Welcome to the 5th TNNN Conference 2026

NTNU

Universitetet i Sørøst-Norge

UiT Norges arktiske universitet

UNIVERSITETET I OSLO

UNIVERSITETET I BERGEN

ELECTRONIC COAST

KONGSBERG

When and where

The TNNN Conference 2026 will be held **6-8 May in Trondheim**. The conference will mainly take place at the **campus of Gløshaugen NTNU, Gamle elektro EL5:** Mazemap link

The conference will begin with lunch on Wednesday, May 6, and will end on Friday, May 8, after lunch.

Accomodation

If you registered and selected the hotel option, we have booked your stay at: Scandic Lerkendal
Address: Klæbuveien 127, 7031 Trondheim

Payment

PhD members and invited speakers are exempt from the fee. TNNN will also cover the conference fee for PhD candidates and postdoctoral researchers who are members of the TNNN Research School.

For other participants, the conference fee is 2000 NOK. Payment link:
https://www.ntnu.no/nettbutikk/billett/arrangement/tnnn-conference-2026/

Practical Information

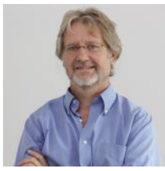
Campus Gløshaugen is within walking distance of the hotel. If you need to use public transport during your stay, you should download the AtB app.

From Trondheim Airport Værnes, you can take either the bus or the train into the city.

Help us spread the word

Share your participation at the TNNN Conference 2026 on **LinkedIn** — and remember to tag **TNNN**.

Wednesday 6 May

11.00 - 12.30	**Lunch and Registration** **NTNU Gløshaugen: Gamle Elektro, room EL5**
12.30- 12.35	**Opening of the conference**
12.35 - 14.10	**Session 1: Quantum technology part 1**
12.35 - 13.20	 **Towards in-memory computing using ferroelectric memristors** Mattias Borg, Associate Professor, Lund University of Sweden
13.25 - 13.50	 **Industry invited speaker:** **Gunnar Maehlum, CEO of Integrated Detector Electronics AS (IDEAS)** Title: From First Principles to Flight Hardware: Microelectronics in Space.
13:50– 14:00	**Stand Presentations**
14.00 - 14.30	**Coffee break**

14.30 - 16.30	**Workshops**
16.30 - 17:00	Poster pitch presentations
17:15	Bus to Lager 11
17.15 - 21:00	Poster session and dinner at Lager 11

Thursday 7 May

09.00 - 12.00	**Session 2: Nanotechnology part 1**
09:00 - 09.45	 **Next-Generation Concepts in Cancer Nanomedicine** Twan Lammers, Professor of Medicine, RWTH Aachen University, Germany
09:45 - 10.00	**Contributed Talk 1: Improving Anti-PD1 Uptake and Therapy in Tumors Using Acoustic Cluster Therapy (ACT) in Mice** Håkon F. Wesche, PhD candidate, Department of Physics, NTNU
10:00 - 10.15	**Contributed Talk 2: Doxorubicin-Loaded Iron Oxide Nanocubes for Targeted Anticancer-Drug Delivery** Egon G. Höfgen, PhD candidate, NTNU

10.15 - 10.45	**Coffee break**
10.45 - 11.30	 **Atomically precise structures tailored into 2D materials** Jani Kotakoski, Professor, University of Vienna
11:30 - 11.45	**Contributed Talk 3: Taper-Engineered AlGaN/GaN Nanowire Photonic Crystal Surface-Emitting UV Lasers** Dishiti Gupta, PhD candidate, Department of Electronic Systems, NTNU
11:45 - 12.00	**Contributed Talk 4: Hybrid antiferroelectric–ferroelectric-ferroelastic domain walls in noncollinear antipolar oxides** Ivan N. Ushakov, Researcher, Department of Materials Science and Engineering, NTNU
12.00 - 13.00	**Lunch**
13.00 - 15.45	**Session 3: Nanotechnology part 2**
13:00 - 13.45	 **Medical Micro & Nanotechnologies – fast blood analysis and "swallow your doctor"** Anja Boisen, Professor Department of Health Technology, Technical University of Denmark

16.30 - 18.30	Social program: quiz at Work-Work arranged by the PhD counsil
19.00 -	Conference dinner at Rockheim Panorama

Friday 8 May

08.45 - 12.00	**Session 4: Optics, photonics and materials**
08:45 - 09.00	**Contributed Talk 11: Emergent non-reciprocity and unidirectional domain dynamics in a magnetic metamaterial** Ida Breivik, PhD candidate, Department of Electronic Systems, NTNU
09:00 - 09.45	**From Glass Slides to Photonic Chips: A New Era of Multi-Modal Microscopy** Balpreet S. Ahluwalia, Professor / Ultrasound, Microwaves and Optics, UiT - The Arctic University of Norway
09:45 - 10.00	**Contributed Talk 12: Seeing the invisible – upconversion of mid-infrared light to visible using molecular optomechanics in dual-resonant metasurfaces** Julia Lövgren, PhD candidate, Department of Electronic Systems, NTNU
10:00 - 10.15	**Contributed Talk 13: Resolving Operando Breathing of Li-ion Batteries with X-ray Computed Tomography** Shibi Tharayanmaru Palliyalil, PhD candidate, Department of Physics, NTNU
10.15 - 10.45	**Coffee break**

10:45 - 11.00	**Contributed Talk 14: Peierls-induced topological Weyl semimetal in PtBi2** Anders C. Mathisen, PhD candidate, Department of Physics, NTNU
11:00 - 11.15	**Contributed Talk 15: Regulating interactions via Nanoscale Assembly for Uniform Adhesive Networks** Jun Chen, Postdoctoral Fellow, Department of Structural Engineering, NTNU
11:15 - 11.30	**Contributed Talk 16: Self-Assembling Monolayers as a Tool for Selective Chemical Solution Deposition** Karola Neeleman, PhD candidate, Department of Materials Science and Engineering, NTNU
11:30 - 11.45	**Contributed Talk 17: Towards reconfigurable magnonic crystals using artificial spin ice based magnetic multilayer structures** Johannes Hestmark, PhD candidate, Department of Electronic Systems, NTNU
11:45 - 12.00	**Contributed Talk 18: Optimizing Pulsed Laser Deposition of Cr + N Co-Doped TiO2 for Intermediate Band Solar Cells** Eskil Vik, PhD candidate, Department of Physics, NTNU
12.00 - 13.00	**Lunch and end-of-conference wrap-up**

Invited speakers information

Prof. Dr. Dr. Twan Lammers
RWTH Aachen University, Germany

Title: Next-Generation Concepts in Cancer Nanomedicine

Abstract:
Nanomedicines are extensively used for cancer therapy. By delivering drug molecules more effectively and more selectively to pathological sites, nanomedicines assist in improving the balance between drug efficacy and toxicity. The tumor accumu-lation of nanomedicines is traditionally ascribed to the EPR effect, which is highly variable, both in animal models and in patients. To address issues associated with tumor targeting heterogeneity, and to promote cancer nanomedicine clinical per-formance and translation, we are working on tools and technologies to modulate, monitor and predict tumor-targeted drug delivery. In this TNNN lecture, several of these strategies will be highlighted, including physical (ultrasound), pharmacological and physiological interventions to prime the tumor microenvironment, and the use of imaging and histopathology biomarkers for patient selection and personalized medicine. Altogether, our efforts aim to establish rational and realistic ways forward to improve the clinical impact of cancer nanomedicines.

Assoc. Prof. Mattias Borg
Lund University of Sweden

Title: Towards in-memory computing using ferroelectric memristors

Abstract:
Recent advances in artificial intelligence have led to rapidly escalating energy demands, motivating the search for fundamentally new hardware paradigms for efficient computation. In-memory computing based on memristive devices offers a promising route to dramatically reducing energy consumption by eliminating the traditional separation between memory and processing. Among these devices, ferroelectric memristors stand out due to their intrinsically low operating currents and robust, nonvolatile switching characteristics.

In this work, we present our recent progress toward reliable in-memory computing using ferroelectric tunnel junction (FTJ) memristors. Through the development of refined programming schemes, we have enhanced the analog resistance precision from 5 to 7.5 effective bits, enabling more accurate analog computation within neuromorphic and AI-accelerated architectures. We further evaluate FTJ device performance in representative AI workloads, including image segmentation and natural language processing, and identify an especially strong match with the computational patterns found in natural language applications.

Finally, we demonstrate advances in materials engineering aimed at improving device scalability and manufacturability. Using nanosecond-pulse laser annealing, we reduce the ferroelectric tunnel barrier thickness to 3.4nm while improving the electrode/ferroelectric interface quality, paving the way for back-end-of-line integration. Together, these results represent a significant step toward practical, energy-efficient in-memory computing platforms based on ferroelectric memristive technologies.

Prof. Balpreet S. Ahluwalia
UiT, The Arctic University of Norway
Title: From Glass Slides to Photonic Chips: A New Era of Multi-Modal Microscopy

Abstract:
For more than a century, optical microscopy has relied on glass slides and coverslips as the basic support for biological samples. To overcome the diffraction limit of conventional optical microscopy, researchers have historically modified the photophysical properties of fluorophores and developed advanced laser engineering techniques. These efforts have significantly enhanced the microscope's optical setup, yet the fundamental sample support, i.e. glass slides or coverslips has largely remained unchanged.
In this talk, an overview of photonic chip-based multi-modal super-resolution microscopy is presented. Instead of a glass coverslips, the sample is seeded directly on top of an optical waveguide, (photonic-chip), that delivers the evanescent field illumination directly to the sample via total internal reflection (TIR). The core of chip is made of high-refractive index material ensuring excellent optical sectioning via ultra-thin (decay <50nm), ultra-large and clean TIR illumination over entire length of the chip (centimeter scale) and supports broad spectral range.
The photonic-chip based microscopy not only reduces the footprint, and complexity but enables integration of different microscopy platforms such as on-chip single molecule localization optical microscopy (SMLM) [1], on-chip TIRF-structured illumination microscopy (TIRF-SIM) [2], light intensity fluctuation based optical super-resolution microscopy [3] and its compatibility with correlative light-electron microscopy [4]. The chip-based SMLM enabled super-resolved images over millimetre field-of-view scale; a 100-fold increase in imaging area as compared to conventional SMLM platforms, thus opening the opportunities of high-throughput optical nanoscopy. The compatibility of photonic-chip for different biological applications have been demonstrated on living (5) and delicate cells such as neurons (6). Similarly, the photonic-chip withstands standard preparation protocols of histopathology (7). This makes photonic-chip optical microscopy an attractive platform for application looking for scanning large areas with super-resolution and ultra-high contrast.
In this talk, I will also present, recent development of harnessing dark-field alike TIR-illumination from a photonic-chip for label-free superior contrast imaging (8) and label-free super-resolution imaging (9) of nanosized extra-cellular vesciles and tissue sections. By exploiting the photoluminence of the silicon nitride waveguide platform in tandem with the autofluoroscence of tissue sections, we proposed novel incoherent label-free super-resolution optical microscopy. Depending on time, will reflect future directions towards spatial omics applications using photonoic-chip nanoscopy.

Reference
1. R. Diekmann, O. I. Helle, C. I. Oie, P. McCourt, T. R. Huser, M. Schuttpelz, and B. S. Ahluwalia, "Chip-based wide field-of-view nanoscopy," Nature Photonics 11, 322 (2017).
2.. Ø.I. Helle, F.T. Dullo, M. Lahrberg, J.C.Tinguley, O.G. Hellesø and B. S. Ahluwalia, " Structured illumination microscopy using a photonic chip. Nature Photonics 14, 431–438 (2020).
3. N. Jayakumar, Ø.I. Helle, K. Agarwal and B. S. Ahluwalia, "On-chip TIRF nanoscopy by applying Haar wavelet kernel analysis on intensity fluctuations induced by chip illumination", Opt. Express, 28, 35454, 2020.
4. J.C. Tinguely, A. M. Steyer, C. I. Øie, Ø.I. Helle, F.T. Dullo, R. Olsen, P. McCourt, Y. Schwab, B. S. Ahluwalia, "Photonic-chip assisted correlative light and electron microscopy", Communication Biology 3, 739 (2020).
5. J.C. Tinguely, Ø. I. Helle, and B. S. Ahluwalia, "Silicon nitride waveguide platform for fluorescence microscopy of living cells," Opt. Express 25, 27678-27690 (2017).
6. I. S. Opstad, F. Ströhl, M. Fantham, C. Hockings, O. Vanderpoorten, F. W. van Tartwijk, J. Q. Lin, J.C. Tinguely, F. T. Dullo, G. S. Kaminski-Schierle, B S. Ahluwalia, C F. Kaminski, "A waveguide imaging platform for live-cell TIRF imaging of neurons over large fields of view", Journal of Biophotonics, 13, 6, e201960222, 2020.
7. Villegas-Hernández, L.E., et al., Chip-based multimodal super-resolution microscopy for histological investigations of cryopreserved tissue sections. Light: Science & Applications, 2022. 11(1): p. 1-17.
8. N. Jayakumar, F.T. Dullo, V. Dubey, A. Ahmad, F. Ströhl, J. Cauzzo, E. M. Guerreiro, O. Snir, N. Skalko-Basnet, K. Agarwal, B. S . Ahluwalia, "Multi-moded high-index contrast optical waveguide for super-contrast high-resolution label-free microscopy" Nanophotonics, vol. 11, no. 15, 2022.
9. N Jayakumar, L E. Villegas-Hernández, W. Zhao, H. Mao, F. T Dullo, J.C Tinguley, K. Sagini, A. Llorente, B. S. Ahluwalia, "Label-free incoherent super-resolution optical microscopy", Light: Science & Applications 14 (259) 2025.

Univ.-Prof. Dr. Jani Kotakoski
University of Vienna
Ttile: Atomically precise structures tailored into 2D materials

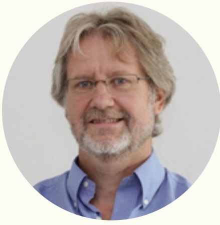
Abstract
Transmission electron microscopy (TEM) is often carried out separate from other experimental steps, allowing only "post mortem" analysis. This is a significant disadvantage compared to for example scanning tunneling microscopy, where the microscopic investigation is directly integrated as a part of the same experimental setup where the samples are grown and manipulated. There is however no fundamental reason why TEM and scanning TEM (STEM) could not be similarly integrated into more comprehensive system.
In this contribution, I will present the experimental setup that we have established at the University of Vienna over the past decade to overcome this disadvantage [1]. I will further show how this setup and other advances made in the group in manipulation of 2D materials have enabled research towards truly atomically precise structures that can be tailored into 2D materials (e.g., Refs. [2-8]) for applications ranging from catalysis to quantum information technology.

1. Mangler et al., Microsc. Microanal. 28 S1, 2940 (2022)
2. Trentino et al., Nano Lett. 21, 5179-5185 (2021)
3. Leuthner et al., 2D Mater. 8, 035023 (2021)
4. Trentino et al., Micron 184, 103667 (2024)
5. Längle et al., Nat. Mater. 23, 762 (2024)
6. Speckmann et al., Adv. Mater. Interfaces 12, 2400784 (2024)
7. Längle et al., arXiv: 2404.07166 (2025)
8. Joudi et al., Phys. Rev. Lett. 134, 166102 (2025)

Prof. Anja Boisen
Technical University of Denmark
Title: Medical Micro & Nanotechnologies – fast blood analysis and 'swallow your doctor'

Abstract:
Our ability to shape materials at the nanoscale opens new possibilities for, among other things, rapid diagnostics and smart medication. I will give examples from our research that encompass both new discoveries and startup stories.
In the treatment of leukemia and sepsis, there is a need for therapeutic monitoring of drug concentrations in patients' blood. Silicon structures at the nanometer scale can have surprising optical properties. For example, they can enhance the so-called Raman scattering more than a million times. This effect can be used to perform very sensitive measurements of small molecules in a complex blood sample.
Our vision is that in the future we can 'swallow our doctor'. Ingestible capsules can be made smart so that they can eventually measure, take samples, and perform local repairs/medication in the stomach and intestines. Can this be done without also having to swallow a battery, and how do you take a sample from the intestines?

Invited industry talk



Gunnar Maehlum
CEO of Integrated Detector Electronics AS (IDEAS)
Title: From First Principles to Flight Hardware: Microelectronics in Space.

Abstract:
Space microelectronics is driven by first-principle physics constrained by the harsh operational environment in space.

This talk follows a path from semiconductor device physics and radiation–matter interactions to the realization of flight-qualified hardware for space missions. Key topics include radiation effects in ICs, system-level trade-offs, and the qualification process that bridges prototypes and spaceflight hardware.

The objective is to give PhD students and early-career engineers a taste of how robust space systems are engineered. —and how deep technical competence becomes a long-term asset in both space missions and emerging commercial markets.

Poster Pitch Session – Rules

Duration:
Each presenter has **1 - 2 minutes** to deliver their pitch.

Format:
Use 1 slide (in .pptx) to introduce your scientific work. Please send your slide to pawel.sikorski@ntnu.no by no later than 09:00 on Wednesday 6th of May. U**se your poster number (see the table below) as the file name (example: PS-12.pptx).**

Goal:
Briefly **highlight the key idea** and **motivate the audience** to visit your poster for more details. This is a **presentation-only session**—no questions will be taken during the pitch.

Tip:
Focus on the **main contribution, why it matters,** and **what visitors will learn** at your poster.

NAME	NUMBER	TITLE
Jean-Claude Tinguely	PS-1	Coming nanofabrication cleanroom and facilities at UiT The Arctic University of Norway
Hildegunn Haugan	PS-2	Oblique Plane Microscopy of cardiomyoblasts from embryonic rat hearts and hiPSC-derived cardiomyocytes
Jean-Baptiste Boyssou	PS-3	Influence of Nanoparticles on Pickering Foam Stability: A Microfluidics Insight
Henrik Tidemann Kaarbø	PS-4	Solving inverse problems in computational micromagnetics to optimize magnet shape for novel and optimized
Diamante Boscaro	PS-5	Alginate-encapsulated bone spheroids: approaches to study bone cells in 3D
Saber Mohammadi	PS-6	An Operational Flow Assurance Approach to Asphaltene and Wax Control Using Single-Walled Carbon Nanotubes: Experimental Field-Condition Study
Mina Alexandra Thor	PS-7	Optical parametric amplification, simulations, fabrications, and measurements.
Nadiia Piiter	PS-8	Contemporary Micro-Battery Technologies: Advances in
NA WANG	PS-9	TiO_2/Co_3O_4 Heterojunction Kinetics for Betavoltaic Power Batteries
Anniken Mathea Rafnum Sjødal	PS-10	Microbubble- and ultrasound-mediated delivery of viral vectors across the blood-brain barrier
Payel Chatterjee	PS-11	Growth Optimization of $La_{0.7}Sr_{0.3}MnO_3$ Thin Films on $LiNbO_3$ Substrate by Pulsed Laser Deposition
Ece Kurt Majidli	PS.12	Integration of Carbon Nanotubes for Nanoelectronic Devices and Sensing Applications
Ali Pourabdollah Vardin	PS-13	Next-Generation Mobile Micro-IDT Acoustic Generators for Biological Applications
Guoli Zhang	PS-14	Graphitization-Regulated Nanoarchitectured Mesoporous Carbon Derived from Carbon Quantum Dots for Efficient Zn^{2+} Storage
Noemie Mestre	PS-15	Innovative GeSi wall waveguides for on-chip broadband mid-IR spectroscopy
Dheerendra singh bhandari	PS-16	Harnessing spin-orbit torque for electrical control of nanomagnets
Gulzhan Baigarinova	PS-17	Selective Area Growth of GaN Nanowires by Molecular Beam Epitaxy
Madhura Bhaiyasaheb Bonde	PS-18	AFM Insights into Supramolecular Polymorphism of Chiral Amyloid Isoforms in Insulin and Lysozyme.
Dharsana Pulikkottil Dinesh	PS-19	Influence of Ba-O Formation on Barium Titanate Thin Film Properties
Marius Holen	PS-20	Patterning LSMO on Lithium Niobate for magnetomechanical devices

Jessica Zeman	PS-21	4D X-ray imaging of NaCl crystal growth and morphology
Melania Rogowska	PS-22	Atomic layer deposition of $BaSnO_3$ using novel metal-organic precursors: towards FeFET and FTJ integration.
Joe Stickland	PS-23	Coherent X-ray Diffraction Imaging of Microparticle Internal Morphology at Ultra-High Voxel Resolution
Tessana Masse	PS-24	OPD Calibration Method Development for GLIM
Shubhankar Mishra	PS-25	Designing RF Point Contact Spectroscopy: A Novel Modular Approach for Local Probing of Magnon-Phonon
Sudip Sharma	PS-26	Surrogate-Based Multi-Objective Optimisation of Magnetic Induction Swing Adsorption Cycles for Post-Combustion CO_2 Capture
Håvard Rugtvedt	PS-27	Probing freezing-induced electrical potentials for novel energy harvesting from water
Veronica Nordlund	PS-28	Ultrasound-mediated delivery of free and liposomal doxorubicin to solid tumors
Enrico Melani	PS-29	Thin-Film Lithium Tantalate for Nonlinear and Quantum Photonic Integrated Circuits
Ali Ghasemibousjin	PS.30	High-Performance Broadband Infrared Silicon-based Doublet Metalenses Imaging: Evolution from Grayscale to One-Bit Binary Lithography(9-11 µm)