
NSC
FINLAND

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NANONEWS in

2021

Editorial

Sanna Rauhamäki
Tero Heikkilä

Figures

Fabien Cougnon
Suvi Ruuskanen
Kezilebieke Shawulienu
Tatu Kumpulainen
Marko Melander
Laura Lavendure
Fabiola Domínguez-Flores
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Marianne Lampi
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PREFACE

This is the fourth NSC Newsletter, the last one with me as the scientific director. I am now stepping down from the position feeling both relief and gratitude for the four past years. Because of you, dear fellow nanoscientists, Nanoscience Center is a great place to work and do research. It is a real pity we still cannot organize a Christmas party because of the corona situation – this year we would have had the record attendance.

This Newsletter tells how the Nanoscience Center is constantly renewing its research profile. In the past year or so, five new research groups on different topics have been formed. Partially the new recruitment result from positive funding decisions, partially they are strategic initiatives. It is great to have new people with their new ideas. Simultaneously we should worry about possible fragmentation of research and reducing publication metrics and number of highlights. On the other hand, in each recruitment I can see a true connection to our strong areas, and perhaps the low number of publications and highlights is a delayed effect of the pandemic.

Next year NSC will get a great new scientific director, Lotta-Riina Sundberg. I am very happy that she accepted the position and I very much look forward to her fresh ideas on how to further improve our operations. I wish her success with the position and hope that all of you will support her in the same way as you have supported me.

I wish you all Merry Christmas and a Happy New Year 2022!

Prof. Tero Heikkilä
Scientific Director of NSC 2018-2021

I am really excited to have the opportunity to become the next scientific director of the Nanoscience Center. People in NSC form an enthusiastic community, with open eyes and mind for new possibilities. We do excellent science, and our work is visible in many ways. Upcoming years, my aim is to strengthen the role of NSC both in JYU and in the society, using our strategy as a guideline. Hopefully the corona situation will allow for more in-person meetings, gatherings, and activities to increase the vibrant discussions that are the core of the NSC spirit. I look forward to working with you all!

Assoc. Prof. Lotta-Riina Sundberg
Scientific Director of NSC 2022-2023

Announcements

The 31st Jyväskylä Summer School
8.–19.8.2022

Nordic Femtochemistry 2022
8.–10.6.2022

Nanoscience Days 2022
4.–5.10.2022

NSC Paper of the Year Award
December 2022

All seminars and events in Year 2022:
- **Light and Matter seminar**, Every second Monday at 9:00, YNC330
- **Microbiology seminar**, TBA
- **Nanophysics Theory seminar**, Tuesdays at 14:30, YNC122
- **NSC Explain this!** at 14:00 first Wednesday of each month, NSC coffee room
- **Nanoseminar**, Fridays at 13:00, YNC121

More information:
www.jyu.fi/nanoscience/current

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New Projects at NSC

Virus research to secure multiple funding sources

Professor Varpu Marjomäki is the antimicrobial work package leader in 5.2 M€ BIOPROT project led by Lappeenranta-Lahti University of Technology LUT. BIOPROT combines three Business Finland Co-Creation projects into two-year Co-Innovation project. The project focuses particularly on the development of respirators and surgical masks that answer to sustainable development requirements and help fight off infections. These goals are pursued by bringing together biobased materials, natural antivirals, and digitalization. There are 15 partners involved in the project, research organizations LUT, LAB University of Applied Sciences, VTT Technical Research Centre of Finland Ltd, JYU, Luke Natural Resources Institute Finland, and University of Helsinki as well as companies Lifa-Air, Teknicum, Teknos, and Premix as beneficiaries and Suominen Corporation, Berner, HUS Helsinki University Hospital, Mehiläinen, and Optitune with their work contribution.

Jane and Aatos Erkko Foundation to fund basic research on promising antiviral moelcules

Professor Varpu Marjomäki's group received 480 000 € funding from Jane and Aatos Erkko Foundation for studying promising antiviral molecules. The project utilizes various cell and molecular biology methods as well as novel approaches developed by Marjomäki's group to shed light on the underlying mechanisms that are responsible for the antiviral properties. The project is conducted together with Professor Sarah Butcher from University of Helsinki and in addition, there are important international collaborators from Pasteur Institute in Paris, France, and Sapienza University of Rome in Italy involved in the project.

Business Finland Co-Creation funding for biobased antiviral coatings and paints

In addition, Professor Varpu Marjomäki's group, together with Professor Rama Layek's group from LUT, has received six month long Co-Creation funding from Business Finland. The main goal of the funding is to develop a Co-Innovation project that would involve multiple industrial partners in order to develop safe, biobased antiviral surface coatings to replace current environmentally harmful products.

Read more *(in Finnish)*: https://www.jyu.fi/fi/ajankohtaista/arkisto/2021/11/useita-rahoituksia-jyvaskylan-yliopiston-virustutkimukseen

More information:
Varpu Marjomäki, varpu.s.marjomaki@jyu.fi

Interdisciplinary nanoscience among the four funded fields during 6th round of university profiling scheme

The Academy of Finland grants competitive funding for university profiling. During the sixth round of university profiling calls, University of Jyväskylä focused on developing four major topics: interdisciplinary nanoscience; the behavior change, health, and wellbeing across the lifespan in sport and health sciences; social sustainability for children and families; and emergent work in the digital age. The 5.68 M€ funding, granted to JYU for the period of 2021-2026, contributes to the long-term development of JYU research and education by further strengthening the previously funded fields and introducing the characteristics of digital work as a new profiling area. The unique combination of three major fields in Interdisciplinary nanoscience, contributes to the JYU strategy for example through exploitable results in medicine and technology.

Read more: https://www.jyu.fi/en/current/archive/2021/01/the-university2019s-research-profile-enhanced-2013-jyu-succeeds-in-academy-funding-applications

Academy Projects (01.09.2021 - 31.08.2025):
500 000 € for muscle development and disease

Professor Jari Ylänne received 500 000 € funding for a project called “Filamin mechanosensor in muscle development and disease”. Using fruit fly indirect flight muscle as an experimental model, the project investigates how gauge proteins such as filamin relay mechanical information into chemical signals. The research provides new insights regarding muscle development and aids in understanding the mechanisms of sarcomeric muscle dystrophies, also found in humans.

More information:
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245 000 € for antivirals originating from the forest

Professor Varpu Marjomäki received 245 000 € for taking part in a consortium called ForestAntivirals, investigating antivirals originating from forest biomasses. The project titled “Antivirals from forest biomasses: structure, function, and applicability” focuses on the antiviral and antimicrobial properties of non-wood biomasses originating from tree bark and fungi. The recent collaboration between the consortium members has discovered bioactive agents that reduce the infectivity of entero- and coronaviruses. This project aims at unraveling the underlying molecular mechanisms behind the antiviral and antimicrobial functionalities. The project it led by Tuula Jyske from Natural Resources Institute Finland.

More information:
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250 000 € for studying gut microbiome (01.09.2021-31.08.2023)

Assistant Professor Suvi Ruuskanen received 250 000 € funding for a project “How fit is your gut? Microbiome underlying winter adaptations in wild populations”. Gut microbiome has been shown to have a prominent effect on our overall health but the significance of its role in adaptation into varying environments is not yet known. Accordingly, this project sets out to test the role of microbiome in adaptation to winter conditions in passerine birds. Using novel molecular tools and microbiome transplant methods, the project gains new insights on the origins of phenotypic variation and the role of microbiome in adapting to rapidly evolving environmental conditions.

More information:
Suvi Ruuskanen, suvi.k.ruuskanen@jyu.fi

Read more on the projects *(in Finnish)*: https://www.jyu.fi/fi/ajankohtaista/arkisto/2021/05/suomen-akatemia-tukee-lihassairauksien-suolistomikrobiomin-antiviraalien-seka-aerobisen-kunnon-ja-kolesterolin-yhteyden-tutkimusta-jyvaskylan-yliopistossa

More than 550 000 € for COCOA project consortium

Professor Petri Pihko and Professor Gerrit Groenhof received funding of over 550 000 euros for a project consortium called COCOA: Control of catalyst operation with anions in Academy Project funding call (1.9.2021-31.8.2025). The consortium led by Petri Pihko aims at applying control elements into synthetic, artificial catalysts, sensors and activators, mimicing the processes that occur in Nature. These elements, consisting of small anions, can then be utilized for optimization and regulation of synthetic catalysts. The project is executed together with Professor Rikkert Wierenga from University of Oulu.

More information:
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Gerrit Groenhof, gerrit.x.groenhof@jyu.fi

Over 550 000 € for molecular nanomagnets

Academy Research Fellow Jani Moilanen obtained over 550 000 € funding for a project "Luminous molecular nanomagnets with thermal sensing properties". The project focuses on the fundamental physical and chemical properties of molecular nanomagnets with thermal sensing capabilities. Both experimental and computational chemistry methods are applied to develop multifunctional molecular materials that can function as molecular nanomagnets and optical molecular thermometers.

More information:
Jani Moilanen, jani.o.moilanen@jyu.fi

Nearly 540 000 € for studying thermophononics

Professor Ilari Maasilta received nearly 540 000 € funding for a project "ThermoPhononics: Heat blockade, tunneling and topological heat flow". Compared to the manipulation of the quanta of charge (electrons) and light (photons), the quanta of vibration and heat (phonons) have received much less attention. Thus, this project aims at establishing novel ways to control phonons and the heat transport associated with them. The project uses nanoscale devices such as phononic crystals and phononic class, topological phononic metamaterials and phonon tunnel junctions to study novel ways to control and strongly modify heat flow.

More information:
Ilari Maasilta, ilari.j.maasilta@jyu.fi

Other Academy of Finland funding

Academy Research Fellow (01.09.2021 - 31.08.2026):
Marko Melander, Department of Chemistry, 447 650 €: "*CompEL: computational electrochemistry to resolve electrocatalytic oxygen reduction*"

Kezilebieke Shawulienu, Department of Chemistry, 447 650 €: "*Crafting topological superconductivity in 2D van der Waals heterostructures*"

Postdoctoral Researcher (01.01.2022 - 31.12.2024)
Pavel Buslaev, Department of Chemistry, 244 130 €: *"Computational activity screening of enzymes"*

Noora Hyttinen, Department of Chemistry, 244 440 €: *"Improving thermodynamic property estimates of SOA constituents using machine learning"*

Erich See, Department of Chemistry, 248 650 €: *"Direct Laser Guiding of Neuronal Growth"*

Read more on the projects *(in Finnish)*: https://www.jyu.fi/fi/ajankohtaista/arkisto/2021/06/suomen-akatemialta-yli-4-miljoonan-euron-tuki-jyvaskylan-yliopiston-luonnontieteiden-ja-tekniikan-tutkimuksille

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Three new tenure track professors at the NSC

The new tenure track professors share their main research interests and talk about their ideas for the future as NSC professors.

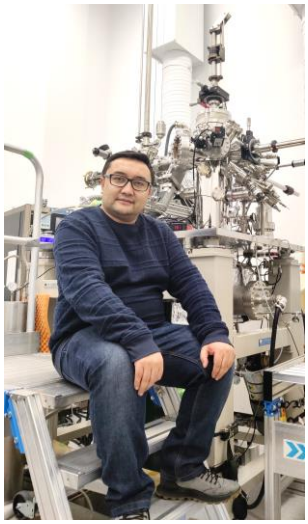
Associate Professor Fabien Cougnon

My research interests lie in molecular nanotopology, an emerging field of chemistry. Our main goal is to develop technologies that will enable chemists to "knit" synthetic molecular threads into definite nano-objects with different shapes and functions. We envision that such nano-objects can be used to perform complex tasks at the molecular scale – such as transporting drugs or catalysing new chemical transformations. The NSC will be a great place to develop applications at the interface with other disciplines, and I am looking forward to getting our research started in the coming year after a short break caused by the pandemic.

Assistant Professor Suvi Ruuskanen

I started as an Assistant Professor in Environmental Physiology in January 2021. My research lies at the interphase of evolutionary and molecular ecology, physiology and toxicology. I am interested in the physiological and molecular mechanisms via which anthropogenic changes influence organisms, often across generations, and how these traits may (or may not) enable organismal adaptation to changing environmental conditions. I mostly use non-model vertebrate systems, birds and fish, in my research. My NSC interests are especially focused on molecular biology of host-microbiome interactions, as well as developing and applying methods for small molecule analyses (like hormones and metabolites). I think that NSC is an excellent platform for interdisciplinary research, and I am looking forward to collaborators, for example bringing in and utilizing new methodologies in my ecological model systems. For 2022 as a new NSC member, I hope to learn more about research of NSC colleagues!

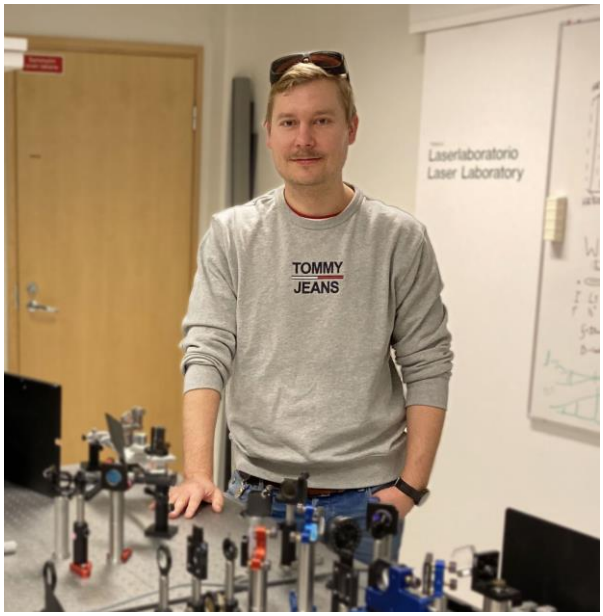
Assistant Professor Kezilebieke Shawulienu



The main interests of my research deal with experimental condensed matter physics. I explore materials that exhibit mysterious and exotic phases of quantum matter, such as topological superconductivity, topological insulators, and collective behaviors of interacting electrons in materials with reduced dimensions, as well as spin properties of atoms and molecules on surfaces. These types of materials can give rise to exotic electronic states that provide a platform to explore physics beyond what we have found so far, and that ultimately in the future may open a new venue for modern electronics with completely new operational principles. My goal for the next two years is to build a state-of-the-art experimental lab here at Jyväskylä university to be able to do such kinds of research. Of course, research is not only pursuing a scientific curiosity but also passing on to others what I have learned. I hope this professorship will strengthen my teaching skills and create an opportunity to develop new teaching methods and practices.

Introducing new NSC group leaders

Tatu Kumpulainen



My name is Tatu Kumpulainen and I lead the Molecular Photochemistry and Photophysics group. The group is associated with both the Department of Chemistry and the NSC. Our research focus is on investigating fast photochemical reactions by means of time-resolved spectroscopy. Currently, we are particularly focused on excited-state proton-transfer reactions in solutions and biological interfaces. Our group is part of the Laserlab-NSC where most of our research is carried out.

Recently, the first additional member, Amar Raj, joined the group as a PhD student. You can read the full introduction of Amar in the next section of this newsletter.

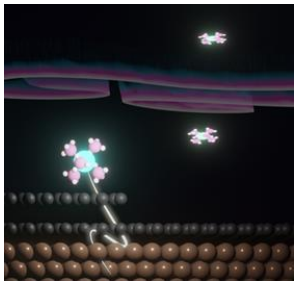
I work as a Senior lecturer at the Department of Chemistry, but we carry out most of our research at the Laserlab-NSC. Furthermore, our research interests lie at the interface between chemistry, physics, and biology. Therefore, it seemed logical to join the NSC as a group leader.

I relocated to JYU in October 2020 so 2022 will be my second year at the NSC. Due to covid restrictions as well as heavy teaching load in 2021, I had very limited time to focus on research. In 2022, I hope to get my research back up to speed together with my PhD student.

More information:
https://www.jyu.fi/science/en/chemistry/research/molecular-photochemistry-photophysics

Marko Melander

My name is Marko Melander and I have been working at the Nanoscience Center since 2017 first on a short-term grant, followed by an Academy of Finland postdoc period between 2017-2020, and in 2020-2021 as project researcher on Karoliina Honkala's projects. Before coming to Jyväskylä, I obtained my PhD in physical/computational chemistry at the Aalto Univeristy in 2015 after which I worked as a postdoc at the Technical University of Denmark (DTU)



In September 2021 I started as an Academy of Finland Fellow which allowed to establish the Computational Electrochemistry, CompEL, group. At the moment the group has two members, me and Dr. Fabiola Dominguez-Flores, but a doctoral student will join us next year. Research in the CompEL group focuses on the chemistry at electrochemical interfaces using multiscale computational methods. The overarching theme is to understand and control how the atomic-scale details control the activity and selectivity of electrochemical reactions relevant for energy conversion/storage or fundamental electrochemistry. To achieve this, we develop and use methods ranging from constant potential density functional theory, solvent/electrolyte models for solid-liquid interfaces, and computational methods for electron and proton-transfer reactions to mechanistic studies at electrochemical interfaces and simulation of reaction kinetics.

Becoming a group leader felt like the natural next step which I was happy to take after securing the Fellow funding. Continuing at the Nanoscience Center also felt natural as I enjoy working here and living in Jyväskylä. In the coming years I wish to further establish electrochemistry as a strong research line in Jyväskylä and, in particular, hope to connect with experimental groups – I think nanoscale electrochemistry offers many interesting opportunities for collaborations within NSC.

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 NSC building?
3. Why do you want to be part of NSC?
4. What is your major scientific finding in Year 2021?
5. What should researchers at NSC do together in Year 2022?

1. My name is Laura Lavendure and I am a postdoctoral researcher in Prof. Karoliina Honkala's group. My core field at NCS is computational electrocatalytic chemistry.
2. NSC is my workplace so I visit 5 times a week.
3. I want to be part of NSC due to opportunities for funding, collaboration, and to gain further experience in applying computational techniques to electrocatalysis to complement or confirm experimental results.
4. Keto-enol tautomerization between dihydroxyacetone and glyceraldehyde via 1,2,3-propenetriol is not energetically favored on a bare gold surface found under acidic conditions and even less favored in the presence of adsorbed hydroxides found under basic conditions.
5. Outdoor activities – beach, sledding, hiking. Regular internal seminars where an NSC member (graduate student/postdoc/prof) gives a 20-40 min talk on research they have been doing – would help raise awareness of what other research occurs at NSC beyond a person's own group.

1. I am postdoctoral researcher Fabiola Domínguez-Flores, my group leader is Dr. Marko Melander and my core field is computational electrochemistry.
2. My project will be centered on computational electrochemistry to resolve electrocatalytic oxygen reduction reaction. I spend my working hours at the NCS.
3. I found a project that fits perfectly with my goals and interests, and it was precisely here at the NSC.
4. My major finding was the project that I am working on now, I am really excited, and I think we will be able to provide atomic insight to explain, predict, and disentangle the complex interplay of factors controlling the ORR.
5. It would come in handy if the NSC will throw a workshop where all the people in the NSC could meet each other and get more insight into the projects of others.

1. Juha Tiihonen, nice to meet you. I'm working as a postdoc with Hannu Häkkinen and Robert van Leeuwen. My speciality is high-accuracy calculation of atomic structures with quantum Monte Carlo (QMC).
2. My current project is paving way for structural optimization of strongly correlated systems, such as atomically thin 2D materials, using QMC. Also I will be looking into high-accuracy relativistic many-body wavefunctions of small gold clusters.
3. I really, really like the view. Also fascinated by the self-sustainable and inter-disciplinary works all around. Proud to be here.
4. I have learned that the density functional theory is a decent surrogate for predicting the process of energy minimization with more sophisticated electronic structure methods.
5. Let's book a floorball slot.

1. My name is Amar Raj. I started my Ph.D. studies in Tatu Kumpulainen's research group in autumn 2021. My research lies in the field of femtosecond and time-resolved fluorescence spectroscopy.
2. The goal of my Ph.D. project is to increase our understanding by observing how environmental factors influence acidity, proton transfer, and diffusion in various systems (solvents, fluorescent proteins, and biological membranes). To accomplish this, we employ

the use of photoacids which enable us to perform detailed time-resolved studies on the mechanism and kinetics of dissociation in different environments. My office and the workstation are located in the Nanoscience Center, so I am here during most of my work hours.
3. A researcher can conduct research in NSC's open and free environment which makes it an ideal setting to conduct interdisciplinary research. My project is interdisciplinary and under one roof one can find scientists specializing in a variety of fields which boosts the quality of the research as well as personal research skills.
4. Before joining JYU, during my master's project, I developed a couple of fluorescent and colorimetric sensors which can detect cations (Cu(II), Zn(II), Ni(II)) selectively in aqueous and biological samples (10.26434/chemrxiv.14594568.v1). This research involved steady-state spectroscopy, synthesis and computations, giving me a glimpse of interdisciplinary research. Through my Ph.D. project, I would be able to further develop and utilize my skills and hopefully get some good results.
5. NSC could have more after-work get-together activities (say some sports activities or a weekend trip) to get to know each other and have more interaction with other Ph.D. students and other experienced colleagues.

1. I am Kameyab Raza Abidi, a doctoral researcher in Prof. Pekka Koskinen's Low Dimensional Nanomaterials Modelling group. The core research theme of our group focuses on using computational methods to investigate different 2D materials properties.
2. My research project is intended to explore possible 2D metals and Alloys. Then the aim is to look out for deformation electromechanics of such 2D systems. I feel a perfect environment in NSC to concentrate on my research objective, thereof I used to be at NSC daily.
3. I was looking for a research group for my PhD which has coherent concatenation to my research interest, fortunately, my research group being the pioneer of 2D metals research propelled me to join the NSC.
4. I joined the NSC in the last quarter of 2021, so didn't get ample time to work on any major research problem. However, the 2D metals which already existed in the literature were investigated on a different computational platform.
5. It will be interesting to get involved in collaboration within the NSC and get to know the people better off the work too.

1. My name is Dimitri Delcourt and I am a doctoral researcher in the group of Assoc. Prof. Fabien Cougnon. My core field is supramolecular chemistry.
2. I work on the programmable self-assembly of helicates and interlocked molecules. I work in the synthesis laboratory of NSC every day.
3. NSC hosts groups from different fields (Chemistry, Physics, Biology), each interlocked together. This diversity enables us to work with another group on a similar project, but with a different approach. NSC is also hosting people from different nationality and it is an asset to know other cultures.
4. This year we observed the self-assembly of a double helicate in water led by the hydrophobic effect. Further experiments are about to demonstrate the assembly of higher order helicates.
5. It would be great if we can avoid remote work and meetings. If the pandemic situation enables it, it would be interesting to organize extra-professional activities to know better other groups, having human contacts.

Research Outreach and Highlights

Corona virus online live broadcast on 23rd of February 2021

University of Jyväskylä and Nanoscience Center organized an online live broadcast where three scientists, Lotta-Riina Sundberg and Varpu Marjomäki from NSC, and Matti Vihola from the Department of Mathematics and Statistics shared their knowledge regarding corona virus. Lotta-Riina Sundberg discussed the way corona virus mutates and Varpu Marjomäki shed light on the vaccinations that are currently available. In addition, Matti Vihola explained to the audience the intricacies related to modelling the spread of corona virus. The event had 3700 online viewers.
Read more: (*in Finnish*):
https://www.jyu.fi/fi/ajankohtaista/arkisto/2021/02/tutkimustietoa-koronaviruksesta-ja-rokotekehityksesta-23-2-2021-suoraa-lahetys-jyvaskylan-yliopistosta

Researchers' night

European science event, the Researchers' night, makes science familiar to the public. On 24th of September 2021, audience had the possibility to experience the event both virtually and on-site. At the NSC, visitors explored nanoscience through a guided laboratory tour.
Read more: https://www.jyu.fi/en/current/archive/2021/09/researchers2019-night-attracts-audience-both-on-site-and-online

NSDays 2021

The Nanoscience Days (*chair* Heikki Takala) took place during 5th–6th October 2021. The event was held as a hybrid event where local participants were offered the possibility to join the even in Agora on Mattilanniemi campus and remote participants joined using Zoom platform. Nanoscience Days are a traditional event organized for the seventeenth time by NSC. The scientific program included high-profile plenary lectures, contributed communications selected based on abstracts, and an online poster session. The topics presented a balanced overview of emerging trends and perspectives in nanoscience and nanotechnology.
Read more:
https://www.jyu.fi/en/current/archive/2021/09/mechanisms-of-cell-survival-virus-like-particles-and-metal-coordinated-nano-cages-presented-at-the-nanoscience-days-in-jyvaskyla-520136-oct

The Nobel Evening

Offered by the University of Jyväskylä, Nanoscience Center and Keskisuomalainen, the Nobel Evening was organized as an online event on 7th of December 2021. The event caught the attention of 570 viewers. In the usual fashion, the experts from University of Jyväskylä introduced this year's Nobel Prize winners. Two of the experts were from the Nanoscience Center. Petri Pihko introduced the chemistry Nobel awarded to the development of asymmetric organocatalysis. This method provides a precise and greener method for building molecules which is essential from pharmaceutics to energy storage. Jari Ylänne discussed the medicine Nobel awarded to the discoveries of receptors for temperature and touch. With the help of capsaicin, the active component of chili peppers, and pressure sensitive cells, these discoveries explained how nerve impulses convert to the sense of heat, cold, and mechanical stimuli. The Scientific Director of the NSC Tero Heikkilä gave both the opening and closing words of the evening.
Read more *(in Finnish)*:
https://www.jyu.fi/fi/ajankohtaista/arkisto/2021/11/nobel-kattauksessa-esitellaan-fysiikan-kemian-laaketieteen-taloustieteen-ja-kirjallisuuden-lapimurrot-2021

Greetings from the new secretary of NSC

My name is Marianne Lampi, and I started working as a secretary at the NSC in August. Previously I have also worked as a research assistant and conference secretary in a few projects at the Faculty of Information Technology and the Department of Social Sciences and Philosophy here at JYU. My background is not actually in natural sciences, since I have graduated from Social and Public Policy. I think it's interesting to work with people from another scientific field because then I also get to learn some new things. I look forward to 2022 with more events and face to face meetings above all. Nice to meet you!

Highlights at NSC in 2021*

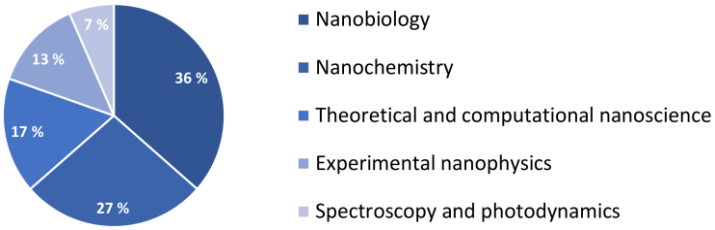
- V. Vaňo, M. Amini, S.C. Ganguli, G. Chen, J.L. Lado, S. Kezilebieke, P. Liljeroth. *"Artificial heavy fermions in a van der Waals heterostructure."* Nature 2021, 599, 582–586.
- I. V. Bobkova, A. M. Bobkov, and M. A. Silaev. *"Dynamic Spin-Triplet Order Induced by Alternating Electric Fields in Superconductor-Ferromagnet-Superconductor Josephson Junctions."* Phys. Rev. Lett. 127, 147701.
- R. Chevigny, J. Schirmer, C.C. Piras, A. Johansson, E. Kalenius, D.K Smith, M. Pettersson, E.D. Sitsanidis, M. Nissinen. *"Triggering a transient organo-gelation system in a chemically active solvent."* Chem Commun. 2021, 57(80), 10375-10378.
- E. Multamäki, R. Nanekar, D. Morozov, T. Lievonen, D. Golonka, W.Y. Wahlgren, B. Stucki-Buchli, J. Rossi, V.P. Hytönen, S. Westenhoff, J.A. Ihalainen, A. Möglich, and H. Takala. *"Comparative analysis of two paradigm bacteriophytochromes reveals opposite functionalities in two-component signaling"* Nat. Commun. 2021, 12, 4394.
- M. F. Matus, S. Malola, and H. Häkkinen. *"Ligand ratio plays a critical role in the design of optimal multifunctional gold nanoclusters for targeted gastric cancer therapy."* ACS Nanoscience Au 1, 1, 47-60.
- V.-M. Hiltunen, P. Koskinen, K. K. Mentel, J. Manninen, P. Myllyperkiö, M. Pettersson and A. Johansson. *"Ultrastiff graphene."* npj 2D Mater. Appl. 2021, 5, 49.
- O. López-Estrada, B. Zuniga-Gutierrez, E. Selenius, S. Malola and H. Häkkinen. *"Magnetically induced currents and aromaticity in ligand-stabilized Au and AuPt superatoms."* Nat. Commun. 2021, 12, 2477.

36
Group leaders*

140
Researchers*

107
Peer-reviewed publications**

Top 5	Author (No. of Publications)
1.	Hannu Häkkinen (16)
2.	Sami Malola (14)
3.	Perttu Permi (10)
4.	Janne Ihalainen, Mika Pettersson (6)
5.	Pasi Myllyperkiö, Lotta-Riina Sundberg (5)



*Data taken from NSC websites on 26.11.2021
**Data taken from Scopus on 8.12.2021, affiliation search with keywords: Nanosci* and Univ* Jyvaskyla