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Cell Type Classification and Circuit Mapping in the Mouse Brain

To understand the function of the brain and how its dysfunction leads to brain diseases, it is essential to have a deep understanding of the cell type composition of the brain, how the cell types are connected with each other and what their roles are in circuit function. At the Allen Institute, we have built multiple platforms, including single-cell transcriptomics, single and multi-patching electrophysiology, 3D reconstruction of neuronal morphology, high throughput brain-wide connectivity mapping, and large-scale neuronal activity imaging, to characterize the transcriptomic, physiological, morphological, and connectional properties of different types of neurons in a standardized way, towards a taxonomy of cell types and a description of their wiring diagram for the mouse brain, with a focus on the visual cortico-thalamic system. Building such knowledge base lays the foundation towards the understanding of the computational mechanisms of brain circuit function.

Biography

Hongkui Zeng, Ph.D., is Executive Director of Structured Science in Allen Institute for Brain Science. She is leading the Structured Science Division to develop and operate high-throughput pipelines to generate large-scale, open-access datasets and tools to accelerate neuroscience discovery. Zeng received her Ph.D. in molecular and cell biology from Brandeis University, where she studied the molecular mechanisms of the circadian clock in fruit flies. Then as a postdoctoral fellow at Massachusetts Institute of Technology, she studied the molecular and synaptic mechanisms underlying hippocampus-dependent plasticity and learning. Since joining the Allen Institute, she has led several research programs, including the Transgenic Technology program, the Human Cortex Gene Survey project, the Allen Mouse Brain Connectivity Atlas project and the Cell Types program. She is also leading a BRAIN Initiative effort to create a Brain Cell Atlas in the mouse. She has broad scientific experience and a keen interest in using a combined molecular, anatomical and physiological approach to unravel mechanisms of brain circuitry and potential approaches for treating brain diseases. Her current research interests are in

understanding neuronal diversity and connectivity in the visual cortical circuit and how different neuronal types work together to process and transform visual information. She has received many honors, including the 2016 AWIS Award for Scientific Advancement and the 2018 Gill Transformative Investigator Award.