DANDRITE / NeuroCampus Aarhus Lecture

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at 13.15 – 14.15

Building 1162, room 013 (Aud. A /Physiology), Aarhus University

Jinhyun Kim

Director, Principal Investigator

Center for Functional Connectomics, Korea Institute of Science and Technology (KIST)

Previous:
Research Specialist, Janelia Farm Research Campus, Howard Hughes Medical Institute, USA
Postdoc, National Institutes of Health, USA

"mGRASP for mapping mammalian synaptic circuit at multiple scales"

Mapping mammalian synaptic connectivity has long been an important goal of neuroscientists since it is considered crucial for explaining human perception and behavior. Our new genetically controlled method to resolve synapses at the level of LM, termed mammalian GFP reconstitution across synaptic partners (mGRASP), is synapse-specific labeling with two complementary GFP components. mGRASP is based on two non-fluorescent split-GFP fragments (called spGFP1-10 and spGFP11) tethered to synaptic membranes in each of two neuronal populations. When two neurons, each expressing one of the fragments, are tightly opposed across a synaptic cleft, fluorescent GFP is reconstituted. mGRASP can relatively quickly reveal the precise locations and numbers of synapses along postsynaptic dendrites, sites responsible for determining many important characteristics of signal processing. Thus, mGRASP technology is suitable for mapping large-scale connectivity patterns at multiple scales: micro-scale for synapse-by-synapse or neuron-by-neuron analysis; and meso-scale for revealing local circuits. We performed a comprehensive fine-scale circuit mapping of hippocampal regions using the mGRASP. This mapping revealed spatially non-uniform and clustered synaptic connectivity patterns. Furthermore, synaptic clustering was enhanced between groups of neurons that shared a similar developmental/migration time window, suggesting a mechanism for establishing the spatial structure of synaptic connectivity. Such connectivity patterns are thought to effectively engage active dendritic processing and storage mechanisms, thereby potentially enhancing neuronal feature selectivity. Based on these prime connectivity characteristics, our study recently focuses on understanding synaptic connectivity profiles associated with neurological disorders using mGRASP.

Host: Group Leader Anders Nykjær, DANDRITE, Dept. of Biomedicine, Aarhus University