**Qingming Luo**, Huazhong University of Science and Technology, China  
*Brainsmatics: Deciphering Brain Function with Brain-Wide Genetically Defined Networks*

**Viviana Gradinaru**, California Institute of Technology, USA  
*Gene Delivery Across the Blood-Brain-Barrier, Whole-Body Tissue Clearing, and Optogenetics to Understand and Influence Physiology and Behavior*

**Alan R. Mardinly**, University of California, Berkeley, USA  
*Short Talk: Precise Holographic Manipulation of Neural Ensembles in Behaving Animals*

#### Towards a Census of Cell Types

\***Walter J. Koroshetz**, NINDS, National Institutes of Health, USA

**Hongkui Zeng**, Allen Institute for Brain Science, USA  
*Building a Cell Type Taxonomy for Mouse Cortical Neurons*

**Sten Linnarsson**, Karolinska Institutet, Sweden  
*Brain Cell Types and Lineages from Transcriptomes*

**Hideyuki Okano**, Keio University School of Medicine, Japan  
*Disease Modeling and Brain Mapping using Genetically Modified Marmosets*

**Kee Wui Huang**, Harvard Medical School, USA  
*Short Talk: Single-Cell Transcriptomic Profiling with Spatial Mapping Reveals Distinct 5-HT Neuron Subtypes in the Dorsal Raphe Nucleus*

#### Poster Session 1

### TUESDAY, JANUARY 16

#### Genetic Dissection of Microcircuitry

\***Karel Svoboda**, Janelia Research Campus & Cold Spring Harbor Laboratory, USA

**Botond Roska**, Friedrich Miescher Institute, Switzerland  
*Genetic Dissection of the Retina*

**Liqun Luo**, Stanford University, USA  
*TRAPing Active Neurons*

**Andreas Tolias**, Baylor College of Medicine, USA  
*The Fabric of the Neocortex*

**Z. Josh Huang**, Cold Spring Harbor Laboratory, USA  
*Cortical Interneuron Types, Subtypes and Connection Specificity*

**Seung-Hee Lee**, Korea Advanced Institutes of Science and Technology, KAIST, South Korea  
*Short Talk: Locomotion Modulates Audiovisual Integration in the Posterior Parietal Cortex*

**Balázs József Rózsa**, Hungarian Academy of Sciences, Hungary  
*Short Talk: Fast 3D Imaging and Re-Activation of Neuronal Networks, Dendrites, and Spines in Several Cubic Millimeter Volumes in Behaving Animals to Understand Visual Representation*

#### Workshop 1: Cell Type Discovery using Single-Cell Transcriptomics

\***Sten Linnarsson**, Karolinska Institutet, Sweden

**Ariel Levine**, NINDS, National Institutes of Health, USA  
*Large-Scale Single Nucleus Transcriptional Profiling Defines Spinal Cord Cell Types and Their Activity during Behavior*

**Shristi Pandey**, Harvard University, USA  
*Spatial Mapping of Cell Types in the Zebrafish Habenula using Single-Cell RNAseq*

**Damon Polioudakis**, University of California, Los Angeles, USA  
*A Molecular Taxonomy of Cell Types in Developing Human Cortex*

**Marie Aare Bentsen**, University of Washington School of Medicine, USA  
*A Single-Cell Transcriptomics Roadmap to Investigate Type 2 Diabetes Remission Induced by the Action of Fibroblast Growth Factor 1 in the Brain*

**Lisa Topolnik**, CRCHUQ, Canada  
*Transcriptomic Profiling, Connectivity and Network State-Dependent Recruitment of Long-Range VIP-GABAergic Neurons in the Mouse Hippocampus*

**Zhuzhu Zhang**, The Salk Institute for Biological Studies, USA  
*Single-Nucleus Methylome and Transcriptome Sequencing Reveals Molecular Differences between Identified Cortical Projection Cell Types*

#### Genetic Dissection of Meso and Macroconnectivity

\***Z. Josh Huang**, Cold Spring Harbor Laboratory, USA

**Ann-Shyn Chiang**, National Tsing Hua University, Taiwan  
*Multiscale Anatomy of Drosophila Connectome*

**Attila Losonczy**, Columbia University, USA  
*Dissecting Hippocampal Circuit Dynamics during Temporal Associative Learning*

**Suzanaerculano-Houzel**, Vanderbilt University, USA  
*It Takes Three Variables to Build a Cortex (and the Human Cortex Is Not Special): Lessons from Comparative Neuroanatomy*

**Johannes Passecker**, Medical University Vienna, Austria  
*Short Talk: Activity of Prefrontal Neurons Predict Future Choices during Gambling*

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### Poster Session 2

#### WEDNESDAY, JANUARY 17

##### Data, Modeling, Informatics

\***Hongkui Zeng**, Allen Institute for Brain Science, USA

**Kenneth Harris**, University College London, UK  
*High-Dimensional Geometry of the Cortical Population Code as Revealed by 10,000-Cell Recordings*

**Sean Hill**, Centre for Addiction and Mental Health, Canada  
*A Digital Reconstruction of Cortical Microcircuitry: From Gene Expression to Emergent Network Activity*

**Surya Ganguli**, Stanford University, USA  
*Cell Classification as a Computational Problem*

**György Buzsáki**, New York University, Langone Medical Center, USA  
*How Does Circuit Modification Support Learning?*

**Michael Kunst**, Max Planck Institute of Neurobiology, Germany  
*Short Talk: A Cellular-Resolution Atlas of the Larval Zebrafish Brain*

**Eilif Muller**, EPFL, Switzerland  
*Short Talk: Recent Advances in Data-Driven Brain Region Reconstruction and Simulation in the Human Brain Project*

##### Genetic Dissection of Behavior

\***György Buzsáki**, New York University, Langone Medical Center, USA

**Yang Dan**, University of California, Berkeley, USA  
*Neural Circuits Controlling Sleep*

**Karel Svoboda**, Janelia Research Campus & Cold Spring Harbor Laboratory, USA  
*Cell Type-Specific Analysis of the Cortical Circuits for Motor Planning and Movement Initiation*

**Marion Ponsierre**, Max Planck Institute of Neurobiology, Germany  
*Short Talk: Organization of Central Amygdala Circuits that Regulate Appetitive Behavior*

**Scott Waddell**, University of Oxford, UK  
*Short Talk: Competition between Memories of Opposite Valence Underlies Memory Extinction in Drosophila*

### Poster Session 3

#### THURSDAY, JANUARY 18

##### Genetic Dissection of Brain Disorders and Diseases

\***Yang Dan**, University of California, Berkeley, USA

**Freda D. Miller**, Hospital for Sick Children, Canada  
*Extrinsic Regulation of Cellular Genesis during Normal and Pathological Cortex Development*

**Lorna W. Role**, Stony Brook University, USA  
*Genetic Dissection of Cholinergic Signaling in Memory Disorders*

**Khalil Ramadi**, Massachusetts Institute of Technology, USA  
*Short Talk: A Chronically Implanted, Remotely-Controlled, Drug Delivery System to Deep Brain Microstructures Elicits Repeatable Behavioral Modulation in a Volume-Dependent Manner*

**Noam D. Beckmann**, Icahn School of Medicine at Mount Sinai, USA  
*Short Talk: Multiscale Causal Networks Integrating DNA, RNA, and Proteomic Data Identify VGF as a Novel Key Driver of Alzheimer's Disease*

**Summer Thyme**, Harvard University, USA  
*Short Talk: Shared Neurobiological Roles of Schizophrenia-Associated Genes*

##### Workshop 2: Genetic Dissection of Circuits and Behavior

\***Lorna W. Role**, Stony Brook University, USA

**Yoav Adam**, Harvard University, USA  
*All-Optical Electrophysiology in Behaving Mice with Enhanced Near Infrared Voltage Sensors*

**Nikolaos Balaskas**, Columbia University, USA  
*Defining the Genetic Diversity of Spinal Presynaptic Inhibitory Interneurons*

**Takaaki Miyazaki**, National Institute of Genetics, Japan  
*Anatomical Screening and Live Imaging of Gustatory 2nd-Order Neurons that Link Sugar Detection and Feeding/Reward Systems*

**Jean-Francois Poulin**, Northwestern University, USA  
*Mapping Projections of Dopamine Neuron Subtypes using Intersectional Genetic Strategies*

**Kazuki Katori**, University of Tokyo, Japan  
*Sharp Wave-Associated Activity Pattern of Olfactory Cortical Neurons in the Mouse Piriform Cortex*

**Taehong Yang**, Stanford University, USA  
*Social Control of Hypothalamus-Mediated Male Aggression*

##### From Genetic Dissection to the Clinic

\***Freda D. Miller**, Hospital for Sick Children, Canada

**Thomas Portmann**, Circuit Therapeutics, Inc., USA  
*A Circuit-Based Approach to CNS Drug Discovery: Integrating Optogenetics and Single-Cell Genomics*

**Edward S. Boyden**, Massachusetts Institute of Technology, USA  
*Technologies for Analyzing and Controlling Neural Circuits*

##### Meeting Wrap-Up: Outcomes and Future Directions (Organizers)

#### FRIDAY, JANUARY 19

##### Departure