Introductory Remarks to Symposium 1

Assessing neuronal excitability and sensory neuron subclasses using Patch-Seq

Angelika Lampert and Eckhard Friauf, Aachen and Kaiserslautern

The molecular basis of intrinsic excitability is highly complex, driven by the diversity of neuronal ion channels and their alternative splicing.
In this symposium Shreejoy Tripathy will present a novel approach linking alternative splicing events with intracellular electrophysiological features using Patch-Seq, which combines electrophysiological and transcriptomic data. This method revealed that isoforms of the Shaw-related potassium channel gene, Kcnc1, are associated with firing rates and action potential widths due to their polarized targeting to distinct cellular compartments. These findings highlight novel regulation of neuronal excitability.
Angelika Lampert's group employed Patch-Seq and multimodal approaches to identify the molecular identity of human dermal sleeping nociceptors, a sensory neuron subclass linked to neuropathic pain, offering critical insights into their role in human neuropathic pain.
Cathryn Cadwell will discuss how Patch-seq in the mouse motor cortex revealed continuous and correlated molecular and morpho-electric landscapes, challenging the notion of transcriptomic cell types as discrete, homogenous entities. She will present insights into human cortical development and areal specification enabled by Patch-seq, highlighting its strengths and limitations for integrating multimodal datasets.
Brett Addison Emery combines spatially resolved transcriptomics with high-density microelectrode arrays to reveal causal links between gene expression and neural activity. Her findings offer insights into experience-dependent connectome and network dynamics in the hippocampal-cortical network.
Finally, Eckhard Friauf's talk focuses on the lateral superior olive (LSO), a brainstem hub for ascending and descending pathways. Using Patch-Seq in juvenile mice, his group identified two neuronal clusters distinguished by 353 differentially expressed genes, including those encoding Kv channels, transmitter-related proteins, and proteins for energy supply. The talk integrates findings from all presentations to address pros and cons of differentially expressed genes.

Symposium 1

Wednesday, March 26, 2025
14:30 -16:30, Lecture Hall 8

Chairs: Angelika Lampert and Eckhard Friauf, Aachen and Kaiserslautern

14:30 **Opening Remarks**

14:35 Shreejoy Tripathy, Toronto, Canada
ASSOCIATING ION CHANNEL ALTERNATIVE SPLICING WITH NEURONAL INTRINSIC ELECTROPHYSIOLOGICAL PROPERTIES USING PATCH-SEQ (S1-1)

15:00 Angelika Lampert, Aachen
MOLECULAR IDENTITY OF SLEEPING NOCICEPTORS REVEALED BY A MULTIMODAL PATCH-SEQ STUDY (S1-2)

15:25 Cathryn Cadwell, San Francisco, USA
AREAL SPECIFICATION OF EXCITATORY CORTICAL NEURONS IN THE HUMAN BRAIN (S1-3)

15:50 Brett Addison Emery, Dresden
MEA-SeqX: DECODING THE IMPACT OF RICH EXPERIENCE ON MULTISCALE HIPPOCAMPAL NETWORK DYNAMICS (S1-4)

16:05 Eckhard Friauf, Kaiserslautern-Landau
PATCH-SEQ IN THE AUDITORY SYSTEM – WHERE ASCENDING AND DESCENDING NEURONS MEET (S1-5)