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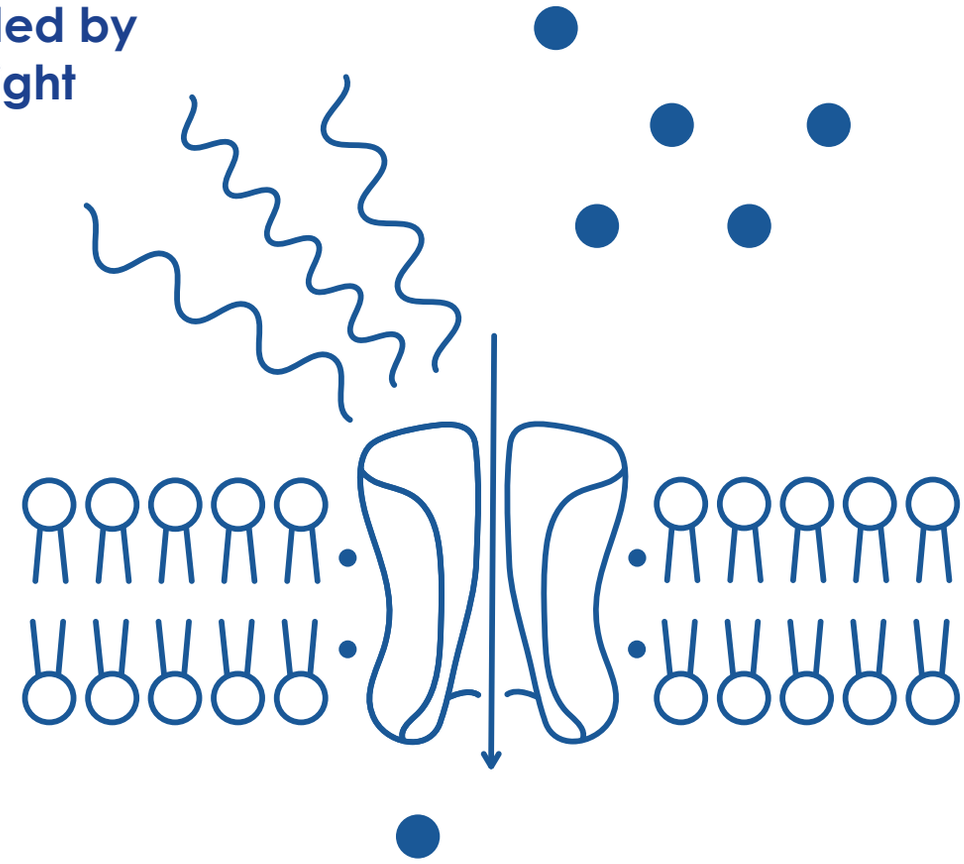

Nanion User Meeting 2025

Munich, Germany

Science, Workshops, Networking

Nanion User Meeting 2025 Agenda

Dates: October 28-29th, 2025

Venue: Ganghoferstraße 66b, 80339 München

Tuesday, October 28th

09:45 - 12:00 h CEST
User instrument Workshops (Registration required)

11:45 - 13:00 h CEST
Registration & welcome bites

13:00 - 13:15 h CEST
Niels Fertig (Nanion Technologies)
Welcome words

13:15 - 13:40 h CEST
Christian Grimm (Ludwig-Maximilians University)
High-throughput organellar electrophysiology to allow early Drug discovery from native Lysosomes

13:40 - 14:05 h CEST
Ann-Katrin Piper (University of Wollongong)
Potential Role of the CLCA1-ANO1 Axis in Supporting Survival of Gastric Cancer Circulating Tumour Cells

14:05 - 14:15 h CEST
Poster flash talks (x3, 3 min each)

14:15 - 14:30 h CEST
Short break

14:30 - 15:15 h CEST
Instrument demos - Rotation 1

15:15 - 16:00 h CEST
Instrument demos - Rotation 2

16:00 - 16:15 h CEST
Short break

16:15 - 16:40 h CEST
Jan Behrends (University of Freiburg)
Simultaneous high-resolution fluorescence and voltage clamp measurements on free-standing membranes on a chip

16:40 - 17:05 h CEST
Anasua Mukhopahyay (University of Fribourg)
Single-Molecule Detection of Protein Biomarkers in Neurodegenerative Disease

17:05 - 17:30 h CEST
Marianna Mitsioni (EPFL University)
Fluorescence-Based Approaches to Study Biological Nanopore Mechanisms

17:30 - 17:40 h CEST
Poster flash talks (x3, 3 min each)

17:40 - 18:45 h CEST
Posters & networking

19:00 - 23:00 h CEST
Dinner hosted by Nanion Technologies

Wednesday, October 29th

08:45 - 09:15 h CEST
Coffee & tea

09:15 - 09:40 h CEST
David Colameo (University of Zurich)
Exploring Heterogeneous Cell Populations Using Automated Patch-Clamp and Correlative Imaging

09:40 - 10:05 h CEST
Michel de Waard (University of Nantes)
Photosensitive natural peptides for the optical control of ion channels

10:05 - 10:30 h CEST
Stephan Pless (University of Copenhagen)
Leveraging deep learning tools to design miniprotein modulators of ion channels

10:30 - 11:00 h CEST
Coffee break

11:00 - 11:25 h CEST
Francesco Tadini-Buoninsegni (University of Florence)
Investigating charge transport by P-type ATPases with the SURFE^{2}R technology

11:25 - 11:50 h CEST
Ines Benhammouche (Aarhus University)
Structural and mechanistic insights into PIN8 and its inhibition by Morphactins

11:50 - 12:15 h CEST
Felix Baerenz (Sanofi)
High-throughput SLC inhibition assays: Combining SSM electrophysiology & ADE-MS

12:15 - 13:30 h CEST
Lunch

13:30 - 13:55 h CEST
Terence Hébert (McGill University)
GPCR-based drug discovery using iPSC-derived cardiomyocytes and cardiac fibroblasts

13:55 - 14:20 h CEST
Bettina Lickiss (innoVitro)
In Vitro Modeling of Atrial Fibrillation Using Human iPSC-Derived Cardiomyocytes for Therapeutic Screening

14:20 - 14:35 h CEST
Julia Erl (Regensburg University)
Monitoring the Reversibility of GPCR Signaling by Combining Photochromic Ligands with Label-free Impedance Analysis

14:35 - 14:50 h CEST
Tobias Ensslen (Hahn-Schickard)
Real-Time Monitoring of Pore-Forming Toxin Activity in Live Cells Using High-Throughput Impedance Assays

14:50 - 15:00 h CEST
Elena Dragicevic (Nanion Technologies)
Closing words

MEMBRANE PHYSIOLOGY SYMPOSIUM

Scan for Tickets

Save the Date April 14th - 15th 2026

Napa Valley, California

Science, Networking, & A Little Wine

Questions Contact:
Brian.Camillo@nanion.de

October 28th

13:00 - 14:15 h CEST

Niels Fertig

Nanion Technologies

Welcome words

For over two decades, Nanion Technologies has been a leader in providing diverse solutions for electrophysiologists worldwide. Our innovative work in ion channel APC electrophysiology, cell viability and contraction monitoring, and electrogenic transporter research supports high-throughput capabilities. Niels Fertig will highlight our significant milestones and achievements from the past year, showcasing our ongoing efforts to advance electrophysiology and support groundbreaking research.

Session: Applications of High-Throughput Electrophysiology
Chair: Ali Obergrussberger (Director of Scientific Sales and Customer Engagement)

Christian Grimm

Ludwig-Maximilians University

High-throughput organellar electrophysiology to allow early Drug discovery from native Lysosomes

Lysosomes are increasingly recognized for their vital role in homeostasis, cellular signaling, and metabolism. Dysfunctions in lysosomal function are associated with various diseases. However, direct functional analysis of lysosomal ion channels remains limited due to technical challenges and time consumption in subcellular electrophysiology. To overcome these challenges, Nanion Technologies recently established high throughput characterization of isolated lysosomes using automated patch clamp (APC), which uses a specialized planar glass substrate for whole lysosome patch clamp recordings. Here, we have further refined the approach using the SyncroPatch 384 system with optimized protocols for lysosomal isolation as well as recording conditions where we have investigated the effect of reference compounds on overexpressed TPC2 channels as well as currents from control lysosomes. The data shows the potential application for early-stage drug discovery targeting lysosomal ion channels and explore novel therapies directly at the organelle level.

Ann-Katrin Piper

University of Wollongong

Potential Role of the CLCA1-ANO1 Axis in Supporting Survival of Gastric Cancer Circulating Tumour Cells

Gastric cancer is the fifth leading cause of cancer-related death worldwide. Most therapies target the primary tumour, with few addressing metastasis. Understanding how circulating tumour cells (CTCs) survive hematogenous spread is critical to intercepting metastatic progression. We compared CTC-derived (UWG02CTCs) and ascites-derived (UWG02ASCs) cell lines from one patient, revealing selective upregulation of chloride channel regulator CLCA1 and related ANO1-mediated chloride currents in CTCs. T-type Ca^{2+} channels were also differentially expressed. Transcriptomics and lipidomics indicate membrane and adhesion adaptations. Our findings suggest the ANO1-CLCA1 axis supports CTC survival and represents a novel target to inhibit metastasis.

Instrument demos

- Two rotations, 45 min each
- **Where:** Nanion labs, ground floor
- **Start time:** 14:30 h
- **End time:** 16:00 h

October 28th

16:15 - 17:40 h CEST

Session: Single-Molecule, Nanopores and Fluorescence Insights
Chair: Conrad Weichbrodt (Senior Scientist / Product Manger Orbit systems)

Jan Behrends
University of Freiburg

Simultaneous high-resolution fluorescence and voltage clamp measurements on free-standing membranes on a chip

Voltage clamp analysis in the form of single ion channel recording was the first biophysical technique to attain single molecule resolution 50 years ago. The first speculation as to the feasibility of combined spectroscopic and electrical recordings techniques in single channel studies dates back 30 years. Such experiments are notoriously difficult to set up, especially if high resolution is to be preserved for both modalities. In addition the compounded propensities for the rupturing of membranes, bleaching of fluorophores and other mishaps makes successful experiments a rarity when single membranes are used. I will report on recent progress based on a variant of the microelectrode cavity array (MECA) chip with microelectrodes shaped to leave an optical window through which a free-standing membrane can be addressed with high-NA optics. This MECA-opto system is currently used both for widefield and confocal/ FCS analysis of membranes with pore-forming peptides and proteins and promises to enable combined electrical-optical recording from reconstituted protein ion channels.

Anasua Mukhopadhyay
University of Fribourg

Single-Molecule Detection of Protein Biomarkers in Neurodegenerative Disease

Biological nanopores are powerful tools for single-molecule analysis, yet limited pore size restricts the sensing of large, folded protein biomarkers. We introduce a stable, low-noise ~20 ± 2 nm cylindrical nanopore formed by Pneumolysin (PLY) via *in situ* self-assembly on lipid bilayers at 100 mV. This large pore enables resistive-pulse sensing to estimate the volume and shape of folded proteins, from FAB (≈50 kDa) to concanavalin A tetramers (112 kDa). Using PLY, we detected tau monomers (≈45 kDa) and oligomers up to hexamers. Volume and shape analysis revealed tau oligomerization at nanomolar levels. PLY nanopores offer a promising tool for characterizing protein biomarkers in neurodegenerative diseases.

Marianna Mitsioni
EPFL University

Fluorescence-Based Approaches to Study Biological Nanopore Mechanisms

β-barrel nanopores exhibit complex nonlinear transport phenomena that are essential for biological function yet remain poorly understood. Here, we fully rationalize both rectification and gating in aerolysin nanopores by quantitatively modeling these behaviors as direct consequences of lumen charge distribution. Through systematic mutagenesis, we demonstrate that both phenomena are tunable and predictable based on the electrostatic profile of the pore. Building on this framework, we propose that gating arises from voltage-driven conformational changes of the β-barrel. To directly probe this mechanism, we developed a FRET-based approach using labeled aerolysin mutants and optical imaging under applied voltage, enabling the real-time detection of structural rearrangements during gating events. Together, our findings provide a comprehensive mechanistic understanding of ion transport in β-barrel nanopores.

Join us at the user meeting dinner!

When: October 28th, 2025 | 19:00 h
Due to limited capacity, attendance is reserved for those who registered in advance.

October 29th

09:15 - 10:30 h CEST

Session: Advances in Ion Channel Drug Discovery
Chair: Artem Kondratskyi (Scientific Solutions Manager)

David Colameo
University of Zurich

Exploring Heterogeneous Cell Populations Using Automated Patch-Clamp and Correlative Imaging

High-throughput automated patch-clamp (HT-APC) is a powerful alternative to manual recordings but is typically restricted to homogeneous cell populations. We established a workflow that combines HT-APC with post-fixation and high-content imaging, allowing the cell type of each patched cell to be identified. As a proof of concept, we created mixed populations with defined electrophysiological and fluorescent properties to validate the method. This approach enables cell-type–specific electrophysiology in complex cultures and primary tissues, opening new possibilities for disease modelling and functional analysis of heterogeneous systems.

Michel de Waard
University of Nantes

Photosensitive natural peptides for the optical control of ion channels

Photopharmacology enables selective modulation of compound potency within specific organs *in vivo*. Unlike optogenetics, it holds greater clinical promise as it often avoids genetic tissue manipulation. We will present technologies applied to natural peptides active on ion channels, where Nanion's SyncroPatch 384 proves highly valuable. These peptides offer key advantages: high affinity, *in vivo* stability, targeted ion channel interaction, and slower tissue diffusion than small molecules. The goal is to assess these technologies directly *in vivo* for controlling physiological parameters or tissue excitability. The talk will highlight their implementation, versatility, and clinical potential.

Stephan Pless
University of Copenhagen

Leveraging deep learning tools to design miniprotein modulators of ion channels

Ion channels constitute important drug targets but remain difficult to target with high specificity. Challenging targets include ion channels such as acid-sensing ion channels (ASICs) and the sodium leak channel (NALCN) complex that play crucial roles in stroke and neurodevelopment, respectively. We used a combination of RFdiffusion, ProteinMPNN and AlphaFold metrics to predict binders of hASIC1a and the NALCN complex. These were expressed, purified and tested with electrophysiology. We thereby identified inhibitors of ASIC1a and the NALCN complex, including of disease-causing gain-of-function variants. De novo design of miniproteins thus constitutes a promising avenue to generate ion channel modulators.

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October 29th

11:00 - 12:15 h CEST

Session: Mechanistic Insights into Membrane Transporters
Chair: Maria Barthmes (Product Manager SURFE²R / Senior Scientist)

Francesco Tadini-Buoninsegni
University of Florence

Investigating charge transport by P-type ATPases with the SURFE²R technology

P-type ATPases couple ATP hydrolysis to the transport of various ions across biological membranes, thereby generating essential electrochemical potential gradients. We investigated charge transport by P-type ATPases using solid supported membrane (SSM)-based electrophysiology. In particular, we studied the Ca^{2+} transport activity of sarcoplasmic reticulum (SR) Ca^{2+}-ATPase (SERCA). SR vesicles containing SERCA were adsorbed to the SSM and activated by an ATP concentration jump. Following SERCA activation, an electrical current was detected which was attributed to movement of Ca^{2+} ions within the SERCA enzyme. The effects of pharmacologically relevant compounds on SERCA transport activity were characterized.

Ines Benhammouche
Aarhus University

Structural and mechanistic insights into PIN8 and its inhibition by Morphactins

We characterised the auxin transporter PIN8 in complex with the synthetic herbicide Morphactin (Cl-HFC), revealing how it locks the transporter in an outward-occluded state and blocks auxin efflux. Cl-HFC showed higher potency than NPA in SURFE²R-based electrophysiology assays. Structural data uncovered a chlorine-dependent interaction network underpinning Cl-HFC's specificity and affinity. This unique inhibition mechanism, distinct from phenoxyacetic acid herbicides, provides a basis for developing next-generation, PIN-specific herbicides.

Felix Baerenz
Sanofi

High-throughput SLC inhibition assays: Combining SSM electrophysiology & ADE-MS

The solute carrier (SLC) superfamily comprises over 400 membrane transporters essential for moving diverse substrates across cellular membranes, maintaining homeostasis and supporting critical physiological functions. Despite their significance as drug targets and disease mediators, drug discovery efforts targeting SLCs have been hampered by methodological limitations. We developed complementary screening platforms using Acoustic Droplet Ejection Mass Spectrometry (ADE-MS) and Solid Supported Membrane (SSM)-based electrophysiology that demonstrate excellent sensitivity and reproducibility for detecting substrate transport and inhibitor activity. These robust platforms enable efficient high-throughput screening campaigns for novel SLC modulators, potentially accelerating drug discovery for numerous conditions associated with transporter dysfunction.

We welcome your feedback. How do you like the meeting?

October 29th

13:30 - 15:00 h CEST

Session: Cell-Based Assays in Drug Discovery
Chair: Elena Dragicevic (Global Marketing Manager)

Terence Hébert
McGill University

GPCR-based drug discovery using iPSC-derived cardiomyocytes and cardiac fibroblasts

To personalize medicine, we must model disease on a patient-specific basis. Using PBMCs, we generate iPSC lines and derive cardiovascular-relevant cells. Evidence shows that cellular signaling "hubs" controlling function and fate are cell- and tissue-specific, and influenced by patient genetics. Alterations in these hubs shape disease-specific signaling. By mapping outcomes in control versus patient-derived iPSC-CMs, we aim to identify deregulated pathways and clarify how context drives disease. Using biosensors, phenotypic profiling, and platforms like CardioExcyte 96 and AtlaZ, we study cardiomyocyte and fibroblast responses to therapies.

Bettina Lickiss
innoVitro

In Vitro Modeling of Atrial Fibrillation Using Human iPSC-Derived Cardiomyocytes for Therapeutic Screening

Atrial fibrillation (AF) is the most common cardiac arrhythmia, yet animal models often fail to capture human-specific disease features. We developed a high-throughput AF assay using human iPSC-derived atrial cardiomyocytes (Axol Biosciences) to assess AF-related changes via extracellular field potential duration (EFPD). Cells were cultured in 96-well plates and tachypaced at 2.5 Hz for 24 h on the CardioExcyte 96. Following AF-like EFPD shortening, class III antiarrhythmics (dofetilide, sotalol, and ibutilide) induced concentration-dependent EFPD prolongation. This human-relevant model enables robust, translational screening of AF mechanisms and therapies.

Julia Erl
University of Regensburg

Monitoring the Reversibility of GPCR Signaling by Combining Photochromic Ligands with Label-free Impedance Analysis

G protein-coupled cell surface receptors (GPCR) are activated upon agonist binding by complex mechanisms. Classic pharmacological assays provide information about binding affinities, activation, or blockade at different stages of the signaling cascade, but real time dynamics and reversibility of processes remain often disguised. We show that combining photochromic NPY Y4 receptor ligands, which can be toggled in their receptor activation ability by irradiation with light of different wavelengths, with whole cell label-free impedance assays allows the observation of activation profiles over time and the reversibility of activation. The concept demonstrated on NPY receptors may be well applicable for many other GPCR activations to provide a deeper insight into the time course of molecular activation processes.

Tobias Ensslen
Hahn-Schickard

Real-Time Monitoring of Pore-Forming Toxin Activity in Live Cells Using High-Throughput Impedance Assays

Pore-forming toxins (PFTs) are virulence factors that disrupt membrane integrity and induce cell death. Beyond their pathogenic role, they can act as biological nanopores for single-molecule sensing and hold therapeutic promise in cancer. We used a high-throughput, label-free impedance assay to study SarolL-1 from *Salpingoeca rosetta* and Aerolysin from *Aeromonas hydrophila* in H1299 and HT-29 carcinoma cells. Real-time impedance tracking revealed distinct kinetics and receptor specificity toward the glycosphingolipid Gb3. The AtlaZ platform enabled scalable assays, highlighting impedance sensing as a robust tool for real-time analysis of PFT-induced cytotoxicity.

Posters

Board #1. "Human iPSC-derived motor neurons for ALS modeling on the high-throughput SyncroPatch 384 platform"
Presenter: Stuart Prime (Axol Bioscience)

Board #2. "Electrophysiological Analysis of a Klotho Activator on Ion Channels in Hepatocyte-Derived BNL CL.2 Cells performed with Port-a-Patch mini'"
Presenter: Annamaria Di Turi (University of Bari Aldo Moro) - ***Flash talk***

Board #3. "Functional Effects of Autoantibodies from Chagas Disease Patients on the Electrophysiology of Cardiomyocytes Derived from Human Induced Pluripotent Stem Cells"
Presenter: Keyla da Silva Coutinho (Federal University of Rio de Janeiro)- ***Flash talk***

Board #4. "Structural insights into regulation of the human TRPV6 channel by magnesium"
Presenter: Aleksei Shalygin (LMU Munich, Institute of Pharmacology and Toxicology)

Board #5. "Electrophysiological screening of potential drug candidates at the Tetronarce californica nicotinic acetylcholine receptor to counteract organophosphate poisoning"
Presenter: Fabian Springer (German Armed Forces, Institute of Pharmacology and Toxicology) - ***Flash talk***

Board #6. "TRPM7 underlies cadmium cytotoxicity in pulmonary cells"
Presenter: Leonor Correia (LMU Munich, Institute of Pharmacology and Toxicology)

Board #7. "Tackling muscle degeneration and pain disorders via automated patch clamp"
Presenter: Manuel Marinelli (University of Bari Aldo Moro)

Board #8. "Investigating the Pathomechanisms of Developmental and Epileptic Encephalopathies: Toward Automated Patch Clamp–Based Functional Characterization of Ion Channel Variants."
Presenter: Cristiana Pelorosso (Meyer Children's Hospital, Florence) - ***Flash talk***

Board #9. "Co-culture of iPSC-derived Cardiomyocytes and Cardiac Fibroblasts on the FLEXcyte 96"
Presenter: Amr Othman (Fujifilm Cellular Dynamics)

Board #10. "TMPRSS6 cleaves KCNE1 and causes arrhythmias in iron overload disease"
Presenter: Minay Mertens (University of Münster) - ***Flash talk***

Board #11. "Proton selective conductance and gating of the lysosomal cation channel TMEM175"
Presenter: Oliver Rauh (Bonn-Rhein-Sieg University of Applied Sciences)- ***Flash talk***

Board #12. "PP1-disrupting peptides (PDPs) and their applications in cardiomyocytes"
Presenter: Melda Ercan (University of Bonn)

Notes

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