

Nicolai Winter-Hjelm

Researcher, Ph.D

Email nicolai.winter-hjelm@ntnu.no

LinkedIn www.linkedin.com/in/niwh

Date of birth 1994-06-17

Phone +47 990 10 998

Website ntnu.edu/employees/nicolai.winter-hjelm



Education and Qualifications

- 2020-08 - 2024-09 **Medicine, Ph.D.**
Norwegian University of Science and Technology (NTNU)
Advisors: Professor Ioanna Sandvig (NTNU, INB) & Professor Pawel Sikorski (NTNU, IFY)
Thesis Title: "Bioengineered Neural Networks as Computational Systems - Designing Anatomically Inspired Microcircuits to Decode Neural Function and Dysfunction"
- 2015-08 - 2020-06 **Bionanotechnology, M.Sc.**
Norwegian University of Science and Technology (NTNU)
Advisors: Dr. Peter Köllensperger (NTNU, NanoLab) & Professor Ioanna Sandvig (INB, NTNU)
Thesis Title: "Development of a Tailored Microfluidic Platform with Improved Electrical Signal Detection for In Vitro Studies of Neural Networks and Neural Network Pathology"
- 2019-01 - 2019-05 **Cellular Biology, Exchange Studies**
Nanyang Technological University (NTU)
Courses in stem cell and gene technologies, telomere biology, and immunology.

Publications

- 7. **N. Winter-Hjelm**, P. Sikorski, A. Sandvig and I. Sandvig. Engineered Cortical Microcircuits for Investigations of Neuroplasticity. *Lab Chip* (accepted, 2024). DOI: 10.1039/D4LC00546E
- 6. **N. Winter-Hjelm**, K. G. Klausen, A. S. Normann, A. Sandvig, I. Sandvig and P. Sikorski. Functional Complexity of Engineered Neural Networks Self-Organized on Novel 3D Interfaces. *Small* (under revision, 2024). BioRxiv: 10.1101/2024.06.01.596939
- 5. **N. Winter-Hjelm**, L. Isdal, P. A. Köllensperger, A. Sandvig, I. Sandvig and P. Sikorski. Nanoporous Platinum Microelectrode Arrays for Neuroscience Applications. *Sens Actuators B Chem* (in review, 2024). BioRxiv: 10.1101/2024.06.06.597813
- 4. K. S. Hanssen*, **N. Winter-Hjelm***, S. N. Niethammer, A. Kibro-Flatmoen, M. P. Witter, A. Sandvig and I. Sandvig. Reverse Engineering of Feedforward Cortical-Hippocampal Microcircuits for Modelling Neural Network Function and Dysfunction. *Sci. Rep.* (under revision, 2024). *Shared first authorship. BioRxiv: 10.1101/2023.06.26.546556
- 3. V. Fiskum, **N. Winter-Hjelm**, N. Christiansen, A. Sandvig and I. Sandvig. ALS Patient-Derived Motor Neuron Networks Exhibit Microscale Dysfunction and Mesoscale Compensation Rendering Them Highly Vulnerable to Perturbation. BioRxiv: 10.1101/2024.01.04.574167
- 2. J. S. Weir*, K. S. Hanssen*, **N. Winter-Hjelm**, A. Sandvig and I. Sandvig. Evolving alterations of structural organization and functional connectivity in feedforward neural networks after induced P301L tau mutation. *EJN* (in review, 2024). *Shared first authorship. BioRxiv: 10.1101/2023.09.12.557339

1. N. Winter-Hjelm, Å. B. Tomren, P. Sikorski, A. Sandvig and I. Sandvig. Structure-Function Dynamics of Engineered, Modular Neuronal Networks with Controllable Afferent-Efferent Connectivity. *J. Neural Eng.* 20(4):046024, 2023. Doi: 10.1088/1741-2552/ace37f



Awards

2024-06

Best Contributed Talk - TNNN 3rd Annual Conference

The research school for Training the Next generation of micro- and Nanotechnology researchers in Norway (TNNN)

Evaluation by expert committee

2024-05

Best Image - NanoLab Image Contest

NTNU NanoLab

2024-06

Best Poster Presentation - Nordic NanoLab User Meeting

The Nordic NanoLab Network

Evaluation by expert committee

2022-09

Best Poster Presentation - NRSN 9th Annual Conference

Norwegian Research School in Neuroscience (NRSN)

Participant Vote

2021-10

Best Contributed Talk - The 3. Annual Norwegian Nanosymposium

NorFab

Evaluation by expert committee

2020-06

Best Master's Thesis at the Faculty of Natural Sciences, NTNU (Nominee)



Institutional Responsibilities and Teaching

2023-08 - 2024-07

Board Member - The Board of NTNU

Board member elected by temporary scientific employees in the highest governing body of the university, making decisions of principal importance on strategy, objectives and expected results, accounts, financial statements, and budget proposals.

2020-08 - 2024-08

PhD Duty Worker - NTNU NanoLab

Responsible for Instrument trainings for new users, lithography and electrochemistry process development and documentation, and providing feedback on articles to the Norwegian encyclopedia.

2022-08 - 2023-12

Lecturer - Department of Neuromedicine and Movement Science, NTNU

NEVR3001 – Cellular and Systems Neuroscience (master's level course). Lecturing in glutamate induced neurotoxicity, neurodegeneration, Alzheimer's disease and stroke.

2015-10 - 2020-01

Scientific Assistant - NTNU NanoLab

Responsible for onboarding of new users, doing internal and external invoicing, administrating the Lab Infrastructure and Management System, compiling statistics and KPIs for the board and Norwegian Research Council. Did also contribute with setting up the full cost model for the cleanroom.

2018-08 - 2019-12

Teaching Assistant - Department of Materials Science and Engineering, NTNU

TMT4320 – Nanomaterials (undergraduate course). Responsible for weekly exercises and exercise classes with the students.



Organization of Scientific Meetings

- ◆

2023-09

Norwegian Research School in Neuroscience (NRSN) Annual Conference
Committee Member

National PhD conference with approximately 50 participants and internationally recognized speakers. Responsible for the scientific and social programme, evaluating abstracts, chairing sessions and other practical's of running the conference.
- ◆

2021-11

Norwegian Nano Symposium (NNS) (digital)
Committee Member

National nanotechnology conference with approximately 200 participants and internationally recognized speakers. Responsible for the scientific programme, chairing sessions and other practical's of running the conference.
- ◆

2018-08

International Nanoscience Student Conference (INASCON)
Conference Co-Leader

International nanoscience student conference with approximately 150 participants, internationally recognized speakers (including two nobel laureates) and companies. Responsible for all practical's of running the conference.



Student Supervision

- ◆

2023-08 - 2024-06

Marie Wahlstrøm
M.Sc. Biotechnology

Thesis title: "Investigating PACMA31 as a Potential Inhibitor for NO-Induced Growth Cone Collapse of In Vitro Neural Networks"
- ◆

2022-08 - 2023-06

Kasper Grøndahl Klausen
M.Sc. Bionanotechnology

Thesis title: "Microelectrode Arrays Interfaced with SU-8 3050 3D Microscaffolds for Neuroscience Applications"
- ◆

2022-08 - 2023-06

Polina Malahov
M.Sc. Neuroscience

Thesis title: "Advanced Neuroengineering for Studying the Structure-Function Dynamics in Healthy and Perturbed Neural Networks"
- ◆

2021-08 - 2022-06

Åste Brune Tomren
M.Sc. Bionanotechnology

Thesis title: "Using Microfluidics and 3D Surfaces to Increase the Physiological Translatability of In Vitro Neuronal Networks"
- ◆

2021-08 - 2022-06

Amund Stensrud Normann
M.Sc. Bionanotechnology

Thesis title: "Fabrication of 3D Surfaces for Enhanced Physiological Translatability of In Vitro Neuronal Network Models using Inclined Lithography of SU-8 3050"
- ◆

2021-08 - 2022-06

Truels Lone
M.Sc. Molecular Medicine

Thesis title: "Controlling Structure-Function Dynamics of Neural Networks Using Microfluidics"

◆	2020-08 - 2021-06	Leik Isdal <i>M.Sc. Bionanotechnology</i> Thesis title: "Developing 2.5D Nanotopographical In Vitro Neural Network Recording Platform to Mimic the Physical Environment of the Brain"
◆	2020-08 - 2021-06	Edevard Hvide <i>M.Sc. Bionanotechnology</i> Thesis title: "Effects of Nanostructured SU-8 Surfaces on Neurons and Neural Networks in Vitro"
◆	2020-08 - 2021-06	Aleksandar Kavazov <i>M.Sc. Biophysics</i> Thesis title: "Fabrication of Platinum Mushroom-Shaped Microelectrode Array for In Vitro Studies of Neural Networks and Neural Network Pathologies"
◆	2020-08 - 2020-12	Nienke Laura de Jong <i>M.Sc. Bionanotechnology</i> Thesis title: "An In Vitro Microfluidic Neural Network Model for Unidirectional Axonal Growth"
◆	Conference Presentations and Posters	
◆	2024-06	13. TNNN Conference 2024 <i>Engineered Cortical Microcircuits for Investigations of Neuroplasticity</i> N. Winter-Hjelm , A. Sandvig, P. Sikorski and I. Sandvig. <i>Talk.</i>
◆	2024-06	12. Nordic NanoLab User Meeting 2024 <i>Advanced Interfaces for Investigating the Impact of Topology on the Functional Dynamics of Engineered Neural Networks</i> N. Winter-Hjelm , K. S. Hanssen, K. G. Klausen, Å. B. Tomren, A. S. Normann, A. Sandvig, P. Sikorski and I. Sandvig. <i>Poster presentation.</i>
◆	2024-04	11. Maxwell Summit 2024 <i>Advanced Interfaces for Investigating the Impact of Topology on the Functional Dynamics of Engineered Neural Networks</i> N. Winter-Hjelm , K. S. Hanssen, K. G. Klausen, Å. B. Tomren, A. S. Normann, A. Sandvig, P. Sikorski and I. Sandvig. <i>Talk and poster presentation.</i>
◆	2023-09	10. NRSN Conference 2023 <i>Novel 3D Interfaces for Enhancing the Electrophysiological Complexity of Engineered Neuronal Networks</i> N. Winter-Hjelm , K. G. Klausen, A. S. Normann, A. Sandvig, I. Sandvig and P. Sikorski. <i>Talk.</i>
◆	2023-08	9. EBSA Congress 2023 <i>Engineered Multi-Nodal Neuronal Networks with Predefined Afferent-Efferent Connectivity for Advanced Modelling of Network Function and Dysfunction</i> N. Winter-Hjelm , P. Sikorski, A. Sandvig and I. Sandvig. <i>Poster presentation.</i>
◆	2023-06	8. TNNN Conference 2023 <i>Novel 3D Interfaces with Embedded Nanoporous Microelectrodes for Preclinical Neuroscience Research</i> N. Winter-Hjelm , K. G. Klausen, A. S. Normann, A. Sandvig, I. Sandvig and P. Sikorski. <i>Talk.</i>

◆	2023-04	7. YROCK & NeuroSYS Conference 2023 <i>Advanced Engineering Approaches for Recapitulating Structure-Function Dynamics of Neuronal Networks In Vitro</i> N. Winter-Hjelm , K. S. Hanssen, P. Sikorski, A. Sandvig and I. Sandvig. <i>Invited talk.</i>
◆	2022-11	6. TNNN Conference 2022 <i>Advanced Engineering Approaches for Recapitulation of Structure-Function Dynamics in Neuronal Networks</i> N. Winter-Hjelm , P. Sikorski, A. Sandvig and I. Sandvig. <i>Talk.</i>
◆	2022-09	5. NRSN Conference 2022 <i>Advanced Engineering Approaches for Recapitulation of Structure-Function Dynamics in Neural Networks</i> N. Winter-Hjelm , P. Sikorski, A. Sandvig and I. Sandvig. <i>Poster presentation.</i>
◆	2022-07	4. FENS Forum 2022 <i>Advanced Engineering Approaches for Recapitulation of Structure-Function Dynamics in Neural Networks</i> N. Winter-Hjelm , P. Sikorski, A. Sandvig and I. Sandvig. <i>Poster presentation.</i>
◆	2022-05	3. Nordic NanoLab User Meeting 2022 <i>Next-Generation Microfluidics Interfaced with Microelectrode Arrays for Neuroscience Applications</i> N. Winter-Hjelm , P. Sikorski, A. Sandvig and I. Sandvig. <i>Poster presentation.</i>
◆	2021-10	2. Norwegian Nanosymposium 2021 <i>Controlling the Flow of Information in Neuronal Networks Through the use of Customized Microfluidics</i> N. Winter-Hjelm , P. Sikorski, A. Sandvig and I. Sandvig. <i>Talk.</i>
◆	2021-10	1. NRSN National Neuroscience Symposium 2021 <i>Engineered Neural Networks as Computational Substrates</i> N. Winter-Hjelm , P. Sikorski, A. Sandvig and I. Sandvig. <i>Poster presentation.</i>

◆ Skills

◆	Cleanroom fabrication	
	Photolithography, e-beam evaporation, PECVD deposition, ICP-RIE etching, electrochemical deposition, wafer dicing, lift-off & soft lithography.	
◆	Characterization & Microscopy	
	Scanning electron microscopy, fluorescence microscopy, mechanical profilometry, optical profilometry & reflectometry.	
◆	Aseptic Cell Culture Work	
	Primary and iPSC derived cell cultures, viral transduction tools & immunocytochemistry.	
◆	Electrophysiology and Analysis	
	MEA data acquisition and analysis (Matlab / Python / SPSS), calcium imaging & optogenetics.	

◆ Languages

◆	Norwegian	★★★★★
◆	English	★★★★★

