



INTER- DISCIPLINARY NANO- SCIENCE



NSC
FINLAND



UNIVERSITY OF JYVÄSKYLÄ



MULTIDISCIPLINARY RESEARCH

The University of Jyväskylä is the only university in Finland that offers the possibility to specialise in multidisciplinary nanoscience. **The Nanoscience Center (NSC)** is responsible for nanoscience research. It is an international, interdisciplinary research organisation where biologists, chemists and physicists work together to study nature at the nanoscale. Research projects span from fundamental investigations of processes in nanoscale structures to the development of commercial products.



**One nanometer is
a millionth of a millimeter.**

WHAT IS NANOSCIENCE?

Nanoscience studies natural phenomena by combining physics, chemistry and biology. The examination and manipulation of molecules, materials and structures take place on a small scale: at least one of the dimensions must be less than one hundred nanometers. The aim is to bring forth new phenomena not present in larger systems.



The University of Jyväskylä is a multidisciplinary research university with 15 000 students and 2 500 faculty or staff members. More than 140 researchers and 30 research groups work at the Nanoscience Center.

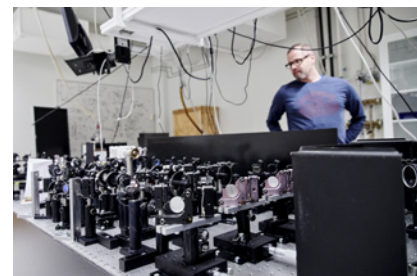


WELCOME TO FINLAND AND JYVÄSKYLÄ

Finland is an EU Member State located in northern Europe. Finland is known for its strengths of safety and equality. All people are equal regardless of gender and other characteristics, also in working life: women work and receive the same pay as men. For those moving to Finland, services that support integration and learning the Finnish language are available.

Jyväskylä is located in Central Finland, about 270 kilometres north of the capital Helsinki. Jyväskylä is a lively and close-to-nature city that is also popular with international students. The living environment is safe and almost all services are within walking or cycling distance.

The city is surrounded by pristine forests and hundreds of lakes. Befittingly, this landscape is actualized at the university campus of NSC by Lake Jyväskylä. There are great opportunities for outdoor and sports activities.





STUDY TO BECOME A NANOSCIENCE PROFESSIONAL

Are you fascinated by natural phenomena and working across academic boundaries? Do you want to find answers to big questions about the health and well-being, environment and energy? If your answer is yes, nanoscience is your thing!

Nanoscience combines physics, chemistry, and biology in a fascinating way. The prospects for the development of the field are huge and there are diverse employment opportunities for graduates as research and product development need more and more wide-ranging experts.

MASTER'S STUDIES IN ENGLISH

In Jyväskylä, you can start your studies in nanosciences in the Bachelor's Degree Programme and continue to the international Master's Degree Programme in Nanoscience. The Master's Degree Programme in Nanoscience is taught in English and the studies last two years. The entry requirement for the Master's Degree Programme is a Bachelor's Degree in physics, chemistry, cell and molecular biology, nanoscience or another relevant field.

The scope of the Master's Degree Programme is 120 credits. It includes compulsory studies in nanoscience and the major discipline of choice, as well as optional studies in biology, chemistry, physics, or any other field of interest. Students prepare their Master's Thesis by working within established research teams, in collaboration with the team members. Students have access to the latest research equipment and methods, which they can get acquainted with already during their studies. After completing their degree, students have the opportunity for postgraduate studies.



Read more about the programme:

[www.jyu.fi/en/apply/masters-programmes/
masters-degree-programmes/nanoscience](http://www.jyu.fi/en/apply/masters-programmes/masters-degree-programmes/nanoscience)

FINANCIAL SUPPORT FOR STUDIES

Tuition is free for citizens of EU/EEA countries and Switzerland. In addition, students who are in possession of a valid residence permit in Finland are exempted from paying tuition for the duration of the validity of the permit.

In the Master's Degree Programme in Nanoscience, two 100% scholarships and four 50% scholarships are available for applicants required to pay the tuition fee. Non-Finnish students, who are not eligible for government's student financial aid, can apply for a scholarship for living expenses.



Additional information on tuition fees and scholarships:

www.jyu.fi/en/apply/masters-programmes/tuition-fees-and-scholarships



To date, more than 200 nanoscientists have graduated from the Master's Degree Programme in Nanoscience. In 2020, 97% of these graduates were currently employed, about half in industry and the rest mainly in academia.



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MODERN FACILITIES FOR RESEARCH

The Nanoscience Center brings together diverse expertise, strong know-how and modern research facilities. In addition to its own internationally renowned research, the centre conducts research for companies and communities on request. The facilities and equipment can also be used by academic and industrial partners under joint research or study projects. In addition, students use the facilities and equipment during their studies in their coursework, theses and dissertations.

The facilities and equipment enable a diverse range of research in the key research areas of the Nanoscience Center: nanobiology and -chemistry, experimental nanophysics, spectroscopy and photodynamics, and theoretical and computational nanoscience. NSC's research seeks to comprehensively address the multidisciplinary challenges of health and well-being, a sustainable society and the second quantum revolution. Finding new solutions to combat bacteria and viruses, promoting sustainable chemistry and the circular economy, and developing quantum technologies are the key objectives of the Nanoscience Center.

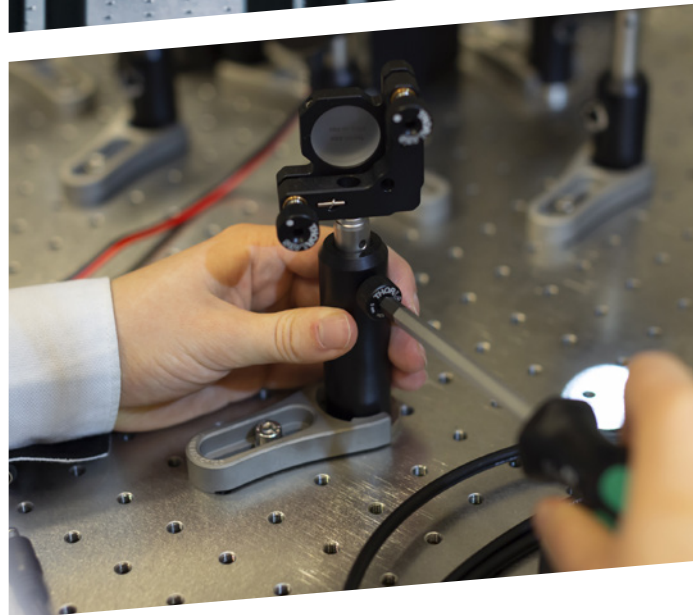


See the list of our equipment:
www.jyu.fi/science/en/nanoscience-center/research/infrastructures/nanofacility

LASER LABORATORY

The Laser Laboratory focuses in particular on vibrational spectroscopy (infrared and Raman), nonlinear spectroscopy and imaging, biomolecular spectroscopy, plasmonics and the development of analytical methods.

The laboratory offers unique research opportunities with world-class equipment. There are three femtosecond laser systems and several other spectroscopic setups enabling various experiments in time and frequency domains and also imaging.



Laser light differs from natural light in that it is coherent light with properties that can be modified for multiple purposes.

MULTIPURPOSE TECHNOLOGY

Laser technology and photonics can be used not only in science but also elsewhere in society. With the help of laser technology, it is possible, for example, to transfer and process information as well as to target, image, measure and deliver energy accurately. Laser technology is therefore useful in gas analysis, telecommunication networks, cutting and drilling tasks that require industrial precision and in laser surgery in healthcare.



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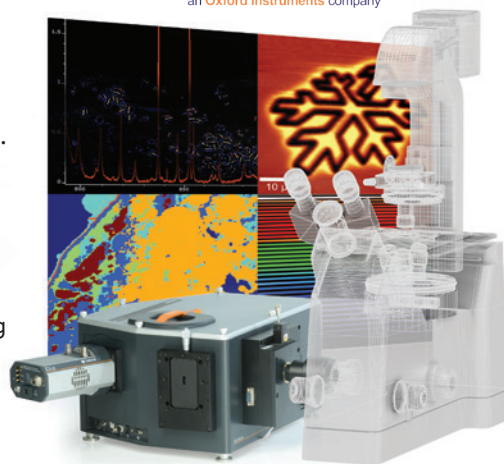
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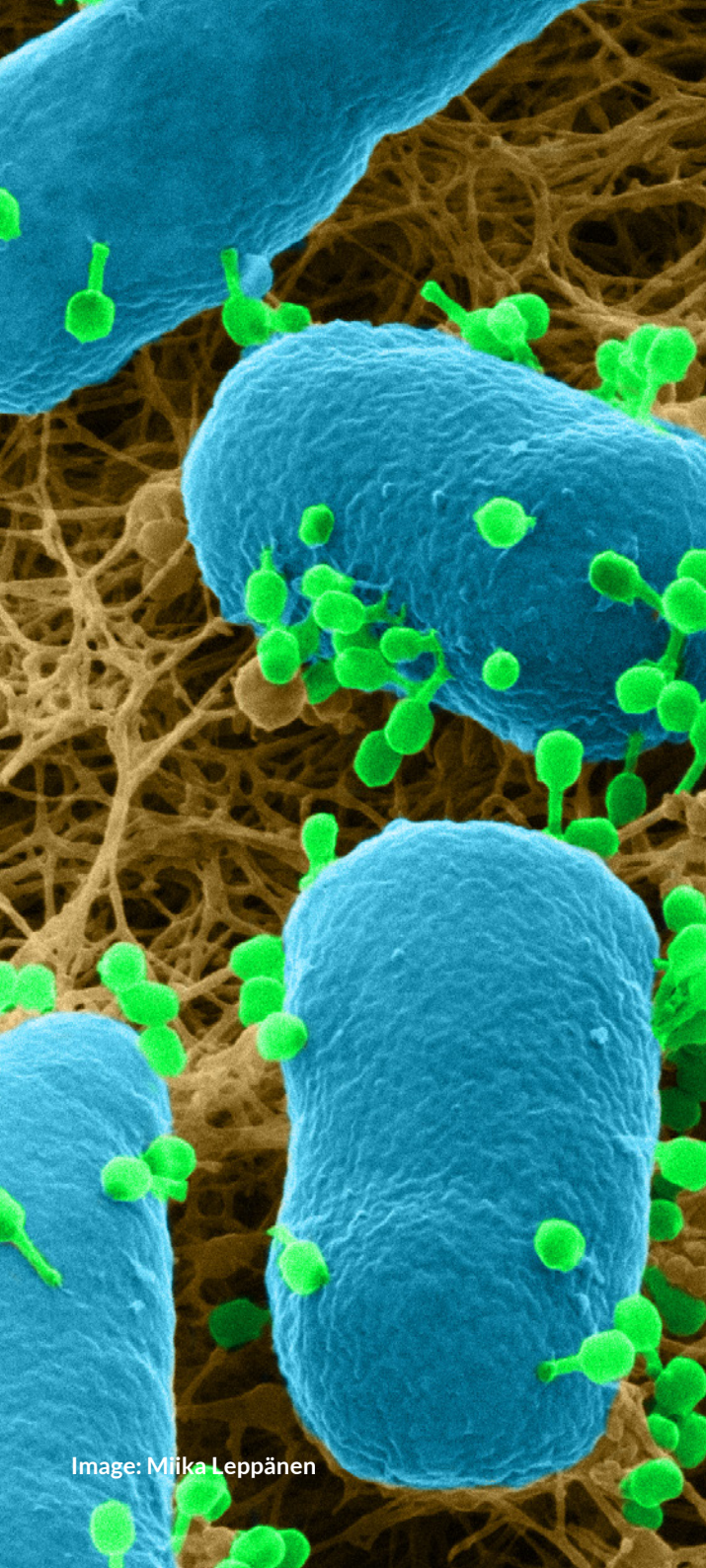


Image: Miika Leppänen

IMAGING

Jyväskylä Imaging facility offers several microscopy alternatives for studying the phenomena of biology, chemistry and physics. The equipment can be used by both researchers and students. The facility also organises courses and workshops for those interested in imaging and image processing.



The imaging facility performs light, electron, Raman/CARS, atomic force and helium ion microscopy.

ZEISS ORION NANOFAB HELIUM ION MICROSCOPE

Finland's only Helium Ion Microscope, HIM, is located at the Nanoscience Center. Microscopes capable of nanoscale resolution usually utilise electrons, whereas HIM uses helium or alternatively neon ions. As ions are heavier than electrons, they provide more accurate images. Other advantages of HIM include better depth of field, high surface contrast without metal coatings and minor sample damage due to the examination method.



HIM has been used to successfully imagine the interaction between bacteria and bacterial viruses, or phages.



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EDWARDS

mBRAUN

**HIDEN
ANALYTICAL**



CLEAN ROOM

For advanced multidisciplinary nanofabrication NSC has an ISO 5-level clean room. Device fabrication can be based on UV-photolithography, advanced electron-beam lithography, direct 3D laser writing and ion beam lithography and milling.



A wide variety of techniques exist for material deposition and etching, such as evaporation, atomic layer deposition, pulsed laser deposition and reactive ion etching.

VIRUS AND CELL CULTURE FACILITIES

Together with modern culture laboratory capabilities, the facility has comprehensive bioimaging equipment that enables high-resolution imaging of both live and fixed cells.

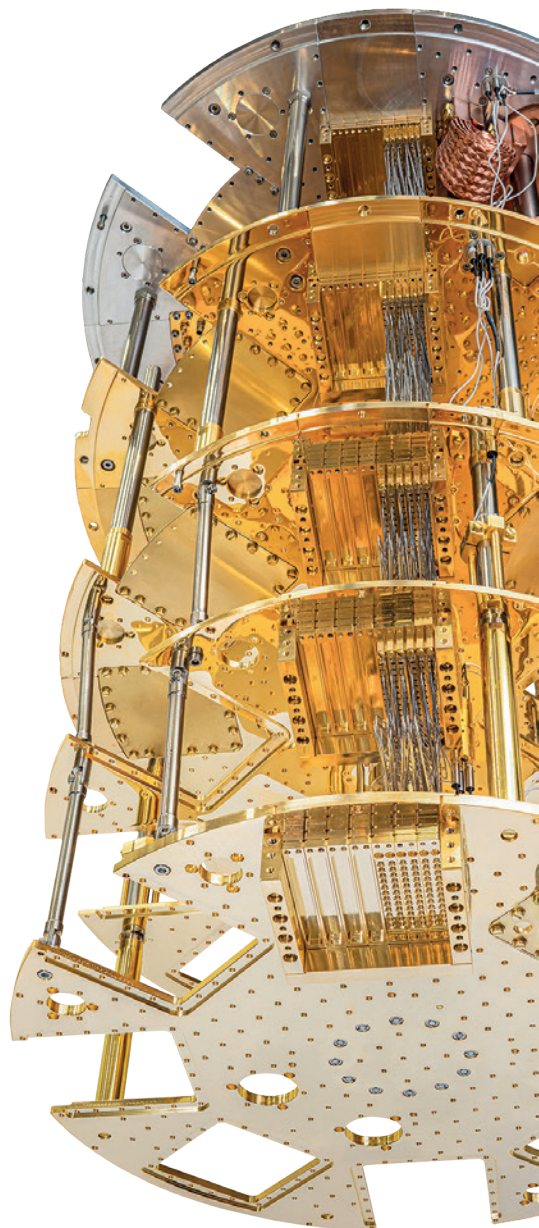
In addition, BSL2 (biosafety level 2) working areas for viruses and bacteria can be used to study pathogens of a moderate health risk. The majority of pathogens fall into this category, so the facilities provide an excellent setting for tackling emerging pandemic threats, for example.



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Photos: University of Jyväskylä and Saara Karttunen