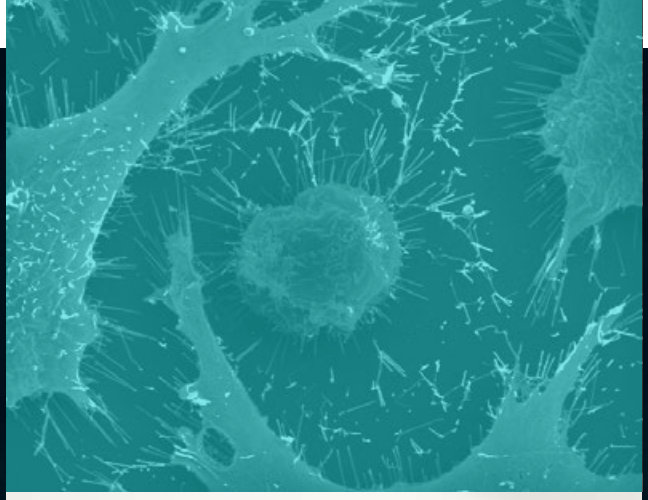
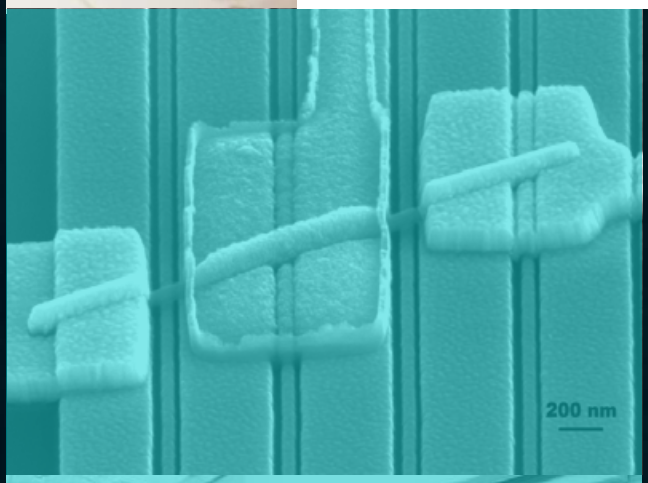


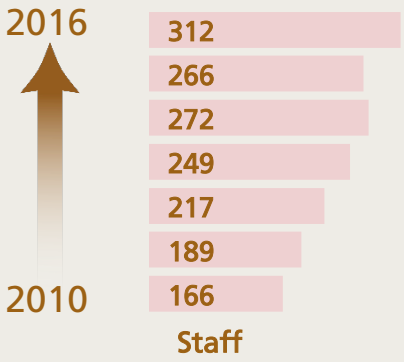
LUND UNIVERSITY

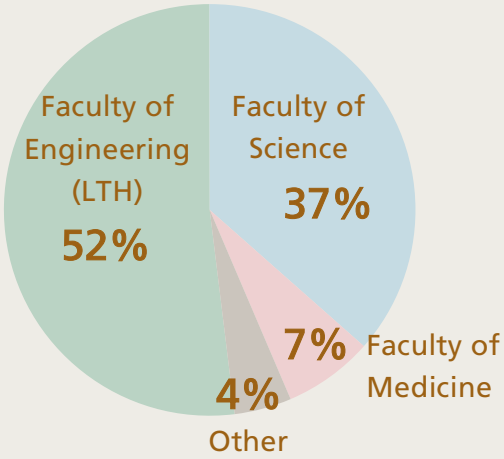
NANOLUND

ANNUAL REPORT 2016



2016 IN BRIEF





Current numbers

20 Contributing divisions

Faculty members **62**

32% Women

PhD students **121**

212 MSEK Funding 70% external

Average impact factor **5.6**

HISTORY

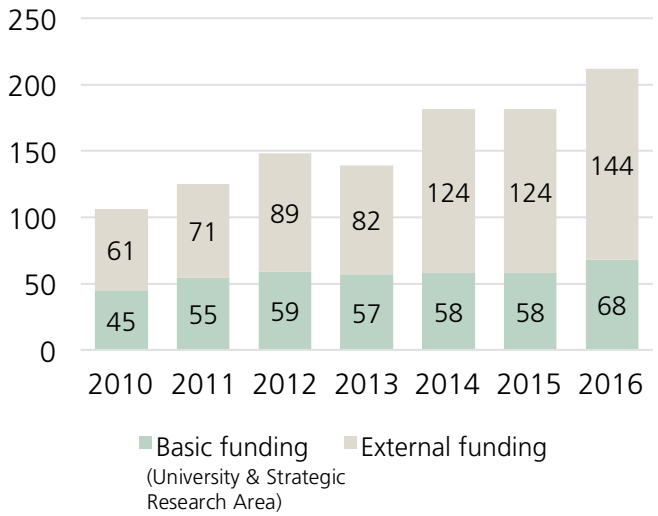
1988 Lars Samuelson initiates the Nanometer Structure Consortium (nmC)

2010 Strategic Research Area funded by the Swedish Government

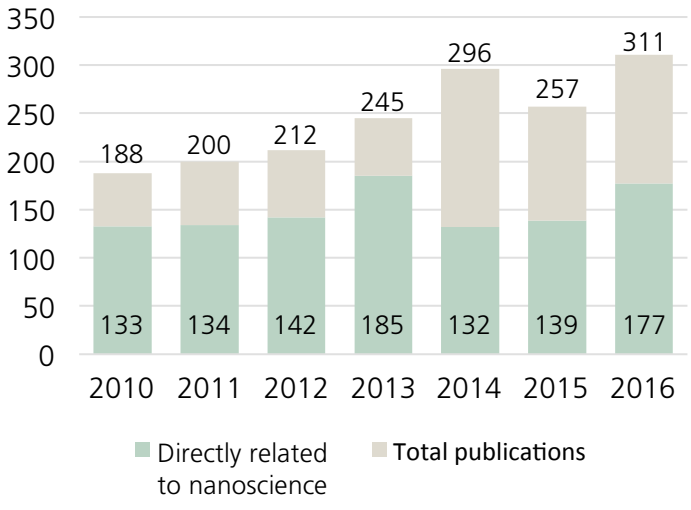
2015 nmC becomes NanoLund, the Center for Nanoscience at Lund University

TRENDS

Funding over time (MSEK)



Total number of publications



FOREWORD

A GREAT PLACE TO DO NANOSCIENCE

During 2016, positive trends from the previous years have consolidated. Since NanoLund became a Strategic Research Area in 2010, the external funding raised by NanoLund research groups has more than doubled. Our international visibility remains high, with an average impact factor of more than 5.5 across all our nanoscience publications, about 100 invited and plenary talks given at international conferences, and the start of the organization of the IVC-21, an international congress in advanced technology, materials science, nanotechnology and bioscience that will bring more than 1000 attendees to Malmö in 2019. During 2016 we also developed a Strategic Plan for the period 2016-2020, and we began the planning for a new Lund Nano Lab in Science Village Scandinavia – building a bridgehead for what we hope and expect will become a lively and highly interconnected Lund University campus in the vicinity to MAX IV and ESS.

On behalf of all of us at NanoLund, I would like to say Thank You to our very many supporters who make all of this possible: our funders, the university and regional leaders as well as industry representatives and our international collaborators and colleagues. We are very much looking forward to continuing our exciting journey together with you.

HEINER LINKE
NANOLUND DIRECTOR

ORGANISATION

HOW NANOLUND IS SET UP

NanoLund is a truly crossdisciplinary research center, engaging in total more than 300 scientists, teachers and staff from more than 20 divisions over three faculties - Engineering (LTH), Science and Medicine.

The NanoLund Management is led by an **Executive Group** with responsibility for day-to-day management and long-term planning.
NanoLund is organized into six research areas:

- **Materials Science**
- **Quantum Physics**
- **Nanoelectronics & nanophotonics**
- **Nanoenergy**
- **Nanobiology & nanoneuroscience**
- **Nanosafety**

The scientific work is enabled and supported by four key resource areas, namely: Lund Nano Lab (LNL), Lund Nano Characterisation Labs (LNCL), Nanoeducation and Nanovation.

Each research- and resource area has a coordinator and a co-coordinator, who have important roles in prioritizing activities and developing strategic aims.

NanoLund is headed by a **Board**, which takes strategic and formal decisions.

The center is advised by an international **Scientific Advisory Board** and by an **External Advisory Council** from society, academia and industry.

From 2016-2020 NanoLund works with the following long-term strategic aims:

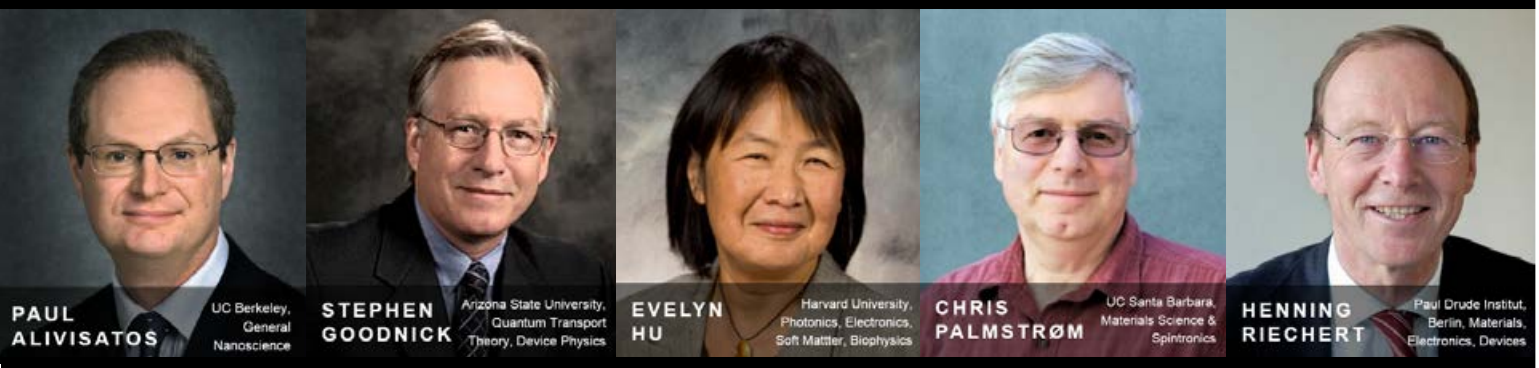
Highly controlled nanostructures
To realize, model and characterize nanostructures, devices and systems with atom-level control.

Fundamental science for future devices
To discover fundamental physics, materials science and paradigms that may lead to future energy and ICT devices with enhanced performance.

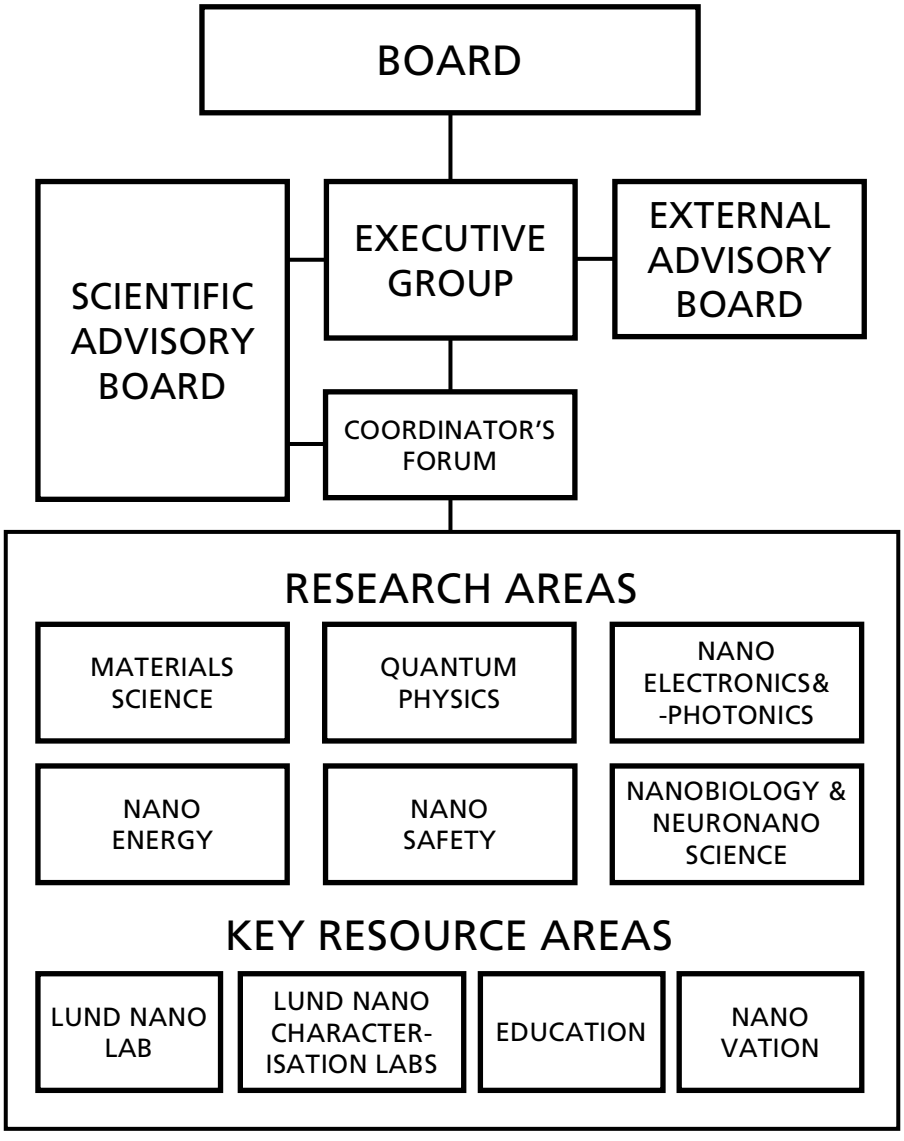
Tools for single-cell biomedicine
To develop sensors, probes, stimulators and single-molecule methods for single- and few-cell biomedicine.

A Great Place to do Nanoscience
To be an internationally highly visible nanoscience center that offers exceptional scientific opportunities, training and career development.

Nanomaterials industry
To establish an ecosystem that integrates education, research, R&D and pilot production to take ideas from research to the marketplace.



NANOLUND 2016 SCIENTIFIC ADVISORY BOARD



NanoLund Board Members:
Viktor Öwall (Chair), Dean, LTH
Ulf Karlsson, Professor, Linköping U.
Frida Lindberg, Student rep.
Heiner Linke, Director, NanoLund
Sara Linse, Science faculty
Camilla Modéer, IVA
Stephanie Reimann, LTH
Regina Schmitt, Student rep.
Jens Schouenborg, Medical faculty
Reine Wallenberg, LTH
Tord Wingren, Huawei

Executive Group:
Heiner Linke (Director)
Lars Samuelson (Vice-Director)
Anneli Löfgren (Co-Director)
Anders Mikkelsen (Co-Director)

External Advisory Board:
Camilla Modéer (Chair), IVA
Ola Asplund, IF Metall
Sarah Fredriksson, Genovis AB
Peter Honeth, former State Secretary
Ulf Karlsson, Linköping University
Ilmar Reepalu, Region Skåne
Tord Wingren, Huawei

Coordinator's forum:
Consists of: Executive group (4), Chair of the Board, 20 area coordinators and co-coordinators and 2 student representatives to the Board

RESEARCH

2016 METRICS

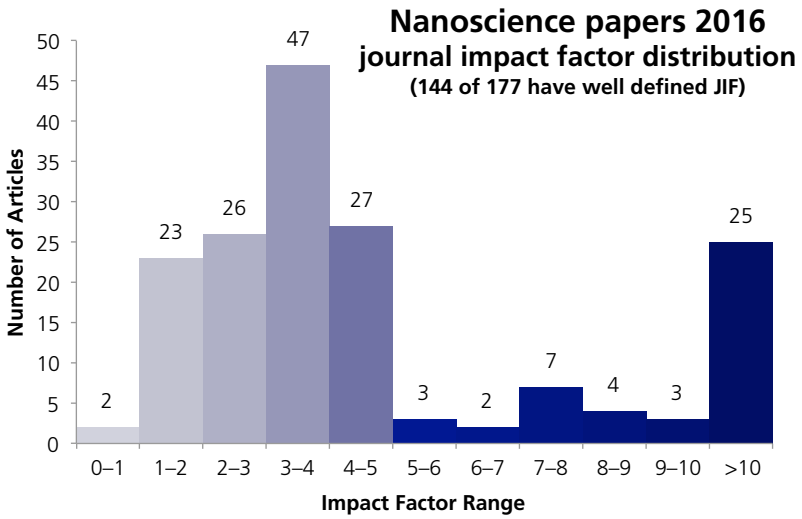
62	Members (Group Leaders, Teachers and Managers)
21	Affiliated Members
311	Publications in total by members, of these
177	specifically in Nano-science, and of these
25	with journal impact factor (JIF) > 10
11	Papers in Nature, Nat. family, Science & PNAS
10	Nano Letters
25	Conference Papers
24	PhD Dissertations
5.6	Average impact factor (144 of 177 publications have a well-defined JIF)

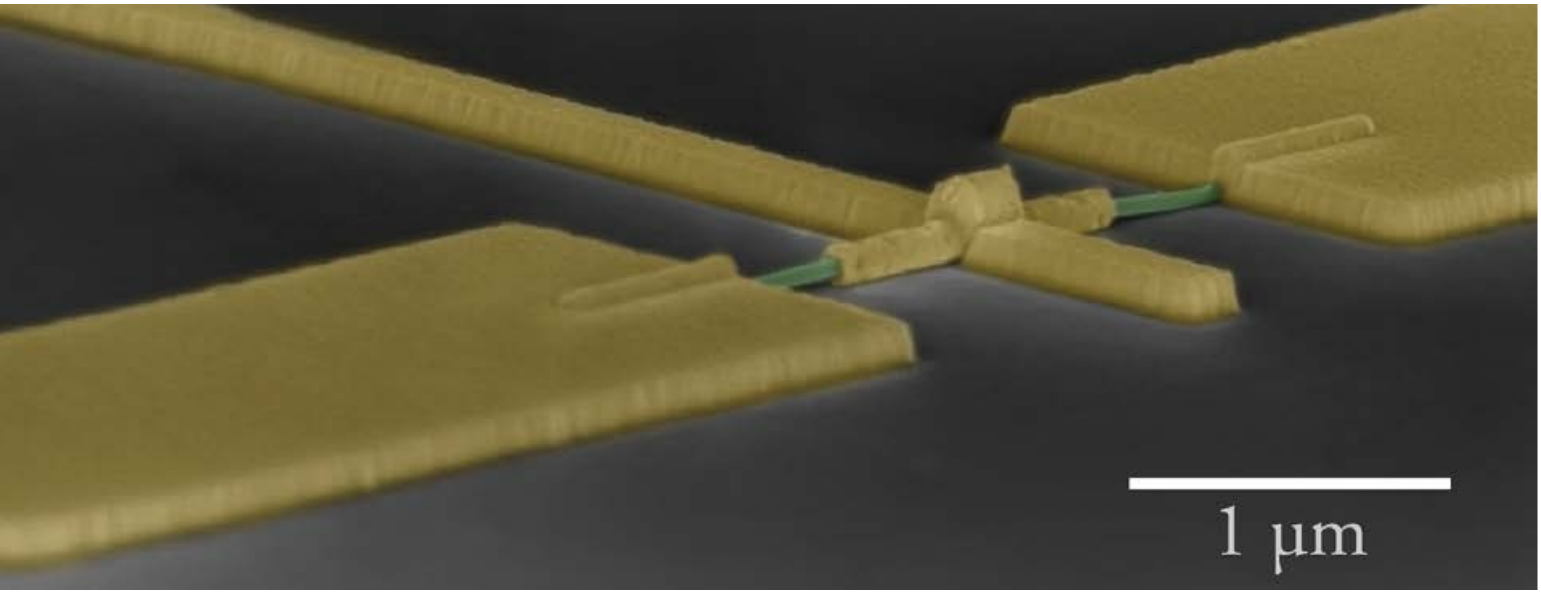
SCIENTIFIC PROGRESS

Scientific publications are the culmination of our core activities. In 2016, our numbers have grown, most significantly with an influx of post-docs (an increase of 49% over last year) and PhD students (a 17% increase over last year). This is a reflection of the success of proposals in the previous years.

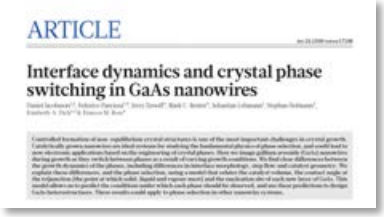
NanoLund members continue to publish at the forefront of nanoscience, with just over 14% of publications relevant to nanoscience in 2016 being published in journals with a journal impact factor larger than 10. The bibliometrics of Nano-Lund in the field of nanowires has for many years been on a par with the other world-leading research centres at UC Berkeley and Harvard.

We are very proud of our 24 PhDs graduated in 2016 and wish them all a brilliant career.





PUBLICATION HIGHLIGHTS OF THE YEAR


ARTICLE

Interface dynamics and crystal phase switching in GaAs nanowires

NATURE NanoLund PI: *Kimberly A. Dick*
doi:10.1038/nature17148

Interface dynamics and crystal phase switching in GaAs nanowires

Controlled formation of non-equilibrium crystal structures is one of the most important chal-lenges in crystal growth. Catalytically grown nanowires are ideal systems for studying the fundamental physics of phase selection, and could lead to new electronic applications based on the engineering of crystal phases. Here we image gallium arsenide (GaAs) nanowires during growth as they switch between phases as a result of varying growth conditions. We find clear differences between the growth dynamics of the phases, including differences in interface morphology, step flow and catalyst geometry. We explain these differences, and the phase selection, using a model that relates the catalyst volume, the contact angle at the trijunction (the point at which solid, liquid and vapour meet) and the nucleation site of each new layer of GaAs. This model allows us to predict the conditions under which each phase should be observed, and use these predictions to design GaAs heterostructures. These results could apply to phase selection in other nanowire systems.


Analytical Methods

ANALYTICAL METHODS COVER STORY NanoLund PI: *Jonas Tegenfeldt*
doi:10.1039/C6AY00443A

Simplifying microfluidic separation devices towards field-detection of blood parasites

The front cover of the April 28th issue of Analytical Methods is decorated by a picture from an article by NanoLund researchers reporting a new simple design for enrichment of blood parasites from a sample of blood.

An important challenge in combating infectious disease is rapid diagnosis. This can be solved by for example direct observation of the responsible pathogens. However, in many diseases the pathogens appear at a very low concentration making enrichment essential for the successful detection. The study shows a design based on advanced multilayer SU8 processing to sort and enrich parasites based on their shape and size from blood. This opens up for improved diagnosis of parasite-borne disease such as sleeping sickness.

2016 SELECTED HIGHLIGHTS PER RESEARCH AREA

MATERIALS SCIENCE

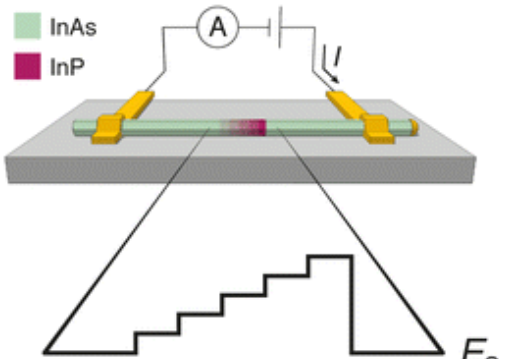
Subareas:

- Controlled fabrication of advanced nanostructures
- Characterisation and properties
- Developing new processes and applications

Coordinator & Co-coord.:

Reine Wallenberg
Maria Messing

Working in the pirority **"Highly controlled nano-structures"**, we published on the experimental realisation of very precise lateral control of the composition of 1D nanowires to realize graded, "ratchet"-like heterostructure energy barriers. The devices show clear rectifying behaviour and open the door to new types of experiments.



Designed Quasi-1D Potential Structures Realized in Compositionally Graded $InAs_{1-x}P_x$ Nanowires
Nano Lett. **16**, 1017 (2016)

QUANTUM PHYSICS

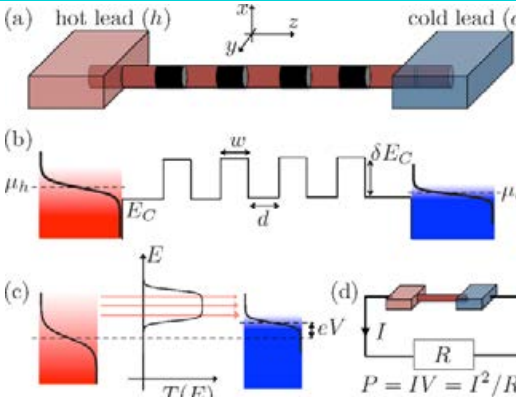
Subareas:

- Transport Physics
- Quantum Information
- Optical Physics

Coordinator & Co-coord.:

Stephanie Reimann
Niklas Sköld

One focus in the area of quantum physics is on thermodynamics and energy conversion at the nanoscale. We published a theoretical investigation of nonlinear ballistic thermoelectric transport in a superlattice-structured nanowire, showing that the efficiency can remain high even when operating at significant power.



Nonlinear thermoelectric efficiency of superlattice-structured nanowires
Phys. Rev. B, **94**, 115414 (2016)

NANOELECTRONICS AND PHOTONICS

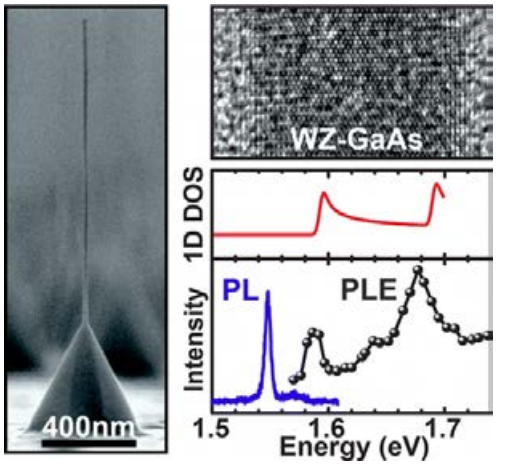
Subareas:

- Nanoelectronics
- Spin based devices
- Nanophotonics

Coordinator & Co-coord.:

Mats-Erik Pistol
Erik Lind

N. Vainorius et. al. set the stage for fabricating quantum dots with full 3D confinement with optical investigations of narrow (to 10 nm diameter), wurtzite GaAs nanowires. Combining photoluminescence excitation spectroscopy with transmission electron microscopy, we extracted electron and hole effective masses. Nano Lett. **16**, 2774



NANOENERGY

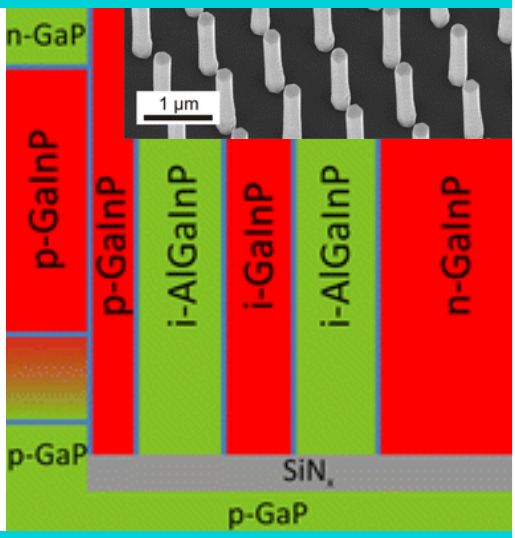
Subareas:

- Nanowire photovoltaics
- Light Emitting Diodes
- Nanothermodynamics

Coordinator & Co-coord.:

Magnus Borgström
Peter Samuelson

With LEDs based on radial quantum-well structures in the AlGaNP system, working in the priority "**Fundamental Science for future devices**", we demonstrated the application of materials science all the way to working device structures in a collaboration with researchers from Lyngby and Halmstad. Nano Lett. **16**, 656 (2016)



NANOSAFETY

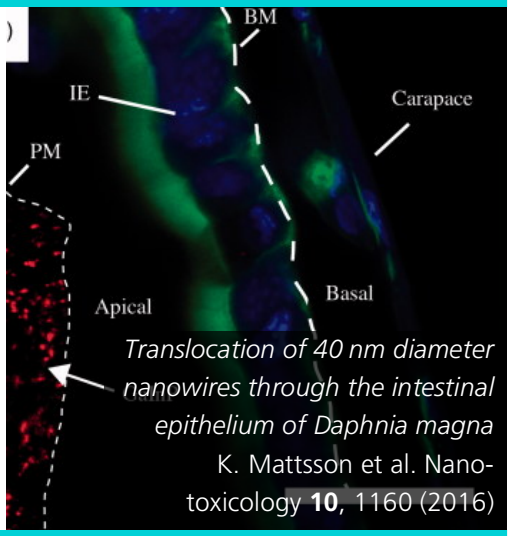
Subareas:

- Work place exposure to physiological effects
- Molecular mechanisms to effects on living cells
- Action mode to societal & environmental impact

Coordinator & Co-coord.:

Tommy Cedervall
Anders Gudmundsson

Apart from our initial work in establishing a NanoSafety Centre with the project "Small & Safe", we have evaluated the effect of NW diameter on the gut penetrance of NWs in Daphnia magna. Our results show that the feeding behavior of animals may enhance the ability of NWs to penetrate biological barriers.



Translocation of 40 nm diameter nanowires through the intestinal epithelium of Daphnia magna
K. Mattsson et al. Nanotoxicology **10**, 1160 (2016)

NEURONANOSCIENCE AND NANOBIOLOGY

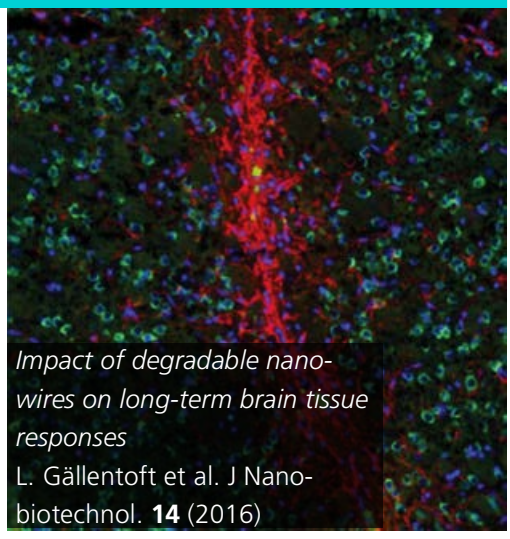
Subareas:

- Nanowires for interation with neurons
- Fundamental Cell-nanowire interactions
- Single-molecule and Single-cell biophysics

Coordinator & Co-coord.:

Jonas Tegenfeldt
Jens Schouenborg

As a part of our work in the priority "**Tools for single-cell biomedicine**", we investigated whether implanted degradable nanowires offer any advantage over non-degradable nanowires. SiOx-coated gallium phosphide nanowires and bio-stable hafnium oxide-coated GaP nanowires embedded in rat brains were compared in the study.



Impact of degradable nanowires on long-term brain tissue responses
L. Gällentoft et al. J Nanobiotechnol. **14** (2016)

SCIENTIFIC VISIBILITY AND COMMUNICATION

2016 SCIENTIFIC TALKS

87 Invited Talks

13 Keynote & Plenary

NanoLund members work hard to disseminate scientific results. In 2016 we have collectively been to at least 23 different countries disseminating our scientific work in nanoscience. A few notable talks are highlighted here.

2 INVITED TALKS
MRS Fall Meeting
Boston, USA

Magnus Borgström

Nanowire tandem solar cells and *Nanowires for high efficiency photovoltaics*

KEYNOTE TALK
INOW
in Munich, Germany

Lars Samuelson

Nanowire-based Materials for Optoelectronic Applications

INVITED TALK
APS March Meeting 2016
in Baltimore, USA

Heiner Linke

Reversible electron-hole separation in a hot-carrier solar cell

KEYNOTE TALK
APS March Meeting 2016
in Baltimore, USA

Peter Schurtenberger

Soft particles with anisotropic interactions

INVITED TALK
IMS 2016
San Fransisco, USA

Erik Lind

Nanoscale III-V FETs and NW Devices

INVITED TALK
IWN 2016
Orlando, USA

Maryam Khalilian

AlGaN Material Structures for UV-LEDs Based on Dislocation-Free GaN Platelets

INVITED TALK
XXV International Materials Research Congress
in Cancun, Mexico

Christelle Prinz

Interactions of semiconductor nanowires with living cells and tissues

Geographical distribution

- Invited Talks (size proportional to number)
- Keynote & Plenary Talks

INVITED TALK
Microfluidics Congress, London, UK

Thomas Laurell

Acoustic nanoparticle trapping and enrichment enables a rapid route to biomarker analysis in extracellular vesicles

PRIZE WINNER LECTURE
ICPS 2016 in Beijing, China

Kimberly Dick Thelander

Design of advanced one-dimensional semiconductor nanowire materials

INVITED TALK
ICPS 2016 in Beijing, China

Anders Mikkelsen

Scanning Tunneling Microscopy and Spectroscopy of III-V Nanowire Devices to the Atomic Scale and During Operation

INVITED TALK
CECAM worshop, Lugano, Switzerland

Sara Linse

Co-aggregation of amyloid peptides

KEYNOTE TALK
ASOMEA VIII in Okazaki, Japan

Joachim Schnadt

Ambient pressure XPS in the Real-Time Monitoring of Thin Film Growth

INVITED TALK
5th SMMSS International Conference, Perugia, Italy

Ivan Scheblykin

Luminescence of organo-metal-halide perovskites probed at micro- and nanoscales

INVITED TALK
Animal Vegetal Mineral-Boden Research Conference 2016 in Yallingup, Australia

Tommy Nylander

The non-lamellar lipid aqueous interface and biomolecular interactions

FUNDING

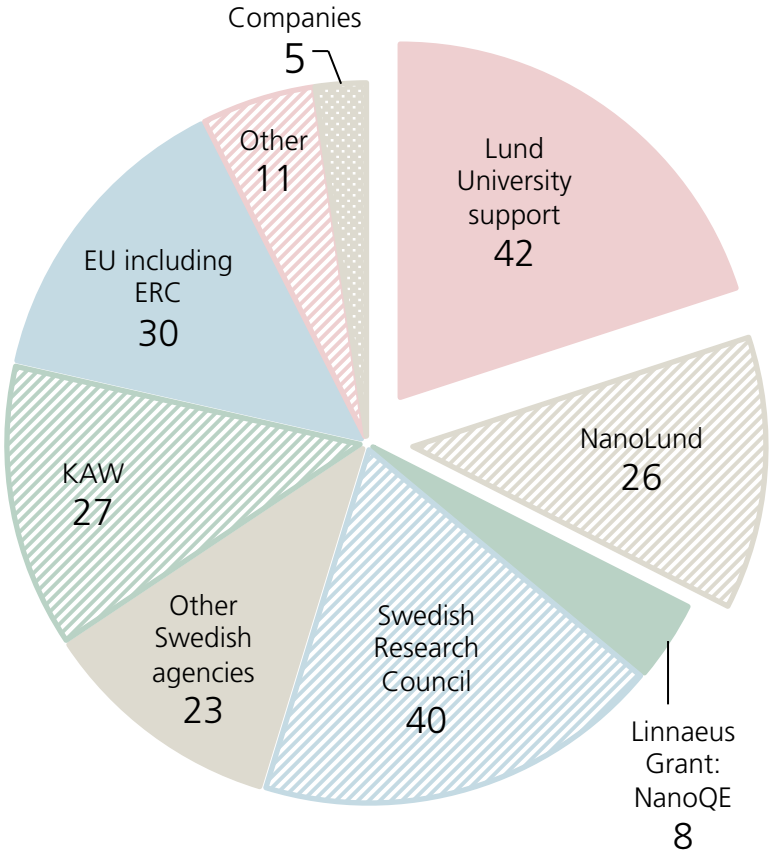
2016	INCOME IN MSEK
212	total income, of which
68	from the University and Strategic Research Area funding and
144	is external funding won in competitive calls. Breaking down the individual contributions there is about
40	from the Swedish Research Council (VR),
30	from EU H2020 funding including ERC,
27	from the Knut and Alice Wallenberg foundation (KAW),
23	from other Swedish funding organisations, SSF and The Swedish Energy Agency,
11	from other grants,
8	Linnaeus grant (NanoQE) &
5	from companies.

NANOLUND INCOME FOR 2016

Our funding comes from a wide range of national and international funding agencies. This ensures that our interdisciplinary environment has the necessary resources to conduct nanoscience research at the highest international standard.

The total income is evaluated as the income of members, weighted with their degree of participation in NanoLund.

NanoLund Incomes 2016 (MSEK)



A great big

THANK YOU

to those who fund our research!

EUROPEAN FUNDING

The NanoLund environment continues to apply for projects, individual funding, and to be active on a European level.

In 2016 members of NanoLund:

- Include 7 ERC awardees
- Participate in 18 EU projects
- Coordinate 5 EU projects, and an MSCA Individual Fellowship

Also funding us are:

STINT
SFO
Carl Trygger
Hjärnfonden
KMA
Fysiografen
Jivestedts
Kocks
Magnus Bergvall
Segerfalk
Parkinsson
Hasselblad
Alzheimer

The Crafoord Foundation
ESTABLISHED BY HOLGER CRAFOORD IN 1980

European Commission
Horizon 2020
European Union funding
for Research & Innovation

INFRASTRUCTURE

Ivan Maximov, Coordinator of LNL

Maria Huffman, LNL Operations Manager

The Lund Nano Lab (LNL)

NanoLund is the host of and responsible for LNL, an open access state-of-the-art scientific nanofabrication facility. LNL trains about 100 students per year, is integrated in the national facility MyFab, and is also (together with nCHREM) part of the European NFFA-EUROPE distributed nanofoundry and nano-analysis infrastructure. LNL has an Epitaxy lab advanced tools for 'bottom-up' growth of III-V semiconductor epitaxial layers, and nanostructures. It also has a Process lab with the necessary tools for 'top-down' fabrication & characterization of nanostructures.

Key features of LNL are:

- Fabrication and analysis of nanometer-scale structures
- Integration between epitaxy and processing
- Open cleanroom facility for both academic research and companies
- 650 m^2 ISO 5-7 cleanrooms for cutting edge nanofabrication

myfab

nffa.eu
nanoscience foundries & fine analysis

2016 LNL STATS

57 085 Hours booked

147 Active users, of whom

125 are users from university, and

29 are commercial

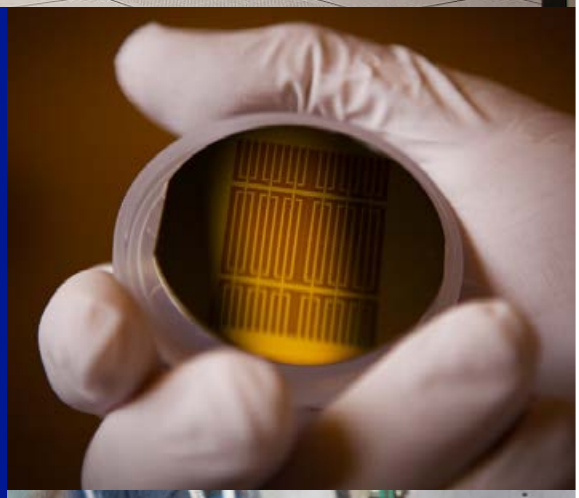
83 Total tools, of these

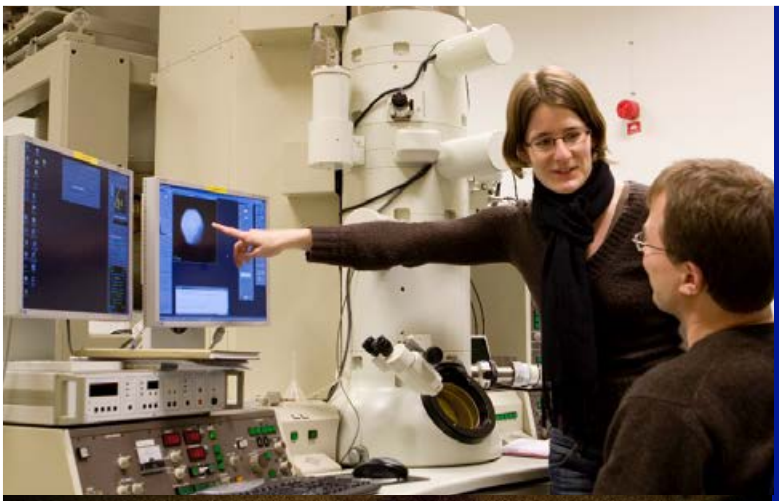
62 tools are bookable

2016 HIGHLIGHT

Tunnel Field-Effect Transistors that operate with a record subthreshold swing below the fundamental thermal limit of 60 mV/dec. (kT/q) were fabricated at LNL and the results presented at IDEM 2016. Transistor channels down to 11 nm diameter were demonstrated and further improvement in the etching technology currently provides currently 6 nm nanowires in transistor structures.

The transistors provide a drive current of about 10 µA/µm at Vds=0.3V, exceeding the values of state-of-the-art Si FinFET and SOI foundry technology at the 16 and 20 nm nodes, respectively. The technology is a key for the VR Research Environment Grant “Electronics beyond kT/q” granted to Lars-Erik Wernersson’s group at EIT which represents a large user grouping at LNL.





Reine Wallenberg, Manager nCHREM

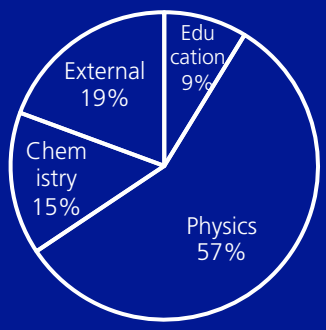
nCHREM - National Center for High-Resolution Microscopy

State-of-the-Art tools for Electron Microscopy

The facility is situated within the Chemical Center at Lund University. We offer expertise in imaging, element analysis, and sample preparation for a wide variety of sample types. The nCHREM also provides equipment for element analyses, specimen preparation, image calculation, processing and documentation, including equipment for plunge-freezing of liquids and cryogenic imaging. We have experience in problem solving and many industrial partners have used our expertise.

The facility has analysed all kinds of materials from biological samples to high-tech electronic chips. We also give advice how to best prepare samples and troubleshooting for other facilities.

USAGE STATS 2016



Lund Nano Characterisation Labs

NanoLund possesses an extremely wide range of world-class characterization techniques ranging from microscopes capable of single-atom imaging to facilities for telemetric monitoring of animals. These characterization laboratories are, in contrast from the Lund Nano Lab, distributed across Lund University.

NanoLund's interdisciplinary environment spans the departments of physics, chemistry, biology, medicine, and electrical engineering at Lund University. Researchers at these departments are involved in groundbreaking methodological developments in areas such as: electrical and optical nanocharacterization, ultra-fast laser spectroscopy, scanning probe microscopy, transmission electron microscopy, synchrotron-based imaging, spectroscopy and scattering, nanosafety, computational quantum chemistry, biocompatible nanoelectrodes, and many-body and transport theory.

Members of NanoLund are also users of major cutting-edge characterization facilities at Large scale Research infrastructures both in Lund and worldwide.

NEWS

NANOLUND AND PRONANO IN SCIENCE VILLAGE SCANDINAVIA

In 2016 NanoLund took the decision to abandon plans for the expansion of the Lund Nano Lab in its old location and instead **prospect a new research environment and lab in Science Village Scandinavia** (SVS) right between MAX IV and ESS in the Brunnshög area of Lund.

After MAX IV, NanoLund becomes one of the first research environments at Lund University to commit to a permanent presence in SVS.

As part of the effort, a co-location of the proposed ProNano nano pilot production facility is prospected alongside LNL.

EDUCATION

2016 ENGINEERING NANO-SCIENCE STATS

72	Undergraduate applicants with the Nanoscience programme as their first choice, of which
57	offered a place
19.64	Grade point average needed for high school students ("meritvärde", scale is 1-20)
1.45	Needed on national SAT equivalent (Swedish "hög-skoleprov", scale 0-2)
14	Licentiate degrees completed

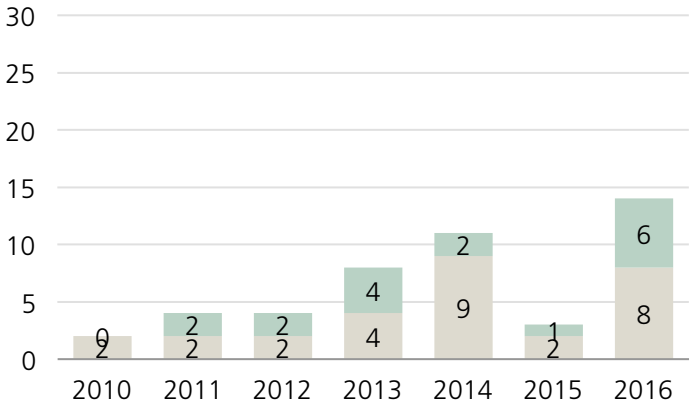
UNDERGRADUATE EDUCATION

The Engineering Nanoscience curriculum at LTH (Faculty of Engineering) is one of the few complete degree programmes in nanoscience in the world that starts at university entrance level and leads to a Master's degree. It was initated in 2003 by NanoLund scientists.

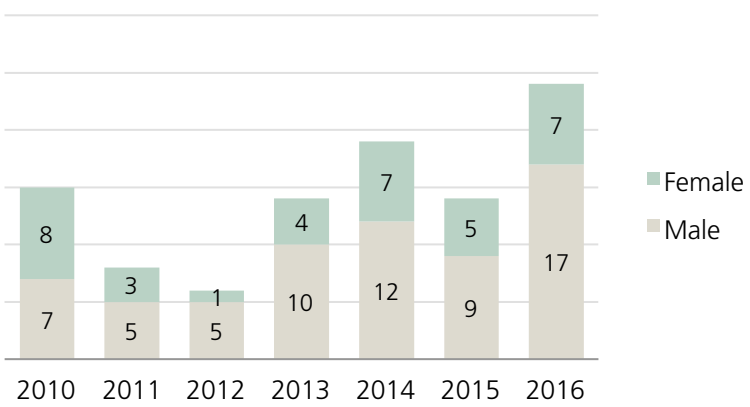
The programme is a unique symbiosis of education and research. Teaching is driven by high-level research activities in the field, and research benefits from the highly qualified graduates leaving the programme. It provides a holistic perspective of nanoscience, in which specially designed courses in biology, biochemistry and medicine broaden the foundation provided by subjects such as physics, maths and chemistry.

The number of applicants has been roughly steady (fluctuating with about ±8 persons) since 2010 when the modern programme was instigated.

NanoLund Lic. theses 2010-2016



NanoLund PhD Theses 2010-2016



GRADUATE EDUCATION

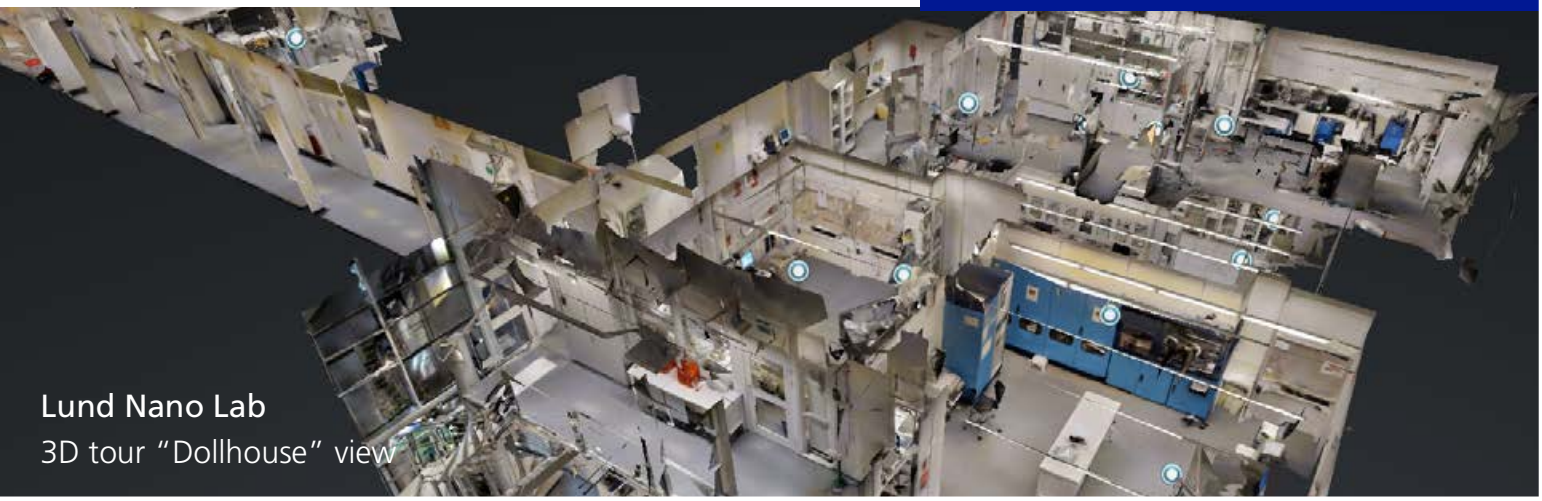
NanoLund is Sweden's largest research environment for interdisciplinary nanoscience and nanotechnology, engaging more than 120 PhD students in sciences ranging from engineering to natural sciences and medicine. PhD students constitute roughly 1/3 of the staff engaged in NanoLund and are an important and integrated part of the research conducted. At the bottom of the opposite page are the trends for completed licentiate and doctorate theses from 2010, with gender specific statistics.

OUTREACH

NanoLund members perform many outreach activities during the year apart from the visibility garnered by press releases propagating on the internet. Some of the most important of these are popular science talks and outreach to the public, local schools and our undergraduate recruitment base. Below is a representation of a 3D interactive tour of lab facilities used in demonstrations.

2016 OUTREACH STATS

74	Online appearances in articles and newsitems
36	Popular science talks,
13	of which in high schools
7	News Articles
5	Exhibitions
3	Pop. Sci. Articles
3	Debate Articles
2	Videos
1	Book Chapter



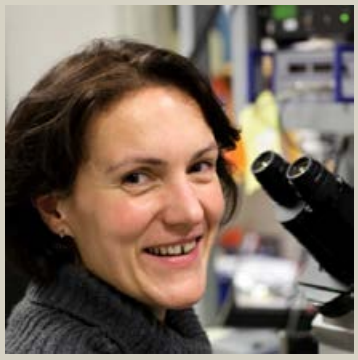
Lund Nano Lab
3D tour "Dollhouse" view

2016 SELECTED NEWS, EVENTS AND AWARDS

IUPAP AWARD
2016-08-05

Kimberly Dick Thelan-der was awarded the IUPAP Young Scientist Prize in Semiconductor Physics at ICPS2016 in Beijing, China

Kimberly was awarded a Young Scientist Prize and also presented a prize lecture on "*Design of advanced one-dimensional semiconductor nanowire materials*" in a plenary session of ICPS2016 dedicated to the prize winners. In the words of the committee she was awarded the prize: "for her work to control and understand growth of nanowires, including three-dimensional structures, superlattices, crystal phase engineering and bandgap design".

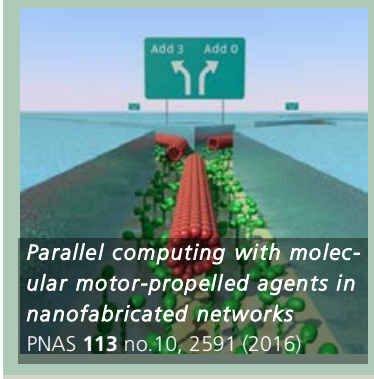


ERC GRANT
2016-02-22

Christelle Prinz was granted an ERC Consolidator grant of 2.62 M Euro for 5 years. The amount includes funds for acquiring a STED microscope. The project named *Nano-Pokers* aims at studying cell heterogeneity in tumours using nanowire arrays.

NEW PROFESSORSHIP
2016-02-18

February 18th the Vice-Chancellor appointed Magnus Borgström Professor in Materials Science with specialization in epitaxy.



Parallel computing with molecular motor-propelled agents in nanofabricated networks
PNAS **113** no.10, 2591 (2016)

COMPUTING WITH MOLECULAR MOTORS
2016-04-19

A computer with nanofabricated channels explored by protein filaments propelled by molecular motors correctly found all possible solutions to a combinatorial problem in parallel using less energy than todays computers.

AVS FELLOW
2016-06-23

Anders Mikkelsen has been elected a fellow of the American Vacuum Society (AVS) the oldest microelectronics processing, materials, technology and interfaces community in the world.

MSW 2016 IN LUND
2016-05-17

Lund University is hosting the The Micronano Systems Workshop 2016. It is chaired by Jonas Tegenfeldt from NanoLund. The highly interdisciplinary conference covers a wide range of topics from fundamentals to applications.

FUNDING FOR ACCONEER
2016-12-19

Lund Nano Lab user Acconeer AB has raised 60 million SEK in equity during the summer, Rapidus reports. About 60% of the money comes from new investors. The new investment is expected to last until a full scale production is running.

RAITH EBL WORKSHOP
2016-12-19

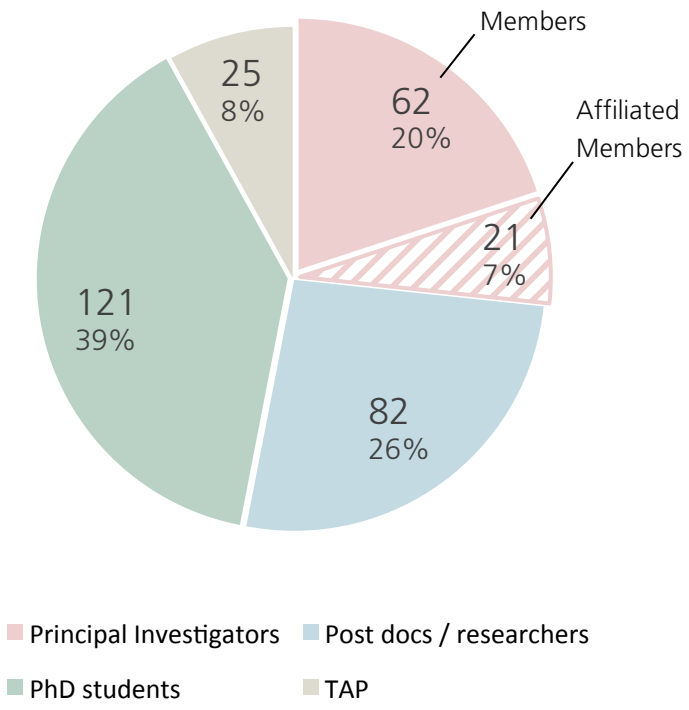
Raith and Lund Nano Lab organized a two-day workshop on applications of electron beam lithography (EBL) in nano-electonics, bio-physics, photonics and X-ray optics. The WS included hands-on sessions with the Raith Voyager EBL installed at LNL.

NANOMAX AT MAX IV
2016-12-19

NanoMAX is a flagship beamline of MAX IV that will allow experiment using nano-focused hard X-rays to look inside complete photovoltaic structures during electrical operation or syntheses. Resolution better than 50 nm has already been demonstrated.

PEOPLE

People per personnel category 2016



PERSONNEL & MEMBERSHIP

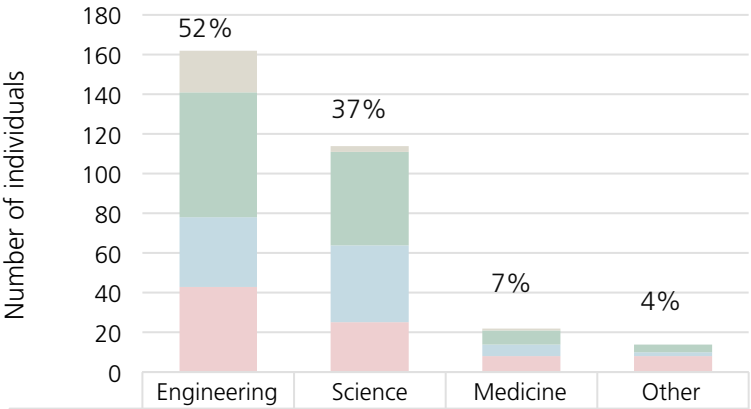
There has been a significant increase in this year in the number of Postdocs (+49%) and PhD students (+17%), a direct reflection of increased external funding to NanoLund research. Meanwhile the number of PIs and their average participation in NanoLund (just over 50%) has remained steady. We find this a sign of health - that scientific programmes are expanding while the scope is well focused.

GENDER BALANCE

NanoLund strives for gender balance and being a diverse and inclusive workplace. Current stats:

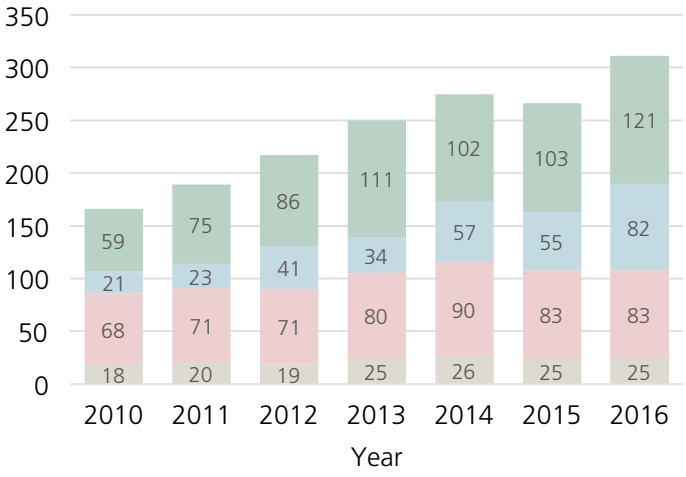
Members:	**23% women**	**77% men**
Postdocs:	**27% women**	**73% men**
PhD stud.:	**40% women**	**60% men**

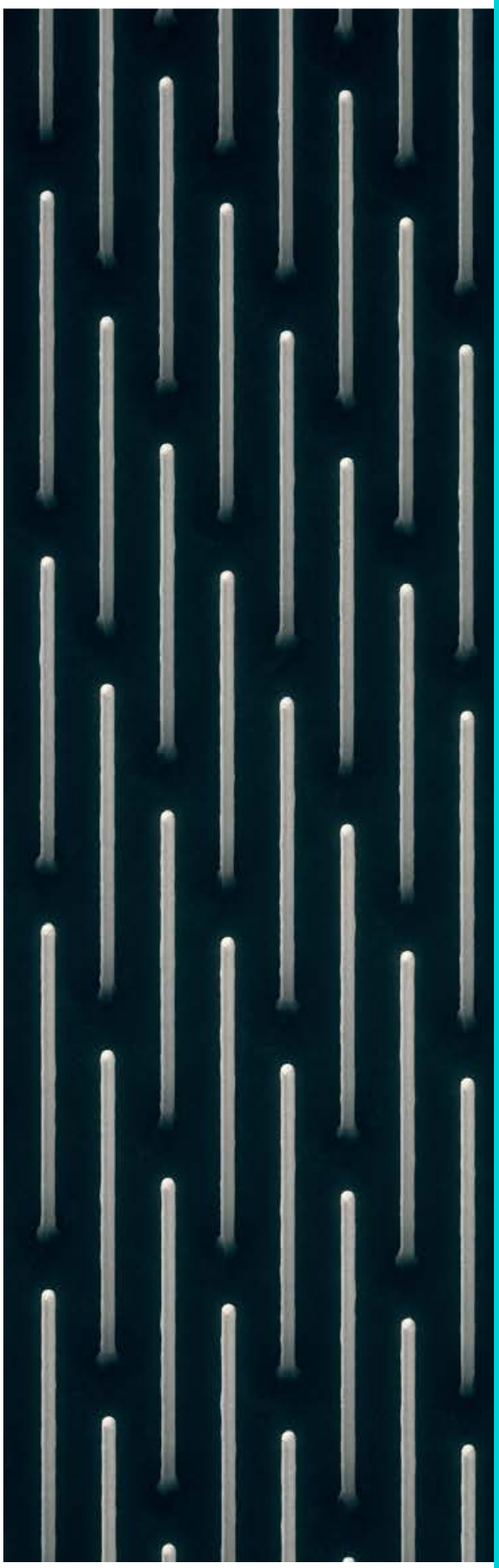
NanoLund people by faculty, 2016



	Engineering	Science	Medicine	Other
TAP	21	3	1	0
PhDs	63	47	7	4
Post docs	35	39	6	2
Pis	43	25	8	8

Personnel trends 2010-2016





INFO

This is the 2016 Annual report for the NanoLund research environment at Lund University presenting scientific, educational, outreach and public impact highlights, progress, data and trends for and up to 2016.

This report is based on material and data compiled and edited by the staff of NanoLund, in particular:

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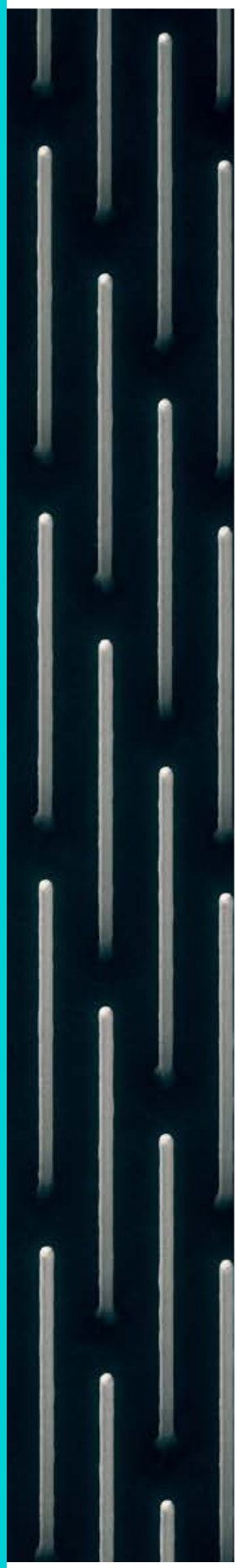

LUND UNIVERSITY

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