



NanoLund

CENTER FOR NANOSCIENCE

## NanoLund Strategic Plan 2026 - 2030

**Our vision** is to be a world-leading interdisciplinary research center that uses the unique opportunities of nanoscience and nanotechnology to both satisfy human curiosity for fundamental knowledge and support technological development, addressing societal challenges with focus on sustainability, health, and resilience.

**Our mission** is to constantly develop internationally outstanding interdisciplinary research and learning environments that conduct and combine basic science and application-driven research. We bring together the most creative scientists, students and industry professionals across traditional disciplines and societal sectors.

**Why we are needed:** Nanoscience and nanotechnology solve key scientific questions and societal challenges, that are not answered by traditional approaches but needs our deeply embedded interdisciplinarity that spans from fundamental to applied science.

### Societal Challenges we aim to address

- **Creating materials and technologies for a sustainable and resilient society**  
*Paradigms and technologies for efficient harvesting, distribution and use of energy, and for nanomaterial-based products that reduce our dependency on scarce or toxic materials, enabling product and production circularity, and make us and our environment safe.*
- **Making information processing sustainable and integrated**  
*New physical concepts, semiconductor materials, quantum technologies, and their heterogeneous integration to enable next-generation energy efficient information processing, including AI and local real-time sensing, to optimize and safeguard environment, production and people.*
- **Advancing life science and precision medicine for the many**  
*Novel single-molecule and cell-level studies, including ultrasensitive sensors and biomimetics. Innovative nano/microstructures, soft matter and microfluidics enabling cutting edge fundamental science and translation to precision medicine, diagnostics and new therapies.*
- **Bringing technological innovation and competence into society**  
*Educating broadly on nanoscience and nanotechnology, embedding our interdisciplinary open-minded way of working. Collaborate with private and public sectors both locally and internationally to understand needs and translate research into products, services and clinical applications.*

## Our strategic aims

Developing the best environment:

- **A great place to do interdisciplinary science**  
*To be an international, highly visible interdisciplinary nanoscience environment that continuously fosters new multidisciplinary clusters and constellations. To offer exceptional scientific opportunities, training, and career development for everyone.*
- **Unique infrastructure**  
*Develop, promote and use outstanding unique infrastructure to create and understand materials and structures. Build state-of-the-art clean room fabrication facilities designed for close interactions with NanoLund researchers and students co-located for maximum interaction with the world class characterization facilities MAX IV and ESS in Science Village.*
- **Interaction with society, from people to industry**  
*Building and using an ecosystem that integrates education, interdisciplinary research and development across societal sectors, in strong collaboration with both small and large industries to promote innovation that benefits us all.*

Developing the best science and technology:

- **Building and understanding with atom-level control**  
*To fabricate nanostructured compound materials and semiconductor devices with atom-level control. To gain a deep understanding of their physical, chemical, and/or biological interactions by modeling and characterizing them at all relevant length- and time scales.*
- **Pioneering fundamental science**  
*To make fundamental scientific discoveries that increase our understanding of the world and form the basis for finding new paradigms and device concepts, using deep knowledge from quantum phenomena to life-science, drawing on our excellent infrastructure and people.*
- **Deep-tech applications**  
*To create technological solutions with enhanced performance and new capabilities for energy, communication, computing, sensing and diagnostics, building on a deep understanding of semiconductors and safe and sustainable use of advanced nanotechnology.*

## Our research and resource areas

NanoLund has six research areas and four resources areas that promote both the deep dive into an area and interdisciplinary collaborations. Together they work to reach our strategic aims and societal challenges.

Research Areas:

1. **Materials & Manufacturing.** *Design, controlled synthesis and assembly of nanomaterials is at the core of nanotechnology.* We aim to understand how nanomaterials form and how their properties emerge from their atomic and nanoscale structure. We explore both physical and chemical synthesis methods to generate nanostructured materials for fundamental research, future nanotechnology and industrial production.
2. **Quantum science and technology.** *From fundamental physics to applications based on quantum phenomena.* Our ambition is to create fundamental knowledge and novel applications by describing, observing and controlling quantum phenomena, with a focus predominantly on semiconductor nanostructures and related materials systems. We also incorporate related topics such as fundamental physical questions and nanothermodynamics.

3. **Photons.** *An interdisciplinary area of science covering light-matter interactions in nanoscale materials.* We conduct research on light-matter interactions using photons, from microwaves to X-rays, with the aim of understanding light-triggered and light-emitting processes in nanoscale materials and devices. We further use scattering of photons from various sources to characterize the diverse properties of nano- and low-dimensional materials.
4. **Semiconductor Technology.** *Devices and applications based on semiconductors are at the heart of modern society.* Semiconductors are vital for information technology, which is why we emphasize research in this field for high-performance devices. We aim to develop and understand new materials, structures, and concepts for applications in high-performance electronic, optical, and energy-harvesting devices and applications.
5. **Life Science & Nano.** *Unravelling fundamental biomolecular and cellular mechanisms for use in biomedical applications.* By utilizing our capabilities to create and study structures on the relevant length scales for cells and molecules, we perform fundamental studies that bridge new fields in novel areas, leading to applications addressing urgent needs for better functioning tools within research, health care and sustainability.
6. **Safe and Sustainable.** *Integrate and promote safety and sustainability - from early-stage research and development to product end-of-life and recycling.* By characterizing human and environmental exposures and assessing health risks across the full material/product life cycle, we aim to promote safe materials management from conception to end-of-life.

Resource areas:

1. **Lund Nano Lab** *is our clean room laboratory, with state-of-the-art semiconductor processing and characterisation equipment.* It provides open access to students, researchers, and industry, enabling cutting-edge research and innovation. We are establishing a new clean room facility at Science Village and investing in new equipment for our users to stay at the research forefront. We are part of Myfab, the Swedish national research infrastructure for micro- and nanofabrication.
2. **Lund Nano Characterization Labs.** *NanoLund researchers develop and use a wide range of world-class characterization techniques that we work to strengthen and coordinate.* This includes cutting-edge instruments and techniques across Lund University as well as the large infrastructures MAX IV and ESS. Our researchers are heavily involved in designing, developing, and refining uniquely tailored cutting-edge characterization tools.
3. **Education.** *We engage in education at all levels, from undergraduate education to professional training for companies.* We work to share our knowledge to help address important needs in society and to inspire young people to engage in the development of nanoscience. NanoLund has a variety of initiatives that aim at educating and informing our society and coming generations of scientists.
4. **Collaboration and Innovation.** *Through our cutting-edge interdisciplinary research, we come up with radically new ideas and innovations to benefit society.* We introduce ground-breaking technology and combine the fields of science and engineering within the physical, biological, and digital arenas. By engaging with companies, we aim to understand their needs and create common ground to address challenges together. We strive to develop long-term partnerships with large international companies and start-ups as well as other societal actors.

## Who we are: our core values

Our core values represent our joint vision of the culture we wish to have for NanoLund, and our view on how we foster this culture through our individual actions. They serve as a guide in making small and large decisions.

- **Openness.** To us, openness is about being inclusive and welcoming of diversity of people and ideas. We work toward a safe environment of mutual trust and respect in which we can share and freely exchange ideas and knowledge to bring out the best in each of us. Only by being open can we be a *great place to do nanoscience*.
- **Enthusiasm.** To us, enthusiasm is about inspiring and driving each other to being *at the forefront of nanoscience*. We approach our tasks with positive energy and commitment, and we encourage and enable each other to overcome challenges.
- **Pioneering.** To us, being pioneering is about combining creativity with resourcefulness and excellence to pursue impactful nanoscience and *nanotechnology for the future*. To advance fundamental science and to address societal challenges, we explore new approaches, select the most promising ones, and aim for deep scientific understanding.

## Sustainability and Resilience

NanoLund advances science and technology with a clear commitment to resilience and sustainability. We contribute to society's ability to address global challenges by developing safe, efficient, and circular solutions that reduce dependence on scarce or toxic resources, strengthen energy efficiency, and secure long-term technological competence.

Our work directly strengthens resilience by:

- **Exploring alternatives:** Developing new materials based on earth-abundant elements to replace scarce or toxic ones.
- **Enabling circularity:** Designing nanomaterials and devices with recycling, re-use, and energy efficiency in mind.
- **Securing competence:** Building expertise in strategically crucial areas such as advanced semiconductors, quantum technologies, materials security and defense-related applications.

Our work directly contributes to sustainability with relevance to the following United Nations Sustainable Development Goals (SDGs):

- **Health and well-being (SDG 3, 6, 10, 14):** Nanoscale diagnostics and therapies support better health outcomes (3.3, 3.4, 3.8) and our research reduces exposure to toxic materials (3.9). Our work contributes to clean water (6.1, 6.2, 6.3), to pollution reduction (14.1, 14.2) and to equality (10).
- **Clean energy (SDG 7):** Creating materials and devices that increase renewable energy use (7.2), enable higher efficiency of devices (7.3), and strengthen energy infrastructure (7b).
- **Sustainable industry and production (SDG 8, 12):** Developing nano-technology-enabled products and processes that improve workplace safety (8.8), encourage sustainable practices (12.6), reduce waste generation (12.5), and support circular use of resources (12.4).