NSC

FINLAND

2024

NSC
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NANONEWS in 2024

Editorial

Sanna Rauhamäki
Lotta-Riina Sundberg

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PREFACE

More than two decades ago, a group of scientists had a vision of making Jyväskylä a home for nanoscience. Nanoscience and nanotechnology were already rising fields in the US, Japan, and Europe, with large investments being made to support the growth of the research field. The activity and excitement of a group of scientists here at JYU led to the establishment of the Nanoscience Center, which then started to evolve around the core infrastructure. Today, after 20+ years, we have 40 research groups in the NSC. Still, the same spirit of excitement and enthusiasm exists among us.

The 20th anniversary of NSC saw a boost in events. We engaged with the public on themes of hydrogen economy, quantum technology, and virology, and broke the record (again!) in Researchers' Night visitor count. The most important event was, of course, the 20th Nanoscience Days conference, with invited talks from Nobel Prize winner Morten Meldal and established scientists with deep connections to the first steps of NSC. In addition, we have had numerous other seminars and happenings. Thank you all for participating and making this year special! Who knows what the next 20 years will look like? Hopefully, good things will happen.

Now our festive year is coming to an end. Maybe there is still one more manuscript version or reviewer report that could be finalized, but dimming the lights, enjoying cozy moments, and recharging over Christmas time is just as good an idea. Peaceful Christmas and all the best for the year 2025!

Prof. Lotta-Riina Sundberg
Scientific Director of NSC 2022-2025

Announcements

The 34th Jyväskylä Summer School
4.-15.8.2025

Nanoscience Days 2025
7.-8.10.2025

IAB meeting
9.-10.10.2025

NSC Paper of the Year
December 2025

Seminars and Events
– Light and Matter seminar
– Nanophysics Theory seminar
– Microbiology seminar
– NSC Explain this!
– Nanoseminar
– Computational Chemistry Methods

More information:
https://www.jyu.fi/en/science/nsc/current-at-the-nanoscience-center

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Major Funding for Researchers at NSC

European Research Council Advanced Grant for Hannu Häkkinen

Vice Dean, Professor Hannu Häkkinen received 2 500 000 € funding from the presigious ERC Advanced Grant funding program. The funding aids Hannu Häkkinen's research team to develop new computational methods to study the interactions between metal nanoparticles and biomolecules. These methods are aimed at exploring the use of metal nanoparticles in diagnostics and therapy application in the field of nanomedicine.

European Research Council
Established by the European Commission

Read more: https://www.jyu.fi/en/news/university-of-jyvaskyla-receives-erc-advanced-grant-for-eu25m-euros-for-research-on-the-interaction

Academy Projects (1.9.2024-31.8.2028)

598 912 € for intergenerational modulation of mammalian epigenetic landscape by paternal regulatory RNA repertoire of sperm

Research Council of Finland

Professor Marja Tiirola received 598 912 € funding to study whether the sperm RNA code can be used to predict causal effects on the offspring phenotypes which could then provide a tool for epigenetic risk management. Using a novel semiconductor microarray approach, the goal is to streamline the RNA mapping and contribute to the decoding of the small non-coding RNA signature. With a closely human-like animal model, the project hopes to further the understanding of the factors influencing intergenerational factors contributing to the rising trend of metabolic diseases and obesity in Western world.

More information:
Marja Tiirola, marja.tiirola@jyu.fi

600 000 € for eradication of multidrug resistant bacteria with cell wall hydrolases

Professor Perttu Permi received 600 000 € funding to explore new means to eradicate multidrug-resistant bacteria. The study focuses on molecules that are capable of both degrading bacterial cells walls and the biofilm they form. It is a highly specific method, leaving beneficial bacterial populations intact while the enzymes eradicate the target bacteria. The effectiveness is tested in controlled laboratory conditions and then directed towards multidrug-resistant bacteria.

More information:
Perttu Permi, perttu.permi@jyu.fi

965 171 € for emergent solar technologies by harnessing the vacuum field

Professor Jussi Toppari together with Professor Gerrit Groenhof and Senior Lecturer Tatu Kumpulainen received the total of 965 171 € funding to develop new light-harvesting systems for collecting and storing solar energy. By utilizing the observation that the properties of materials can change when the reactants are inside an optical cavity, the aim is to engineer promising materials for solar technology. These cavities, which confine specific light modes, enhance the interaction between the material and light. This increased interaction can lead to the formation of hybrid light-matter states known as polaritons. These polaritons represent coherent superpositions of excitations in both the material and the cavity. Not only do they spread the excitation across many molecules within the material, but they also modify the material's potential energy surface. The project seeks to exploit these two fascinating aspects to create innovative light-harvesting systems capable of efficiently collecting and storing solar energy.

More information:
Jussi Toppari, j.jussi.toppari@jyu.fi
Gerrit Groenhof, gerrit.x.groenhof@jyu.fi
Tatu Kumpulainen, tatu.s.kumpulainen@jyu.fi

Other Research Council of Finland Funding

Academy Research Fellow (01.09.2024-31.08.2028)
Minttu Kauppinen, Department of Chemistry, 524 455 €: *"Lignin Upgrading with Selective Hydrotreatment Catalysts"*

Jane and Aatos Erkko Foundation awards 1,7 M€ consortium funding for developing safe, broad-spectrum antivirals and vaccines

Professors Varpu Marjomäki, together with Academy Research Fellow Minna Hankaniemi (TAU), form a consortium lead by Professor Sarah Butcher (UH) and take part in a groundbreaking research initiative funded by the Jane and Aatos Erkko Foundation. The goal is to develop safe, broad-spectrum antivirals and vaccines. By identifying bioactive compounds, understanding their modes of action, and creating stabilized virus-like particle (VLP) vaccines, the team aims to combat viral infections and protect global health.

Read more: https://www.jyu.fi/en/news/research-consortium-develops-safe-broad-spectrum-antivirals-and-vaccines

J&A E Foundation awards nearly 500 k€ for next-generation quantum materials research

University Lecturer Riku Tuovinen has been awarded 484 000 € by the Jane and Aatos Erkko Foundation. This four-year project aims to develop theoretical and computational tools for studying non-equilibrium quantum materials. By advancing the understanding of these materials, which do not adhere to classical physics laws, the research could lead to significant technological innovations. The project will utilize supercomputers to simulate the electronic properties of two-dimensional quantum materials and their interactions with light, potentially impacting various fields from electronics to energy solutions.

Read more (in Finnish): https://www.jyu.fi/fi/uutinen/rahoitusta-seuraavan-sukupolven-kvanttimateriaalien-tutkimiseksi

J&A E Foundation awards 700 k€ for developing light-controlled tool for breast cancer treatment

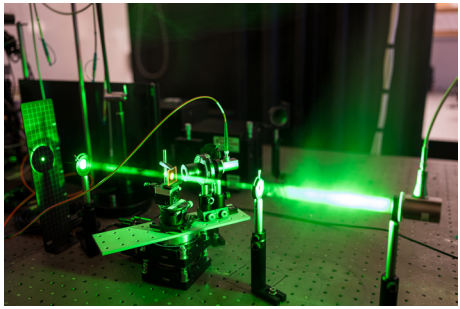
Academy Research Fellow Heikki Takala received significant funding that supports his research team in developing red-light controlled optogenetic tools. These tools are designed to induce programmed cell death, or apoptosis, in target cells using red light, offering a non-invasive alternative for cancer treatment. The project will specifically explore the application of these tools in breast cancer therapy, aiming to provide innovative solutions in the field of biomedicine.

Read more: https://www.jyu.fi/en/news/significant-funding-for-the-development-of-a-light-controlled-tool-for-breast-cancer-treatment

EU funded hydrogen production and storage test facility to Central Finland

NSC researcher, Professor Karoliina Honkala is part of a project called Hydrogen production and storage as an enabler of industrial renewal in Central Finland (HyPER), focusing on hydrogen economy. The goal is to establish a hydrogen production and storage test facility in Central Finland. HyPER is a cooperation project together with VTT where the JYU's sub-project develops materials suitable for hydrogen storage, contributing to the goal of moving towards safe and cost-effective hydrogen storage. HyPER project is co-funded by the European Union.

Read more: https://www.jyu.fi/en/news/university-of-jyvaskyla-and-vtt-to-establish-a-hydrogen-production-and-storage-test-facility-in



Introducing New NSC Group Leaders

I'm Riku Tuovinen, a Senior Lecturer at the Department of Physics and Nanoscience Center since 2022. I did my PhD at the University of Jyväskylä, then worked as a Postdoctoral Researcher at the Max Planck Institute in Hamburg, and as an Academy of Finland Postdoctoral Researcher at the Universities of Turku and Helsinki, before returning to Jyväskylä. Since 2024, I lead the ''Efficient quantum materials simulations'' project funded by the Jane and Aatos Erkko Foundation. Our research focuses on theoretical and computational nanophysics, in particular out-of-equilibrium dynamics of open quantum systems. The goal is to understand the microscopic nature of correlated quantum systems, potentially utilized in next-generation nano- and quantum technologies.

Our research group ''Non-equilibrium quantum materials'' also includes three Doctoral Researchers: Joona Marjamäki (Quantum Doctoral Pilot, together with Prof. Robert van Leeuwen) , Leo Bellassai, and Oscar Moreno Segura. They all work on various topics within non-equilibrium many-body quantum theory and its development together with computational software.

For me, the natural next step in the academic career path was to establish a research group, which was enabled by the research funding opportunities from the Quantum Doctoral Pilot Programme (as part of the Finnish Quantum Flagship) and from the Jane and Aatos Erkko Foundation. This support is gratefully acknowledged.

At the moment, we are getting started with the research program, so there will hopefully be lots of joy of exploration, discovery, and learning. Additionally, we are excited about possible experimental collaborations within our Nanoscience Center, especially with the newly-established scanning probe laboratory of Prof. Shawulienu Kezilebieke.

More information: https://www.jyu.fi/en/research-groups/non-equilibrium-quantum-materials

I'm Minttu Kauppinen, Academy Research Fellow at the Department of Chemistry and NSC. I obtained my PhD at the University of Jyväskylä in Prof Karoliina Honkala's computational catalysis group in 2020. After my studies at JYU I worked as a postdoctoral researcher at the Competence Center for Catalysis at Chalmers University of Technology in Sweden.

I returned to NSC in 2023 for a temporary Senior Lecturer position (Department of Chemistry). During that time, I developed an online course on the catalytic chemistry and materials in electro- and photocatalytic hydrogen production which is offered through the network university FITech.

In 2024 I was granted funding from the Finnish Research Council for my project 'LUSHcat: Lignin Upgrading with Selective Hydrotreatment Catalysts'. LUSHcat explores the catalytic hydrotreatment of lignin by computational methods such as density functional theory and microkinetic modelling. The project includes collaboration with an experimental group in Sweden and a computational group in the US. Currently, I am the sole member of the project, but I seek to hire a postdoc in 2025. I am also open to collaborations with other groups at NSC.

I couldn't be happier to have the opportunity to continue my research at JYU. I am Jyväskylä born, which makes me slightly biased, but I think JYU and especially the NSC is a wonderful research environment. In the future I hope to establish my own computational group that focuses on catalytic valorization of biomass and its derivatives and computational catalyst materials design.

WeNSC – Workshop for Enhancing NSC

In 2024, the WeNSC organizing committee underwent a complete transformation. Three PostDocs and two PhD students enthusiastically took on the responsibility, supported by the research coordinator. Due to the high demand for the traditional location, Konnevesi Research Station, especially during summer and the start of the semester, we secured the only available consecutive dates in the autumn semester. Consequently, the 2024 edition of WeNSC was held on the 13th and 14th of November.

Dedicated program to enhance the community

Upon arrival, Lotta-Riina Sundberg warmly welcomed everyone and introduced an exciting new pilot funding initiative for small bottom-up projects. This initiative encourages multidisciplinary teams of junior scientists to explore new research questions or techniques, with support letters from PIs and small grants to cover research costs.

Participants then dove into a unique ice-breaking activity, choosing small animal figurines to represent themselves and sharing personal interests. This creative and playful introduction session set a friendly and open tone for the event, fostering immediate connections.

After a filling lunch, new NSC PIs Minttu Maria Kauppinen and Riku Tuovinen captivated the audience with introductions to their research groups and background, providing fascinating insights into their current projects. This was followed by a strategy session where Jaakko Sivusuo, the Head of Development, presented an engaging video on the JYU strategy. Lotta-Riina Sundberg then seamlessly connected this to the NSC's current strategy, sparking thoughtful discussions.

In the afternoon, PIs attended a focused meeting while other participants joined a dynamic workshop on elevator pitches, led remotely by Senior IPR Advisor Jarno Mikkonen. This session equipped everyone with the skills needed for the next day's presentations.

The day concluded with a delicious dinner, followed by a relaxing evening featuring a traditional Finnish sauna, BBQ, and socializing. This provided a perfect opportunity for participants to unwind and build stronger connections in a casual setting.

The second day began with a healthy breakfast and final preparations for the elevator pitches. PhD students kicked off the session, showcasing their research in concise and engaging pitches that captivated the audience. After lunch, the PostDocs continued with their presentations, each one more impressive than the last.

In the afternoon, PIs resumed their meeting while PhD students participated in a supportive peer session, sharing experiences and providing valuable feedback. PostDocs took advantage of the sunny weather for a refreshing walk, enjoying the beautiful surroundings.

The event concluded with a lively prize ceremony for the best elevator pitches. Antti Kanniainen's memorable pitch in the style of a caveman won the best PhD student pitch, with Ilia Sokolovskii and Amar Raj as runners-up. Zuned Ahmed won the best PostDoc pitch, with Emmi Pohjolainen and Mohammad Bagheri as runners-up.

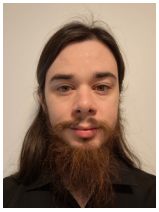
WeNSC 2024 was a resounding success, fostering collaboration, innovation, and community spirit within the NSC. The event not only provided valuable professional development opportunities but also strengthened the bonds among NSC staff, paving the way for future successes.

Meet the New Post Docs and PhD Students

1. What is your name, your group leader, and your core field at NSC?
2. What is your project and how often do you visit at the NSC building?
3. Why do you want to be part of NSC?
4. What is your major scientific finding in year 2024?
5. What should researchers at NSC do together in year 2025?

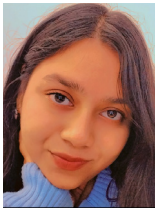
1. My name is Mohammad Bagheri and I'm a postdoctoral researcher in the low-dimensional nanomaterials modeling group led by Prof. Pekka Koskinen. We use various computational methods to study different properties of low-dimensional materials.
2. My current research focuses on investigating various properties of two-dimensional elemental metals and designing interfaces to stabilize two-dimensional metals. Since I'm a computational physicist you can mostly find me at my desk in my office (YNC 321) on working days.
3. NSC is an interdisciplinary center that develops collaboration across various fields, which is something I truly value. Furthermore, I've always had a strong interest in low-dimensional materials, and NSC's low-D group provides an excellent opportunity to continue advancing research in this field.
4. Since I finished my doctoral studies in 2024, my major scientific findings are my doctoral dissertation and one of its main results, the Computational Raman Database (CRD), which is publicly available on (https://ramandb.oulu.fi/). This database is a collection of Raman spectra calculated from first principles and other related properties of a large variety of semiconductors and insulators.
5. The weekly nano seminars are a great platform for researchers to share knowledge and can give us ideas about possible collaborations. I hope these seminars continue in 2025, with the addition of inviting international experts to exchange ideas, which could spark new collaborations.

1. My name is Zohreh Fallah, a postdoc in Prof. Hannu Häkkinen's group. We are the Computational Nanoscience Group (NSC-comp) at NSC investigating the physical and chemical properties of several nanostructures using various computational methods.
2. My project is on designing biosensors from chiral gold nanoclusters and I visit NSC every day.
3. I want to be part of NSC where I feel belonged the most due to interdisciplinary nature of the work I do.
4. I gained interesting results from my ongoing project where different chiral biomolecules showing different behaviours with different ligand-protected chiral gold nanoclusters.
5. I believe researchers at NSC could collaborate and interact more on their projects



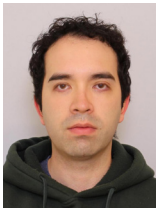
1. I'm Aaron Dunbrack, a postdoc working with Prof. Tero Heikkilä on superconductivity.
2. I'm studying the effects of quantum geometry on superconductivity - i.e., the effects that are not from the energy spectrum of the Hamiltonian, but rather in the particular forms of the wavefunctions. This is especially important in flat-band superconductors, where these effects dominate.
3. I was drawn to NSC by Tero's research, but am always interested to learn more about what other people are doing.
4. Time-reversal-symmetry-breaking in the quantum geometry of superconductors can be analyzed at the perturbative level with the same quantum metric approach used to compute superfluid weight in time-reversal-symmetric superconductors.
5. Personally, I always enjoy small-group activities, especially board games, as a way to get to know people.

1. My name is Oladunjoye Awoga and I'm a postdoc supervised by Stefan Ilic. I work on condensed matter theory in the group led by Tero Heikklä.
2. My project is on superconducting phenomenon and I visit NSC for two weeks per month.
3. Many leading condensed matter theorists are part of NSC, and joining this group would offer me the invaluable opportunity to collaborate with and be mentored by experienced physicists. Additionally, it would allow me to apply my skills and contribute meaningfully to the advancement of superconductivity research.
4. We discovered that quasicrystals, compared with crystalline materials, offer a broader parameter space for the existence of topological superconductivity, making them a promising new platform for the search of Majorana fermions in condensed matter physics. See Phys. Rev. B 110, 134508 (2024) for details.
5. -



1. My name is Sayani Biswas and I'm a PhD student in Dr. Daniel Martín-Yerga's group. My core field of research is electrochemistry.
2. I am working on Electrochemical Biomass Valorization using Chiral Gold Nanorods as a catalyst. I am studying Glucose Oxidation currently and plan to move on to more complex carbohydrates as well. I am synthesizing gold nanorods, induing chirality in them and performing electrochemical experiments to see the effect of this kinked structures on the efficiency as well as to investigate if there is any enantioselective behavior of the catalyst in the process. I am at NSC almost every day of the week (sometimes on Saturday as well) because I love working here.
3. The vision of Nanoscience Center appeals to me more than any of the workplaces I have been a part of before. My background is in Physics (Bachelor's and Master's) but I am here in Department of Chemistry which can be confusing at times, but NSC makes it possible that I can somehow make sense of the knowledge I had before and the knowledge I am gaining now. In addition to that, there are more people like me here so I can easily relate to them.

4. The synthesis of Goldene. I had previous hands-on experience with MXene and this year I was pleasantly surprised to learn the synthesis of single-layer allotrope of gold. I found the protocol very clever.
5. In the upcoming year, in terms of work, I would very much like to see people invest some time and effort on Material Science. In terms of social life, NSC can be more vibrant and lively if the individual groups exchange their ideas and experience more freely without any prior judgement.



1. My name is Santiago Agudelo Gomez. I am a PhD student in the Computational Chemistry group at NSC, led by Gerrit Groenhof.
2. My research focuses on developing advanced mathematical models to describe strong light-matter coupling in plasmonic nanocavities, implementing them in computational simulations and validating them with experimental data.
3. I am excited to be part of NSC because its interdisciplinary research environment is ideal for advancing my project and improving my skills as a scientist.
4. Although I am new to NSC, my most significant scientific achievement this year proceeds from my master's thesis, where I successfully used simulations and first-principles calculations to determine the vibronic-resolved absorption and emission spectra of Green Fluorescent Protein.
5. Looking ahead to 2025, I hope NSC fosters more shared spaces and collaborative opportunities that can spark innovative partnerships among researchers.

1. My name is Oscar Moreno Segura, and I am a PhD student in the Non-equilibrium Quantum Materials Group, led by Riku Tuovinen. Our research focuses on nanophysics using theoretical and computational approaches.
2. My PhD project involves developing efficient computational methods for modeling molecular junctions. Currently, we are studying electroluminescence driven by a scanning tunneling microscope.
3. The NSC is a multidisciplinary and stimulating place for advanced scientific research, and I am happy to be part of it.
4. During my master's degree, I worked on numerical methods to study strongly correlated quantum many-body systems.
5. It would be great to have more get-together activities.

1. I am Pratheek Malol, a doctoral researcher at the Department of Physics. I joined Prof. Juha Muhonen's group, Hybrid Quantum Technologies in silicon, in October 2024. We are an experimental group, and our research focuses on quantum phenomena.
2. My project is about the single donor spin readout in silicon using commercial quantum dot devices. The project is done in close collaboration with Semiqon Oy. My office and research lab are at the NSC.
3. I am motivated by the idea of NSC, where multiple disciplines are joined under the same research centre. This will help to interact and collaborate with different research groups from various disciplines.

4. At the start of the project, we are characterizing the commercial quantum dots devices designed and fabricated by Semiqon Oy. This will provide crucial insights into optimizing the performance of charge detectors for the single donor spin readout.
5. We should have more opportunities to interact with everyone in the department. We can also plan events to know more about everyone's research and future directions.

1. My name is Shalini Mishra, and I am currently working as a PhD student in the research group led by Professor Karoliina Honkala, with Dr. Minttu Kauppinen as my co-supervisor and my core field is Computational Heterogeneous Catalysis.
2. My PhD project focuses on identifying the optimal catalyst for CO_2-to-methanol synthesis using density functional theory (DFT). My office is located in the NSC building, so I spend the majority of my time there working on my research and other academic activities. It serves as the primary space where I conduct my daily tasks, collaborate with colleagues, and engage in discussions related to my PhD project.
3. I want to be part of the NSC because it is a hub of cutting-edge research in nanoscience, fostering collaboration between experts across disciplines. The resources and facilities available at the center provide an ideal environment for innovative research, particularly in my area of interest.
4. I have been in Finland for two months now and have started working on my project. I am currently in the process of exploring and identifying the major scientific discoveries related to my research.
5. In year 2025, we need to strengthen partnerships with industries and other research centers for real-world applications of discoveries.

Research Outreach and Highlights

Tiedeilta: "How the Hydrogen Economy Will Change Central Finland"

As a part of the NSC 20 year anniversary celebrations, the event was held on January 30th, 2024, at the University of Jyväskylä's library, Lähde. The event featured expert insights from Professor Karoliina Honkala of the Nanoscience Center, Engineer Mikko Lappalainen from VTT Technical Research Centre of Finland, and Program Manager Timo Harju from Jyväskylä's economic services. The discussions focused on the potential of green hydrogen to reduce carbon emissions in energy production, industry, and transportation. Attendees learned about the challenges and opportunities of hydrogen production, including the need for renewable energy and efficient catalysts. The event underscored Central Finland's strategic position and readiness to embrace hydrogen technology.

Read more *(in Finnish)*: https://www.jyu.fi/fi/tapahtumat/tiedeilta-miten-vetytalous-muuttaa-kes-ki-suomea

JYU kick off for the Finnish Quantum Flagship

The JYU Kick-off for the Finnish Quantum Flagship took place on April 3rd, 2024, at the Nanoscience Center YNC121. The event, organized by the involved faculties (MLTK, IT, JSBE) and NSC, featured an opening speech by the local Principal Investigator, Professor Tero Heikkilä, followed by introductions from group leaders including Professors Ilari Maasilta, Teiko Heinosaari, and Juha Muhonen as well as Associate Professor Joel Mero and Assistant Professor Kezilebieke Shawulienu. Attendees were treated to poster introductions and a session in the lobby, culminating in a laboratory tour for a select audience. The event highlighted the University of Jyväskylä's strong interdisciplinary expertise within the consortium, emphasizing the collaborative efforts in physics, computational science, and nanotechnology.

Read more: https://www.jyu.fi/en/events/jyu-kick-off-for-the-finnish-quantum-flagship

Yläkaupungin yö: NanoTaideAteljé

The NanoTaideAteljé workshops, part of the Yläkaupungin Yö festival, took place on May 17th and 18th, 2024, at the University of Jyväskylä's Proxima building. Organized by the Nanoscience Center and the Nanokoulu of the Faculty of Education, the event featured a unique blend of art and nanoscience. Participants explored the artistic potential of the nanoscale world through various hands-on activities, including agar art with bacteria, nail polish lithography, and self-assembly demonstrations. The workshops, led by nanoscientists, provided an engaging platform for attendees to visualize and create art inspired by microscopic phenomena. The event also featured a nano art exhibition by artists like Maryam Sabooni, Asre Hazeer and other nanoscientists. The event was part of the NSC 20 year anniversary celebrations.

Read more *(in Finnish)*: https://2024.ylakaupungin-yo.fi/tapahtumat/nanotaideatelje-tyopajat/

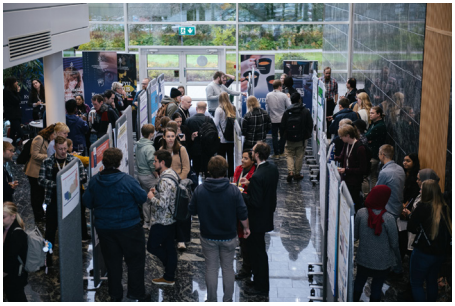
Researchers' Night

The Researchers' Night, aims to make science accessible and engaging for the public. On the 27th of September, coinciding with the City of Light event, attendees had the opportunity to participate in a variety of activities. At the NSC, approximately 1450 visitors explored the fascinating world of nanoscience through interactive workshops and demonstrations. Visitors could engage in hands-on experiments, such as creating nanostructures and observing their properties. Additionally, there were demonstrations showcasing the applications of nanotechnology in everyday life, from medical advancements to environmental solutions. A lecture on quantum technology provided insights into the cutting-edge developments in this field. In total, there were 14 events under the theme of nanoscience. These activities provided a deeper understanding of nanoscience and sparked curiosity and interest in scientific research among participants of all ages. The event concluded with a concert by Nanöband, leaving the audience with a memorable experience.

Research Outreach and Highlights

NSDays 2024

The 20th Anniversary Nanoscience Days took place on the 8th and 9th of October 2024. This milestone event, chaired by the NSC board, attracted 135 registered participants, including researchers and students from Finland and abroad. The program featured eight high-profile plenary lectures delivered by leading experts in the field of nanoscience, alongside a vibrant poster session with 46 presenters showcasing their latest research. A highlight of the event was the keynote address by Nobel laureate Morten Meldal, who was honored with the Nobel Prize in Chemistry in 2022 for his pioneering work in click chemistry. Meldal's lecture, which opened the second day, captivated the audience and sparked lively discussions that continued during the coffee break. His presence underscored the event's prestige and the high caliber of its scientific discourse.



To ensure the smooth running of the event, a group of students was hired to manage practicalities such as the registration desk and microphone operations, building on the positive experience from previous years. This initiative not only provided valuable support but also offered students a unique opportunity to engage with leading scientists and gain insights into the organization of a major scientific conference. In addition to the formal sessions, the event facilitated informal discussions and networking opportunities, which are crucial for the development of new ideas and collaborative projects. The Nanoscience Days have thus solidified their reputation as a key platform for advancing nanoscience research and fostering a vibrant scientific community.

Read more: https://www.jyu.fi/en/feature-article/nobel-laureate-in-click-chemistry-impresses-at-nano-science-days-in-jyvaskyla

Rector Jari Ojala's visit at NSC

On Monday, 11th of November, the Rector Jari Ojala visited the NSC as part of a larger tour of the Ylistö campus. During his visit, the researchers at NSC introduced some of the main attractions on site, such as the virus laboratory, laser laboratory, cryolab, cleanroom, and the helium recovery. Of course, the heart of NSC, the 2nd floor coffee room, was also a highlight, where the Rector enjoyed JURA coffee and pastries. We were proud to show him our infrastructure and had a nice discussion in the coffee room, presenting the role of theoretical and computational research done at the center. The visit was an overall success, and the Rector was impressed by the infrastructure and the high quality of science conducted at NSC.

Research Outreach and Highlights

JQUEST

JQUEST, a mini workshop, held at the Ylistö campus on December 4th and 5th 2024, was attended by 68 participants both from Finland and abroad. Insights into quantum computing, superconductivity, and topological materials were provided by 13 expert speakers from across Europe. The event featured 9 poster presentations, fostering collaboration and innovation in quantum science.

Supported by the Finnish Quantum Flagship, the workshop offered valuable discussions and networking opportunities, enhancing the exchange of knowledge and ideas within the quantum technologies community. Participants benefited from the latest research developments and established new connections in the field.

Read more: https://www.jyu.fi/en/events/jquest

Nobel Evening

This year, the University of Jyväskylä and the Nanoscience Center organized the Nobel Evening as both an onsite and online event on the 11th of December 2024 at the Lähde library. The online broadcast was shown on Yle Areena and the University of Jyväskylä's website. During the event, experts from the University of Jyväskylä introduced this year's Nobel Prize winners. Among the five experts, two were from the Nanoscience Cente. Marja Tiirola introduced the Nobel Prize in Medicine, awarded for the discovery of micro-RNA molecules and their role in gene regulation. Perttu Permi presented the Nobel Prize in Chemistry, awarded for advancements in protein research and the development of the AlphaFold2 AI model for predicting protein structures. The Nobel Evening was opened by Vice Rector Kaisa Miettinen, and after the fascinating talks, the Scientific Director of the NSC, Lotta-Riina Sundberg, gave the closing words. The event was hosted by science journalist Mari Heikkilä, who facilitated engaging discussions and ensured a smooth flow of the program.

Read more *(in Finnish)*: https://www.jyu.fi/fi/artikkeli/nobel-ilta-valaisee-vuoden-2024-tiedehelmet

Highlights at NSC in 2024*

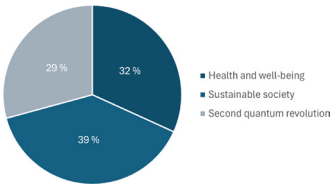
- L. Antenucci, S. Virtanen, C. Thapa, M. Jartti, I. Pitkänen, H. Tossavainen, and P. Permi. *"Reassessing the substrate specificities of the major Staphylococcus aureus peptidoglycan hydrolases lysostaphin and LytM"*. eLife, 2024, 13:RP93673.
- M. F. Matus and H. Häkkinen. *"Rational Design of Targeted Gold Nanoclusters with High Affinity to Integrin αvβ3 for Combination Cancer Therapy"*. Bioconjugate Chem. 2024, 35, 10, 1481–1490.
- A. Pihlajamäki, M. F. Matus, S. Malola and H. Häkkinen. *"GraphBNC: Machine Learning-Aided Prediction of Interactions Between Metal Nanoclusters and Blood Proteins"*. Adv. Mater. 2024, 2407046.
- A. Dutta, V. Tiainen, I. Sokolovskii, L. Duarte, N. Markešević, D. Morozov, H. A. Qureshi, S. Pikker, G. Groenhof and J. J. Toppari. *"Thermal disorder prevents the suppression of ultra-fast photochemistry in the strong light-matter coupling regime."* Nat. Commun. 2024, 15, 6600.
- R. Tuovinen and Y. Pavlyukh. *"Electroluminescence Rectification and High Harmonic Generation in Molecular Junctions"*. Nano Lett. 2024, 24, 29, 9096–9103.
- S. S. M. Meier, E. Multamäki, A. T. Ranzani, H. Takala, and A. Möglich. *"Leveraging the histidine kinase-phosphatase duality to sculpt two-component signaling"*. Nat. Commun. 2024, 15: 4876.
- C. I. Levartoski de Araujo, P. Virtanen, M. Spies, C. González-Orellana, S. Kerschbaumer, M. Ilyn, C. Rogero, T. T. Heikkilä, F. Giazotto and E. Strambini. *"Superconducting spintronic heat engine"*. Nat. Commun. 2024, 15, 4823.
- S. Shroff, A. Perämäki, A. Väisänen, P. Pasanen, K. Grönlund, V. H. Nissinen, J. Jänis, A. Haapala, and V. Marjomäki. *"Tree Species-Dependent Inactivation of Coronaviruses and Enteroviruses on Solid Wood Surfaces"*. ACS Appl. Mater. Interfaces 2024, 16, 23, 29621–29633.
- A.V. Emelianov, M. Pettersson and I Bobrinetskiy. *"Ultrafast Laser Processing of 2D Materials: Novel Routes to Advanced Devices"*. Adv. Mater. 2024, 2402907.
- A. Zupanc, J. Install, T. Weckman, M. M. Melander, M. J. Heikkilä, M. Kemell, K. Honkala and T. Repo. *"Sequential Selective Dissolution of Coinage Metals in Recyclable Ionic Media"*. Angew. Chem. Int. Ed. 2024, 63, e202407147.
- S. Leclerc, A. Gupta, V. Ruokolainen, J.-H. Chen, K. Kunnas, A. A. Ekman, H. Niskanen, I. Belevich, H. Vihinen, P. Turkki, A. J. Perez-Berna, S. Kapishnikov, E. Mäntylä, M. Harkiolaki, E. Dufour, V. Hytönen, E. Pereiro, T. McEnroe, K. Fahy, M. U. Kaikkonen, E. Jokitalo, C. A. Larabell, V. Weinhardt, S. Mattola, V. Aho, M. Vihinen-Ranta. *"Progression of herpesvirus infection remodels mitochondrial organization and metabolism"*. PLOS Pathogens. 2024, 20(4): e1011829.
- K. S. U. Kansanen and T. T. Heikkilä. *"Cavity-induced bifurcation in classical rate theory"*. SciPost Phys. 2024, 16, 025.
- P. Virtanen and T. T. Heikkilä. *"Nonreciprocal Josephson Linear Response"*. Phys. Rev. Lett. 2024, 132, 046002.
- S. Shroff, M. Haapakoski, K. Tapio, M. Laajala, M. Leppänen, Z. Plavec, A. Haapala, S. J. Butcher, J. Ihalainen, J. J. Toppari, and V. Marjomäki. *"Antiviral action of a functionalized plastic surface against human coronaviruses"*. Microbiol. Spectr. 2024, 12:e03008-23.

40
Group leaders*

174
Researchers*

118
Peer-reviewed publications**

Top 5	Author (No. of Publications)
1.	G. Groenhof, H. Häkkinen (10)
2.	P. Bushlaev (7)
3.	K. Honkala, A. Miettinen (6)
4.	T. Heikkilä, J. Ihalainen, V. Marjomäki, M. Melander, P. Pihko (5)
5.	M. Pettersson, J. Moilanen, L.-R. Sundberg (4)



*Data taken from the NSC websites on 4.12.2024
**Data taken from Scopus on 10.12.2024, affiliation search with keywords: Nanosci* and Univ* Jyvaskyla