

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.

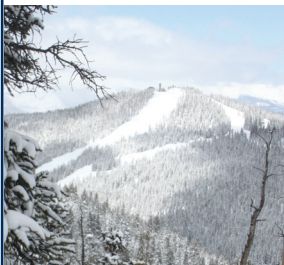
Session Topics:

- 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

Pascal Timshel†, University of Copenhagen, Denmark
A Single-Cell Transcriptome Atlas of Mouse Hypothalamus: Identification and Characterization of High-Fat Diet and GLP-1 Responding Arcuate Nucleus Cell Types

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

***Catherine C. Dulac**, Harvard 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

Nathalie Isabelle Cartier-Lacave, CEA MIRCen, France
The Role of Impaired Brain Cholesterol Metabolism in Neurodegenerative Diseases: Towards Gene Therapy Strategies

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

FRIDAY, JANUARY 19

Departure