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Novel Insights Into Ion Channel and Transporter Research:

From Silent Translocation to Deep Learning Tools

Monday, February 17
11:30 AM – 1:00 PM
Room 404AB

Novel Insights Into Ion Channel and Transporter Research:
From Silent Translocation to Deep Learning Tools

11:30 AM – 11:40 AM
Dr. Tim Strassmaier
Director of Scientific Operations
Nanion Technologies, USA

Novel Insights into Ion Channel & Transporter Research: From Silent Translocation to Deep Learning Tools

For over 2 decades, Nanion Technologies has been providing diverse solutions for electrophysiologists worldwide. We aim to implement innovative technologies in the fields of ion channel automated patch clamp (APC) electrophysiology, monitoring of cell viability and contractility, as well as electrogenic transporters, with various throughput capabilities. Our symposium will start with an introduction by Dr. Strassmaier who will describe the latest advances in Nanion's assays and product portfolio, followed by our speakers, whose work focuses on ion channel and transporter research.

11:40 AM – 12:05 PM
Dr. Janina Sörmann
Postdoctoral Reseracher
University of Copenhagen

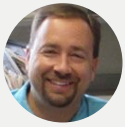
Leveraging Deep Learning Tools to Design hASIC1a Modulators

Stroke is a leading cause of death and adult disability. Acid-sensing ion channels (ASICs) in the central nervous system contribute to tissue damage after ischemic stroke but are underexplored therapeutic targets due to the lack of potent, selective, and stable inhibitors. During this presentation, Dr. Sörmann will describe de novo designed miniproteins capable of inhibiting hASIC1a by integrating deep learning tools in the drug discovery process and combined with functional analysis on the SyncroPatch 384. These computationally designed modulators offer high specificity, efficacy, and cost-effective synthesis, broadening accessibility for stakeholders.

12:05 PM – 12:30 PM
Dr. Rocco Zerlotti
Application Scientist
Nanion Technologies, Germany

Benefits of SSME for the Investigation of the Lysosomal Ion Channels TMEM175, TPC2, and TRPML1

Solid-supported membrane-based electrophysiology (SSME) is a technique for studying transport and electrogenic activities in transporters, pumps, and ion channels, including those located in inner membranes such as mitochondria and lysosomes. Using a fluidic system for rapid solution exchange, transport or ion conductance are driven by substrate concentration gradients at zero membrane potential. Dr. Zerlotti will present a recent study focused on investigation of lysosomal channels TMEM175, TPC2 and TRPML1. Measurements of K^+ and H^+ permeability in TMEM175, revealed two K^+ permeability coefficients and a PH/PK ratio consistent with literature. For TPC2, saturable Na^+ conductance with an EC_{50} of ~40 mM was observed, enhanced by the potentiator TPC2-A1P. SSME offers valuable insights into lysosomal channel function, complementing traditional patch-clamp techniques.



12:30 PM – 12:55 PM
Dr. Dan Burden
Professor, Analytical Chemistry
Wheaton College

Integrated Optical and Electrical Techniques for Investigating Unsupported Lipid Bilayer Dynamics at the Single-Molecule Level

This presentation examines the microelectrode cavity array (MECA) platform for studying biomolecule dynamics in lipid bilayers, emphasizing simultaneous optical and electrical measurements. The platform detects single

fluorescent molecules translocating across lipid bilayers while monitoring electrical currents typical of ion-channel experiments. This dual-modal approach provides insights into membrane processes at the single-molecule level, enabling the study of electrically silent translocation events often missed with conventional methods. Dr. Burden will showcase the method's utility for analyzing lipid and protein diffusion, ion channel insertion, gating, and the influence of biomimetic structures on membrane properties. Key techniques include fluorescence correlation spectroscopy (FCS) and single-particle tracking (SPT). Additionally, challenges with single-molecule fluorescence, such as optical surface irregularities, will be addressed, along with strategies for minimizing background fluorescence and improving signal-to-noise ratios to maximize research potential.

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