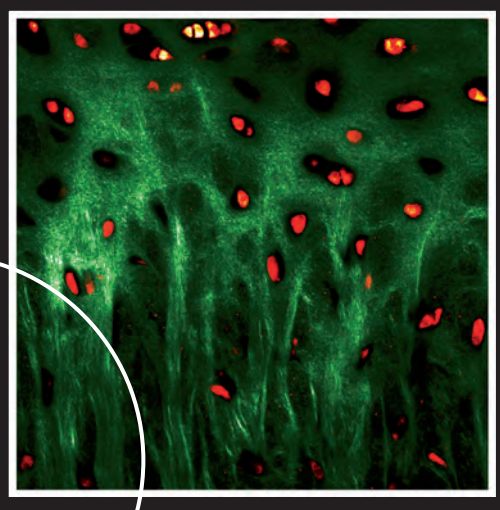
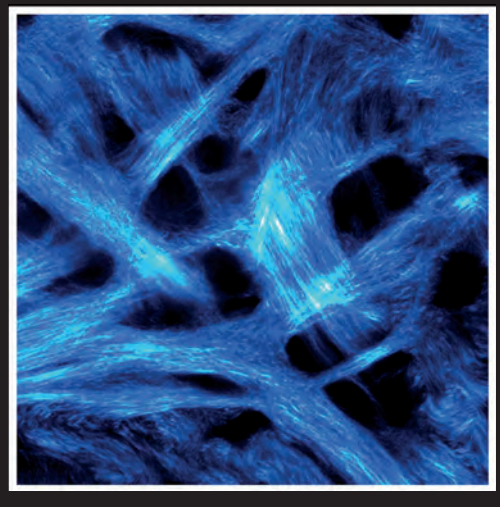
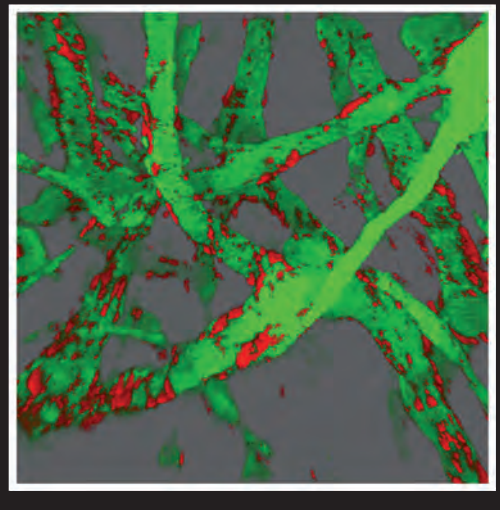


Department of Physics

Annual Report 2011





NTNU
Norwegian University of Science and Technology

DEPARTMENT OF PHYSICS, NTNU

Høgskoleringen 5, 7491 Trondheim, Norway

Phone: +47 73593478
Fax: +47 73597710
E-mail: postmottak@phys.ntnu.no

Head of the Department:	Professor Asle Sudbø
Deputy Head of the Department:	Professor Randi Holmestad Associate Professor Jon Andreas Støvneng
Head of Administration:	Sylvi Vefsnmo / Tove G. Stavø
Head of Technical Staff:	Per Magne Lillebekken

Departmental Board

Elected members:

Head of the Department	Professor Asle Sudbø
Representing the permanent scientific staff	Associate Professor Dag Breiby
Representing the temporary scientific staff	Research Scientist Lars Erik Walle Doctoral Student Paul Letnes
Representing the technical/administrative staff	Head Engineer Per Magne Lillebekken
Representing the students of the Department	Student Cecilie Granerød Student Henrik Vikøren Student Aksel Jan Vestby
Appointed external members:	Research Manager Jostein Mårdalen, SINTEF Petroleum Research
	Professor Lisa Lorentzen, NTNU, Department of Mathematical Sciences

COVER PAGE:

The top image shows cartilage with cartilage cells (red) and collagen (green).
The middle image shows cartilage where collagen is depicted by the second harmonic signal.
The lower image shows blood vessels (green) with the nanoparticles (red) bound to the vessel wall.

Illustration: Magnus B. Lilledahl and Sjoerd Hak, Institutt for fysikk, NTNU.

DEPARTMENT OF PHYSICS, NTNU

www.ntnu.no/fysikk

CONTENTS

Edited by:
Eli Ljøkelsøy Monsøy, Peder Brenne, Aud Lise Kulseth og Asle Sudbø

The Annual report is also available on the internet address:
www.ntnu.no/fysikk/arsrapport

STAFF

Head of Department:
Professor Asle Sudbø

Deputy Head of Department:
Professor Randi Holmestad
Ass. Prof. Jon Andreas Støvneng

PERMANENT STAFF

SCIENTIFIC STAFF:

Professors
Jens Oluf Andersen, Anne Borg, Arne Brataas, Catharina de Lange Davies, Patrick Joseph Espy, Jon Otto Fossum, Ursula Gibson, Alex Hansen, Randi Holmestad, Johan Skule Høye, Michael Kachelriess, Morten Kildemo, Mikael Lindgren, Tore Lindmo, Thor Bernt Melø, Arne Mikkelsen, Jan Myrheim, Kalbe Razi Naqvi, Kåre Olaussen, Steinar Raaen, Ingve Simonsen, Bo-Sture Skagerstam, Irina Sorokina, Bjørn Torger Stokke, Arne Valberg.

Associate professors
Berit Bungum, Dag Werner Breiby, Antonius van Helvoort, Robert E. Hibbins, Jacob Linder, Ragnvald Mathiesen, Jonas Persson, Pawel Tadeusz Sikorski, Marit Sletmoen, Knut Arne Strand, Jon Andreas Støvneng, Erik Wahlstrøm, Turid Worren Reenaas, Ingjald Øverbø.

Adjunct professors
Kenneth Dahl Knudsen, Einar Rofstad, Roger Sollie, John Walmsley, Tor Wøhni.

TECHNICAL AND ADMINISTRATIVE STAFF:

Head of Administration
Sylvi Vefsnmo/Tove Stavø

Administrative staff
Snorre Hansen, Inger Synnøve Kosberg,
Inger Johanne Bjørnerud Lian, Eli Ljøkelsøy Monsøy, Tove Gudny Stavø.

Head of Tecnical staff
Per Magne Lillebekken

Technical staff
Irene Aspli, Astrid Bjørkøy, Ole Tore Buset, Knut Reidar Gjervan, Oddbjørn Grandum, Tor Jakobsen, Dagfinn Johnsen, Erling Kristiansen, Lise Kvalø, Gjertrud Maurstad, Arne Moholdt, Jon Ramlo, Inge Sandaunet, Daniel Skåre, Bjørn Gunnar Soleim, Bertil Olaf Staven, Kristin Grendstad Sæterbø.

TEMPORARY STAFF:

Post doc/research scientist
Mohamed Asbahi, David Barriet, Swarnali Bandopadhay, Ruben Bjørge, Vladislav Dvoyrin, Flemming Ehlers, Song Fei, Davi Fonseca, Kamila Gawel, Kristin Høydalsvik, Sylvie Lélu, Heng Li, Magnus Borstad Lilledahl, Jérôme Maria, Wajira Mirihanage, Florian Mumm, Yrr Mørch, Sergey Ostapchenko, Katarzyna Maria Psonka-Antonczyk, Alireza Qaiumzadeh, Nina Reitan, Zbigniew Rozynek, Santanu Sinha, Bjørn Skjetne, Ragnhild Sæterli, Nikolai Tolstik, Dung Trung Tran, Bao-Xiang Wang, Lars Erik Walle, Justin Wells, Minli Xie, Seoung Shan Yap, Xiaodong Yang, Min Zhou.

Doctoral students
Mercy Afadzi, Mohammad Alidoust, Sigrun Saur Almberg, Arturo Amador, Nina Bjørk Arnfinnsdottir, Kai Muller Beckwith, Troels Arnfred Bojesen, Roya Dehghan, Teferi Demissie, Marianne Daae, Siv Eggen, Marius Eidsaa, Pål Gunnar Ellingsen, Henrik Enoksen, Bjørn-Tore Esjeholm, Morteza Esmaeili, Mari Helene Farstad, Vidar Tonaas Fauske, Vasco Rafael Povoa Fernandes, Jostein Bø Fløystad, Ming Gao, Amund Gjerde Gjendem, Knut Gjerden, Håvard Granlund, Arne Løhre Grimsmo, Morten Grøva, Kjetil Magne Dørheim Hals, Elisabeth Lindbo Hansen, Leif Ove Hansen, Yngve Hofstad Hansen, Håvard Haugen, Kristin Haugstad, Henrik Hemmen, Egil Vålandsmyr Herland, Jon Holmestad, Sigmund Mongstad Hope, Lars Husdal, Armen Julukian, André Kapelrud, Hanne Kauko, Rashid Khan, Dmitry Klimentov, Jacob Berent Kryvi, Iryna Kulagina, Lars Kyllingstad, Lars Erlend Leganger, Paul Anton Letnes, Fredrik Aleksander Martinsen, Maryam Gholami Mayani, Hanne Mehli, Magnus Strøm Mellingsæter, Åsmund Fløystad Monsen, Astrid Marie Muggerud, Florian Mumm, William Naylor, Mohammadreza Nematollahi, Kjetil Liestøl Nielsen, Ingar Stian Nerbø, Kenate Nemera Nigussa, Magnus Nord, Tor Nordam, Amna Noreen, Magnus Østgård Olderøy, Anna Maria Padol, Neelam Panjwani, Andreas Lønning Reiten, Zbigniew Rozynek, Jan Rødal, Severin Sadjina, Takeshi Saito, Rishi Ram Sharma, Tatyana Sherstova, Iver Bakken Sperstad, Einar Stiansen, Arne Stormo, Sedsel Fretheim Thomassen, Malin Torsæter, Jelena Todorovic, Erlend Grytli Tveten, Asle Heide Vaskinn, André Vogt, Sigurd Wenner, Lars Martin Sandvik Aas.

PROFESSOR EMERITI:
Johannes Falnes, Kristian Fossheim, Eivind Hiis Hauge, Per Christian Hemmer, Ola Hunderi, Anders Johnsson, Jørgen Løvseth, Tore Høe Løvaas, Frode Mo, Kjell Mork, Emil J. Samuelsen, Svein Sigmond, Helge R. Skullerud, Arne Valberg.

ACCOUNTS 2011

	Amount kNOK
GOVERNMENT UNIVERSITY FUNDING (including NTNU strategy projects)	**87 453**

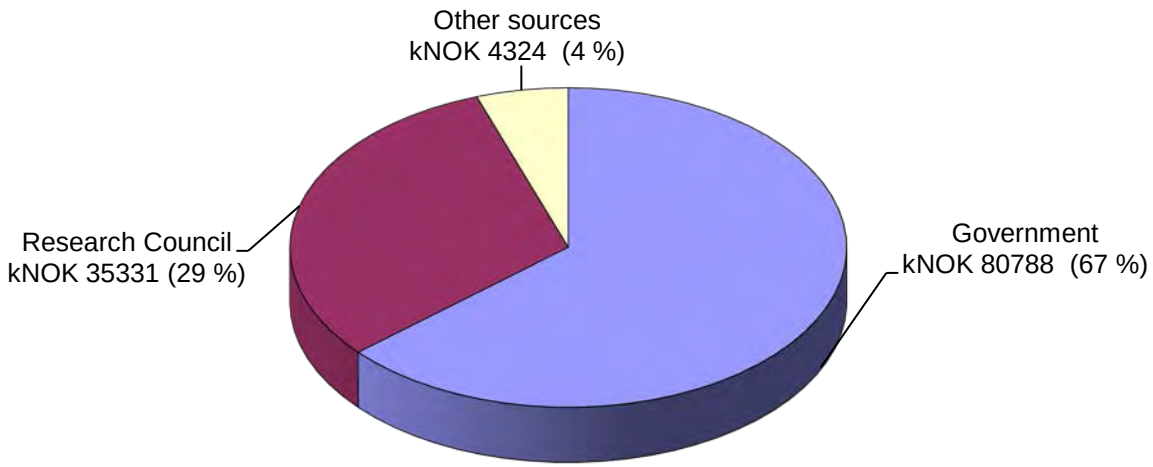
PROJECTS FINANCED BY THE RESEARCH COUNCIL OF NORWAY

Project	Project manager	Amount kNOK
Preparatory project: Norwegian participation in MAX IV	Borg Anne	101
Understanding catalytic effects i Pd alloy model systems	Borg Anne	828
Fundamentals of Nanoscale Systems	Brataas Arne	178
Fundamentals of Condensed Matter	Brataas Arne	736
ColdWear	Breiby Dag Werner	833
Towards nanoscale 3D imaging of working catalyst nanoparticles	Breiby Dag Werner	1 498
Norwegian Molecular Imaging Consortium	Davies Catharina	288
Gravity-wave sources and scales in the Polar Regions	Espy Patrick Joseph	743
Interconnected Physical Phenomena	Fossum Jon Otto	659
Complex systems and soft materials	Fossum Jon Otto	1 531
Sorption and Migration of CO2 in Porous Media	Fossum Jon Otto	4 752
Prosess for produksjon av solceller. NTNU Discovery	Gibson Ursula	73
Role of Bursts in Fracture Front Propagation	Hansen Alex	533
Stimulated production: Steady and NonSteady State	Hansen Alex	1 800
Efficient CO2 Absorption in Water-Saturated Porous Media	Hansen Alex	2 682
Norway-Canada Research Collaboration on MBE and PLD	Hansen Alex	62
Fracture propagation, INDNOR	Hansen Alex	25
Nanosolar	Helvoort Antonius van	636
Modelling towards Value-added Recycling Friendly Aluminium Alloys	Holmestad Randi	620
Kimdanningskontroll for Optimaliserte Egenskaper	Holmestad Randi	844
Fundamental investigations of Solute Clustering and Nucleation of Precipitation	Holmestad Randi	264
SUP -Improvement	Holmestad Randi	223
Norwegian-Japanese Al-Mg-Si Alloy	Holmestad Randi	2 204
Multiscale modelling of hardening precipate interfaces in alloy design	Holmestad Randi	1 356
Fundamental understanding of catalyst nanoparticles by atomic scale chemical imaging	Holmestad Randi	658
Clinical applications of multiphoton microscopy	Lilledahl Magnus Borstad	920
Spin- and charge flow in novel materials	Linder Jacob	193
The mechanisms of photoprotection in natural and artificial photosynthetic systems	Naqvi Kalbe Razi	762
Probing the soyrces of ultrahigh-energy cosmic rays	Kachelriess Michael	755
Nanomaterials for 3rd Generation Solar Cells	Reenaas Turid Worren	1 041
FME SOL - Norwegian Research Centre for Solar Cell Technology	Reenaas Turid Worren	7 728
Socially Robust Solar Cells, SoRoSol	Reenaas Turid Worren	124
Nanoscale Control of Mineral Deposition within Polysaccharide Gel Networks	Sikorski Pawel	1 041
Ultra-short pulsed Tm-doped fiber laser systems	Sorokina Irina	2 494
Marine Laser Radar, MARTEK	Sorokina Irina	152
Biopolymer Engineering, KMB	Stokke Bjørn Torger	245
Responsive (bio)polymer matrices as Fabry-Perot	Stokke Bjørn Torger	1 039
IKT-Oxides	Sudbø Asle	45
Point Contact Investigations	Wahlstrøm Erik	186
Magnetodynamics of Nanostructured Metal Oxides	Wahlstrøm Erik	1 829
Aurora, French-Norwegian researcher cooperation	Several	49
	Sum	**42 730**

CONTRIBUTION FROM OTHER FINANCIAL SOURCES			
Contributors	**Project name**	**Project manager**	**Amount kNOK**
SIU	PhD Programme	Andersen Jens O., Kachelriess Michael	60
EU FP7	Magneto Caloritronics	Brataas Arne	2 204
Sør-Trøndelag Fylkeskommune	Force-in-Action	Bungum Berit	4
Nordforsk	Nordic Science Education Network	Bungum Berit	354
Kreftforeningen	Transport av terapeutiske makromolekyl i tumorvev	Davies Catharina de Lange	32
Nordforsk	Nordic Network in Soft matter Physics	Fossum Jon Otto	51
Statoil	Prof II, Roger Solli	Head of Department	154
Statens Strålevern	Prof II, Tor Wøhni	Head of Department	127
IFE	Prof II, Kenneth Knudsen	Head of Department	134
IFE	PCT2	Head of Department	21
Nordiske Fond	NorTEMnet	Holmestad Randi	228
EU FP7	C2CR - High Energy Interactions	Kachelriess Michael	422
SIU, NUFU-allocation	Spatial and Seasonal variation in solar radiation	Kjeldstad Berit	661
EU FP7	Luminescent polymers for in vivo imaging of amyloid signatures	Lindgren Mikael	1 286
EU FP7	MIntWeld - Modelling of Interface Evolution in Advanced Welding	Mathiesen Ragnvald	1 021
ESA	XRMON	Mathiesen Ragnvald	6
Norgesuniversitetet	IKT-baserte laboratorieøvelser og animasjoner i fjernundervisning i fysikk	Persson Jonas	60
Nordic Energy Research	Nordic Centre of Excellence in Photovoltaics	Reenaas Turid Worren	320
SINTEF	XPS-analyse	Raaen Steinar	107
NTNU sentralt	Posisjoneringstiltak EUs 7 RP	Kildemo Morten	94
		Sum	**7 346**

Total external accounts in 2010	**50 076**

Total financing in 2011 (kNOK)



AWARDS

Eirik Eik Svanes – Student of the year

Former student at the Department of Physics, Eirik Eik Svanes, was awarded by Ragnar and Winnie Mathisens University College Fund for best graduated engineer student at NTNU.

Turid Worren Reenaas best team builder in 2011

At the 2011 graduation ceremony, the Faculty of Natural Sciences and Technology honors and award one staff member who has drawn attention as a team builder. In 2011 Turid Worren Reenaas was – most deservingly – awarded for her efforts to promote good team spirit.

Prize for younger scientist to PhD Simen Andreas Ådnøy Ellingsen

I. K. Lykkes Pris for Yngre Forskere 2011 (I.K. Lykkes Prize for Younger Scientists 2011) was given to former student at the Department of Physics, Simen Andreas Ådnøy Ellingsen. The ceremony took place at The Royal Norwegian Society for Sciences and Letters, March 11, 2011.

Research Prize to Associate Professor Ragnvald Mathiesen

Associate Professor, Ragnvald Mathiesen, was in January 2011 awarded with a Nordic research price for his research on congelation metals. The award is given by the Jernkontoret, the Swedish Steel Producers Association.

HIGHLIGHTS FROM THE ACTIVITY

Arne Brataas appointed as Fellow at the American Physical Society

Professor Arne Brataas at the Department of Physics has been appointed as Fellow at the American Physical Society (APS). The appointment is based on his research on electron spin: "Spin transport and dynamics in magnetic nanostructures and mesoscopic systems".

Alex Hansen head of IUAP

The International Union of Pure and Applied Physics intends to assist in the worldwide development of physics. In 2011 Professor Alex Hansen was appointed head of the Commission on Computational Physics (C20) and elected as the IUPAP Council Vice President.

RESEARCH

DIVISION OF APPLIED PHYSICS AND DIDACTIC PHYSICS

Head of Division
Professor Patrick Espy

Staff
Professor Patrick Espy
Professor Ursula Gibson
Professor Robert Hibbins
Professor Morten Kildemo
Professor Mikael Lindgren
Professor Ingve Simonsen
Professor Irina Sorokina
Assoc. professor Berit Bungum
Assoc. professor Jonas Persson
Assoc. professor Knut Arne Strand
Assoc. professor Turid Worren Reenaas
Adjunct professor Phil Scott

Research staff
Post-doc Vladislav Dvoyrin
Post-doc Maria Jerôme
Post-doc Nikolai Tolstik
Post-doc Yap Seong Shan
Post-doc Xiaodong Yang

Overview

The Division of Applied Physics and Didactic Physics consists of several research teams carrying out research within the fields of *applied optics; laser physics; electron and ion physics; atmospheric, energy and environmental physics; as well as physics education ("didactic physics").*

The applied optics group carries out advanced laser spectroscopy and imaging of molecular systems in biology and materials sciences *(Lindgren)*. The optics group also develops optical instrumentation prototypes in polarimetry *(Kildemo, Lindgren)* and theoretical modelling of optical properties of materials and surface reliefs *(Simonsen)*. The Laser Physics group develops and studies physics of the advanced ultra-short pulsed solid-state and fibre lasers for various applications *(Sorokina)*.

Atmospheric, energy and environmental physics includes studies of climate processes, including atmospheric dynamics, composition and UV-irradiance, as well as the influence of solar radiation and energetic particles on the atmosphere (*Espy, Hibbins Kjeldstad,*). It also includes research in renewable energy sources such as new (third generation) solar cell technologies *(Reenaas)* and new solar cell nano-materials *(Gibson)*.

Studies of interfaces between fluid phases existing in oil and gas reservoirs are performed by light scattering methods (*Strand*). The model systems and samples from actual gas and oil fields are studied under reservoir conditions (at pressure up to 700 bar and temperature up to 180°C). The studies are performed with the purpose of improving condensate and oil reservoir management and production. In electron and ion physics one studies electrical breakdown in fluids and gases (*Løvaas, Sigmond),* breakdown in vacuum related to the Compact Linear Collider (CLIC) at CERN *(Kildemo)*, and transport of ionized gases (*Skullerud)*.

Research in physics education (*Bungum, Persson*) involves research in physics and technology education in schools as well as at university level. The section also co-ordinates the Nordic research network NorSEd, with grants from NordForsk.

For 2011 we have chosen to give a more thorough account of three specific research areas in atmospheric and environmental research and physics education, as well as in laser physics.

Research in physics and technology education
(B. Bungum, J. Persson)

Research and development in the field include: Studies of how science and mathematics can play a part in Design & Technology projects in schools; studies of how teachers make use of participation in authentic scientific practices; the role of physics in engineering education; students attitudes towards physics and learning physics during university studies; ICT-based teaching approaches to modern physics; use of animations and simulations in physics; and the use of video technology and video analysis in laboratory work in physics. Some of these activities are developed as part of in-service physics courses for teachers through the KOMPIS program.

Figure 1. How can Design and Technology contribute to meaningful learning in science and mathematics in schools?

The group is also involved in the S-TEAM project, financed by EU's Seventh Framework Programme and coordinated by NTNU. This project involves science educators from 14 countries, and its main focus is on inquiry-based learning in science. The group's contribution to S-TEAM consist of material for teachers based on a case of best practice in design & technology, as well as the analysis of how design & technology projects can provide contexts for learning in science and mathematics and reflect authentic inquiry in science. The research on teaching in design & technology is also undertaken in cooperation with a research group at Finnmark University College and colleagues at Program for Teacher Education at NTNU. The research is classroom-based, making use of video documentation to investigate dialogues between teachers and students and, in turn, pupils' learning outcome through the projects. In particular, it investigates how the cross-curricular approaches to design & technology, as prescribed by the curriculum, can be realised with regards to learning in science and mathematics.

The group has, in total, four PhD students in physics and technology education research, doing research on in-service education for physics teachers in authentic research contexts, pupils' learning in design & technology, teaching of physics in engineering education and teachers' approaches to inquiry-based teaching in science, respectively. We are also the coordinator of the Nordic research network in science education, NorSEd, with financial support from NordForsk. The network organizes joint PhD training across the Nordic countries and workshops for PhD students and researchers.

Members of the group have been central in the publication of the first physics education book in any Scandinavian language (Angell, Bungum, Henriksen, Kolstø, Persson & Renstrøm: "Fysikkdidaktikk", Høgskoleforlaget 2011). The book provides for research-based approaches to physics teaching.

Atmospheric dynamics at southern mid-latitudes
(R.E. Hibbins, R. de Wit)

As part of a collaboration with the British Antarctic Survery and the University of Leicester, UK, a SuperDARN radar has been deployed at Goose Green in the Falkland Islands (52S, 59W) to study the structure and influences of atmospheric gravity waves and tides, and to measure charged particle precipitation from the outer radiation belt.

Data from the first year of operation have been used to characterize the seasonal variability in the mean winds, atmospheric tides and planetary waves in the upper mesosphere over the South Atlantic.

This is a relatively uncharted area of the Earth's middle atmosphere, being further north than the Antarctic stations, yet too far south for ground-based observations from Australia and South Africa. Yet it is perfectly placed for inter-hemispheric comparisons with the large array of European and North American radar stations at similar northern latitudes.

Figure 2. The Falkand Islands SuperDARN radar at Goose Green (photo Neil Cobbett, BAS)

The data show significant differences in the large scale behaviour of the southern mid-latitude middle atmosphere compared to the north. In particular the well-known 12- and 8-hour tidal oscillations in the winter middle atmosphere are shown to be much stronger in the southern hemisphere than the north. These data provide an exacting test against which global models of large scale atmospheric dynamics must be compared.

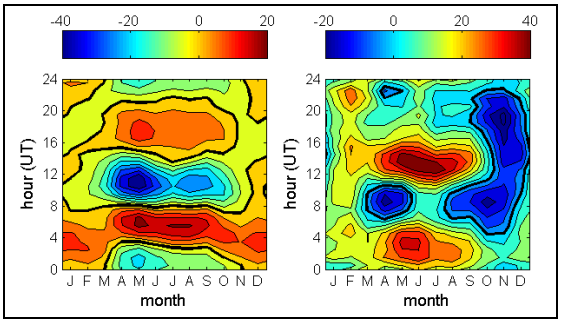


Figure 3. Hourly mean northwards (left panel) and eastwards (right panel) winds near 90 km altitude plotted as month of year and hour of day.

This work I detailed in: Winds and tides in the mid-latitude Southern Hemisphere upper mesosphere recorded with the Falkland Islands SuperDARN radar, R. E. Hibbins, M. P. Freeman, S. E. Milan, and J. M. Ruohoniemi, Ann. Geophys., 29, 1985–1996, 2011, doi:10.5194/angeo-29-1985-2011

Laser Physics
(*I. Sorokina, V. Dvoyrin, D. Klimentov,. N. Tolstik and N. Bertron*)
The group works in the field of Photonics, Atomic and Molecular Physics, as well as laser applications in the fields of laser-ranging, remote-sensing and Biomedical Optics, with the following three main directions:

- *Ultrafast, mid-infrared, solid-state laser technology*: development of the novel ultrafast and broadly tunable lasers in the mid-IR ($\lambda >$ 2 µm) based on new laser materials (new NFR NANO 2021 project *N219686 "Advanced Cr-doped II-VI materials for medical lasers")*
- *Novel all-fibre pulsed laser systems* based on new active fibres and laser designs, operating at 1 µm, 1.55 µm and 2 µm (*FRITEK/191614 project "Ultrafast Tm-fibre laser systems")*
- *Applications*: application of these sources to high-resolution spectroscopy, trace gas and remote-sensing, LIDAR, ranging and imaging. This research is carried out together with the Norwegian and European industry in frames of the *EU ERA-NET project MARTEC MLR.*

Ultrafast mid-IR solid-state laser technology
Ultrafast laser development has been a core expertise of the group. It includes development of the novel ultra-broadband, solid-state laser systems, generating extremely short femtosecond pulses in new wavelength regions. The work has a strong emphasis on exploiting novel laser media and developing versatile ultrafast laser systems with broad spectral coverage for scientific and technological applications. Recent results include:

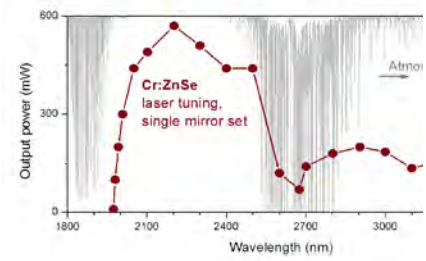


Figure 4. Ultra-broad, ~1400 nm continuous tuning of Cr:ZnSe laser.

- The first femtosecond Cr^{2+}:ZnS laser operating in the mid-IR (2.4 µm) and producing 69 fs pulses (corresponding to only a few optical cycles at this wavelength). The system operates in SESAM- and Kerr-Lens mode-locked regimes, realized in both negative and positive dispersion regimes, producing a record high 0.75 W average power directly from the oscillator.
- The Cr:ZnSe and Cr:ZnS lasers have the broadest continuous tuning range amongst existing lasers of over 1400 nm, extending from 1.95 to 3.35 µm (Fig. 1), an important wavelength range otherwise called the "molecular fingerprint of the atmosphere".
- The first fibre delivery of such short pulses in the soliton regime using a ZBLAN fibre.
- Continuum generation centred at 2.5 µm.

Novel all-fibre pulsed laser systems
Ultrafast laser development is another core expertise of the group and includes the development of novel fibres and fibre laser systems, generating nanosecond to femtosecond pulses.
One of the major assets, serving as a future guarantee of success in the novel fibre laser development is a recently installed Fibre Drawing Facility, funded by the *NFR AVIT project "Fibre drawing tower for advanced nanocrystalline doped and photonic crystal fibres".*

Figure 5. The engineers team right upon Fibre Tower installation (from left to right: Daniel Skåre, Oddbjørn Grandum and Mika Pesonen)

The first silica glass fibre, which was successfully drawn on the tower, was demonstrated to be of the highest optical quality on par with commercial fibres. In the meantime, we investigated the new fibre compositions and were successfully able to develop the first ultra-short pulsed Tm-fibre laser at 2 µm.

KEY REFERENCES:

1. K.L. Vodopyanov, E. Sorokin, I. T. Sorokina, et al. *"Mid-IR frequency comb source spanning 4.4-5.4 µm based on subharmonic GaAs optical parametric oscillator"*, Optics Lett. **36**, 2275 (2011).
2. V. L. Kalashnikov, E. Sorokin, I. T. Sorokina *"Chirped dissipative soliton absorption spectroscopy"* Opt. Express **19**, 17480 (2011).
3. E. Sorokin, N. Tolstik, I.T.Sorokina, *"Femtosecond operation and self-doubling of Cr:ZnS laser"*, paper NThC1, Nonlinear Optics, 2011.
4. I. T. Sorokina, E. Sorokin " *Mid-Infrared Femtosecond Frequency Combs for Sensing and Optical Clocks"*, (invited) Photonics West, paper 7917-45, 2011.
5. V.V. Dvoyrin, I. T. Sorokina, V.M. Mashinsky, et al. *"Tm^{3+}-doped CW fibre laser based on a highly GeO2-doped dispersion-shifted fibre"*, Opt. Express, 19, 7992 (2011).
6. D. Klimentov, N. Tolstik, V.V. Dvoyrin, et al. *"Broad-band dispersion measurement of ZBLAN, germanate and silica fibres in mid-IR"*, J. Lightwave Technol., 30, 1943 (2012).

DIVISION OF BIOPHYSICS AND MEDICAL TECHNOLOGY

Head of Division
Professor Tore Lindmo

Staff
Professor Catharina de Lange Davies
Professor Tore Lindmo
Professor Thor Bernt Melø
Professor Kalbe Razi Naqvi
Professor Bjørn Torger Stokke
Assoc. professor Pawel Tadeusz Sikorski
Assoc. professor Marit Sletmoen
Adjunct professor Einar Rofstad
Adjunct professor Tor Wøhni

Research staff
Post-doc David Barriet
Post-doc Kamila Gawel
Post-doc Sylvie Lelu
Post-doc Heng Li
Post-doc MagnusBorstad Lilledahl
Post-doc Florian Mumm
Post-doc Katarzyna Psonka-Antonczyk
Post-doc Nina Reitan
Post-doc Minli Xie
Research scientist Yrr Asbjørg Mørch

Overview

The research is presented under the following headings: *Medical physics and technology, Biopolymers and bionanotechnology*, and *Photobiophysics*. In the latter section, an example of ongoing research, on photoprotection in natural photosynthetic systems, is described in more detail.

Medical physics and technology

Monte Carlo study of dose distributions from a linear accelerator operating with and without a flattening-filter

(*S. Sauer Almberg, J. Frengen, T. Lindmo*)

6 MV photon beams from conventional linear accelerators operating with a flattening filter have a long tradition in radiotherapy. Thus, clinical experience from this radiation quality is well established. For example, the combination of its dose build-up and attenuation in tissue has made this photon quality popular for breast cancer treatments. With the introduction of intensity-modulated radiotherapy (IMRT), the flattening filter in conventional linear accelerators is principally no longer needed, and so-called flattening-filter-free (FFF) beams have gained interest the past few years. The most striking

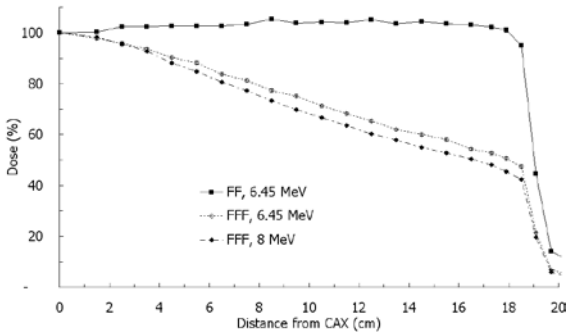


Figure 1. Dose cross-profiles of 40 x 40 cm^2 fields at 5 cm depth in water, as a function of distance from central axis (CAX). FF: field with flattening filter in place; FFF: field without flattening filter (flattening-filter-free). The fields are also specified according to the energy of the electrons incident on target.

difference from conventional beams (with flattening filter: FF) is characteristic bell-shaped fluence and dose profiles of the FFF beams (see Fig. 1). In addition, when the filter is removed, a significant increase in the output is achieved, which should be an advantage considering reduction of the out-of-field dose.

It has been the goal of the present study to investigate and compare some of the dosimetric properties of FF and FFF beams from a modern Elekta linear accelerator. A clinical reference might be to maintain the characteristics of the depth dose distribution. The present study shows that this can be achieved by increasing the incident electron energy on the linear accelerator target from 6.45 MeV to 8.0 MeV. This was found to simultaneously reduce the out-of-field dose for regions < 20 cm from the field border by 10-30 % compared to the original FF situation.

Delivery of nanoparticles in tumour tissue and cells

(C. de Lange Davies, N. Reitan, S. Lelu, Y. Hansen, M. Afadzi, S. Eggen, S. Hak, Y. Mørch)

Nanomedicine such as liposomes, nanoemulsion, polymers or proteins carrying drugs are promising cancer therapeutic agents. Due to the leaky blood vessels in tumour tissue, there is a higher accumulation of the therapeutic agent in tumour tissue than in normal tissue. However, the tumour uptake is low and the distribution heterogeneous. The aim of our research is to study the mechanism

and improve the delivery of nanoparticles. In 2011 we have focused on three main projects:

Characterization of nanoemulsions and their behaviour in cells and in tumours growing in mice.

Multifunctional nanoparticles (NP) combining contrast agents for imaging and therapeutic agents have opened new possibilities in cancer therapy. The effects of NP surface properties such as hydrophilic polyethylene glycol (PEG) surface coating density and targeting to specific cell surface receptors in cell culture and in tumours growing in mice, were studied. Accumulation in the tumour occurred more rapidly for the targeted than for the non-targeting nanoemulsion, and the PEG density had a strong effect on NP targeting efficacy.

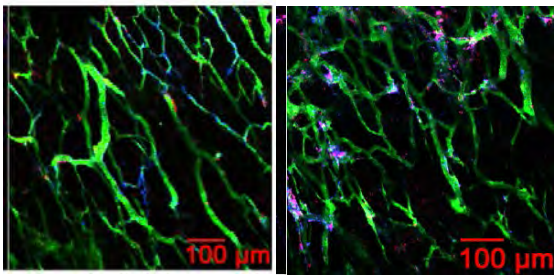


Figure 2. Confocal laser scanning images of tumour tissue and blood vessels (green) in mice, comparing targeted (blue) and non-targeted (red) nanoemulsions with 5% PEG (left) and 50% PEG (right).

Ultrasound mediated drug delivery.

Ultrasound (300 kHz and 1 MHz) enhanced the uptake and improved the distribution of liposomes containing the cytotoxic drug doxorubicin in prostate tumours growing in mice. Polymeric NP of poly(butylcyanoacrylate) was developed and characterized. These NP have the ability to stabilize gas bubbles thereby forming particles to be used for ultrasound imaging and delivery of therapeutic agents. Chemical degrading and ultrasound released drugs from the NP. Cellular uptake of the NP by endocytosis and the effect of ultrasound and gas bubbles on cellular uptake were studied.

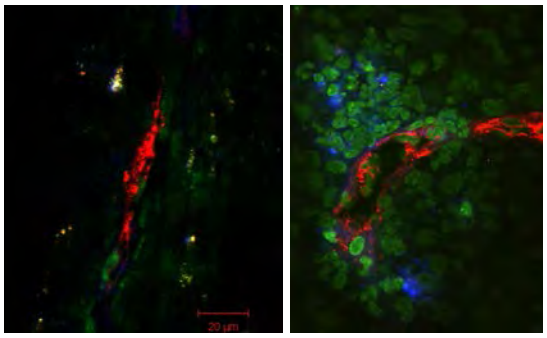


Figure 3. Confocal laser scanning images of prostate cancer in untreated mice (left) and mice treated with ultrasound (right) after injection of liposomes (blue) containing drug taken up by cells (green), and blood vessels (red).

Chitosan as a DNA carrier in gene therapy.

Chitosans are positively charged polysaccharides which interact with the negatively charged DNA thereby forming NP. The endocytic pathways of NP formed by chitosans showing low and high transfection efficiency were determined. Furthermore, the importance of coating the DNA-chitosan complexes with PEG to make the NP mobile through collagen gels which mimic the extracellular matrix, was demonstrated.

Clinical applications of multiphoton microscopy

(C. de Lange Davies, M. Lilledahl, M. Kildemo, P.G. Ellingsen)

Multiphoton microscopy is an ideal tool for studying many biological molecules. Many important such molecules like collagen, elastin and many lipids, can be imaged without any exogenous stains, thereby simplifying in vivo imaging and providing the potential for clinical applications. Our research aims to identify such clinical applications, develop the necessary analysis tools, and understand the biological relevance of the data to develop multiphoton microscopy as a clinical tool.

We are currently focusing on two clinically relevant applications: atherosclerosis in arteries and osteoarthritis in cartilage. Through a collaboration with the Beckman Laser Institute at the University of California, Irvine, we have shown that stimulated Raman scattering (SRS) may be used to differentiate between different types of lipids (e.g.

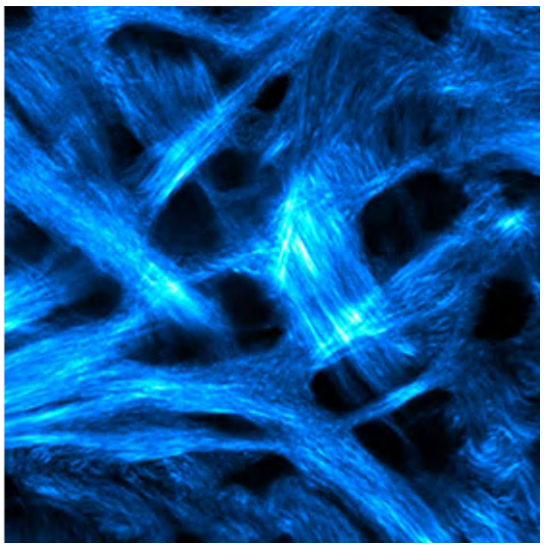


Figure 4. Collagen fibrils from the superficial layer of cartilage imaged with non-linear microscopy forms an interconnected structure which imparts mechanical strength to the tissue.

cholesterol and fatty acids) in atherosclerotic plaques. In addition, we showed that the combination of SRS with second harmonic generation can be used to differentiate amorphous lipids from crystalline lipids (e.g. cholesterol crystals).

For cartilage we are in the process of establishing methods for three dimensional, quantitative analysis of collagen networks, based on sophisticated image analysis of second harmonic generation images. Through the year we have established collaborators in the clinical area and in stem cell research where we plan to employ these techniques. We have also extended our collaboration with the biomechanics field where we are employing nonlinear imaging techniques to derive biomechanical parameters.

Biopolymers and bionanotechnology

Biopolymer mesoscale structural organization and interactions

(B. T. Stokke, K. Psonka-Antonczyk, D. Barriet, K. Gawel, A. Padol, M. Gao, T. Sherstova)

http://home.phys.ntnu.no/brukdef/prosjekter/biopolymerphysics/

Our research focuses on mesoscale structure formation and interactions within biological macromolecules. This research field includes the internal and collective organisation of biological polymers that is crucial for life, and the knowledge obtained forms a basis for various technological exploitations. We are currently pursuing research topics as e.g., polyelectrolyte complexation, biopolymer multilayers and gels, (1,3)-β-D-glucans and their interactions with polynucleotides, physics of enzymatic mode of action, responsive gels as biospecific signal transducers, and nanoscale studies of toll-like receptors. In addition to classical ensemble averaging techniques, application of single-molecule techniques is a distinctive facet of our approach to tackle core issues within these topics. See the website for further information.

In 2011, we reported on application of the high resolution interferometric platform for determining hydrogel swelling response. The focus was on optimizing hydrogel swelling response by selection of molecular parameters in DNA-hybrid hydrogels. The DNA-sensitive hydrogel comprised sensing (S) and blocking (B) oligonucleotide pairs copolymerized with the network and forming reversible crosslinks in addition to stable covalent ones. Oligonucleotide probes (P) complementary to S with longer complementary regions compared to B result in competitive replacement of S-B strands (Fig. 5). The associated destabilization of DNA crosslinks results in changes of the hydrogel swelling. S-B dioligonucleotidic crosslinkers were designed with various basepairs in the hybridized regions. The swelling of the hydrogel was faster the higher the temperature and closer to the S-B melting point. The data shows direct correlation between the kinetics of strand displacement reaction and hydrogel swelling rates and provides a direction for further application of DNA-sensitive hydrogels. A concept for extending functionality of the DNA-polymer hybrid hydrogels was implemented by extending the connectivity of the hybridized ds DNA segments. This allowed for making swelling response that either display a Boolean OR or AND character.

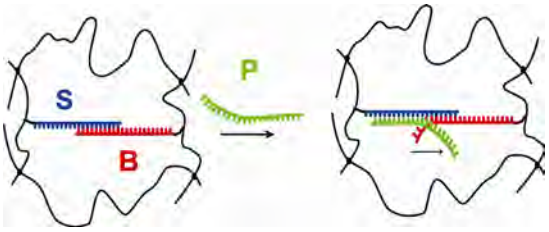


Figure 5. Schematic illustration of competitive displacement of sDNA probe molecule (P) displacing the hybridized dsDNA sequence between the sensing (S) and blocking (B) ssDNA.

Amyloid structures studied by atomic force microscopy (AFM) and total internal reflection fluorescence microscopy (TIRFM) was carried out in collaboration with M. Lindgren and international partners. Due to abnormal alterations of its secondary structure, a protein can form aggregated insoluble fibrils that are deposited extracellulary, leading to amyloidosis. Abnormal accumulation of amyloids is associated with many neurodegenerative diseases: systemic amyloidosis, Alzheimer's disease, maturity onset diabetes, and the prion-related transmissible spongiform encephalopathies. We study insulin amyloids to resolve the structure and organization at the level of single aggregates. Amyloids used in this study are labeled with newly designed fluorescent probes that can be potentially used as biomarkers to identify amyloid aggregates in histopathological studies. AFM offers a possibility to visualize individual amyloid structures revealing the detailed ultrastructure at nanoscale. When combined with the TIRFM, a very sensitive tool to visualize single fluorophores, the ultrastructural information can be colocalized with the fluorescent signal originated from the bound probes.

Single molecule techniques in bionanotechnology

(M. Sletmoen, K.E. Haugstad, N. B. Arnfinnsdottir, J. Nilsen-Nygaard)

In 2011 we have used the sensitive force probes AFM and optical tweezers (OT) to quantify the strength and lifetime of several different systems of intermolecular bonds. The examples include OT

studies of repair proteins binding to DNA (Fig. 6), OT and AFM studies of binding of enzymes involved in biosynthesis of polysaccharides from precursor polymers, and AFM (Fig. 7) and OT studies of self-association of glycoproteins presenting carbohydrate can cer antigens, possibly leading to activation of mucin and mucin-type receptors by self-association on cells. By quantifying the strength and lifetimes of self-associations occurring between glycoproteins with different carbohydrate decoration patterns, we have also taken the first steps towards unraveling the mechanism governing such interactions. In 2011 we also initiated studies of micro- and nano emulsions using optical tweezers, aiming at obtaining information related to physical properties and controlled stability of such emulsions.

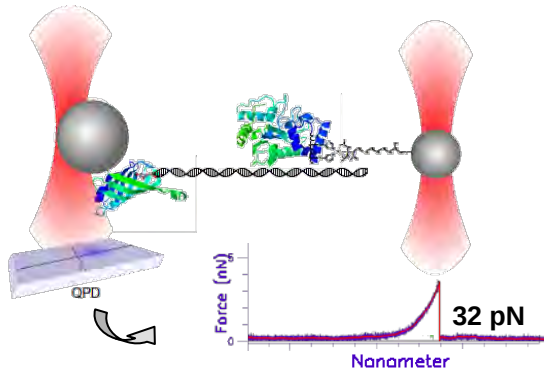


Figure 6. Optical tweezers used to study binding of UNG proteins, involved in damage repair of DNA, to DNA. Laser beams are used to trap polystyrene beads. DNA is attached to a 3.05 µm sized polystyrene bead through a streptavidin – biotin complex, and UNG is attached to a 2 µm sized polystyrene bead through a His-Ni^{2+}-NTA complex. The strength as well as other characteristics of the UNG-DNA interaction is quantified through force vs distance curves.

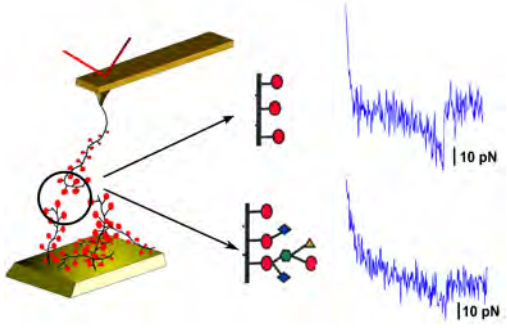


Figure 7. Setup used to reveal enhanced self-association of mucins possessing the T and Tn carbohydrate cancer antigens at the single-molecule level. Illustration from Haugstad, KE; Gerken, TA; Stokke, BT; Dam, TK; Brewer, CF; and Sletmoen, M., Biomacromolecules 2012.

Soft lithography techniques, like microcontact printing with elastomer stamps, provide an easy, cheap and reproducible method for creating chemically patterned surfaces with features down to the sub-micrometer range. In 2011 we initiated work in the NTNU Nanolab, where we produce PDMS stamps with features in the micrometer range using both UV- and electric beam-lithography. Microcontact printing is performed with these stamps to pattern proteins onto glass surfaces in order to control bacterial adhesion to the surfaces. This patterning process allows the production of single cell arrays of live bacteria. These arrays of bacteria will be used for mapping of the behavior of individual cells in populations of bacteria in an efficient manner, while strictly controlling the environment of the bacteria.

Bionanotechnology

(P. Sikorski, F. Mumm, M. Olderøy, M. Xie, K. M. Beckwith)

The biomineralisation project was concluded in 2011. Several publications were completed including description of mechanical properties of mineralised hydrogels (in collaboration with Birmingham University), enzymatic mineralisation process and further details on calcium carbonate crystallisation. Results obtained have been used in pilot experiments, aiming at creating human bone model in mice.

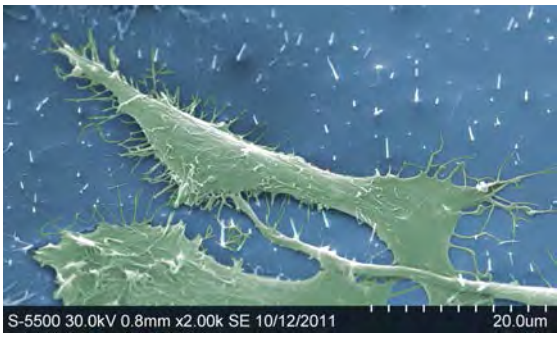


Figure 8. Hela cells on nanowire surface. Photo: Kai M. Beckwith.

In our research we extensively use NTNU Nanolab, both for characterisation of biomaterials, as well as for development of new nanotechnology-based devices for controlled delivery of molecules into living cells. In 2011 we have developed a method to make a transparent nanowire-based cell impalement device suitable for detailed cell-nanowire interaction studies. Those are currently used in a number of studies, where we test delivery of biological molecules into various cell types. We have also continued working on polymer based superhydrophobic surfaces and how they can be used to control cell behaviour.

Photobiophysics

Photosynthetic systems and pigments

(H. Li, T.B. Melø, K.R. Naqvi)

This report will deal exclusively with our work on photoprotection in natural photosynthetic systems.

Photosynthesis, the process carried out by photoautotrophic organisms for converting carbon dioxide and water into carbohydrates and dioxygen (O_2), occurs in two steps: the first consists of light-harvesting, which commences with the act of light absorption by an antenna system, also called a light-harvesting complex, and ends with the transfer of the absorbed energy to the reaction centre (RC), where charge-separation, the second step, takes place. We have been engaged in studying photoprotection in each of these stages.

When exposed to more light than is necessary for carrying out photosynthesis, a photosynthetic organism needs photoprotection. Excess light leads to the formation of singlet oxygen, a highly toxic reagent. In photosynthetic organisms, $^1O_2$ is generated during an encounter between a ground state O_2 molecule and a chlorophyll (Chl) molecule in its triplet excited state; photoprotection is achieved by quenching the Chl triplet before it is able to sensitize the formation of $^1O_2$.

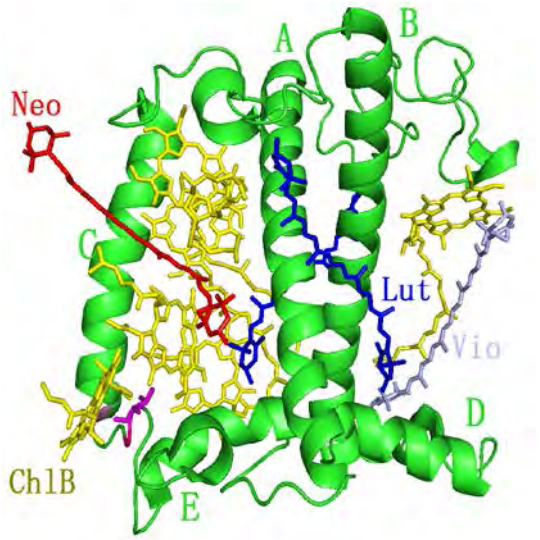


Figure 9. The spatial arrangement of molelcules of Chlb and Car molecules in monomeric LHCIIb.

Antenna Complexes

In higher plants an important role is played by LHCIIb, the major light-harvesting complex of photosystem II (PSII). It is the most abundant protein in the thylakoid membrane (the site of light-dependent reactions in the chloroplast) and contains about half of its Chl content, and it is involved not only in light-harvesting but also in photoprotection (through an efficient quenching of Chl triplets). LHCIIb consists of three similar subunits (LHCIIb monomers) in a trimeric structure. The identification, position and orientation of all pigments are known; each monomer binds, in addition to six molecules of Chl*b* and eight of Chl*a*, four carotenoid (Car) molecules, two are lutein (Lut) molecules and one each of neoxanthin (Neo) and violaxanthin (Vio). Figure 9, which provides a representation displaying only the chromophores of our interest, shows that monomeric LHCIIb is organized as three transmembrane helices (A, B, C), and two amphipathic shorter helices at the luminal side, named E and D.

We have studied LHCIIb wild type (WT) and several mutants in which five amino acids glutamic acid (E)-49, histidine (H)-120, serine (S)-123, valine (V)-118 and tyrosine (Y)-112 in the lumenal loop region have been changed to glycine (G), leucine (L), glycine (G), and phenylalanine (F), respectively, by site-directed mutagenesis. All mutagenesis occurs in helix E region and affects mainly the Chl*b* domain. The diversity of the results defies synopsis in the limited space available here; suffice it to say, however, that that the domain with antiparallel strands (helix E and the loop between helix E to C) plays an important role in photoprotection, and that none of the mutants provides better protection than WT.

Reaction Centre of PSII

The yield of $^1O_2$ formation is particularly high in the RC of photosystem II (PSII), where the donor triplet is produced through the radical pair mechanism, which comes into play when electron transfer on its acceptor side is inhibited, or the plastoquinones, denoted QA and QB, are removed or doubly reduced. The PSII RC from higher plants was the first biological system in which direct emission at 1270 nm from $^1O_2$ with an endogenous origin was observed. The pigment arrangement (depicted in Fig. 10) in the PSII RC imposed by the protein matrix of the D1-D2 heterodimer is unfavourable for efficient triplet-triplet energy transfer from 3P to β-Car, because the two β-carotene (β-Car) molecules are far from the accessory Chl molecule in the D1 protein (ChlD1), where the triplet population is mainly localized, and only a minor population is in the primary donor P680, denoted PD1 and PD2. Hereafter, 3P represents the total population of Chl triplets in the PSII RC (i.e., 3ChlD1 and 3P680 in thermal equilibrium). The two β-Car molecules play an only marginal photoprotective role against $^1O_2$ within the PSII RC, and the pigments and the D1 protein of the PSII RC remain very vulnerable during photosensitation of $^1O_2$ by 3P.

Over the past decade, efforts have been made to gain a better understanding of alternative photoprotective mechanisms, mediated by other quenchers of $^1O_2$, amongst them α-tocopherol (vitamin E) and plastoquinol.

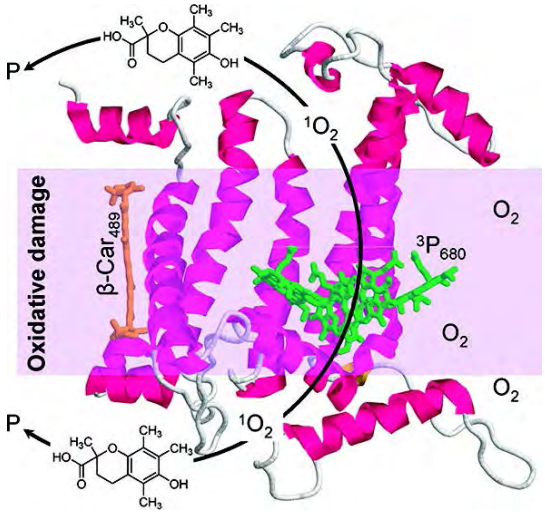


Figure 10. Pictorial representation of the location of β-carotene and the chromophore which sensitizes $^1O_2$.

Investigating the photoprotective role of α-tocopherol was our main objective, but its hydrophobicity presented a major challenge, for it precluded the addition of α-tocopherol to an aqueous suspencion of RC. This obstacle was overcome by using Trolox, a water-soluble analogue of α-tocopherol, and adjusting conditions so that our results acquire physiological relevance. Trolox has two dissociable protons, with pK values of 3.89 for the carboxylic group and 11.92 for the hydroxyl group (also present in α-tocopherol), which affect its solubility in aqueous media.

On the basis of these dissociation constants, Trolox can be easily dissolved in neutral and basic pH-adjusted solutions, or it can be solubilized in detergent micelles in unbuffered aqueous media. In spite of the structural difference between Trolox and α-tocopherol, the chromanol group of vitamin E in biological membranes is exposed to the aqueous surrounding medium and Trolox is found on the surface of lipid model membranes or detergent micelles in unbuffered solutions. Although the total bimolecular rate constant for the scavenging of $^1O_2$ by Trolox was known to be approximately half of that for α-tocopherol, the use of Trolox in this study allowed us to determine the ratio between the total and chemical bimolecular rate constants for the scavenging of $^1O_2$ in aqueous buffer, where PSII RC and Trolox are dispersed homogeneously. PSII RC (instead of PSII) preparations were used to facilitate the accessibility of Trolox to the D1 protein and the pigments housed inside the PSII RC protein matrix. Our results clearly show that Trolox can photoprotect the surface-exposed regions of the D1-D2 heterodimer from photodamage only when Trolox is in the detergent micelles close to the PSII RC, but not when it is freely dissolved in the buffer. This photoprotection requires a high level of consumption of Trolox. Although Trolox succeeds in photoprotecting the surface-exposed domain of the D1-D2 heterodimer, the PSII RC pigments and the membrane region of the protein matrix of PSII RC are left vulnerable to $^1O_2$ in the situations examined here. By extending this conclusion to other studies conducted with α-tocopherol, we propose that, as far as PSII in vivo is concerned, α-tocopherol might photoprotect the surface-exposed regions of the D1 and D2 proteins, but the protection of P680 seems highly unlikely.

DIVISION OF COMPLEX MATERIALS

Head of Division
Arne Mikkelsen

Staff
Professor Jon Otto Fossum
Professor Alex Hansen
Professor Arne Mikkelsen
Professor Steinar Raaen
Professor Bo-Sture Skagerstam
Adjunct professor Kenneth Dahl Knudsen
Assoc. professor Bjørnar Sandnes

Research staff
Post-doc Zbigniew Rozynek
Post-doc Santanu Sinha
Research scientist Bjørn Skjetne

Overview

The division carries out research within *physics of soft and complex materials*. The phenomena studied include: Nanostructured surface alloys, clay-containing systems, biopolymers, spontaneous and guided selfassembly of nanoparticles of various kinds, diffusion properties in nanoporous media, anomalous diffusion processes, mechanical properties of rough surfaces, brittle fracture, mechanical properties of granular media, multiphase flow in porous media.

The research comprises the use of experimental methods, computational methods and theoretical methods.

The list of the *experimental instruments* and facilities situated at the department is long: X-ray photoelectron spectroscopy (XPS); ultraviolet photoelectron spectroscopy (UPS); low energy electron diffraction (LEED); photoemission electron microscopy (PEEM); temperature programmed desorption (TPD) spectroscopy; a range of UHV sample preparation techniques; wide- and small-angle X-ray scattering; static and dynamic light scattering; light microscopy; atomic force microscopy; measurements of dynamic viscoelastic properties of soft materials (rheology); microcalorimetry; thermo-gravimetry; dynamic electro-optic properties of soft materials; circular dichroism; isolation and purification of nanoparticles including biopolymers.

Using *computational methods* we study various complex phenomena including flow in porous media, fracture and fracture networks.

The *theoretical studies* are mainly on condensed matter physics and statistical physics.

Survey of research activities

Experimental investigations of soft and complex matter: From nano to macro.
(*J.O. Fossum*)
The research group has during several years focused on basic understanding of problems within soft and complex materials, in particular physical phenomena in soft matter using synthetic nanolayered silicates (clays), as physical complex model systems. Main physical phenomena studied in these systems include flow and diffusion processes, intercalation processes, spontaneous self-organization into liquid crystalline phases in systems of nanoplatelets, and guided self-organization into electro-rheological and magneto-rheological systems with smart material properties. The most important experimental methods used at NTNU include standard microscopy, as well as AFM and STM; rheology in external applied fields (magnetic or electric); visible light scattering; and wide- and small-angle X-ray scattering. Synchrotron X-ray scattering is performed at ESRF in Grenoble, France, LNLS in Campinas Sao Paulo, Brazil, PAL in Pohang, South Korea, Maxlab Lund University in Sweden. Small-angle-neutron-scattering (SANS) studies are performed at IFE, Kjeller. Magnetic mesonance-spectroscopy and -imaging are performed in collaboration with Universidade Federal de Pernambuco, Recife, Brazil. Other important international collaboration is with University Paris7, ESPCI-ParisTech, University Rennes 1 in France, University of Amsterdam, University of Havana Cuba, Universidade de Brasilia and other institutions in Brazil.

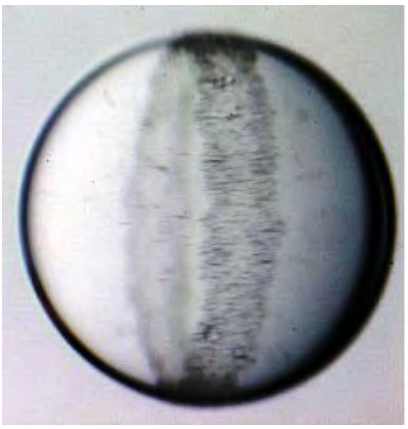


Figure 1. Electric field induced self-organization of clay particles forming a belt on the surface of a micro oildroplet. (Alexander Mikkelsen, Knut Kjerstad, Jon O. Fossum)

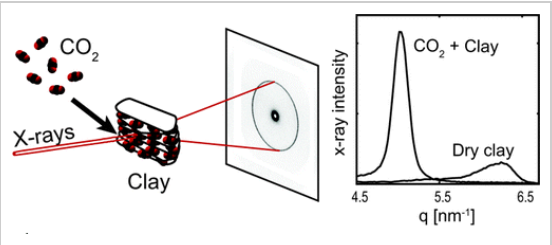


Figure 2. We have shown experimentally that gaseous CO_2 intercalates into the interlayer space of a smectite clay at conditions not too far from ambient. (Hemmen et.al. Langmuir *28* 1678 (2012))

Fracture and transport in disordered systems, growth processes, two-phase flow in porous media

(*A. Hansen*)

Our group study complex phenomena using computational methods. We study two-phase flow in porous media under steady-state conditions, i.e., when the macroscopic flow parameters have stable averages. This state can be described through non-equilibrium thermodynamics. We are collaborating with Professor Signe Kjelstrup at the NTNU Chemistry Department on this. We are also collaborating with Professor Knut Jørgen Måløy at the University of Oslo who does experiments on steady-state flow in two-dimensional model systems. An interesting result that has come out of this work is the recognition that two-phase flow under steady-state conditions has a new effective rheology that is indistinguishable from that of Bingham fluids – i.e. a class of non-Newtonian fluids - in porous media. This leads to non-linearities in the effective permeability which at present is not taken into account in any reservoir simulators.

Our work on brittle fracture continues with a focus on the possible transition between a percolation-like fracture processes on small scales to a fluctuating elastic line process on larger scales. We use numerical models for this work. In particular, we have developed a model that is capable of following a mode I fracture line indefinitely through creating material in front of the fracture line and removing material behind it. With this model, we have observed the transition between the two fracture processes.

We are studying hydraulic fracture – i.e. the creation of fractures through high pressure – through collaboration with the SINTEF Rock Physics Group. We have developed a network model based on poroelastic beams following the Biot equations.

We continue our work on devising a description of fracture networks using a duality transformation. This gives the possibility of using all the new tools that have been developed over the last years for describing complex networks.

We study the permeability of newtonian and non-newtonian fluids in single fractures in collaboration with Dr. Harold Auradou and Laurent Talon at the Université de ParisSud at Orsay. The most important result in 2011 in this project is the identification of a single length scale controlling both the permeability and the dispersive first-arrival time distribution.

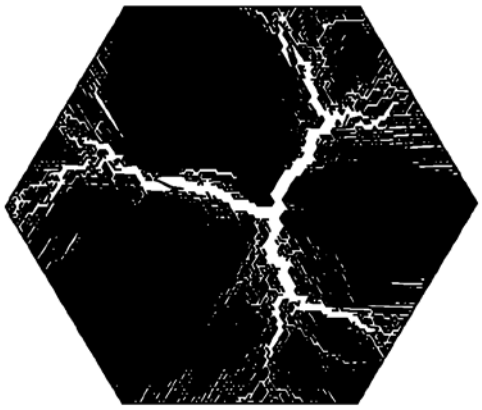


Figure 3. Hydrofracture pattern in a porous medium (Berea sandstone) after an incompressible fluid has been injected at the center (B. Skjetne).

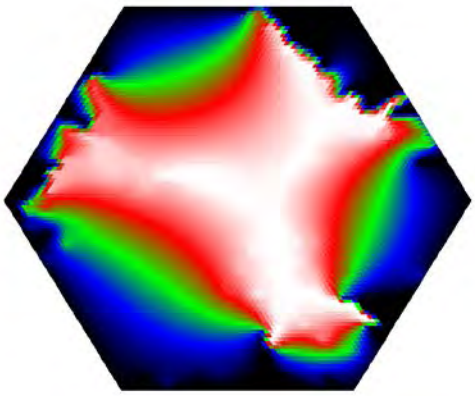


Figure 4. Stress distribution in the (computer generated) berea sandstone sample above (B. Skjetne).

Properties of supported metal surface structures

(Steinar Raaen and Armen Julukian)

It has been long known that the adsorption properties of supported metal nanostructures differ from those of the solid surface. The catalytic activity of small gold particles represents an interesting example, since low-index gold surfaces are known to be noble and inactive towards most molecules. The fundamental question is therefore which size-related properties make the gold nanoparticles catalytically active. Nano-particles of gold can, for instance, catalyze CO oxidation at

room temperature and below, which is significantly lower than the temperatures needed using more traditional supported metal catalysts. In addition to possessing the catalytic properties of the single crystalline substrate from the same material, a metal nanoparticle array contains new degrees of freedom which influence the reaction output. These are particle size and shape, and the interface between the particles and the support, which typically is an oxide surface on which the particles are deposited.

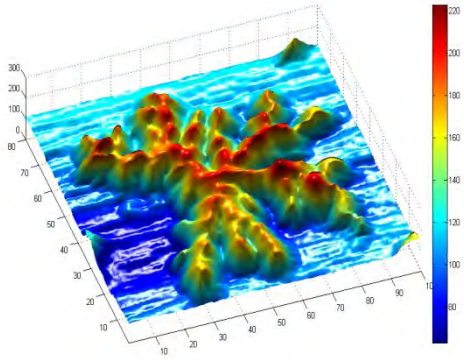


Figure 5. AFM image of self-assembled platinum nanostructure on pyrolytic graphite.

The structures may be formed by self-assembly following evaporation on weakly interacting substrates as shown in Fig.5 for platinum on graphite, or they may be formed by dispersion of nanoparticles on the substrate. It has been found that an effective dimension of the metal nanostructures may be defined based on the metal core level shift for metallic structures supported on nonmetallic substrates. Core level positions for palladium structures on carbon are shown in Fig.6.

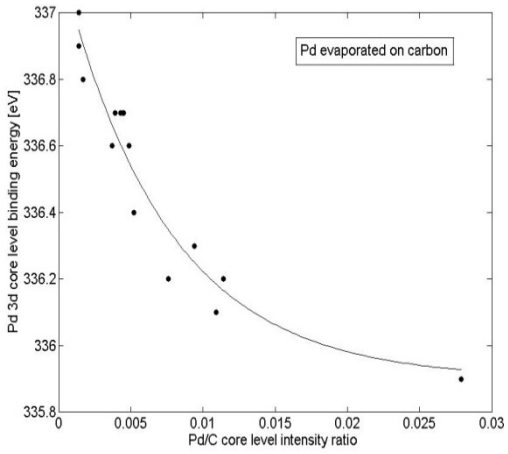


Figure 6. Photoemission core level position for Pd 3d as a function of amount Pd on graphite.

The adsorption properties of a supported metal structure depend on the number of corner-, edge- and surface-atoms, atom-substrate interactions, and well as the potential of the nanostructure. A comprehensive understanding of adsorption on nanostructures requires detailed studies of all these aspects, and still many questions remain unanswered. Ongoing experiments using photoemission, temperature programmed desorption, scanning electron microscopy, and atomic force microscopy are addressing these issues.

Diffusing granular/traffic flows/quantum optics

(*Bo-Sture Skagerstam*)

We have focused our attention on the large-time statistical properties of granular flows (work done in collaboration with A. Hansen and project/master students). In this study use has been made of properties of stochastic differential equations. Some features of the large-time behavior can be interpreted as anomalous diffusion. We have shown that such an anomalous diffusion can be described in terms of a conventional memory function in contrast to the sometimes used method of fractional derivatives. We have also studied the appearance of anomalous diffusion and solitary waves in some non-linear systems.

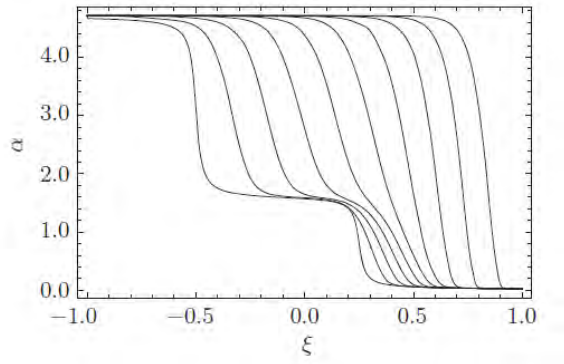


Figure 7. A finite-element solution of a non-linear convection-diffusion equation, with a non-linear diffusion "constant" $D \propto \sqrt{\alpha}$ which allows for the existence of solitary wave structure in terms of its amplitude (α) and a space coordinate (ξ) at various time-steps.

In the field of cavity quantum electrodynamics we have studied the Purcell effect for atoms close to superconducting bodies. We have suggested that the low-frequency dielectric properties of superconducting bodies, which to a large extent is poorly understood, can be investigated by means of spontaneous emission of atoms. Deviation from exponential decay at small and large times has also been investigated in great detail mainly in terms of numerical simulations. A quantum-optics derivation of interference effects in a Michelson-Morley setup for general quantum states has been worked out. The research project on the human eye as a quantum-mechanical detector of photons has

continued. Various features of a predictive model for the response of the human eye on low intensity (quantum) light have been investigated.

Polymer-nanoparticle systems
(*Kenneth D. Knudsen*)
The focus of our work lies within nanostructured soft matter, with an emphasis on polymer-based systems. We have recently made polymer matrices where nanodisks function as anchor points between the different polymer strands, thus modifying the elastic properties of the material. By means of external electric or magnetic fields it is also possible to orient asymmetric particles so that they have a preferred orientation inside the matrix with respect to the material surface. Such alignment will often have further implications for physical and mechanical properties of the material.

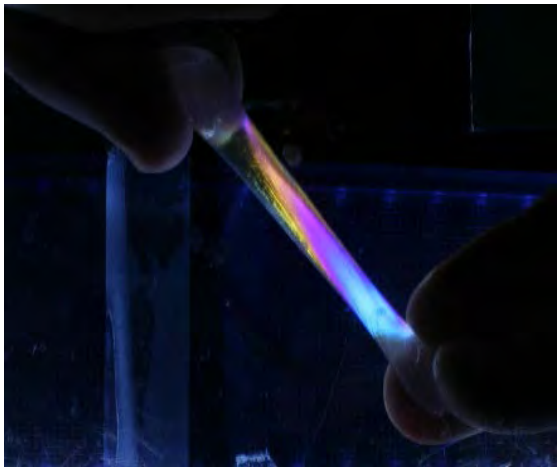


Figure 8. Stretching of a flexible PNIPAAM-based polymer where chains are internally anchored to Laponite nanoparticles. (H. Mauroy)

In order to gain information on the nanostructure of these materials, we rely heavily on various scattering methods, using mainly neutrons and high-intensity X-rays as probes. Via the collaboration with the Institute for Energy Technology (IFE) we have unique access to specialized instrumentation, particularly small-angle neutron scattering. This method is especially useful for the study of soft and light materials, such as polymers, due to the negligible radiation damage and selective interaction for neutrons compared to X-rays.

DIVISION OF CONDENSED MATTER PHYSICS

Head of Division
Dag Werner Breiby

Staff
Professor Anne Borg
Professor Randi Holmestad
Assoc. professor Dag Werner Breiby
Assoc. professor Antonius van Helvoort
Assoc. professor Ragnvald Mathiesen
Assoc. professor Erik Wahlström
Adjunct professor John Walmsley

Research staff
Post-doc Ruben Bjørge
Post-doc Kristin Høydalsvik
Post-doc Ragnhild Sæterli
Post-doc Dung Trung Tran
Post-doc Lars Erik Walle
Post-doc Justin Wells
Research scientist Flemming F.J. Ehlers
Research scientist Song Fei

Overview

The research activities are within experimental condensed matter physics, with particular emphasis on advanced characterization methods for studying physical properties of materials and material structures. The division consists of the transmission electron microscopy (TEM), X-ray, and scanning tunnelling microscopy (STM) groups. The two former groups enjoy status as national resource centres. A large fraction of the research is focused on nanoscale structure studies and the connection to macroscopic physical properties. An increasing part of the activities is directed towards numerical simulations and modelling of both the materials systems and the characterization experiments. Here, a brief survey of the three research groups is given. At the end an example of a current research project is described in more detail.

Survey of research activities

X-ray scattering, diffraction and imaging
(D.W. Breiby, R.H. Mathiesen, O.T. Buset, K. Høydalsvik,
W. Mirihanage)
The X-ray group is active in applying and further developing X-ray scattering and imaging methods for studying materials ranging from functional polymers for organic electronics, via oxides and metallic nano- and microstructured materials. In 2011 the group has continued and expanded its activities within national and European research projects, and enjoys close collaboration with several world-leading groups both in X-ray physics and in materials science. The group currently has two postdocs, four PhD students and several project and master students. The X-ray laboratory is still undergoing substantial upgrades in connection with its new status as a national resource centre, RECX. Presently, it consists of three set ups, two of which are used for X-ray scattering and diffraction experiments, and the third is dedicated to microradiographic imaging. A fourth instrument, a versatile tomography instrument for 3D imaging, will be purchased by the end of this year. The laboratory is generic, covering a large variety of experiments ranging from imaging and tomography, via reflectivity and grazing incidence measurements to traditional wide- and small angle X-ray scattering (WAXS/SAXS). A significant part of the experimental activities of the X-ray group is carried out at synchrotron radiation facilities, mainly at ESRF (Grenoble), HASYLAB (Hamburg) and SLS (Zurich).

Current research activities include:

- Coherent X-ray diffractive imaging, carried out in close collaboration with the Swiss Light Source. We are involved in both methods development and material physics experiments on samples ranging from nanoparticles to organic fibres.
- Raster scanning WAXS and SAXS measurements of thin films and fibres.
- Studies of catalytic nanoparticles under working conditions by small-angle X-ray scattering (SAXS)
- Grazing-incidence small- and wide angle X-ray scattering (GISAXS / GIWAXS), with a special emphasis on modelling (in-house software developments *SimDiffraction*). We employ these techniques mainly for clarifying structure-property relations in conjugated polymers and liquid crystals, mainly for organic electronics.

- Micro- and mesoscale transport during unconstrained dendritic growth
- Pattern selection and interfacial instabilities in regular eutectic solidification microstructures
- Microstructure formation and dechemical modification in irregular eutectic systems
- Convective-diffusive interaction during non-equilibrium transport in metal solidification processes.
- Recrystallization kinetics in ultra-fine grained metals.

Transmission electron microscopy (TEM)
(R. Holmestad, A.T.J. van Helvoort, J. Walmsley, B.G. Soleim, R. Bjørge, F.J.H. Ehlers, R. Sæterli, T.Tran)
The transmission electron microscopy (TEM) research group is active in several projects including nanoscale structural studies and the connection to macroscopic physical properties, within the field of materials physics. The group has 9 PhD students and 4 post-docs, and work in close collaboration with SINTEF through the TEM Gemini centre (see http://www.ntnu.edu/geminicentre/tem).

In 2011 the TEM Gemini centre was involved in 27 journal publications, and educated 2 PhD students; Ruben Bjørge and Malin Torsæter, both within aluminium cluster and precipitate studies. Two new PhD projects with Nanotechnology were started up in 2011.
In October 2011 the nationally coordinated NORTEM project between NTNU, UiO and SINTEF, was granted 58 MNOK from the Research Council of Norway. 21 MNOK from the three partner institutions come in addition to the grant. This investment gives the possibility to realise three new TEMs in Trondheim, including a state-of-the-art probe corrected instrument. In autumn 2011 direct negotiations with TEM equipment manufacturers took place. As part of the purchasing process, microscopes and new technologies were extensively tested using representative materials on demo-machines all over the world. Location for the new instruments in Trondheim will be the basement of Kjemiblokk I, these areas meet the installation criteria, and have a convenient location close to NTNU NanoLab. Besides a top research TEM lab, the infrastructure will provide access to TEM for a broader user environment, addressing fundamental and applied research topics in physics, chemistry, materials science and geology. The purchasing process is in the final stage and contract signing is scheduled for May 2012. The rebuilding activities starts summer 2012 and should finish February 2013. Late spring 2013 the first microscope will be up and running and the whole facility operative by mid December 2013.

PhD student Hanne Kauko at JEOL 2010F. This microscope is used for research and teaching. Photo: Terje Trobe.

The group has for many years worked with SINTEF and Hydro on alloy development and nucleation of precipitates in aluminium alloys, including structure determination of metastable hardening phases by combining experiments (high resolution TEM, scanning TEM, quantitative diffraction and atom probe) and modelling (density functional theory). In addition, there is a broad range of research activity on other materials, with a common emphasis on nano/micro understanding of properties and advanced microscopy techniques. Examples are:

- Multicrystalline silicon solar cell materials-defects and impurity influence on efficiency
- Electronic structure of thermoelectric materials
- Functional perovskite materials - ferroelectric thin films and nanorods
- Nanoparticles and support in catalyst materials – electron tomography and other advanced techniques
- Nanowires of III-V semiconductors
- Intermediate band solar cell materials
- Aluminium surface properties related to corrosion
- High quality TEM sample preparation - tripod polishing and focused ion beam (FIB)

Scanning tunnelling microscopy
(A. Borg, E. Wahlström, J. Wells, F. Song, L.-E. Walle)
The scanning tunnelling microscopy group has two major lines of research activities primarily based on the scanning tunnelling microscopy (STM) instruments in the department, namely nanomagnetics and surface science. There are two ultra high vacuum STM's operated by the group, one with sources and electron energy analyser for UPS/XPS analysis. In addition to this two home built scanning probe microscopes have been developed and are currently operational.

Surface science

During 2011 the surface science activities have included investigations of oxidation and reduction behaviour of Pd-based single crystal alloy surfaces, an activity run in close collaboration with Department of Chemical Engineering at NTNU and Div. of Synchrotron Radiation Research at Lund University. Another main topic has been to understand the adsorption behaviour and interaction of selected adsorbates with ordered TiO_2 surfaces as well growth behaviour of chemical vapour deposited TiO_x thin films on metal substrates, where we collaborate closely with Dept. of Physics and Astronomy at Uppsala University and Dept. Chemical Physics at Lund University. A third line of activities has been directed to determining the stoichiometry of ultrathin $La_{1-x}Sr_xMnO_3$ (LSMO) and $BiFe_{0.5}Mn_{0.5}O_3$ films. Our studies have included STM and high-resolution photoelectron spectroscopy (HRPES) experiments. The HRPES studies were performed at MAX-lab, the Swedish National Synchrotron Facility in Lund, and at Astrid, the storage ring at Aarhus University, Denmark. An ew experimental approach during 2011 has been X-ray photoelectron spectroscopy (XPS) studies of catalytic model systems at near ambient pressures performed at both MAX-lab and the Advanced Light Source, Berkeley, US. The experimental work is complemented with density functional theory calculations performed by collaborating groups in Sweden. Specific projects have been:

- Oxidation and reduction behaviour of (100)-oriented single crystal surfaces of PdAg and PdCu.
- Near ambient pressure XPS studies of Pd- and Pt-based catalytic model systems.
- Adsorption and dissociation behaviour of water on rutile surfaces.
- Formation of thin TiO_x films by chemical vapour deposition on gold and platinum single crystal surfaces.
- Photoelectron spectroscopy studies of $La_{0.67}Sr_{0.33}MnO_3$ and $BiFe_{0.5}Mn_{0.5}O_3$ interfaces.
- Formation of graphite/graphene films through Fe assisted growth on SiC and diamond.

Experimental Nanomagnetics

The research on nanomagnetics is dedicated to understanding the physics of magnetic structures and magnetodynamics at the nanoscale. In particular STM-based transport measurements are utilized to understand how charge and spin currents within materials interplay with the magnetization of materials. A main line of research is performed in conjunction with the Department of Electronics and Telecommunications to study functional metal oxides. In addition to this we have active collaborations with groups at Uppsala University, Chalmers and Lund University in Sweden on static magnetic characterization and USA (New York University), on magnetodynamics. A new activity for the group has also been experiments on time-resolved XMCD at MAX II, utilizing thin films of permalloy to determine the upper frequency limit of the technique..The specific activities during the last year has been along the following lines:

- Magnetodynamic and transport properties of LSMO and heterostructures of LSMO/LMO.
- Investigation of model systems (Fe and Bi on graphite) in preparation for current induced magnetization reversal through laterally resolved point contact studies of interface resistance.
- Development of point contact spectroscopy, methodology and interpretation for energy resolved weak localization studies of HOPG.
- Set up of low temperature FMR characterization (utilizing EPR and waveguide set-up).
- Time resolved XMCD studies of permalloys.

Research example: Nanostructures in organic fibres imaged using X-ray ptychographic tomography

(*J.B. Fløystad, M. Esmaeili, K. Høydalsvik, R.H. Mathiesen, D.W. Breiby*)

X-ray diffraction is a widely used tool for studying the molecular structure of materials, accurately revealing interatomic distances with minimal sample preparation. Because of the highly penetrating and weakly refracting nature of X-rays, constructing appropriate lenses for imaging is difficult, giving a resolution in traditional lens-based X-ray microscopy orders of magnitude inferior to the diffraction limit [1].

Coherent diffractive imaging (CDI) is an upcoming answer to this challenge, evading the objective lens altogether and relying on recreating the real-space image by phase retrieval. This requires a coherent incoming beam available at state-of-the-art synchrotron beamlines like *cSAXS* at the Swiss Light Source. Moreover, the diffraction pattern needs to be oversampled with respect to the Nyquist frequency, which puts stringent requirements on the experimental setup. Iterative numerical procedures, exploiting constraints in both real and reciprocal space, have proven surprisingly robust in retrieving the phase of the X-ray wave field, thus enabling the real space image to be reconstructed. *Ptychography* is one of the most promising CDI measurement schemes, allowing in principle arbitrarily large

fields of view to be measured [1]. Moreover, the 2D transmission images obtained from ptychography can be treated using established tomography routines to obtain 3D images.

In the NTNU X-ray group, we invest considerable resources into building expertise in this technique, which holds promise of becoming a tool complementary to transmission electron microscopy (TEM). Whereas TEM still excels in resolution, it requires very tedious sample preparation and (usually) high vacuum for the measurements. Sample preparation for X-ray studies is easy and the measurements can be done in ambient conditions, or even with high gas pressures and temperatures. X-rays are gentler than electrons to the sample, and organic and biological samples can thus be measured. Finally, the real space CDI images give precise quantitative information about the local electron density, which is of considerable interest, for example as input for theoretical models for material behaviour. We are involved in further refining the ptychography technique both in terms of hardware and software (improving the speed and numerical accuracy of the reconstruction algorithms). Equally important, we are starting to employ this technique, which is still in its infancy, to problems of real interest both industrially and in academia. This includes catalysis, materials science, medicine and physical optics.

As an example, we have characterized a set of organic fibres including silk and wool under varying humidity conditions. Fibres are ubiquitous and play particularly important roles in biology, materials science and in textiles. The latter is of great practical importance, and an interesting scientific challenge is to image the internal nanoporous structure of these fibres. It is well known that many natural fibres possess a highly complex structure with features spanning several length scales, including pores strongly affecting their physical properties. Understanding the structural properties of the pores, including their orientations, size, shape, and response to external applied stimuli (mechanical, chemical, etc.) is crucial for developing new technological applications.

Silk fibres have a typical diameter of 40 µm, which makes them adequate for ptychography studies. We reach a resolution of better than 40 nm in the 2D images, and efforts are currently made to further increase the resolution. Our results confirm the existence of the long nanopores inside the silk fibres, observed non-destructively using ptychography for the first time [2]. This study represents a significant step towards demonstrating the use of lensless X-ray imaging techniques for in situ material studies.

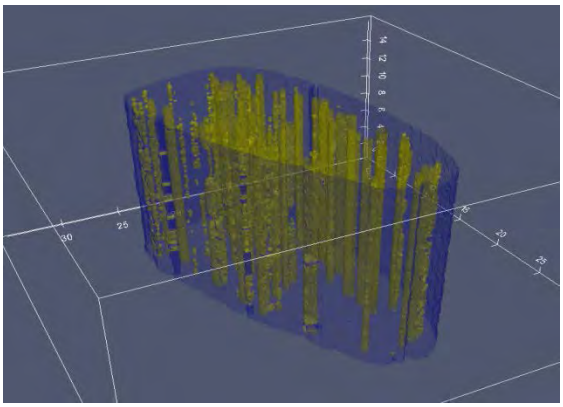


Figure 1. 3D rendering of the porous structure inside of a silk fibre. The shading indicates the rather elliptical cross section of the fibre, having long axis ~40µm and short axis ~15µm.

[1] M. Dierolf, O. Bunk, S. Kynde, P. Thibault, I. Johnson, A. Menzel, K. Jefimovs, C. David, O. Marti and F. Pfeiffer, Europhysics News, 39 No. 1 P.22-24(2008).
[2] M. Esmaeili, J.B. Fløystad, D.W. Breiby, *et al*, manuscript in preparation.

DIVISION OF THEORETICAL PHYSICS

Head of Division
Johan Skule Høye

Staff
Professor Jens Oluf Andersen
Professor Arne Brataas
Professor Johan Skule Høye
Professor Michael Kachelriess
Professor Jan Myrheim
Professor Kåre Olaussen
Professor Asle Sudbø
Assoc. professor Jon Andreas Støvneng
Assoc. professor Ingjald Øverbø
Assoc. professor Jacob Linder
Adjunct professor Roger Sollie

Research staff
Post-doc Alireza Qaiumzadeh
Post-doc Gwenael Giacinti
Research scientist Sergey Ostapchenko

Overview

The research is mainly carried out within the broad fields of condensed matter physics, statistical physics, quantum physics, and astroparticle physics. These contain several subfields with a large variety of topics for research. An overview is given below.

Survey of research activities and examples of research carried out in 2011

Transport of spin and charge in nanostructures
(A. Brataas, A. Qaiumzadeh, H. Haugen, K. Hals, S. Sadjina, A. Kapelrud, E. Tveten)
Understanding nanostructures requires a combination of expertise in different fields by integrating semiconductors and normal metals with magnetic and superconducting materials. Our group explores spin and charge flow in such nano-structures. We aim to develop improved theoretical methods for describing transport phenomena and other physical effects, and use these methods to increase our understanding of experiments. We study the properties of novel systems, pure or hybrid, containing ferromagnets, normal metals, semiconductors, and superconductors. Among our current projects are 1) current induced dynamics in ferromagnets and antiferromagnets, 2) spin flow into superconductors, 3) transport in normal and magnetic semiconductors, 4) fluctuations and dissipation in ferromagnets, 5) spin-transport in graphene, and 6) quantum computing with spins in quantum dots. We published 8 papers in 2011, among which one in Physical Review Letters, one in APL, one in EPL, and five in Physical Review B.

Quantum transport and quantum phase transition
(A. Sudbø, H. Enoksen, I. B. Sperstad, E. B. Stiansen, E. Herland, J. Linder)
Unconventional novel materials open the possibility of studying low-energy states, relevant for quantum transport, with unusual electronic properties in a precise manner experimentally as well as theoretically. Examples of such materials are topological insulators, strongly correlated fermion systems exhibiting unconventional super-conductivity, as well as novel combinations of ferromagnetic and spin-triple superconducting states. We have performed large-scale Monte Carlo results for the dynamical critical exponent z and the spatio-temporal two-point correlation function of a (2+1)-dimensional quantum XY model with bond dissipation, proposed to describe a quantum critical point in high-T_c cuprates near optimal doping. The dynamical critical exponent is found to be $z\approx1$, and the spatio-temporal correlation functions are explicitly demonstrated to be isotropic in space-imaginary time. We have demonstrated a spin-sensitive proximity effect in a ferromagnet/triplet superconductor bilayer. The orientation of a magnetic field can be used to unambiguously distinguish between different spin-triplet states. Moreover, the proximity effect becomes long ranged in spite of the presence of an exchange field and even without any magnetic inhomogeneities, in contrast to conventional S/F junctions. Our results can be verified by scanning-tunneling-microscopy spectroscopy and can be useful as a tool to characterize the pairing state in unconventional superconducting materials. We have published 4 papers on these topics in Physical Review B and Rapid Communications.

Quantum transport and magnetization dynamics
(*J. Linder, M. Alidoust, I. Kulagina*)
During 2011 we published 8 papers in Physical Review B and 1 paper in Physical Review Letters. Four of the papers published in Physical Review B were Rapid Communications. In addition, one of the papers were chosen as Editors' Suggestions. The primary research focus has been to investigate the interplay between quantum transport and magnetization dynamics in hybrid systems featuring multiple broken symmetries. A main goal in this context is to find ways to exert experimental control over the generation, manipulation, and detection of spin- and charge-currents. This is interesting both from a fundamental physics point of view and in terms of possible applications in

nanotechnological structures. In particular, the topics of research in the above publications include supercurrent-induced magnetization dynamics, topological insulators and Majorana fermions, Josephson effect in bilayer graphene, and spin-transfer torque in antiferromagnets.

The research highlights from the above publications include the prediction of how a supercurrent may induce magnetization switching in a multilayer ferromagnetic Josephson junction. We also demonstrated how the broken inversion symmetry due to interfaces in generic hybrid structures will generate a pure transverse spin-current when a charge-current is biased normal to the interface (see Fig. 1). In addition, we have demonstrated that a spin-polarized current injected into an antiferromagnet may cause an instability of the antiparallel configuration of the sublattice magnetizations and inducing a finite magnetic moment.

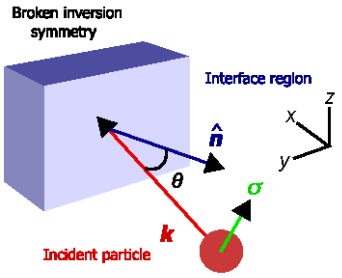


Figure 1. Basic mechanism for the generic spin-current in hybrid structures.. Inversion symmetry is broken near the interface region, giving rise to an effective electric field. Incoming electrons thus feel a momentum-dependent magnetic field coupling to their spin, thus generating a pure transverse spin-current.

High-energy astrophysics
(V. Berezinsky, A. Gazizov, M. Kachelriess, S. Ostapchenko, R. Tomas)
We used the diffuse background of extragalactic gamma-ray radiation measured by Fermi-LAT to limit the electromagnetic energy injected in the Universe. As application, we derived a bound on the flux of cosmogenic neutrinos and excluded strong evolution of cosmic ray sources. A computer code for the evolution of electromagnetic cascades on the extragalactic background light and magnetic fields was developed and made publically available.

Cosmic ray physics
(M. Kachelriess, G. Giacinti, S. Ostapchenko, D. Semikoz, G. Sigl)
Several works studying the propagation of high energy cosmic rays in the Milky Way were performed. The anisotropy of the cosmic ray flux measured at Earth was calculated and it was shown that the new limits of the Pierre Auger Observatory at enrgies around 1 EeV are only consistent with a heavy nuclear composition, if these cosmic rays are of Galactic origin. The diffusion of cosmic rays in magnetic fields was studied. We showed that the diffusion is anisotropic on scales smaller than the coherence length even for a pure isotropic random field. As a result, gamma-ray images of cosmic ray sources show a filamentary structure.

High energy hadronic interactions
(S. Ostapchenko et al.)
The relation between minimum-bias triggers of various LHC experiments and the total inelastic proton-proton cross section was investigated and was demonstrated to depend strongly on the mass distribution of diffractive states. The impact of the uncertainties of hadronic Monte Carlo generators on predictions for cosmic ray induced air showers was investigated. We showed that the most important source of uncertainty for air shower properties is related to the treatment of inelastic diffraction.

Constraints imposed by the first LHC data on the predictions of hadronic interaction models were analysed and the impact on experimental studies of high energy cosmic rays was investigated.

Studies of entanglement
(*J. Myrheim, L. O. Hansen, A. Hauge, Ø. S. Garberg*)
Entanglement in mixed quantum states is studied from a geometric point of view.

Casimir friction
(J. S. Høye, I. Brevik)
The friction force due to the relative motion of a pair of interacting harmonic oscillators has been extended to oscillating dipole moments in 3 dimensions that interact via the electrostatic dipole-dipole interaction. As before we use a statistical mechanical method combined with the Kubo formalism where a response function is evaluated. Earlier we showed the equivalence of this powerful method to time dependent quantum mechanical perturbation theory to obtain the dissipated energy.

Scaling properties and critical indices in 3 dimensions
(J. S. Høye, E. Lomba)
The critical properties of the HRT (hierarchical reference theory) have been analysed further, and accurate numerical work has been performed. The HRT has a basis in renormalization group theory. In earlier work the HRT was unified with the SCOZA (self-consistent Ornstein-Zernike theory). It was found that by approach to the critical point the HRT part would dominate, but somehow certain properties of the SCOZA should remain with the consequence that critical scaling properties would contain a dominating scaling function that are linked to subdominating parts. Our numerical investigation was restricted to supercritical temperatures. Within numerical accuracy the assumed scaling properties were verified. From this simple rational

numbers for the HRT critical indices were found, i.e. we found α=0, β=1/3, δ=5, γ=4/3, η=0, and υ=2/3. According to previous arguments by one of us it is not ruled out that these indices except for logarithmic type corrections are the exact ones for fluids, lattice gases, and the Ising model.

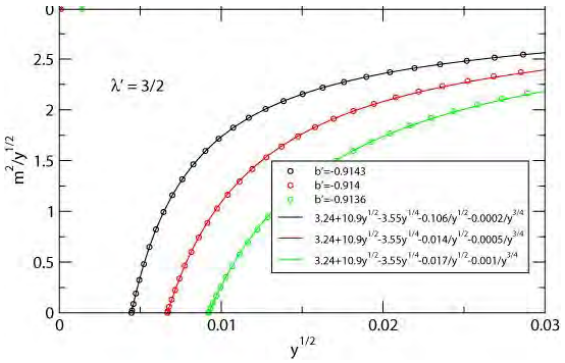


Figure 2. Relation between inverse susceptibility (compressibility) *y* and magnetization *m* compared to the scaling terms (fully drawn curves with deviations not visible on the figure). The first 3 terms in the expressions given (best fit) are the dominant and the subdominant terms of the critical isotherm, while the remaining ones are due temperature *b'(+konst)* dependence away from the critical one.

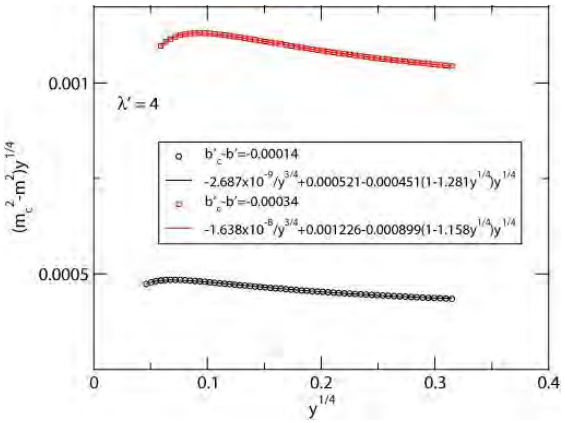


Figure 3. Scaling behavior for deviations from critical isotherm m_c for estimated deviations from critical temperature b_c'.

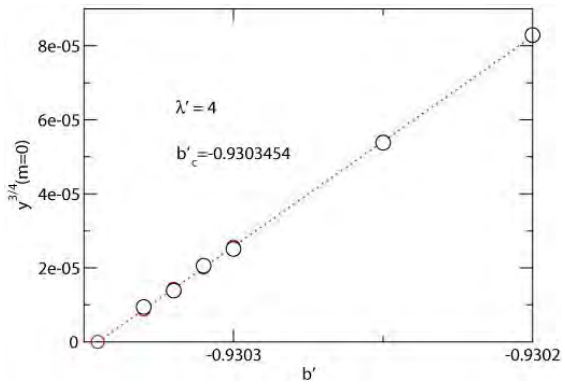


Figure 4. Determination of critical temperature b_c' and critical index γ=4/3 (*y* is inverse susceptibility).

Van der Waals interactions in quantized systems
(J. S. Høye)
The induced van der Waals interaction between a pair of neutral atoms or molecules has been considered by use of a statistical mechanical method. This method is based upon the path integral formulation of quantum mechanics. Equivalence to standard quantum mechanical theory is verified. Earlier the method has been used to recover induced Casimir interactions due to the quantized electromagnetic field. The van der Waals interaction is a special case of the latter where retardation effects are neglected. Now ab initio Hatree-Fock and density functional theory evaluations of molecular energies can be regarded as a statistical mechanical problem to which van der Waals interactions can be added as a leading perturbation that give contributions to molecular energies from non-local correlations.

Some explicit estimates are made for the uniform quantized electron gas at arbitrary density. Especially at low density the perturbing contribution becomes more dominant. This indicates a mechanism for high T_c superconductivity since dominance of perturbing Coulomb forces is expected to let the electrons form a regular lattice. When this lattice is commensurate with the underlying crystal lattice the result is an isolator. But if it does not fit into the underlying lattice the separate electron lattice may be free to slide to make a superconductor.

Surface structure and reactivity
(*Ø. Borck , K. Nigussa, K. L. Nielsen, J. A. Støvneng*)
Solid Cr_2O_3 has a range of applications within catalysis and corrosion resistance. Insight into its geometric and electronic surface structure as well as its reactions with relevant atoms such as H, Cl, and S, is obtained with calculations based on gradient corrected density functional theory. Adsorption energies vary significantly with type of surface termination. The influence on the surface upon atomic adsorption is particularly strong when the (0001) surface is terminated by a layer of oxygen atoms (Fig. X). (K. N. Nigussa et al, *Corrosion Science* **53**, 3612 (2011)).

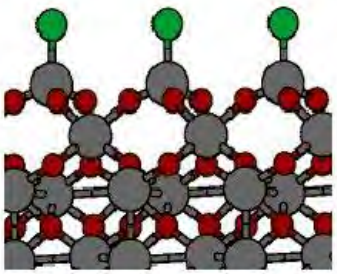


Figure 5. Adsorption of Cl to initially subsurface Cr on oxygen terminated Cr_2O_3(0001). (O – red, Cr – gray, Cl – green.)

QCD Phase Diagram

(J. O. Andersen, R. Khan, L. T. Kyllingstad, L. E. Leganger)

Quantum chromodynamics is generally accepted as the theory that describes the strong interactions among the quarks and gluons. Due to a remarkable property of nonabelian gauge theories called confinement, free quarks are never observed. All quarks are confined inside the hadrons. Hadrons are the bound states of a quark and an antiquark (e.g. pions and kaons), and three quarks (e.g. protons and neutrons). If hadronic matter is heated, it is expected to undergo a phase transition to a new state of matter called the quark-gluon plasma. In this state of matter, the quarks and gluons are no longer confined but are free to move around large distances. The quark-gluon plasma is similar to an ordinary electromagnetic plasma, but is more complicated due to the nonabelian aspects of QCD. The quark-gluon plasma existed in the early universe and so understanding its properties is essential in cosmology. In order to study the properties of the plasma, large experimental efforts at CERN and Brookhaven are made to create it in heavy-ion collisions. Strongly interacting matter also behaves in a highly nontrivial manner if one increases the density. If the density becomes sufficiently high, there is a phase transition to quark matter, which might be in color superconducting state if the temperature is low enough and the baryon density is high enough. This part of the phase diagram (see Fig. 5) is relevant in astrophysics as compact stars are the only known candidate for containing quark matter in its interior.

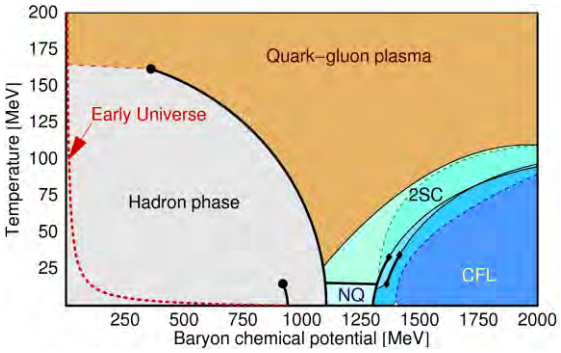


Figure. 6. QCD phase diagram as function of baryon chemical potential and temperature

We are currently carrying out research to determine the thermodynamic properties of the quark-gluon plasma and various phases of dense matter. In particular, we have been using hard-thermal-loop perturbation theory to thermal QCD and studied the possibility for Bose-Einstein condensation of diquarks in two-color QCD. This is a part of the large efforts being made to obtain a quantitative understanding of the properties of strongly interacting matter at finite temperature and density. The group published four papers and two conference proceedings in 2011, among others one in JHEP and one Rapid Communications in Physical Review D.

Very-high-precision calculations in physics

(K. Olaussen, A. Noreen)

We have shown that our previous very-high-precision computations of quantum mechanical eigenvalues of simple systems can be extended to computation of wavefunction normalization integrals (and also to matrix elements). We use the Euler-Maclaurin and Poisson (re-)summation formulas to make apriori estimates of the stepsize and summation range required for a desired precision.

We have found that the magnitude of the coefficients of occuring in the Frobenius series for our wavefunctions can be apriori estimated quite accurately by a Legendre transformation of the WKB approximated solution.

Heat transport in disordered lattices

(K. Olaussen, A. Kværnø, A. Mushtaq)

We have used the Langevin equation to analyse heat transport through a one-dimensional lattice with disordered parameters. In the case of linear dynamics this system can be solved by diagonalization, but one finds that the system will essentially never reach a completely stationary state, due to existence of modes with very long relaxation times (much longer than the lifetime of the universe measured in Planck units).

PUBLICATIONS

JOURNALS IN LEVEL 1 AND 2

Anawati, Ms; Diplas, Spyridon; Holme, Børge; Solberg, Jan Ketil; Mathiesen, Ragnvald; Walmsley, John; Nisancioglu, Kemal.
Surface Characterization of Heat Treated AlPbCu Model Alloys. *Journal of the Electrochemical Society* 2011 ;Volum 158.(6) s. C178-C184

Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Kildemo, Morten.
Near infra-red Mueller matrix imaging system and application to retardance imaging of strain. *Thin Solid Films* 2011 ;Volum 519.(9) s. 2737-2741

Aas, Lars Martin Sandvik; Nerbø, Ingar Stian; Kildemo, Morten; Chiappe, Daniele; Martella, Cristian; Mongeot, Francesco Buatier de.
Mueller matrix imaging of plasmonic polarizers on nanopatterned surface. *Proceedings of SPIE, the International Society for Optical Engineering* 2011 ;Volum 8082.

Alidoust, Mohammad; Linder, Jacob.
Tunable supercurrent at the charge neutrality point via strained graphene junctions. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(3)

Almberg, Sigrun Saur; Lindmo, Tore; Frengen, Jomar.
Superficial doses in breast cancer radiotherapy using conventional and IMRT techniques: A film-based phantom study. *Radiotherapy and Oncology* 2011 ;Volum 100.(2) s. 259-264

Andersen, Jens Oluf; Leganger, Lars Erlend; Strickland, Michael; Su, Nan.
NNLO hard-thermal-loop thermodynamics for QCD. *Physics Letters B* 2011 ;Volum 696.(5) s. 468-472

Andersen, Jens Oluf; Leganger, Lars Erlend; Strickland, Michael; Su, Nan.
QCD trace anomaly. *Physical Review D. Particles and fields* 2011 ;Volum 84.(8)

Andersen, Jens Oluf; Leganger, Lars Erlend; Strickland, Michael; Su, Nan.
The QCD trace anomaly.. *Physical Review D. Particles and fields* 2011 ;Volum 84.(087703)

Andersen, Jens Oluf; Leganger, Lars Erlend; Strickland, Michael; Su, Nan.
Three-loop HTL QCD thermodynamics. *Journal of High Energy Physics (JHEP)* 2011 (8)

Annunziata, Gaetano; Cuoco, Mario; Noce, Canio; Sudbø, Asle; Linder, Jacob.
Spin-sensitive long-range proximity effect in ferromagnet/spin-triplet-superconductor bilayers. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 83.(6)

Annunziata, Gaetano; Enoksen, Henrik; Linder, Jacob; Cuoco, Mario; Noce, Canio; Sudbø, Asle.
Josephson effect in S/F/S junctions: Spin bandwidth asymmetry versus Stoner exchange. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 83.(144520)

Anthonysamy, Fervin Moses; Hoang, Thang Ba; Ahtapodov, Lyubomir; Dasa Lakshmi Narayana, Dheeraj; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Photoluminescence Polarization Anisotropy in a Single Heterostructured III-V Nanowire with Mixed Crystal Phases. *AIP Conference Proceedings* 2011 ;Volum 1399. s. 559-560

Arellano, Juan B.; Li, Heng; Gonzalez-Perez, S; Gutierrez, J.; Melø, Thor Bernt; Vacha, Frantisek; Naqvi, Kalbe Razi.
Trolox, a Water-Soluble Analogue of alpha-Tocopherol, Photoprotects the Surface-Exposed Regions of the Photosystem II Reaction Center in Vitro. Is This Physiologically Relevant?. *Biochemistry* 2011 ;Volum 50.(39) s. 8291-8301

Bageston, JV; Wrasse, CM; Batista, PP; Hibbins, Robert; Fritts, DC; Gobbi, D; Andrioli, VF.
Observation of a mesospheric front in a thermal-doppler duct over King George Island, Antarctica. *Atmospheric Chemistry And Physics* 2011 ;Volum 11. s. 12137-12147

Bageston, JV; Wrasse, CM; Hibbins, Robert; Batista, PP; Gobbi, D; Takahashi, H; Fritts, DC; Andrioli, VF; Fechine, J; Denardini, CM.
Case study of a mesospheric wall event over Ferraz station, Antarctica (62 degrees S). *Annales Geophysicae* 2011 ;Volum 29.(1) s. 209-219

Bandopadhyay, Swarnali; Brataas, Arne; Bauer, Gerrit E. W..
Feedback control of noise in spin valves by the spin-transfer torque. *Applied Physics Letters* 2011 ;Volum 98.(8)

Bandopadhyay, Swarnali; Hentschel, Martina.
Modified Anderson orthogonality catastrophe power law in the presence of shell structure. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 83.(3)

BelBruno, Joseph; Zhang, G.; Gibson, Ursula.
Capacitive sensing of amino acids in molecularly imprinted nylon films. *Sensors and actuators. B, Chemical* 2011 ;Volum 155.(2) s. 915-918

Berezinsky, V; Gazizov, Askhat; Kachelriess, Michael; Ostapchenko, Sergey.
Restricting UHECRs and cosmogenic neutrinos with Fermi-LAT. *Physics Letters B* 2011 ;Volum 695.(1-4) s. 13-18

Berland, Kristian; Borck, Øyvind; Hyldgaard, Per.
Van der Waals density functional calculations of binding in molecular crystals. *Computer Physics Communications* 2011 ;Volum 182.(9), s. 1800-1804

Bhandari, Anak; Hamre, Børge; Frette, Øyvind; Zhao, Lu; Stamnes, Jakob J.; Kildemo, Morten.
Bidirectional reflectance distribution function of Spectralon white reflectance standard illuminated by incoherent unpolarized and plane-polarized light. *Applied Optics* 2011 ;Volum 50.(16) s. 2431-2442

Bjørge, Ruben; Nakashima, Philip N.H.; Marioara, Calin Daniel; Andersen, Sigmund Jarle; Muddle, Barry C.; Etheridge, Joanne; Holmestad, Randi.
Precipitates in an Al-Mg-Ge alloy studied by aberration-corrected scanning transmission electron microscopy. *Acta Materialia* 2011 ;Volum 59.(15) s. 6103-6109

Black-Schaffer, Annica; Linder, Jacob.
Magnetization dynamics and Majorana fermions in ferromagnetic Josephson junctions along the quantum spin Hall edge. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 83.(22)

Black-Schaffer, Annica; Linder, Jacob.
Majorana fermions in spin-orbit-coupled ferromagnetic Josephson junctions. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(180509)

Boschker, Jos Emiel; Folkman, Chad; Bark, C.W.; Monsen, Åsmund Fløystad; Folven, Erik; Grepstad, Jostein; Wahlström, Erik; Eom, C.B.; Tybell, Thomas.
Structural coupling across the LaAlO3/SrTiO3 interface: High-resolution x-ray diffraction study. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(20)

Brändström, B. Urban E.; Enell, Carl-Fredrik; Widell, Ola; Hansson, Thord; Whiter, Daniel; Mäkinen, Sanna; Mikhaylova, Daria; Axelsson, Katarina; Sigernes, Fred; Gulbrandsen, Njål; Schlatter, Nicola M.; Gjendem, Amund Gjerde; Cai, L.; Reistad, Jone Peter; Daae, Marianne; Demissie, Teferi Dejene; Andalsvik, Yngvild Linnea; Roberts, Owen; Poluyanov, Stepan Viktorovich; Chernouss, Sergey.
Results from the intercalibration of optical low-light calibration sources 2011. *Geoscientific Instrumentation, Methods and Data Systems* 2011 ;Volum 1.(1) s. 91-107

Brataas, Arne; Rashba, Emmanuel I..
Nuclear dynamics during Landau-Zener singlet-triplet transitions in double quantum dots. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(4)

Brataas, Arne; Tserkovnyak, Yaroslav; Bauer, Gerrit E. W..
Magnetization dissipation in ferromagnets from scattering theory. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(5)

Butler, Keith T; Vullum, Per Erik; Muggerud, Astrid Marie F; Cabrera, E.; Harding, JH.
Structural and electronic properties of silver/silicon interfaces and implications for solar cell performance. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 83.(23)

Carlsson, Karin; Persson, Egon; Lindgren, Mikael; Carlsson, Uno; Svensson, Magdalena.
Effects on the conformation of FVIIa by sTF and Ca2+ binding: Studies of fluorescence resonance energy transfer and quenching.. *Biochemical and Biophysical Research Communications - BBRC* 2011 ;Volum 413.(4) s. 545-549

Daae, Marianne; Shprits, Yuri; Ni, Bin; Koller, Josef; Kondrashov, Dmitri; Chen, Yue.
Reanalysis of radiation belt electron phase space density using various boundary conditions and loss models. *Advances in Space Research* 2011 ;Volum 48.(8) s. 1327-133

Day, KA; Hibbins, Robert; Mitchell, NJ.
Aura MLS observations of the westward-propagating s=1, 16-day planetary wave in the stratosphere, mesosphere and lower thermosphere. *Atmospheric Chemistry And Physics* 2011 ;Volum 11.(9) s. 4149-4161

Dehghan-Niri, Roya; Hansen, Thomas W.; Wagner, Jakob B.; Holmen, Anders; Rytter, Erling; Borg, Øyvind; Walmsley, John.
In-Situ Reduction of Promoted Cobalt Oxide Supported on Alumina by Environmental Transmission Electron Microscopy. *Catalysis Letters* 2011 ;Volum 141.(6) s. 754-761

d'Enterria, D; Engel, R; Pierog, T; Ostapchenko, Sergey; Werner, K.
Constraints from the first LHC data on hadronic event generators for ultra-high energy cosmic-ray physics. *Astroparticle physics* 2011 ;Volum 35.(2) s. 98-113

Dokuchaev, V; Berezinsky, V; Eroshenko, Y; Kachelriess, Michael; Solberg, Marius Aase.
Superdense dark matter clumps. *PoS - Proceedings of Science* 2011 ;Volum PoS(IDM2010). s.

Dolag, K; Kachelriess, Michael; Ostapchenko, Sergey; Tomas, Ricard.
Lower limit on the strength and filling factor of extragalactic magnetic fields. *The Astrophysical Journal* 2011 ;Volum 727.(1)

Duffaut, Kenneth; Landrø, Martin; Sollie, Roger; Pedersen, Ørjan.
Mindlin's friction term and implications for shear modulus and anisotropy in granular media. *Society of Exploration Geophysicists. Expanded Abstracts with Biographies* 2011 ;Volum 30. s. 2194-2199

Dvoyrin, Vladislav; Sorokina, Irina T; Mashinsky, Valery M.; Ischakova, Lyudmila D.; Dianov, Evgenii M; Kalashnikov, Valdimir L; Yashkov, Mikhail V.; Khopin, Vladimir F.; Guryanov, Aleksey N..
Tm3+-doped CW fiber laser based on a highly GeO2-doped dispersion-shifted fiber. *Optics Express* 2011 ;Volum 19.(9) s. 7992-7999

Eberg, Espen; Van Helvoort, Antonius; Takahashi, Ryota; Gass, Mhairi; Mendis, Budhika; Bleloch, Andrew; Holmestad, Randi; Tybell, Thomas.
Electron energy loss spectroscopy investigation of Pb and Ti hybridization with O at the PbTiO3/SrTiO3 interface. *Journal of Applied Physics* 2011 ;Volum 109.(3)

Ekroll, Ingvild Kinn; Gederaas, Odrun Arna; Helander, Linda; Hjelde, Astrid; Melø, Thor Bernt; Johnsson, Anders.
Photo induced hexylaminolevulinate destruction of rat bladder cells AY-27. *Photochemical and Photobiological Sciences* 2011 ;Volum 10.(6) s. 1072-1079

El-Agamey, Ali; Fukuzumi, S.; Naqvi, Kalbe Razi; McGarvey, David J.
Kinetic studies of retinol addition radicals. *Organic and biomolecular chemistry* 2011 ;Volum 9.(5) s. 1459-1465

Ellingsen, Pål Gunnar; Lilledahl, Magnus Borstad; Aas, Lars Martin Sandvik; Davies, Catharina De Lange; Kildemo, Morten.
Quantitative characterization of articular cartilage using Mueller matrix imaging and multiphoton microscopy. *Journal of Biomedical Optics* 2011 ;Volum 16.(11) s. 116002-1-116002-6

Espy, Patrick Joseph; Ochoa, Sara; Forkman, P; Murtagh, D; Stegman, J..
The role of the QBO in the inter-hemispheric coupling of summer mesospheric temperatures. *Atmospheric Chemistry And Physics* 2011 ;Volum 11.(2) s. 495-502

Frette, Vidar; Hemmer, Per Christian.
Queues on narrow roads and in airplanes. *AIP Conference Proceedings* 2011 ;Volum 1332. s. 253-254

Gallavardin, T; Maurin, M; Marotte, S; Simon, T; Gabudean, AM; Bretonniere, Yann; Lindgren, Mikael; Lerouge, F; Baldeck, Patrice L.; Stephan, O; Leverrier, Y; Marvel, Jacqueline; Parola, Stephane; Maury, Olivier; Andraud, Chantal.
Photodynamic therapy and two-photon bio-imaging applications of hydrophobic chromophores through amphiphilic polymer delivery. *Photochemical and Photobiological Sciences* 2011 ;Volum 10.(7) s. 1216-1225

Gao, Ming; Gawel, Kamila; Stokke, Bjørn Torger.
Toehold of dsDNA exchange affects the hydrogel swelling kinetics of a polymer-dsDNA hybrid hydrogel. *Soft Matter* 2011 ;Volum 7.(5) s. 1741-1746

Gardner, CS; Chu, XZ; Espy, Patrick Joseph; Plane, JMC; Marsh, Daniel R.; Janches, D.
Seasonal variations of the mesospheric Fe layer at Rothera, Antarctica (67.5 degrees S, 68.0 degrees W). *Journal of Geophysical Research - Atmospheres* 2011 ;Volum 116.

Gawel, Kamila; Stokke, Bjørn Torger.
Logic swelling response of DNA-polymer hybrid hydrogel. *Soft Matter* 2011 ;Volum 7.(10) s. 4615-4618

Giacinti, Gwenael; Kachelriess, Michael; Semikoz, Dimitry; Sigl, Guenter.
Ultrahigh energy nuclei in the turbulent Galactic magnetic field. *Astroparticle physics* 2011 ;Volum 35.(4) s. 192-200

Grøva, Morten; Hansen, Alex.
Two-phase flow in porous media: power-law scaling of effective permeability. *Journal of Physics, Conference Series* 2011 ;Volum 319.(1) s. 1-10

Gupta, Manisha; Chowdhury, Fatema Rezwana; Sauer, Vincent; Yap, Seong Shan; Reenaas, Turid Worren; Tsui, Ying Yin.
Pulsed laser deposition of Si nanodots for photonic applications. *Proceedings of SPIE, the International Society for Optical Engineering* 2011 ;Volum 8007.

Hals, Kjetil Magne Dørheim; Brataas, Arne.
Magnetization dissipation in the ferromagnetic semiconductor (Ga,Mn)As. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(10)

Hals, Kjetil Magne Dørheim; Tserkovnyak, Yaroslav; Brataas, Arne.
Phenomenology of Current-Induced Dynamics in Antiferromagnets. *Physical Review Letters* 2011 ;Volum 106.(10) s. –

Halterman, Klaus; Valls, OT; Alidoust, Mohammad.
Characteristic energies, transition temperatures, and switching effects in clean S vertical bar N vertical bar S graphene nanostructures. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(6)

Hansen, Alex; Lucena, Liacir; da Silva, Luciano R..
Spatial correlations in permeability distributions due to extreme dynamics restructuring of unconsolidated sandstone. *Physica A: Statistical Mechanics and its Applications* 2011 ;Volum

Hansen, Alex; Skagerstam, Bo-Sture; Tørå, Glenn.
Anomalous scaling and solitary waves in systems with nonlinear diffusion. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2011 ;Volum 83.(5)

Gjessing, Jo; Marstein, Erik Stensrud.
Colloidal crystals as templates for light harvesting structures in solar cells. *Energy Procedia* 2011 ;Volum 10. s. 292-296

Haugen, Håvard; Brataas, Arne; Waintal, Xavier; Bauer, Gerrit E. W..
Focused crossed Andreev reflection. *Europhysics letters* 2011 ;Volum 93.(6)

Hemmen, Henrik; Alme, Lars Ramstad; Fossum, Jon Otto; Meheust, Yves.
Erratum: X-ray studies of interlayer water absorption and mesoporous water transport in a weakly hydrated clay. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2011 ;Volum 83.(1) s. 019901(E)-

Hibbins, Robert; Freeman, Mervyn P.; Milan, Steve E.; Ruohoniemi, J. M..
Winds and tides in the mid-latitude southern hemisphere upper mesosphere recorded with the Falkland Islands SuperDARN radar. *Annales Geophysicae* 2011 ;Volum 29.(11) s. 1985-1996

Høye, Johan Skule.
Van der Waals interactions: Evaluations by use of a statistical mechanical method. *Journal of Chemical Physics* 2011 ;Volum 135.(13)

Høye, Johan Skule; Brevik, Iver Håkon.
Casimir friction force and energy dissipation for moving harmonic oscillators. II. *European Physical Journal D : Atomic, Molecular and Optical Physics* 2011 ;Volum 61.(2) s. 335-339

Høye, Johan Skule; Brevik, Iver Håkon.
Casimir friction in terms of moving harmonic oscillators: equivalence between two different formulations. *European Physical Journal D : Atomic, Molecular and Optical Physics* 2011 ;Volum 64.(1) s. 1-3

Høye, Johan Skule; Lomba, Enrique.
Analysis if the critical region of the hierarchical reference theory. *Molecular Physics* 2011 ;Volum 109.(23-24) s. 2773-2786

Julukian, Armen; Fadnes, Tore; Raaen, Steinar; Balci, Mustafa Hasan.
Size effect on thermal desorption of CO from Pt nanostructures on graphite. *Journal of Applied Physics* 2011 ;Volum 109.(12)

Kachelriess, Michael.
Constraints from the EBL. *PoS - Proceedings of Science* 2011 ;Volum PoS(Texas 2010).

Kachelriess, Michael; Ostapchenko, Sergey; Tomas, R.
Antimatter Production in Supernova Remnants. *The Astrophysical Journal* 2011 ;Volum 733.(2)

Kalashnikov, Vladimir L; Sorokin, Evgeni; Sorokina, Irina T.
Chirped dissipative soliton absorption spectroscopy. *Optics Express* 2011 ;Volum 19.(18) s. 17480-17492

Khan, Rashid; Kyllingstad, Lars Tandle.
The chiral phase transition and the role of vacuum fluctuations. *AIP Conference Proceedings* 2011 ;Volum 1343. s. 504-506

Kildemo, Morten; Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Hemmen, Henrik; Hansen, Elisabeth Lindbo; Fossum, Jon Otto.
Mueller matrix imaging of nematic textures in colloidal dispersions of Na-fluorohectorite synthetic clay. *Proceedings of SPIE, the International Society for Optical Engineering* 2011 ;Volum 8082.

Kitagawa, Takuya; Oka, Takashi; Brataas, Arne; Fu, Liang; Demler, Eugene.
Transport properties of nonequilibrium systems under the application of light: Photoinduced quantum Hall insulators without Landau levels. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(23)

Lee, Barry B.; Sun, Hao; Valberg, Arne.
Segregation of chromatic and luminance signals using a novel grating stimulus. *Journal of Physiology* 2011 ;Volum 589.(1) s. 59-73

Leganger, Lars Erlend.
Kaon condensation in CFL quark matter, the Goldstone theorem, and the 2PI Hartree approximation. *AIP Conference Proceedings* 2011 ;Volum 1343. s. 586-588

Lelu, Sylvie; Strand, Sabina P.; Steine, Jan; Davies, Catharina De Lange.
Effect of PEGylation on the diffusion and stability of chitosan-DNA polyplexes in collagen gels. *Biomacromolecules* 2011 ;Volum 12.(10) s. 3656-3665

Leskova, Tamara A.; Letnes, Paul Anton; Maradudin, Alexei A.; Nordam, Tor; Simonsen, Ingve.
The scattering of light from two-dimensional randomly rough surfaces. *Proceedings of SPIE, the International Society for Optical Engineering* 2011 ;Volum 8172.(1)

Letnes, Paul Anton; Simonsen, Ingve; Mills, DL.
Substrate influence on the plasmonic response of clusters of spherical nanoparticles. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 83.(7)

Lilledahl, Magnus Borstad; Pierce, David M.; Ricken, Tim; Holzapfel, GA; Davies, Catharina De Lange.
Structural Analysis of Articular Cartilage Using Multiphoton Microscopy: Input for Biomechanical Modeling. *IEEE Transactions on Medical Imaging* 2011 ;Volum 30.(9) s. 1635-1648

Linder, Jacob.
Controllable spin-transfer torque on an antiferromagnet in a dual spin-valve. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(9)

Linder, Jacob; Yokohama, Takehito.
Supercurrent-induced magnetization dynamics in a Josephson junction with two misaligned ferromagnetic layers. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 83.(1)

Linder, Jacob; Yokoyama, Takehito.
Spin Current in Generic Hybrid Structures due to Interfacial Spin-Orbit Scattering. *Physical Review Letters* 2011 ;Volum 106.(23)

Madaro, Francesco; Sæterli, Ragnhild; Tolchard, Julian R; Einarsrud, Mari-Ann; Holmestad, Randi; Grande, Tor.
Molten salt synthesis of K4Nb6O17, K2Nb4O11 and KNb3O8 crystals with needle- or plate-like morphology. *CrysteEngComm* 2011 ;Volum 13.(5) s. 1304-1313

Malinen, Eirik; Rødal, Jan; Knudtsen, Ingerid Skjei; Søvik, Åste; Skogmo, Hege Kippenes.
Spatiotemporal analysis of tumor uptake patterns in dynamic (18)FDG-PET and dynamic contrast enhanced CT. *Acta Oncologica* 2011 ;Volum 50.(6) s. 873-882

Mathiesen, Ragnvald; Arnberg, Lars; Li, Yanjun; Meier, Vivienne; Schaffer, Paul; Snigireva, Irina; Snigirev, Anatoly; Dahle, Arne Kristian.
X-Ray Videomicroscopy Studies of Eutectic Al-Si Solidification in Al-Si-Cu. *Metallurgical and Materials Transactions. A* 2011 ;Volum 42A.(1)

Matsuda, Kenji; Nakamura, Junya; Kawabata, T; Ikeno, Susum; Sato, Tatsuo; Marioara, Calin Daniel; Andersen, Sigmund Jarle; Holmestad, Randi.
Effect of Additional Elements (Cu, Ag) on Precipitation in 6xxx (Al-Mg-Si) Alloys. *Materials Science Forum* 2011 ;Volum 706-709. s. 357-360

McDonald, A.J.; Hibbins, Robert; Jarvis, M.J..
Properties of the quasi 16 day wave derived from EOS MLS observations. *Journal of Geophysical Research - Atmospheres* 2011 ;Volum 116.

Meheust, Yves; Parmar, Kanak Pal Singh; Schjelderupsen, Børge; Fossum, Jon Otto.
The electrorheology of suspensions of Na-fluorohectorite clay in silicone oil. *Journal of rheology (New York, N.Y.)* 2011 ;Volum 55.(4) s. 809-833

Moffat-Griffin, T; Hibbins, Robert; Jarvis, M.J.; Colwell, S.R..
Seasonal variations of gravity wave activity in the lower stratosphere over an Antarctic Peninsula station. *Journal of Geophysical Research - Atmospheres* 2011 ;Volum 116.

Mohn, Silje; Wasbø, Ellen.
Simulation of respiratory motion during IMRT dose delivery. *Acta Oncologica* 2011 ;Volum 50.(6) s. 935-943

Mumm, Florian; Sikorski, Pawel.
Oxidative fabrication of patterned, large, non-flaking CuO nanowire arrays. *Nanotechnology* 2011 ;Volum 22.(10)

Mushtaq, Asif; Noreen, Amna; Olaussen, Kåre; Øverbø, Ingjald.
Very-high-precision solutions of a class of Schrodinger type equations. *Computer Physics Communications* 2011 ;Volum 182.(9) s. 1810-1813

Nagayoshi, H; Nordmark, Heidi; Nishimura, S; Terashima, K; Marioara, Calin Daniel; Walmsley, John; Holmestad, Randi; Ulyashin, Alexander.
Vapor-solid-solid Si nano-whiskers growth using pure hydrogen as the source gas. *Thin Solid Films* 2011 ;Volum 519.(14) s. 4613-4616

Nerbø, Ingar Stian; Le Roy, Sebastien; Foldyna, Martin; Søndergård, Elin; Kildemo, Morten.
Real-time in situ Mueller matrix ellipsometry of GaSb nanopillars: observation of anisotropic local alignment. *Optics Express* 2011 ;Volum 19.(13) s. 12551-12561

Newnham, David; Espy, Patrick Joseph; Clilverd, Mark; Rodger, Craig J; Seppala, Annika; Maxfield, David; Hartogh, Paul; Holmén, Kim Johan; Horne, R.
Direct observations of nitric oxide produced by energetic electron precipitation into the Antarctic middle atmosphere. *Geophysical Research Letters* 2011 ;Volum 38.

Nguyen-Thi, H; Bogno, A; Reinhart, G; Billia, B; Mathiesen, Ragnvald; Zimmermann, Gerhard; Houltz, Y; Loth, K; Voss, D; Verga, A; de Pascale, F.
Investigation of gravity effects on solidification of binary alloys with in situ X-ray radiography on earth and in microgravity environment. *Journal of Physics, Conference Series* 2011 ;Volum 327.(012012)

Nigussa, Kenate Nemera; Nielsen, Kjetil Liestøl; Borck, Øyvind; Støvneng, Jon Andreas.
Adsorption of hydrogen, chlorine, and sulfur atoms on alpha-Cr2O3(0001) surfaces: A density functional theory investigation. *Corrosion Science* 2011 ;Volum 53.(11) s. 3612-3622

Nigussa, Kenate Nemera; Støvneng, Jon Andreas.
Theoretical investigation of the interaction of oxygen with pure and K-doped NiTi shape memory surface alloys. *Computer Physics Communications* 2011 ;Volum 182.(9) s. 1979-1983

Nordmark, Heidi; Ulyashin, Alexander; Walmsley, John; Holmestad, Randi.
H-initiated extended defects from plasma treatment: Comparison between c-Si and mc-Si. *Journal of Physics, Conference Series* 2011 ;Volum 519. s. 4613-4616

Noreen, Amna; Olaussen, Kåre.
Very-high-precision normalized eigenfunctions for a class of Schrodinger type equations. *Proceedings of World Academy of Science, Engineering and Technology* 2011 ;Volum 76. s. 831-836

Olaussen, Kåre; Osland, Per; Solberg, Marius Aase.
Symmetry and mass degeneration in multi-Higgs-doublet models. *Journal of High Energy Physics (JHEP)* 2011 (7)

Olderøy, Magnus Østgård; Xie, Minli; Strand, Berit Løkensgard; Draget, Kurt Ingar; Sikorski, Pawel; Andreassen, Jens-Petter.
Polymorph Switching in the Calcium Carbonate System by Well-Defined Alginate Oligomers. *Crystal Growth & Design* 2011 ;Volum 11.(2) s. 520-529

Ostapchenko, Sergey.
Monte Carlo treatment of hadronic interactions in enhanced Pomeron scheme: QGSJET-II model. *Physical Review D* 2011 ;Volum 83.(1) s.

Ostapchenko, Sergey.
On the model-dependence of the relation between minimum-bias and inelastic proton-proton cross sections. *Physics Letters B* 2011 ;Volum 703.(5) s. 588-592

Park, Song Hee; Lee, Hwa Sung; Kim, Jong-Dae; Breiby, Dag Werner; Kim, Eunhye; Park, Yeong Don; Ryu, Du Yeol; Lee, Dong Ryeol; Cho,
Jeong ho.
A polymer brush organic interlayer improves the overlying pentacene nanostructure and organic field-effect transistor performance. *Journal of Materials Chemistry* 2011 ;Volum 21.(39) s. 15580-15586

Parsons, RD; Bleve, C; Ostapchenko, Sergey; Knapp, J.
Systematic uncertainties in air shower measurements from high-energy hadronic interaction models. *Astroparticle physics* 2011 ;Volum 34.(11) s. 832-839

Pedersen, FB; Hemmer, Per Christian.
Exact solution of a confined two-particle system with calculation of its dead-layer size. *Molecular Physics* 2011 ;Volum 109.(4) s. 551-558

Pradhan, Srutarshi; Hemmer, Per Christian.
Prediction of the collapse point of overloaded materials by monitoring energy emissions. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2011 ;Volum 83.(4)

Rakete, Christoph; Baumbach, C; Goldschmidt, A; Samberg, D; Schroer, C.G.; Breede, F; Stenzel, C; Zimmermann, Gerhard; Pickmann, C; Houltz, Y; Lockowandt, C; Svenonius, O; Wiklund, P; Mathiesen, Ragnvald.
Compact x-ray microradiograph for in situ imaging of solidification processes: Bringing in situ x-ray micro-imaging from the synchrotron to the laboratory. *Review of Scientific Instruments* 2011 ;Volum 82.(10)

Rauwel, Erwan Yann; Nilsen, Ola; Galeckas, Augustinas; Walmsley, John; Rytter, Erling; Fjellvåg, Helmer.
ALD Applied to Conformal Coating of Nanoporous γ-Alumina: Spinel Formation and Luminescence Induced by Europium Doping. *ECS Transactions* 2011 ;Volum 41.(2) s. 123-130

Rozynek, Zbigniew; Jozefczak, A; Knudsen, Kenneth Dahl; Skumiel, A; Hornowski, T; Fossum, Jon Otto; Timko, M; Kopcansky, P; Koneracka, M.
Structuring from nanoparticles in oil-based ferrofluids. *The European Physical Journal E : Soft matter* 2011 ;Volum 34.(3)

Rødal, Jan; Waldeland, Einar; Søvik, Åste; Malinen, Eirik.
Dosimmric verification of biologically adapted IMRT. *Medical physics (Lancaster)* 2011 ;Volum 38.(5) s. 2586-2594

Samardak, A; Sukovatitsina, E; Ognev, A; Anisimova, M; Wahlström, Erik; Chebotkevich, L.
Magnetization Reversal and Domain Structure of Magnetic Tunnel Junctions. *Solid State Phenomena* 2011 ;Volum 168. s. 253-256

Sandell, Anders; Sanyal, Biplab; Walle, Lars Erik; Uvdal, Per; Borg, Anne.
Probing the conduction band edge of transition metal oxides by x-ray absorption spectroscopy. *Journal of Electron Spectroscopy and Related Phenomena* 2011 ;Volum 183.(1-3) s. 107-113

Siew, Wee Ong; Yap, Seong Shan; Ladam, Cecile; Dahl, Øystein; Reenaas, Turid Worren; Tou,
Teck Yong.
Nanosecond laser ablation and deposition of silicon. *Applied Physics A: Materials Science & Processing* 2011 ;Volum 104.(3) s. 877-881

Simonsen, Ingve; Kryvi, Jacob Berent; Maradudin, Alexei A.; Leskova, Tamara A..
Light scattering from anisotropic, randomly rough, perfectly conducting surfaces. *Computer Physics Communications* 2011 ;Volum 182.(9) s. 1904-1908

Simonsen, Jens B.; Westerlund, Fredrik; Breiby, Dag Werner; Harrit, Niels; Laursen, Bo W..
Columnar Self-Assembly and Alignment of Planar Carbenium Ions in Langmuir-Blodgett Films. *Langmuir* 2011 ;Volum 27.(2) s. 792-799

Sinha, Santanu; Grøva, Morten; Ødegården, Torgeir Bryge; Skjetne, Erik; Hansen, Alex.
Local wettability reversal during steady-state two-phase flow in porous media. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2011 ;Volum 84.(3) s. 037303-1-037303-4

Sjöqvist, Jonas; Linares, Mathieu; Lindgren, Mikael; Norman, Patrick.
Molecular dynamics effects on luminescence properties of oligothiophene derivatives: a molecular mechanics-response theory study based on the CHARMM force field and density functional theory. *Physical Chemistry, Chemical Physics - PCCP* 2011 ;Volum 13.(39) s. 17532-17542

Skadsem, Hans Joakim; Brataas, Arne; Martinek, J; Tserkovnyak, Yaroslav.
Ferromagnetic resonance and voltage-induced transport in normal metal-ferromagnet-superconductor trilayers. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(10)

Sollid, Per Øyvind; Leinaas, Jon Magne; Myrheim, Jan.
Unextendible product bases and extremal density matrices with positive partial transpose. *Physical Review A. Atomic, Molecular, and Optical Physics* 2011 ;Volum 84.(4)

Song, Fei; Gammelgaard, L; Hofmann, P; Wells, Justin W.
Suppression of the Ag/Si surface conductivity transition temperature by organic adsorbates. *Applied Physics Letters* 2011 ;Volum 98.(5)

Sperstad, Iver Bakken; Stiansen, Einar; Sudbø, Asle.
Quantum criticality in a dissipative (2+1)-dimensional XY model of circulating currents in high-Tc cuprates. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 84.(18)

Stiansen, Einar; Sperstad, Iver Bakken; Sudbø, Asle.
Criticality of compact and noncompact quantum dissipative Z4 models in (1+1) dimensions. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 83.(11)

Strandberg, Rune; Reenaas, Turid Worren.
Drift-diffusion model for intermediate band solar cells including photofilling effects. *Progress in Photovoltaics* 2011 ;Volum 19.(1) s. 21-32

Strandberg, Rune; Reenaas, Turid Worren.
Optimal Filling of the Intermediate Band in Idealized Intermediate-Band Solar Cells. *IEEE Transactions on Electron Devices* 2011 ;Volum 58.(8) s. 2559-2565

Strickland, Michael; Andersen, Jens Oluf; Leganger, Lars Erlend; Su, Nan.
Hard-Thermal-Loop QCD Thermodynamics. *Progress of Theoretical Physics Supplement* 2011 (187) s. 106-114

Svanes, Eirik Eik; Andersen, Jens Oluf.
Functional renormalization group at finite density and Bose condensation. *Nuclear Physics A* 2011 ;Volum 857.(1) s. 16-28

Svensen, Øyvind; Stamnes, Jakob J.; Kildemo, Morten; Aas, Lars Martin Sandvik; Erga, Svein Rune; Frette, Øyvind.
Mueller matrix measurements of algae with different shape and size distributions. *Applied Optics* 2011 ;Volum 50.(26) s. 5149-5157

Sæterli, Ragnhild; Flage-Larsen, Espen; Friis, Jesper; Løvvik, Ole Martin; Pacaud, Jerome; Marthinsen, Knut; Holmestad, Randi.
Experimental and theoretical study of electron density and structure factors in CoSb3. *Ultramicroscopy* 2011 ;Volum 111.(7) s. 847-853

Teichmann, Katharina; Marioara, Calin Daniel; Andersen, Sigmund Jarle; Pedersen, Ketill Olav; Gulbrandsen-Dahl, Sverre; Kolar, Michal; Holmestad, Randi; Marthinsen, Knut.
HRTEM study of the effect of deformation on the early precipitation behaviour in an AA6060 Al-Mg-Si alloy. *Philosophical Magazine* 2011 ;Volum 91.(28) s. 3744-3754

Thomassen, Sedsel Fretheim; Reenaas, Turid Worren; Fimland, Bjørn-Ove.
InAs/GaAs quantum dot density variation across a quarter wafer when grown with substrate rotation. *Journal of Crystal Growth* 2011 ;Volum 323.(1) s. 223-227

Todorovic, Jelena; Anthonysamy, Fervin Moses; Dasa Lakshmi Narayana, Dheeraj; Olk, Phillip; Fimland, Bjørn-Ove; Weman, Helge; Van Helvoort, Antonius.
Correlated micro-photoluminescence and electron microscopy study of a heterostructured semiconductor nanowire. *Journal of Physics, Conference Series* 2011 ;Volum 326.

Todorovic, Jelena; Anthonysamy, Fervin Moses; Karlberg, Thomas Andre; Olk, Phillip; Dasa Lakshmi Narayana, Dheeraj; Fimland, Bjørn-Ove; Weman, Helge; Van Helvoort, Antonius.
Correlated micro-photoluminescence and electron microscopy studies of the same individual heterostructured semiconductor nanowires. *Nanotechnology* 2011 ;Volum 22.(32)

Torsæter, Malin; LeFebvre, William; Marioara, Calin Daniel; Andersen, Sigmund Jarle; Walmsley, John; Holmestad, Randi.
Study of intergrown L and Q ' precipitates in Al-Mg-Si-Cu alloys. *Scripta Materialia* 2011 ;Volum 64.(9) s. 817-820

Vodopyanov, KL; Sorokin, E; Sorokina, Irina T; Schunemann, PG.
Mid-IR frequency comb source spanning 4.4-5.4 mu m based on subharmonic GaAs optical parametric oscillator. *Optics Letters* 2011 ;Volum 36.(12) s. 2275-2277

Vullum, Per Erik; Pitt, Mark P.; Walmsley, John C.; Hauback, Bjørn C.; Holmestad, Randi.
TEM characterization of pure and transition metal enhanced NaAlH4. *Journal of Alloys and Compounds* 2011 ;Volum 509.(2) s. 281-289

Walle, Lars Erik; Agnoli, Stefano; Svenum, Ingeborg-Helene; Borg, Anne; Artiglia, Luca; Krüger, Peter; Sandell, Anders; Granozzi, Gaetano.
High resolution photoemission and x-ray absorption spectroscopy of a lepidocrocite-like TiO2 nanosheet on Pt(110)(1x2). *Journal of Chemical Physics* 2011 ;Volum 135. s. 054706-

Walle, Lars Erik; Borg, Anne; Johansson, Erik; Plogmaker, Stefan; Rensmo, Håkan; Uvdal, Per; Sandell, Anders.
Mixed Dissociative and Molecular Water Adsorption on Anatase TiO2(101). *The Journal of Physical Chemistry C* 2011 ;Volum 115.(19) s. 9545-9550

Weigand, Christian Carl; Bergren, M.R.; Ladam, Cecile; Tveit, Johannes; Holmestad, Randi; Vullum, Per Erik; Walmsley, John; Dahl, Øystein; Furtak, T.E.; Collins, R.T.; Grepstad, Jostein; Weman, Helge.
Formation of ZnO Nanosheets Grown by Catalyst-Assisted Pulsed Laser Deposition. *Crystal Growth & Design* 2011 ;Volum 11.(12) s. 5298-5304

Weigand, Christian Carl; Skåre, Daniel; Ladam, Cecile; Grepstad, Jostein; Weman, Helge.
Effects of substrate annealing on the gold-catalyzed growth of ZnO nanostructures. *Nanoscale Research Letters* 2011 ;Volum 6. s. 566-

Yap, Seong Shan; Siew, Wee Ong; Ladam, Cecile; Reenaas, Turid Worren; Tou, Teck Yong.
Effects of laser wavelength and fluence in pulsed laser deposition of Ge films. *AIP Conference Proceedings* 2011 ;Volum 1328.(1) s. 305-307

Yokoyama, Takehito; Linder, Jacob.
Anomalous magnetic transport in ferromagnetic graphene junctions. *Physical Review B. Condensed Matter and Materials Physics* 2011 ;Volum 83.(8)

Zha, Chaolin; Dumas, RK; Lau, JW; Mohseni, SM; Sani, SR; Golosovsky, IV; Monsen, Åsmund Fløystad; Nogues, Juan P.; Åkerman, Jonas.
Nanostructured MnGa films on Si/SiO2 with 20.5 kOe room temperature coercivity. *Journal of Applied Physics* 2011 ;Volum 110.(9) s.

Zhang, Ye; Yousef, YA; Li, Heng; Melø, Thor Bernt; Naqvi, Kalbe Razi.
Comparison of the Photochemical Behaviors of alpha-Tocopherol and its Acetate in Organic and Aqueous Mice liar Solutions. *Journal of Physical Chemistry A* 2011 ;Volum 115.(29) s. 8242-8247

Zhou, Min; Hu, Ye; Ferrari, Mauro; Xie, Zhaohui.
Self-Assembled Zinc/Copper Hydroxide Carbonates with Tunable Hierarchical Nanostructure. *Journal of Nanoscience and Nanotechnology* 2011 ;Volum 11.(8) s. 7037-7041

OTHER JOURNALS

Andersen, Pål Flodin; Sandnes, Bjørnar.
Fysikk i Sandkassa. Forskning.no [Internett] 2011-05-06

Bjørnæs, Ingvil; Sandnes, Bjørnar.
Nye mønstre for industrielle prosesser. Forskningsrådet [Internett] 2011-04-19

Breiby, Dag Werner; Samuelsen, Emil J.
Talboteffekt med røntgenstråling. *Fra Fysikkens Verden* 2011 ;Volum 73.(2) s. 59-63

Bungum, Berit.
In Memorial: Phil Scott 1953-2011. *NorDiNa : Nordic Studies in Science Education* 2011 ;Volum 7.(2) s. 232-232

Davies, Catharina De Lange.
Nanotek+ultralyd+cellgift=ny kreftbehandling. [Avis] 2011-10-17

Fossheim, Kristian.
Ny pris for bærekraftig forsking. *Adresseavisen* 2011

Fossheim, Kristian.
Sveltefora forskarar. *Aftenposten (morgenutg. : trykt utg.)* 2011

Gustafsson, Håkan; Berg, Kirsti; Lindgren, Mikael; Engström, Maria; De Muinck, Ebo; Zachrisson, Helene.
Fe3+ Heterogeneity in Ex Vivo Carotid Atherosclerotic Plaques. *Free Radical Biology & Medicine* 2011 ;Volum 51. s. S40-S40

Hansen, Alex; Sudbø, Asle.
Special Edition for Conference on Computational Physics Trondheim, Norway, June 23-26, 2010 Preface. *Computer Physics Communications* 2011 ;Volum 182.(9) s. 1755-1755

Johnsson, Anders; Mork, Kjell Johannes; Olaussen, Kåre; Osland, Per.
Haakon Andreas Olsen. *Det Kgl. Norske Videnskabers Selskabs Årsbok 2010* 2011 s. 137-139

Johnsson, Anders; Mork, Kjell Johannes; Olaussen, Kåre; Osland, Per.
Minneord over Haakon Andreas Olsen. *NTVA's Årbok 2010* 2011 s. 85-87

Lelu, Sylvie; Strand, Sabina P.; Steine, Jan; Davies, Catharina De Lange.
PEGylation increases mobility of chitosan-DNA delivery systems in artificial extracellular matrices. *European Biophysics Journal* 2011 ;Volum 40. Suppl. 1 s. 238-238

Meland, Svein Inge; Espy, Patrick Joseph.
Radar «leser» stjerneskudd. Adresseavisen [Avis] 2011-08-16

Oftedal, Gunnhild; Johnsson, Anders; Stovner, Lars Jacob; Straume, Aksel.
Response to 'Comment on mobile phone headache: A double-blind, sham-controlled provocation study'. *Cephalalgia* 2011 ;Volum 31.(4) s. 508-509

Olderøy, Magnus Østgård; Strand, Berit Løkensgard.
Skeleton greenhouse. Gemini [Avis] 2011-03-01

Olderøy, Magnus Østgård; Strand, Berit Løkensgard; Sikorski, Pawel.
Skeleton greenhouse. GEMINI [Avis] 2011-03-01

Persson, Rolf Jonas; Hagen, Jan Egil.
Videos determine the Moon's g. *Physics Education* 2011 ;Volum 46. s. 12-13

Prasad, Jocelyn; Sandnes, Bjørnar.
New shapes in granular movement. University of Sydney [Internett] 2011-04-20

Samuelsen, Emil J.
Ein materialeigenskap som kan vere normal, gigantisk eller kolossal. *Fra Fysikkens Verden* 2011 (2) s. 63-67

Samuelsen, Emil J.
Nord-Troms 700 år etter slaget på Stiklestad. *Menneske og miljø i Nord-Troms* 2011 ;Volum 26. s. 9-15

Samuelsen, Emil J.
Perovskitt: talrike i naturen, nyttige i teknologien. *Naturen* 2011 ;Volum 135.(2) s. 50-58

Samuelsen, Emil J.
Silke og spindelvev. *Naturen* 2011 ;Volum 135.(4) s. 166-173

Samuelsen, Emil J.
Ulemper ved vindmøller. *Framtid i Nord* 2011

Samuelsen, Emil J.
"Vatn i nanorør". *Fra Fysikkens Verden* 2011 ;Volum 73.(4) s. 124-128

Sandnes, Bjørnar.
Pattern palette for complex fluid flows. *Physics today* 2011 ;Volum 64.(6)

BOOKS, BOOK CHAPTERS AND REPORTS

BOOKS AND PART OF BOOKS AT LEVEL 1 AND 2

Angell, Carl; Bungum, Berit; Henriksen, Ellen Karoline; Kolstø, Stein Dankert; Persson, Rolf Jonas; Renstrøm, Reidun.
Fysikkdidaktikk. Høyskoleforlaget 2011 (ISBN 978-82-7634-878-1) 436 s.

Brudevoll, Trond; Storebø, Asta Katrine; Skaaring, O.; Kirkemo, Camilla Nestande; Norum, O.C.; Olsen, Øyvind; Breivik, Magnus.
Time-Resolved Laser Spectroscopy of Semiconductors - Physical Processes and Methods of Analysis. I: *Femtosecond-Scale Optics*. INTECH 2011 ISBN 978-953-307-769-7. s. 139-168

Haugen, Nils Erland Leinebø; Kragset, Steinar; Bjørnstad, Anders Granskogen.
Fundamental modes of particle impaction on a solid object. I: *MekIT'11: Sixth National Conference on Computational Mechanics, Trondheim 23-24 May 2011*. Tapir Akademisk Forlag 2011 ISBN 978-82-519-2798-7. s. 117-126

Letnes, Paul Anton; Nerbø, Ingar Stian; Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Kildemo, Morten.
Genetic invention of fast and optimal broad-band stokes/mueller polarimeter designs. I: *Proceedings of the 13th annual conference companion on Genetic and evolutionary computation*. Association for Computing Machinery (ACM) 2011 ISBN 978-1-4503-0690-4. s. 237-238

Wei, Yingkang; Holter, Bengt; Simonsen, Ingve; Kuhnle, Jacob; Husby, Karsten; Norum, Lars Einar.
Calculation of Sommerfeld Integrals for Conductive Media at Low Frequencies. I: *IEEE International Workshop on Electromagnetics, Applications and Student Innovation (iWEM), 8-10 August, 2011, Taipei*. IEEE conference proceedings 2011 ISBN 978-1-61284-463-3. s. 130-134

OTHER BOOKS/REPORTS

Angell, Carl; Bungum, Berit; Henriksen, Ellen Karoline; Kolstø, Stein Dankert; Persson, Rolf Jonas; Renstrøm, Reidun.
Fysikkdidaktikk. Høyskoleforlaget 2011 (ISBN 978-82-7634-878-1) 436 s.

Broekmans, Maarten A.T.M; Korneliussen, Are; Muller, Axel; Roaldset, Elen; Selbekk, Rune S; van der Eijk, Casper; Van Helvoort, Antonius.
Proceedings of the 10th International Congress for Applied Mineralogy (ICAM). Trondheim: International Congress for Applied Mineralogy (ICAM) 2011 (ISBN 978-82-7385-141-3) 823 s.

Broekmans, Maarten A.T.M; Korneliussen, Are; Müller, Axel; Roaldset, Elen; Selbekk, Rune S; van der Eijk, Casper; Van Helvoort, Antonius.
Program and abstract 10th International Congress for Applied Mineralogy (ICAM). Trondheim: International Congress for Applied Mineralogy (ICAM) 2011 (ISBN 978-82-7385-140-6) 96 s.

Blomberg, Sara; Martin, Natalia; Gustafson, Johan; Andersen, Jesper N.; Lundgren, Edvin; Walle, Lars Erik; Borg, Anne; Messing, Maria; Deppert, Knut; Grönbeck, Henrik.
Production and characterization of PdAg aerosol nanoparticles on SiOx. I: *MAX-lab Activity Report 2010*. Lund: MAX-lab 2011 s. 116-117

Brudevoll, Trond; Storebø, Asta Katrine; Skaaring, O.; Kirkemo, Camilla Nestande; Norum, O.C.; Olsen, Øyvind; Breivik, Magnus.
Time-Resolved Laser Spectroscopy of Semiconductors - Physical Processes and Methods of Analysis. I: *Femtosecond-Scale Optics*. INTECH 2011 ISBN 978-953-307-769-7. s. 139-168

Dvoyrin, Vladislav; Sorokina, Irina T; Kalashnikov, Valdimir L; Masinsky, V. M.; Ischakova, L. D.; Dianov, E. M.; Khopin, V. F.; Guryanov, A. N..
Tm3+-doped CW fiber laser based on a highly GeO2-doped dispersion shifted fiber. I: *Advanced Solid-State Photonics (ASSP)*. : Optical Society of America 2011 ISBN 978-1-55752-904-6.

Dvoyrin, Vladislav; Sorokina, Irina T; Okhotnikov, Oleg; Mashinsky, Valery M.; Ischakova, Lyudmila D.; Dianov, Evgenii M; Khopin, Vladimir F.; Guryanov, Aleksey N..
1.9 micron Tm3+-doped germanate fiber laser source for Si-processing. I: *Advanced Solid-State Photonics (ASSP)*. : Optical Society of America 2011 ISBN 978-1-55752-904-6.

Steinar; Bjørnstad, Anders Granskogen.
Fundamental modes of particle impaction on a solid object. I: *MekIT'11: Sixth National Conference on Computational Mechanics, Trondheim 23-24 May 2011*. Tapir Akademisk Forlag 2011 ISBN 978-82-519-2798-7. s. 117-126

Kalashnikov, Valdimir L; Dvoyrin, Vladislav; Sorokina, Irina T.
Energy scalable passively mode-locked mid-IR Tm-fiber laser. I: *CLEO/Europe and EQEC 2011 Conference Digest*. Washington, DC: Optical Society of America 2011 ISBN 978-1-4577-0532-8.

Kalashnikov, Valdimir L; Sorokin, Evgeni; Sorokina, Irina T.
Chaotic mode-locking of mid-IR chirped-pulse oscillator. I: *CLEO/Europe and EQEC 2011 Conference Digest*. Washington, DC: Optical Society of America 2011 ISBN 978-1-4577-0532-8.

Kalashnikov, Valdimir L; Sorokina, Irina T; Dvoyrin, Vladislav.
Energy scalability of 2 μm ultrashort pulsed Tm-laser based on germanate dispersion shifted fiber. I: *Advanced Solid-State Photonics (ASSP)*. : Optical Society of America 2011 ISBN 978-1-55752-904-6.

Kalashnikov, Valdimir L; Sorokina, Irina T; Dvoyrin, Vladislav.
Nonlinear dispersion shifted germanate fiber for continuum generation around 2 μm. I: *Advanced Solid-State Photonics (ASSP)*. : Optical Society of America 2011 ISBN 978-1-55752-904-6.

Letnes, Paul Anton; Nerbø, Ingar Stian; Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Kildemo, Morten.
Genetic invention of fast and optimal broad-band stokes/mueller polarimeter designs. I: *Proceedings of the 13th annual conference companion on Genetic and evolutionary computation*. Association for Computing Machinery (ACM) 2011 ISBN 978-1-4503-0690-4. s. 237-238

Ragazzon, Davide; Schaefer, Andreas; Walle, Lars Erik; Farstad, Mari Helene; Zakharov, Alexei; Borg, Anne; Sandell, Anders.
Investigation of TiOx phases grown on Au(111) by chemical vapor depostion. I: *MAX-lab Activity Report 2010*. Lund: MAX-lab 2011 s. 150-151

Schaefer, Andreas; Ragazzon, Davide; Walle, Lars Erik; Wittstock, Arne; Borg, Anne; Bäumer, Marcus; Sandell, Anders.
Cleaning and oxidation of nanoporous gold. A detailed photoemission study. I: *MAX-lab Activity Report 2010*. Lund: MAX-lab 2011 s. 152-153

Sorokin, Evgeni; Klimentov, Dmitry; Sorokina, Irina T; Kozlovskii, V. I.; Korostelin, Yu. V.; Landman, A. I.; Podmar'kov, Y. P.; Skasyrskii, Ya. K.; Frolov, M. P..
Broadly tunable high-power continuous-wave Cr2+:CdS laser. I: *Advanced Solid-State Photonics (ASSP)*. : Optical Society of America 2011 ISBN 978-1-55752-904-6.

Sorokin, Evgeni; Sorokina, Irina T; Tolstik, Nikolai.
Femtosecond operation and self-doubling of Cr:ZnS laser. I: *Nonlinear Optics (NLO)*. Washington, DC: Optical Society of America 2011 ISBN 978-1-55752-915-2.

Vodopyanov, K. L.; Sorokin, Evgeni; Sorokina, Irina T; Schunemann, P. G..
4.4-5.4 μm frequency comb from a subharmonic OP-GaAs OPO pumped by a femtosecond Cr:ZnSe laser. I: *Advanced Solid-State Photonics (ASSP)*. : Optical Society of America 2011 ISBN 978-1-55752-904-6.
NTNU

Walle, Lars Erik; Amft, Martin; Ragazzon, Davide; Borg, Anne; Uvdal, Per; Skorodumova, Natalia; Sandell, Anders.
Growth of the first water layer on rutile TiO2(110). I: *MAX-lab Activity Report 2010*. Lund: MAX-lab 2011 s. 430-431

Walle, Lars Erik; Borg, Anne; Johansson, Erik; Plogmaker, Stefan; Rensmo, Håkan; Uvdal, Per; Sandell, Anders.
Mixed dissociative and molecular water adsorption on anatase TiO2(101). I: *MAX-lab Activity Report 2010*. Lund: MAX-lab 2011 s. 432-433

Wei, Yingkang; Holter, Bengt; Simonsen, Ingve; Kuhnle, Jacob; Husby, Karsten; Norum, Lars Einar.
Calculation of Sommerfeld Integrals for Conductive Media at Low Frequencies. I: *IEEE International Workshop on Electromagnetics, Applications and Student Innovation (iWEM), 8-10 August, 2011, Taipei*. IEEE conference proceedings 2011 ISBN 978-1-61284-463-3. s. 130-134

DOCTORAL THESIS

Bjørge, Ruben
"Scanning transmission electron microscopy studies of precipitation in Al-Mg-Ge alloys"
ISBN: 978-82-471-3028-5
Supervisors: Randi Holmestad, Calin Marioara, Jostein Røyset

Hals, Kjetil Magne Dørheim
"Current-Induced Dynamics in Ferromagnets and Antiferromagnets"
ISBN: 978-82-471-2957-9
Antiferromagnets"
Supervisors: Arne Brataas, Kiet Anh

Kyllingstad, Lars Tandle
"Aspects of QCD thermodynamics through scalar field theory and NJL models"
ISBN: 978-82-471-2926-5
Supervisor: Jens Oluf Andersen

Leganger, Lars Erlend
"Matter in extreme conditions Resumming QCD thermodynamics"
ISBN: 978-82-471-2832-9
Supervisor: Jens Oluf Andersen

Nerbø, Ingar Stian
"Real-time Study of the Formation of GaSb Nanopillars by Spectroscopic Mueller Matrix Ellipsometry"
ISBN: 978-82-471-2970-8 Supervisor: Morten Kildemo

Nigussa, Kenate Nemera
"Density Functional Theory Investigations of Surface Structure and Reactivity"
ISBN: 978-82-471-2717-9
Supervisors: Jon Andreas Støvneng, Øyvind Borck

Olderøy, Magnus Østgård
"Bioinspired mineralization of alginate hydrogels"
ISBN: 978-82-471-3039-1
Supervisors: Pawel Tadeusz Sikorski, Berit L. Strand, Jens Petter Andreassen

Rozynek, Zbigniew Jerzy
"Experimental Studies of Self-organization from Electrically Polarized Clay Particles"
ISBN: 978-82-471-3127-5
Supervisor: Jon Otto Fossum

Torsæter, Malin
"Quantitative studies of clustering and precipitation in Al-Mg-Si(-Cu) alloys"
ISBN: 978-82-471-2979-1
Supervisors. Randi Holmestad, John Walmsley, Williams Lefebvre

CONFERENCES AND TALKS

SCIENTIFIC TALKS

Ahtapodov, Lyubomir; Olk, Phillip; Todorovic, Jelena; Ericsson, M.; Dasa Lakshmi Narayana, Dheeraj; Van Helvoort, Antonius; Bergman, J.P.; Fimland, Bjørn-Ove; Weman, Helge.
Optical properties of Wurtzite GaAs nanowires. GDR Semiconductor Nanowires and Nanotubes; 2011-10-17 - 2011-10-21

Ahtapodov, Lyubomir; Olk, Phillip; Todorovic, Jelena; Mjåland, Terje Sund; Dasa Lakshmi Narayana, Dheeraj; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Optical characterization of single semiconductor nanowires. 6th NanoLab user meeting; 2011-11-16 - 2011-11-16

Ahtapodov, Lyubomir; Olk, Phillip; Todorovic, Jelena; Mjåland, Terje Sund; Eriksson, M.; Bergman, P; Dasa Lakshmi Narayana, Dheeraj; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Combined studies of single Au-assisted GaAs/AlGaAs core/shell nanowires with PL spectroscopy and TEM. PDI Topical Workshop on MBE-grown Arsenide Nanowires; 2011-09-08 - 2011-09-09

Anthonysamy, Fervin Moses; Todorovic, Jelena; Dasa Lakshmi Narayana, Dheeraj; Olk, Phillip; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Consecutive optical and structural characterization of a single heterostructured III-V semiconductor nanowire. 2nd Nano-network Workshop; 2011-06-15 - 2011-06-17

Anthonysamy, Fervin Moses; Todorovic, Jelena; karlberg, Thomas; Van Helvoort, Antonius; Dasa Lakshmi Narayana, Dheeraj; Olk, Phillip; Fimland, Bjørn-Ove; Weman, Helge.
Consecutive Photoluminescence and Transmission Electron Microscopy Studies of Single GaAs/AlGaAs Core-shell Nanowires with a GaAsSb Insert. MRS Spring meeting 2011; 2011-04-25 - 2011-04-29

Barriet, David; Stokke, Bjørn Torger.
Formation of Polymer Nanoparticles using Microfluidics. NanoLab Annual meeting; 2011-11-16 - 2011-11-16

Bjørge, Ruben; Dwyer, Christian; Weyland, Matthew; Nakashima, Philip N.H.; Etheridge, Joanne; Holmestad, Randi.
Quantitative HAADF STEM study of β'-like precipitates in an Al-Mg-Ge alloy. EMAG2011; 2011-09-06 - 2011-09-09

Boschker, Jos Emiel; Monsen, Åsmund Fløystad; Folkman, Chad; Bark, C.W.; Folven, Erik; Grepstad, Jostein; Eom, C.B.; Wahlström, Erik; Tybell, Thomas.
Periodic lattice distortions and domain formation in perovskite thin films. The joint STINT Workshop on multifunctional oxides and mineral; 2011-03-01 - 2011-03-03

Boschker, Jos Emiel; Monsen, Åsmund Fløystad; Folkman, Chad; Eom, C.B.; Wahlström, Erik; Tybell, Thomas.
Control of twinning and periodic in-plane structure in epitaxial La0.7Sr0.3MnO3 thin films. MRS Spring meeting; 2011-04-25 - 2011-04-29

Brataas, Arne.
Current-induced Torques and Spin-Pumping in Ferromagnets. Nordic Magnetic Conference 2011; 2011-10-04 - 2011-10-05

Brataas, Arne.
Spinntronikk. NANOMAT sluttkonferanse; 2011-11-02 - 2011-11-02

Brataas, Arne; Hals, Kjetil Magne Dørheim; Waintal, Xavier; Nguyen, Anh Kiet.
Magnetic Monopole Fingerprints. A&M University seminar; 2011-03-25 - 2011-03-25

Brataas, Arne; Hals, Kjetil Magne Dørheim; Waintal, Xavier; Nguyen, Anh Kiet.
Magnetic Monopole Fingerprints. Seminar, University of Utah, USA; 2011-01-25 - 2011-01-25

Brataas, Arne; Hals, Kjetil Magne Dørheim; Waintal, Xavier; Nguyen, Anh Kiet.
Magnetic Monopole Fingerprints. Harvard University; 2011-02-17 - 2011-02-17

Brataas, Arne; Hals, Kjetil Magne Dørheim; Waintal, Xavier; Nguyen, Anh Kiet.
Magnetic Monopole Fingerprints. NYU seminar; 2011-04-06 - 2011-04-06

Brataas, Arne; Hals, Kjetil Magne Dørheim; Waintal, Xavier; Nguyen, Anh Kiet.
Magnetic Monopole Fingerprints. Seminar, Geneva University, Switzerland; 2011-11-15 - 2011-11-15

Bungum, Berit.
Engaging pupils in authentic science inquiry through design & technology projects. Workshop ved Institut for naturfagenes didaktik; 2011-12-12 - 2011-12-12

Bungum, Berit.
Tverrfaglige prosjekter i Teknologi og Design: Hva er potensialet for å lære naturfag, og hvordan kan det realiseres?. Nordisk Forskersymposium om undervisning i naturvitenskap; 2011-06-14 - 2011-06-16

Chen, Yongjun; Li, Yanjun; Walmsley, John; Dumoulin, Stephane; Roven, Hans Jørgen.
Quantitative analysis of grain refinement in heavily deformed titanium. Nanostructured materials by severe plastic deformation 5 (NanoSPD5); 2011-03-21 - 2011-03-25

Daae, Marianne; Espy, Patrick Joseph; Lisa, M. S. N.; Nesse Tyssøy, Hilde; Søraas, Finn; Stadsnes, Johan; Rodger, Craig J; Newnham, David.
The effect of radiation belt particles on middle atmospheric nighttime ozone during enhanced geomagnetic activity. XXV IUGG GEneral Assembly; 2011-06-28 - 2011-07-07

Daae, Marianne; Espy, Patrick Joseph; Lisa, M.K.N.; Sørås, Finn; Newnham, David.
Ground-based and satellite observations of ozone loss over Antarctica during moderate geomagnetic activity. High Energy Particle Precipitation in the Atmosphere; 2011-05-09 - 2011-05-11

Daae, Marianne; Espy, Patrick Joseph; Søraas, Finn; Newnham, David.
The effect of radiation belt particles on middle atmospheric night time ozone during enhanced geo-magnetic activity. IUGG; 2011-07-27 - 2011-08-07

Dasa Lakshmi Narayana, Dheeraj; Munshi, Abdul Mazid; DONG CHUL, KIM; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Controlling crystal phases in GaAs nanowires grown by Au- and Ga-assisted MBE. PDI Topical Workshop on MBE-grown Arsenide Nanowires; 2011-09-08 - 2011-09-08

Davies, Catharina De Lange.
Delivery of nanoparticles in tumour tissue. Oslo Cancer Cluster; 2011-10-27 - 2011-10-27

Demissie, Teferi Dejene; Espy, Patrick Joseph; Hosokawa, Keisuke.
Relationship of Polar Mesospheric Summer Echoes and Ozone in middle and upper atmosphere. European Geophysical Union General Assembly; 2011-04-03 - 2011-04-08

Eberg, Espen; Van Helvoort, Antonius; Takahashi, Ryota; Gass, Mhairi; Mendis, Budhika; Bleloch, Andrew; Tybell, Thomas; Holmestad, Randi.
EELS (and HAADF-STEM) studies of the PbTiO3 /SrTiO3 interface in ferroelectric thin films. 6th International Conference on the Physical Properties and Application of Advanced MATerials (ICPMAT2011); 2011-10-11 - 2011-10-15

Enoksen, Henrik; Linder, Jacob; Sudbø, Asle.
Josephson effect in S/F/S junctions: spin bandwidth asymmetry vs. Stoner exchange. APS March Meeting 2011; 2011-03-21 - 2011-03-25

Espy, Patrick Joseph; Daae, Marianne; Hibbins, Robert; Newnham, David; Sørås, Finn.
Atmospheric effects of radiation belt precipitation over Antarctica. International Union of Geodesy and Geophysics General Assembly; 2011-06-28 - 2011-07-07

Espy, Patrick Joseph; Demissie, Teferi Dejene; Lund, Harald; Hibbins, Robert.
Climatology of mesospheric gravity waves and their sources above Rothera, Antarctica. AGU Chapman Conference on Atmospheric Gravity Waves and Their Effects on General Circulation and Climate; 2011-02-28 - 2011-03-04

Fauske, Vidar Tonaas; Munshi, Abdul Mazid; Dasa Lakshmi Narayana, Dheeraj; DONG CHUL, KIM; Fimland, Bjørn-Ove; Weman, Helge; Van Helvoort, Antonius.
Cross-sectional Electron Microscopy characterization of the interface between GaAs Nanowires and a Si Substrate. 6th Nanolab usermeeting; 2011-11-16 - 2011-11-16

Fernandes, Vasco Rafael P; Walle, Lars Erik; Farstad, Mari Helene; Blomberg, Sara; Gustafson, Johan; Andersen, Jesper N.; Lundgren, Edvin; Borg, Anne.
Reduction of Surface Oxides Formed on Pd75Ag25(100) and Pd(100). NordForsk workshop; 2011-11-21 - 2011-11-22

Foong, Chee Woh; Løvseth, Jørgen; Nydal, Ole Jørgen.
3-dimensional finite element analysis on a latent heat storage unit with NaNO3 and KNO3 binary mixture. 40th ASES National Solar Conference; 2011-05-17 - 2011-05-21

Foong, Chee Woh; Nydal, Ole Jørgen; Løvseth, Jørgen; Hustad, Johan Einar.
Numerical study of a high temperature latent heat storage (200-3000C) using NaNO3 – KNO3 binary mixture.. 6th annual COMSOL Conference; 2011-11-17 - 2011-11-19

Fossheim, Kristian.
Superconductivity 100 years.Important moments and anecdotes from the memory of Nobel laureates. Vortex matter in nanostructured superconductors; 2011-09-10 - 2011-09-17

Fossheim, Kristian.
Superleiar i hundre år: Frå Ubegripeleg til uunnverleg. SINTEFs Rådsmøte; 2011-11-30

Fossum, Jon Otto.
Activities at Lab. for Soft and Complex Matter Studies at Dept. of Physics, NTNU. Invite lecture Soft Matter Physics Nordforsk Network; 2011-06-28 - 2011-07-01

Fossum, Jon Otto.
Complex Matters. Symposium for the 70th birthday of Arne T. Skjeltorp; 2011-05-20

Fossum, Jon Otto.
COMPLEX Physical Phenomena in Clays: Structures, flows and fluid transport. I Encontro dos Usuários de Técnicas de Difração da CEM UFABC; 2011-12-07 - 2011-12-08

Fossum, Jon Otto.
CO2 storage in porous media. Research Council of Norway CLIMIT Conference; 2011-10-05 - 2011-10-06

Fossum, Jon Otto.
Experimental Studies of Physical Phenomena in Clays. Guest lecture Instability and Turbulence Group, DSM/IRAMIS/SPEC/ GIT, CEA-Saclay, France; 2011-03-23

Fossum, Jon Otto.
Flow of Clays. Adv. Study Inst.: Cooperative Phenomena in Flows; 2011-04-04 - 2011-04-14

Fossum, Jon Otto.
Magnetic resonance studies of clays: Examples of what one can learn. International Workshop on Complex Phenomena in Superconductors and Magnetic Systems; 2011-08-29 - 2011-09-02

Fossum, Jon Otto.
Physical Phenomena in Clays. Guest lecture, Pontificia Universidade Catolica do Rio de Janeiro (PUC-Rio); 2011-01-04

Fossum, Jon Otto.
Physical Phenomena in Clays. Guest lecture AMKS group, Department of Physics, University of Oslo; 2011-04-01

Fossum, Jon Otto.
Physical Phenomena in Clays: Structures, flows and fluid transport. Guest lecture Universidade de Sao Paulo (USP), Sao Paulo, Brasil; 2011-05-30

Fossum, Jon Otto.
Physical Phenomena in Clays: Structures, flows and fluid transport. Guest lecture Niels Bohr Institute, Copenhagen, Denmark; 2011-06-26

Fossum, Jon Otto.
Physical Phenomena in Clays: Structures, flows and fluid transport. Guest lecture Pontificia Universidade Catolica do Rio de Janeiro (PUC-Rio); 2011-10-11

Fossum, Jon Otto.
Physical Phenomena in Clays: Structures, flows and fluid transport. Guest lecture PETROBRAS Research Center CENPES, Rio de Janeiro, Brasil; 2011-10-17

Fossum, Jon Otto.
Use of X-ray scattering methods for studies of physical phenomena in soft materials. Guest lecture Universidade de Brasilia; 2011-12-15

Friis, Jesper; Ehlers, Flemming J H; Marioara, Calin Daniel; Dumoulin, Stephane; Marthinsen, Knut; Holmestad, Randi.
Multi-scale precipitation modelling for age-hardenable Al-Mg-Si alloys. 1st European Conference on Aluminium Alloys; 2011-10-05 - 2011-10-07

Gibson, Ursula.
Magnetic vortices - a new twist for logic gates. NTNU Physics dept colloquium; 2011-03-11 - 2011-03-11

Gibson, Ursula.
Silicon purification. Meeting with company; 2011-06-27 - 2011-06-27

Gibson, Ursula.
Vertical Junction Solar Cells. FME annual meeting; 2011-05-05 - 2011-05-06

Gibson, Ursula.
ZnO Nanowire Solar Cells. Norway-China Workshop; 2011-08-31 - 2011-09-01

Gupta, Manisha; Chowdhury, Fatema Rezwana; Sauer, Vincent; Yap, Seong Shan; Reenaas, Turid Worren; Tsui, Ying Yin.
Pulsed laser deposition of Si nanodots for photonic applications. Photonics North 2011; 2011-05-16 - 2011-05-18

Hals, Kjetil Magne Dørheim; Brataas, Arne; Tserkovnyak, Y.
Phenomenology of Current-Induced Dynamics in Antiferromagnets. American Physical Society, March Meeting; 2011-03-08 - 2011-03-08

Hals, Kjetil Magne Dørheim; Brataas, Arne; Tserkovnyak, Y.
Phenomenology of Current-Induced Dynamics in Antiferromagnets. EU 7. STREP MACALO network meeting; 2011-04-19 - 2011-04-19

Hansen, Alex.
Flow in Fractures: Optimal Paths and Length Scales. CCP2012; 2011-10-30 - 2011-11-03

Hansen, Alex.
Fractures and Fracture Networks: Structure and Transport. Complexity in Oil Industry; 2011-11-14 - 2011-11-18

Hansen, Alex.
Steady-State Two-Phase Flow in Porous Media: A Missed Problem. Perspectives and Challenges in Statistical Physics and Complex Systems for the Next Decade; 2011-11-09 - 2011-11-11

Hansen, Alex.
Steady-State Two-Phase Flow in Porous Media: Open Questions. 24th Smoluchowski Symposium; 2011-09-17 - 2011-09-22

Hansen, Alex.
Thermodynamics of steady state flow in porous media. CMDS12; 2011-02-21 - 2011-02-25

Hansen, Alex; Grøva, Morten.
Effective Permeability Scaling in Immiscible Two-Phase Flow in Porous Media. SigmaPhi; 2011-07-11 - 2011-07-15

Hansen, Alex; Grøva, Morten.
Effective Permeability Scaling in Immiscible Two-Phase Flow in Porous Media. Fysikermøtet; 2011-06-20 - 2011-06-22

Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fonseca, Davi de Miranda; Fossum, Jon Otto.
Temperature induced structural alterations of colloidal clay suspensions. 1st Nordic Workshop on Soft Matter Physics; 2011-06-28 - 2011-07-02

Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fonseca, Davi de Miranda; Knudsen, Kenneth Dahl; Fossum, Jon Otto.
SAXS-WAXS studies of temperature induced changes in the structure of saline clay suspensions. 8th Nordic Workshop on Scattering from Soft Matter; 2011-01-26 - 2011-01-27

Haugstad, Kristin Elisabeth; Brewer, Curtis Fred; Dam, Tarun K; Gerken, Thomas A; Stokke, Bjørn T,; Sletmoen, Marit.
Single molecule studies of porcine submaxillary mucin interaction with proteins and carbohydrates. 11th international workshop on carcinoma-associated mucins; 2011-07-09 - 2011-07-13

Haugstad, Kristin Elisabeth; Brewer, Curtis Fred; Gerken, Thomas A; Stokke, Bjørn T.; Sletmoen, Marit.
Mucin self-interactions studied at the single-molecule level. International symposium on scanning probe microscopy and optical tweezers in life sciences; 2011-10-05 - 2011-10-06

Hemmen, Henrik; Alme, Lars Ramstad; Fossum, Jon Otto; Meheust, Yves.
On the Influence of Interlayer Water Intercalation on the Global Mesoporous Water Transport in a Clay: X-Ray Studies. 2011 MRS Fall Meeting; 2011-11-28 - 2011-12-02

Hemmen, Henrik; Alme, Lars Ramstad; Fossum, Jon Otto; Meheust, Yves.
X-ray studies of interlayer water absorption and mesoporous water transport in a weakly hydrated clay. 1st Nordic Workshop on Soft Matter Physics; 2011-06-28 - 2011-07-02

Herland, Egil; Babaev, Egor; Sudbø, Asle.
Phase transitions in a three dimensional $U(1) \times U(1)$ lattice London superconductor: Metallic superfluid and charge-4e superconducting states. APS March Meeting; 2011-03-21 - 2011-03-25

Holmestad, Randi; Bjørge, Ruben; Ehlers, Flemming J H; Matsuda, Kenji; Marioara, Calin Daniel; Andersen, Sigmund Jarle.
Imperfect (and 'perfect'!) precipitates in 6xxx Aluminium Alloys. 6th International Conference on the Physical Properties and Application of Advanced MATerials (ICPMAT2011),; 2011-10-11 - 2011-10-15

Holmestad, Randi; Bjørge, Ruben; Ehlers, Flemming J H; Matsuda, Kenji; Marioara, Calin Daniel; Andersen, Sigmund Jarle.
Imperfect precipitates in 6xxx Aluminium Alloys. EMAG2011; 2011-09-06 - 2011-09-09

Høydalsvik, Kristin.
In situ X-ray imaging of catalyst nanoparticles by using ptychographic coherent diffractive imaging. Besøk til Aberystwyth University; 2011-07-14 - 2011-07-14

Kapelrud, Andre; Brataas, Arne.
Magnetization Dynamics in Thin Films. EU 7. STREP MACALO network meeting; 2011-10-05 - 2011-10-05

Kauko, Hanne; Bjørge, Ruben; Holmestad, Randi; Van Helvoort, Antonius.
Quantitative HAADF-STEM on heterostructured GaAs nanowires. EMAG2011; 2011-09-06 - 2011-09-06

Kauko, Hanne; Bjørge, Ruben; Holmestad, Randi; Van Helvoort, Antonius.
Quantitative HAADF-STEM on heterostructured GaAs nanowires. Scandem2011; 2011-06-08 - 2011-06-10

Kauko, Hanne; Grieb, Tim; Rosenauer, A.; Bjørge, Ruben; Munshi, Abdul Mazid; Weman, Helge; Van Helvoort, Antonius.
Composition analysis of heterostructured GaAs nanowires with quantitative HAADF-STEM. 6th Nanolab usermeeting; 2011-11-16 - 2011-11-16

Kildemo, Morten.
Mueller matrix imaging of nematic textures in colloidal dispersions of Na-fluorohectorite synthetic clay. World Of Photonics Congress Optical Metrology; 2011-05-22 - 2011-05-26

Letnes, Paul Anton; Mills, DL; Simonsen, Ingve.
Surface plasmonics in surfaces patterned by nanoparticles. Conference on Computational Physics; 2011-10-30 - 2011-11-03

Lilledahl, Magnus Borstad.
Second harmonic generation microscopy. NorMic User meeting; 2011-10-20 - 2011-10-21

Lindgren, Mikael.
Multifunctional molecular tools for spectroscopic imaging diagnostics of amyloid states. 6th Annual NTNU NanoLab Meeting; 2011-11-16

L**indgren, Mikael.**
Nanoscopic and photonic ultrastructural characterization of amyloid states. International Workshop on Nano and Bio-Photonics (IWNBP); 2011-10-23 - 2011-10-28

Lysne, Dag Atle; Bentsen, Birgitte; Bungum, Berit; Byrkjeflot, Liv; Esjeholm, Bjørn-Tore; Hoveid, Halvor; Manshadi, Saeed Dehghan.
Praktisk arbeid på tvers av fag: Sløsing med tid eller godt læringsarbeid? (Symposium). FoU i praksis; 2011-04-26 - 2011-04-27

Løvseth, Jørgen.
Commercial concentrating solar power systems. ENPE møte Mekelle University, Etiopia; 2011-05-25

Løvseth, Jørgen.
Solar Ovens for Food Preparation. Promising Concepts; Remaining Challenges. NTNU-ENPE seminar for African MSc students; 2011-05-22 - 2011-05-27

Mathiesen, Ragnvald.
Studies of solidification microstructure evolution in metals by synchrotron experiments.. Metallurgmøtet, Stockholm 2011; 2011-01-19 - 2011-01-20

Mathiesen, Ragnvald.
X-radiographic video microscopy studies of alloy solidification processes. Instituttseminar, Dept. Mat. Eng. and Mat. Sci., Univ. Queensland; 2011-05-31 - 2011-05-31

Mathiesen, Ragnvald; Arnberg, Lars; Li, Yanjun; Dahle, Arne Kristian.
Al-Si eutectic microstructure formation in directional solidification of Al-Si-Cu alloys. The fourth Chineese-Norwegian symposium on light metals & new energy; 2011-08-24 - 2011-08-26

Mehli, Hanne; Bungum, Berit.
Rom for læring, rom for lærere - effekter av sommerkurs i romteknologi. Nordiskt Forskarsymposium om undervisning i naturvetenskap; 2011-06-14 - 2011-06-16

Mehli, Hanne; Bungum, Berit.
Teachers in space – investigation of effects of summer courses in space technology. European Science Education Research Association; 2011-09-05 - 2011-09-09

Mehli, Hanne; Sagar, Helena.
Issues of authenticity in Continuing Professional Development - Same goals, different measures. Nordiskt Forskarsymposium om undervisning i naturvetenskap; 2011-06-14 - 2011-06-16

Mellingsæter, Magnus Strøm; Bungum, Berit.
Fysikk i ingeniørutdanningen: Hvilken rolle spiller faget?. Nordisk Forskersymposium om undervisning i naturvitenskap; 2011-06-14 - 2011-06-16

Monsen, Åsmund Fløystad; Wahlström, Erik; Tybell, Thomas; Boschker, Jos Emiel; Wells, Justin W; mathieu, roland; Nordblad, Per; Li, Zheshen; Hudl, Matthias.
Photo electron spectroscopy study of the stoichiometric composition of ultrathin La_{0.67}Sr_{0.33}$MnO_{3} films. Verhandlungen der Deutsche Physikalische Gesellschaft; 2011-03-13

Muggerud, Astrid Marie F; Yanjun, Li; Eva, Mørtsell; Randi, Holmestad.
Precipitation behaviour of dispersoids in 3xxx alloys during annealing at low temperatures. Group meeting; 2011-11-24 - 2011-11-24

Muggerud, Astrid Marie F; Yanjun, Li; Eva, Mørtsell; Randi, Holmestad.
Precipitation behaviour of dispersoids in 3xxx alloys during annealing at low temperatures. ECAA 2011; 2011-10-05 - 2011-10-07

Munshi, Abdul Mazid; Dasa Lakshmi Narayana, Dheeraj; DONG CHUL, KIM; Todorovic, Jelena; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Crystal phase and position control of self-catalyzed GaAs nanowires grown on a Si substrate. 6th NanoLab user meeting; 2011-11-16 - 2011-11-16

Munshi, Abdul Mazid; Dasa Lakshmi Narayana, Dheeraj; DONG CHUL, KIM; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Periodic arrays of self-catalyzed heterostructured GaAs nanowires on Si substrates grown by molecular beam epitaxy. GDR Semiconductor Nanowires and Nanotubes; 2011-10-17 - 2011-10-21

Mørch, Yrr Asbjørg; Strand, Berit Løkensgard; Rokstad, Anne Mari; Skjåk-Bræk, Gudmund.
Alginate Microcapsules for the Treatment of Type 1 Diabetes. National Congress of the Norwegian Chemical Society, Invited speaker; 2011-09-28 - 2011-09-29

Nguyen-Thi, H; Bogno, A; Reinhart, G; Billia, B; Mathiesen, Ragnvald; Zimmermann, Gerhard; Houltz, Y; Loth, K; Voss, D; Verga, A; de Pascale, F.
XRMON-GF experimental set-up devoted to x-ray radiographic observation of directional solidification under microgravity on maser12 sounding rocket mission. 20th ESA Symposium on European Rocket & Balloon Programmes and related research; 2011-05-22 - 2011-05-26

Nordam, Tor; Letnes, Paul Anton; Simonsen, Ingve.
Numerical simulations of scattering of light from two-dimensional surfaces using the Reduced Rayleigh Equation. Conference on Computational Physics 2011; 2011-10-30 - 2011-11-03

Parola, Stephane; Mpambani, Francis; Cepraga, Cristina; Gallavardin, Thibault; Chaput, Fredric; Lerouge, Frederic; Massue, Jeanne; Monnereau, Cyrille; Maury, Olivier; Andraud, Chantal; Favier, Andraud; Charreyre, Marie-Therese; Baldeck, Patrice L.; Åslund, Andreas; Nilsson, Peter; Nyström, Sofie; Hammarström, Per; Widerøe, Marius; Thuen, Marthe; Lindgren, Mikael.
Two-absorption hybrid nanoperticles for diagnostics and therapy. 11th International Conference on Frontiers of Polymers and Advanced Materials; 2011-05-23 - 2011-05-27

Rauwel, Erwan Yann; Nilsen, Ola; Galeckas, Augustinas; Walmsley, John; Rytter, Erling; Fjellvåg, Helmer.
ALD applied to conformal coating of nanoporous γ-alumina: Spinel formation and luminescence induced by europium doping. ECS 220th meeting Boston; 2011-10-09 - 2011-10-14

Rauwel, Erwan Yann; Nilsen, Ola; Walmsley, John; Rytter, Erling; Fjellvåg, Helmer.
ALD system combined with glass powder cell applied to oxide coating of nanoporous γ-alumina.. inGAP seminar; 2011-12-01 - 2011-12-02

Rauwel, Erwan Yann; Nilsen, Ola; Walmsley, John; Rytter, Erling; Fjellvåg, Helmer.
Oxide coating of nanoporous alumina using ALD to produce highly porous spinel. 11 international conference on atomic layer deposition: ALD2011; 2011-06-26 - 2011-06-29

Rozynek, Zbigniew; Fossum, Jon Otto; Knudsen, Kenneth Dahl.
Experimental studies of structured organoclays in electric field. Biannual meeeting of the Norwegian Physical Society; 2011-06-20 - 2011-06-22

Sagar, Helena; Mehli, Hanne.
Issues of authenticity in Continuing Professional Development – same goals, different measures. European Science Education Research Association; 2011-09-05 - 2011-09-09

Samuelsen, Emil J.
Quasicrystals - the Nobel prize in chemistry 2011. Seminar i materialfysikk; 2011-11-23 - 2011-11-23

Sandnes, Bjørnar.
Displacement patterns in multiphase flows. NTNU Physics colloquia; 2011-10-21 - 2011-10-21

Sandnes, Bjørnar.
Displacement structures in multiphase flows. Civ Eng Seminar Series; 2011-03-23 - 2011-03-23

Sandnes, Bjørnar.
REM: The RetroEMission effect.. Biofocus meeting; 2011-03-04 - 2011-03-04

Sandru, Eugenia Mariana; Elgsaeter, Arnljot; Sliwka, Hans-Richard; Partali, Vassilia.
Controlling aggregation-carotenoids aggregates with predifined size. 16th International Symposium on Carotenoids; 2011-07-17 - 2011-07-22

Sletmoen, Marit; Haugstad, Kristin Elisabeth; Brewer, Curtis Fred; Dam, Tarun K; Gerken, Thomas A; Stokke, Bjørn T..
Single-molecule characterization of biopolymer material constituents. KIFEE 2011; 2011-03-09 - 2011-03-12

Sorokin, Evgeni; Klimentov, Dmitry; Sorokina, Irina T; Kozlovskii, V. I.; Korostelin, Yu. V.; Landman, A. I.; Podmar'kov, Y. P.; Skasyrskii, Ya. K.; Frolov, M. P..
Broadly tunable high-power continuous-wave Cr2+:CdS laser. Advanced Solid-State Photonics 2011; 2011-02-13

Sorokin, Evgeni; Sorokina, Irina T; Tolstik, Nikolai.
Femtosecond operation and self-doubling of Cr:ZnS laser. Nonlinear Optics; 2011-07-17 - 2011-07-23

Sorokina, Irina T.
Mid-infrared solid-state laser technology: principles and applications. International Summer Session “Lasers and their applications”; 2011-07-31 - 2011-08-05

Sorokina, Irina T; Sorokin, Evgeni.
Mid-Infrared Femtosecond Frequency Combs for Sensing and Optical Clocks. Photonics West 2011; 2011-01-22 - 2011-01-27

Sorokina, Irina T; Sorokin, Evgeni.
Mid-Infrared Femtosecond Frequency Combs for Sensing and Optical Clocks. Photonics West 2011; 2011-01-22 - 2011-01-27

Sperstad, Iver Bakken; Stiansen, Einar; Sudbø, Asle.
Criticality of compact and noncompact $(1+1)D$ quantum dissipative Z_4-models. APS March Meeting; 2011-03-21 - 2011-03-25

Stokke, Bjørn Torger.
Biomacromolecular interactions – from single-molecular pair interactions to exploitation in bioesensing. Gjesteforelesning; 2011-06-22 - 2011-06-22

Stokke, Bjørn Torger; Tierney, Sven; Gao, Ming; Gawel, Kamila; Skjåk-Bræk, Gudmund; Sletmoen, Marit; Toita, Sayaka; Akyioshi, Kazunari.
Hydrogel swelling with nanometer resolution. 5th international KIFEE Symposium; 2011-03-08 - 2011-03-11

Sudbø, Asle; Herland, Egil; Babaev, Egor.
Competing Interactions in Multi-Component Condensates. Frontiers in Condensed Matter Physics; 2011-01-03 - 2011-01-08

Sudbø, Asle; Sperstad, Iver Bakken; Stiansen, Einar.
Criticality in Dissipative Quantum Rotor Models. Theory Seminar; 2011-11-30 - 2011-11-30

Sudbø, Asle; Sperstad, Iver Bakken; Stiansen, Einar.
Dissipation and quantum criticality in high-Tc cuprates. Intl. Conf. Vortex Matter in Nanostructured Superconductors; 2011-09-10 - 2011-09-17

Todorovic, Jelena; Anthonysamy, Fervin Moses; Dasa Lakshmi Narayana, Dheeraj; Olk, Phillip; Fimland, Bjørn-Ove; Weman, Helge; Van Helvoort, Antonius.
Correlated micro-photoluminescence and electron microscopy study of a heterostructured semiconductor nanowire. Microscopy of Semiconducting Materials 2011 (MSM XVII); 2011-04-04 - 2011-04-04

Vodopyanov, K. L.; Sorokin, Evgeni; Sorokina, Irina T; Schunemann, P. G..
4.4-5.4 μm frequency comb from a subharmonic OP-GaAs OPO pumped by a femtosecond Cr:ZnSe laser. Advanced Solid-State Photonics 2011; 2011-02-13 - 2011-02-18

Wahlström, Erik; Monsen, Åsmund Fløystad; Wells, Justin W; Tybell, Thomas; Boschker, Jos Emiel; mathieu, roland.
Photoelectron spectroscopy study of La0.67Sr0.33MnO3 interfaces. The joint STINT Workshop on multifunctional oxides and minerals; 2011-03-01

Wahlström, Erik; Yang, DeZheng.
STM-based point contact measurements of magnetoresistive systems. The joint STINT Workshop on multifunctional oxides and minerals; 2011-02-01

Walle, Lars Erik; Blomquist, Jacob; Uvdal, Per; Borg, Anne; Sandell, Anders.
Evidence for heterogeneous Li-storage in anatase TiO2 nanoparticles in ultra-high vacuum. 2nd Nano Today conference; 2011-12-11 - 2011-12-15

Walle, Lars Erik; Borg, Anne; Johansson, Erik; Plogmaker, Stefan; Rensmo, Håkan; Uvdal, Per; Sandell, Anders.
Mixed dissociative and molecular water adsorption on anatase TiO2(101). ICSOS10; 2011-08-01 - 2011-08-05

Walle, Lars Erik; Svenum, Ingeborg-Helene; Andersen, Trine; Grönbeck, Henrik; Gustafson, Johan; Lundgren, Edvin; Andersen, Jesper N.; Borg, Anne.
Oxide formation and adsorption of CO on Pd0.57Cu0.43(100). ECOSS 28; 2011-08-28 - 2011-09-02

Weigand, Christian Carl; Skåre, Daniel; Tveit, Johannes; Ladam, Cecile; Holmestad, Randi; Grepstad, Jostein; Weman, Helge.
Growth of ZnO nanostructures on c- and a-plane sapphire by Au-assisted pulsed laser deposition. GDR Semiconductor Nanowires and Nanotubes; 2011-10-17 - 2011-10-21

Wenner, Sigurd.
Computing for stronger aluminium alloys. Fysikermøtet; 2011-06-20 - 2011-06-22

Wenner, Sigurd; Torsæter, Malin; Marioara, Calin Daniel; Holmestad, Randi.
The Role of Copper in Clustering and Precipitation in Al-Mg-Si-Cu Alloys. ECAA 2011; 2011-10-05 - 2011-10-07

SCIENTIFIC POSTERS

Aas, Lars Martin Sandvik; Nerbø, Ingar Stian; Kildemo, Morten.
Mueller matrix imaging of plasmonic polarizers on nanopatterned surface. World of Photonics Congress Optical Metrology; 2011-05-22 - 2011-05-26

Afadzi, Mercy; Hansen, Yngve Hofstad; Hansen, Rune; Johansen, Tonni Franke; Angelsen, Bjørn Atle J.; Davies, Catharina De Lange.
Intracellular Delivery of Nanoparticles using Ultrasound. 2011 IEEE International Ultrasonics Symposium; 2011-10-18 - 2011-10-21

Böttiger, Arvid P.L.; Larsen-Olsen, Thue T.; Thyden, K; Krebs, Frederik C.; Andreasen, Jens Wenzel; Fløystad, Jostein Bø; Esmaeili, Morteza; Breiby, Dag Werner; Diaz, Ana.
Investigating the 3D morphology of Polymer Solar Cells using Coherent X-ray Scattering. Global Organic Photo Voltaic (GOPV); 2011-10-10 - 2011-10-12

Böttiger, Arvid P.L.; Larsen-Olsen, Thue T.; Thyden, Karl; Krebs, Frederik C.; Andreasen, Jens wenzel; Fløystad, Jostein Bø; Esmaeili, Morteza; Breiby, Dag Werner; Diaz, Ana.
Investigating the 3D morphology of Polymer Solar Cells using Coherent X-ray Scattering. International Symposium on Functional \pi-Electron Systems; 2011-10-13 - 2011-10-17

Brataas, Arne; Rashba, Emmanuel I..
Nuclear Polarization Pumped by Landau-Zener Transitions in Double Quantum Dots. IARPA/ARO; 2011-06-08 - 2011-06-09

Chowdhury, Fatema Rezwana; Gupta, Manisha; Sauer, Vincent; Yap, Seong Shan; Reenaas, Turid Worren; Tsui, Ying Yin.
Pulsed laser deposition of Si nanodots. 1st Canadian Institute of Photonics Innovation (CIPI) Annual Meeting; 2011-05-18 - 2011-05-20

Cybulska, Justyna; Szymanska-Chargot, Monika; Zdunek, Artur; Psonka-Antonczyk, Katarzyna Maria; Stokke, Bjørn Torger.
Crystallinity and nanostructure of cellulose from different sources. 11th International Congress on Engineering and Food (ICEF11); 2011-05-22 - 2011-05-26

Davies, Catharina De Lange; Garaiova, Zuzana; Reitan, Nina Kristine; Bjørkøy, Astrid; Folasire, Oladayo; Størset, Sigmund Østtveit; Berg, Kristian; Strand, Sabina P..
DNA-Chitosan nanoparticles in gene delivery: Endocytotic pathways and intracellular trafficking. 102 Annual Meeting,American Association for Cancer Research; 2011-04-02 - 2011-04-06

Dvoyrin, Vladislav; Sorokina, Irina T; Kalashnikov, Valdimir L; Masinsky, V. M.; Ischakova, L. D.; Dianov, E. M.; Khopin, V. F.; Guryanov, A. N..
Tm3+-doped CW fiber laser based on a highly GeO2-doped dispersion shifted fiber. Advanced Solid-state Photonics (ASSP); 2011-02-13 - 2011-02-18

Dvoyrin, Vladislav; Sorokina, Irina T; Okhotnikov, Oleg; Mashinsky, Valery M.; Ischakova, Lyudmila D.; Dianov, Evgenii M; Khopin, Vladimir F.; Guryanov, Aleksey N..
1.9 micron Tm3+-doped germanate fiber laser source for Si-processing. Fiber Laser Applications (FILAS) 2011; 2011-02-16 - 2011-02-18

Eberg, Espen; Van Helvoort, Antonius; Selbach, Sverre Magnus; Soleim, Bjørn Gunnar; Folven, Erik; Choudhury, P.R.; Grepstad, Jostein; Eom, C.B.; Grande, Tor; Holmestad, Randi; Tybell, Thomas.
Epitaxial perovskite nanostructures: effect of topology and stoichiometry. 18th International Workshop on Oxide Electronics Napa Valley; 2011-09-26 - 2011-09-28

Esmaeili, Morteza; Fløystad, Jostein Bø; Granlund, Håvard; Høydalsvik, Kristin; Breiby, Dag Werner.
Molecular 1D Electronic Wires. 6th Annual NTNU NanoLab Meeting; 2011-11-16 - 2011-11-16

Esmaeili, Morteza; Fløystad, Jostein Bø; Granlund, Håvard; Høydalsvik, Kristin; Breiby, Dag Werner.
Packing Motifs in 1D Molecular Electronic Wires. European Conference on Molecular Electronics (ECME 2011); 2011-09-07 - 2011-09-10

Esmaeili, Morteza; Høydalsvik, Kristin; Breiby, Dag Werner.
X-ray Characterization of Internal Nanostructures in Self-Organized Molecular Electronic Wires. 2nd annual workshop in the Norwegian PhD Network on Nanotechnology for Microsystems; 2011-06-15 - 2011-06-17

Evensmoen, Hallvard Røe; Møller, Jarle Alexander; Hansen, Tor Ivar; Ladstein, Jarle; Houben, Rob; Pintzka, Carl Wolfgang Schøyen; Håberg, Asta.
The medial temporal lobe and encoding of object landmarks. Society for neroscience annual meeting; 2011-11-12 - 2011-11-16

Farstad, Mari Helene; Walle, Lars Erik; Borg, Anne; Johansson, Erik; Plogmaker, Stefan; Rensmo, Håkan; Uvdal, Per; Ragazzon, Davide; Schaefer, Andreas; Sandell, Anders.
Comparison of water on anatase and rutile TiO2 surfaces. ECOSS 2011; 2011-08-28 - 2011-09-02

Farstad, Mari Helene; Walle, Lars Erik; Borg, Anne; Johansson, Erik; Plogmaker, Stefan; Rensmo, Håkan; Uvdal, Per; Ragazzon, Davide; Schaefer, Andreas; Sandell, Anders.
Comparison of water on anatase and rutile TiO2 surfaces. FASM Annual User Meeting, MAX-lab; 2011-11-14 - 2011-11-16

Farstad, Mari Helene; Walle, Lars Erik; Borg, Anne; Johansson, Erik; Plogmaker, Stefan; Rensmo, Håkan; Uvdal, Per; Sandell, Anders.
Comparison of water on anatase and rutile TiO2 surfaces. Nordic summer school; 2011-06-13 - 2011-06-21

Fløystad, Jostein Bø; Høydalsvik, Kristin; Mathiesen, Ragnvald; Rønning, Magnus; Breiby, Dag Werner.
In situ X-ray imaging of catalyst nanoparticles. HERCULES 2011; 2011-03-18 - 2011-03-18

Gao, Ming; Gawel, Kamila; Stokke, Bjørn Torger.
DNA-polymer hybrid hydrogel for biosensors by interferometric technique. 2nd Annual Workshop, The Norwegian PhD Network on Nanotechnology for Microsystems; 2011-06-15 - 2011-06-17

Garskaite, Edita; Grande, Tor; Einarsrud, Mari-Ann; Ciorba, S; Richards, B; Lindgren, Mikael; Van Helvoort, Antonius; Olsen, Espen.
Synthesis and Photoluminscent properties of rare earth doped Al2O3 for solar cell applications. 10th Int. Conf. Lithuanian Chemist ("CHEMISTRY 2011"); 2011-10-14 - 2011-10-14

Garskaite, Edita; Olsen, Espen; Ciorba, S; Richards, B; Van Helvoort, Antonius; Zalga, A.; Kareiva, A.
Sol-gel synthesis of rare earth doped oxide materials and their luminscence properties. 20th International Baltic Conference ("MATERIALS ENGINEERING 2011"); 2011-10-27 - 2011-10-28

Garskaite, Edita; Olsen, Espen; Svarstad, Anne Marie; Kareiva, A; Beganskiene, A; Van Helvoort, Antonius; Ciorba, S; Richards, B.
Luminescent TiO2 Films Produced by Sol-Gel Method for Dye Sensitised Solar Cell Applications. The 13th International Conference-School Advanced Materials and Technologies; 2011-08-27 - 2011-08-31

Garskaite, Edita; Svarstad Flø, A.; Van Helvoort, Antonius; Kareiva, A; Olsen, Espen.
Investigation of rare earth doped TiO2 films and powders produced by the sol gel method using fluorescence hyperspectral imaging technique. Chemistry and Chemical Technology; 2011-04-27

Gholami, Mayani Maryam; Reenaas, Turid Worren.
Non-Radiative Recombination and Photofilling in Intermediate Band Solar Cells. 37th IEEE Photovoltaic Specialists Conference; 2011-06-19 - 2011-06-24

Granlund, Håvard; Fall, S; Pattier, B; Gibaud, Alain; Breiby, Dag Werner.
GISAXS simulations of thin-films using SimDiffraction. Eighth Nordic Workshop on Scattering from Soft Matter; 2011-01-26 - 2011-01-27

Granlund, Håvard; Fløystad, Jostein Bø; Andreasen, Jens wenzel; Esmaeili, Morteza; Stingelin, Natalie.
Mapping Morphological Variations in Pressed Polymers. European Conference on Molecular Electronics (ECME 2011); 2011-09-07 - 2011-09-10

Granlund, Håvard; Fløystad, Jostein Bø; Andreasen, Jens wenzel; Esmaeili, Morteza; Stingelin, Natalie; Breiby, Dag Werner.
Applying Scanning WAXS to Mechanically Squeezed Polymers. The 6th Annual NanoLab Meeting; 2011-11-16 - 2011-11-16

Granlund, Håvard; Fløystad, Jostein Bø; Andreasen, Jens wenzel; Esmaeili, Morteza; Stingelin, Natalie; Breiby, Dag Werner.
Mapping morphological variations in pressed polymers. European Conference on Molecular Electronics (ECME 2011); 2011-09-07 - 2011-09-10

Granlund, Håvard; Fløystad, Jostein Bø; Esmaeili, Morteza; Andreasen, Jens wenzel; Stingelin, Natalie; Breiby, Dag Werner.
Investigation of morphological variations in pressed P3HT polymers with SAXS. Nordic Summer School in Synchrotron Radiation Research; 2011-06-13 - 2011-06-21

Gupta, Manisha; Chowdhury, Fatema Rezwana; Yap, Seong Shan; Sauer, Vincent; Reenaas, Turid Worren; Tsui, Ying Yin.
Semiconductor nanodots deposition using laser ablation. 11th International Conference on Laser Ablation (COLA); 2011-11-13 - 2011-11-19

Gustafsson, Håkan; Berg, Kirsti; Lindgren, Mikael; Engström, Maria; De Muinck, Ebo; Zachrisson, Helene.
Fe(3+) Heterogeneity in Ex Vivo Carotid Atherosclerotic Plaques. 18th Annual Meeting of the Society-for-Free-Radical-Biology-and-Medicine; 2011-11-16 - 2011-11-20

Gustafsson, Håkan; Dasu, Alexander; Berg, Kirsti; Ericsson, Madelene; Zachrisson, Helene; Lindgren, Mikael.
MEDICAL APPLICATIONS OF ELECTRON PARAMAGNETIC RESONANCE (EPR) AND EPR IMAGING. LIU CANCER BIRTHDAY PARTY; 2011-11-06 - 2011-11-06

Hak, Sjoerd; Emily, Helgesen; Hektoen, Helga H; Sæterbø, Kristin Grenstad; Marte, Thuen; Mulder, Willem J. M.; Haraldseth, Olav; Davies, Catharina De Lange.
Combined in vivo confocal laser scanning microscopy and magnetic resonance imaging to study an avb3-integrin targeted nanoemulsion. World Molecular Imaging Conference; 2011-09-10

Hak, Sjoerd; Helgesen, Emily; Hektoen, Helga H; Sæterbø, Kristin Grendstad; Thuen, Marte; Mulder, Willem J. M.; Haraldseth, Olav; Davies, Catharina De Lange.
The effect of polyethylene glycol surface density on the targeting efficiency of αvβ3-integrin specific nanoparticles. PhD conference Norwegian Research School in Medical Imaging; 2011-11-20

Hak, Sjoerd; Thuen, Marte; Jarzyna, Peter A.; Mulder, Willem J.M.; Syversen, Tore; Haraldseth, Olav; Davies, Catharina De Lange.
Combined in vivo confocal laser scanning microscopy and magnetic resonance imaging to study an αvβ3-integrin targeted nanoemulsion. International Society for Magnetic Resonance in Medicine; 2011-05-07

Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fonseca, Davi de Miranda; Coutant, C.; Plivelic, T; Knudsen, Kenneth Dahl; Fossum, Jon Otto.
Nanostructural Alterations and Rheological Aging of Clay Dispersions in Response to Heating. Materials Research Society 2011 MRS Fall Meeting; 2011-11-28 - 2011-12-02

Hemmen, Henrik; Austad, Karianne; Hansen, Elisabeth Lindbo; Fonseca, Davi de Miranda; Fossum, Jon Otto.
Controlled Deposition of Clay Nanoplatelets by Fluid Evaporation from Droplets. Materials Research Society 2011 MRS Fall Meeting; 2011-11-28 - 2011-12-02

Hemmen, Henrik; Ringdal, Nils Ivar; de Azevedo, EN; Engeslberg, Mario; Hansen, Elisabeth Lindbo; Meheust, Y; Fossum, Jon Otto; Knudsen, Kenneth Dahl.
SAXS-WAXS studies of temperature induced changes in the structure of saline clay suspensions. International Workshop on Complex Phenomena in Superconductors and Magnetic Systems; 2011-08-29 - 2011-09-02

Holst, Bodil; Fredriksen, Åshild; Borg, Anne.
On the Recruitment and Participation of Women in Physics: A Report from Norway. International Conference for Women in Physics; 2011-04-05 - 2011-04-08

Hope, Sigmund Mongstad; Moreira, André Auto; Andrade, Jose Soares; Hansen, Alex.
Reservoir Mapping by Global Correlation Analysis. The 9th Euroconference on Rock Physics and Geomechanics; 2011-10-17 - 2011-10-21

Høydalsvik, Kristin; Buset, Ole Tore; Mathiesen, Ragnvald; Breiby, Dag Werner.
General Angle X-ray Scattering ("GAXS") – a multipurpose instrument for X-ray scattering experiments. 6th Annual NTNU NanoLab Meeting; 2011-11-16 - 2011-11-16

Høydalsvik, Kristin; Esmaeili, Morteza; Fløystad, Jostein Bø; Granlund, Håvard; Buset, Ole Tore; Mathiesen, Ragnvald; Breiby, Dag Werner.
GAXS – a multipurpose instrument for X-ray scattering experiments. GISAXS 2011; 2011-10-10 - 2011-10-12

Kalashnikov, Valdimir L; Dvoyrin, Vladislav; Sorokina, Irina T.
Energy scalable passively mode-locked mid-IR Tm-fiber laser. Conference on Lasers and Electro-Optics Europe (CLEO EUROPE/EQEC), 2011 and 12th European Quantum Electronics Conference; 2011-05-22 - 2011-05-26

Kalashnikov, Valdimir L; Sorokin, Evgeni; Sorokina, Irina T.
Chaotic mode-locking of mid-IR chirped-pulse oscillator. 2011 Conference on Lasers and Electro-Optics Europe and 12th European Quantum Electronics Conference (CLEO®/Europe - EQEC 2011); 2011-05-22 - 2011-05-26

Kalashnikov, Valdimir L; Sorokina, Irina T; Dvoyrin, Vladislav.
Energy scalability of 2 μm ultrashort pulsed Tm-laser based on germanate dispersion shifted fiber. Fiber Laser Applications (FILAS) 2011; 2011-02-16 - 2011-02-18

Kalashnikov, Valdimir L; Sorokina, Irina T; Dvoyrin, Vladislav.
Nonlinear dispersion shifted germanate fiber for continuum generation around 2 μm. Fiber Laser Applications (FILAS); 2011-02-16 - 2011-02-18

Klimentov, Dmitry; Dvoyrin, Vladislav; Tolstik, Nikolai; Sorokina, Irina T.
GVD measurement in single-mode optical fibers in the 1.7–2 μm wavelength range. International Summer Session: Lasers and Their Applications; 2011-07-31 - 2011-08-05

Lelu, Sylvie; Strand, Sabina P.; Maurstad, Gjertrud; Steine, Jan; Reitan, Nina Kristine; Davies, Catharina De Lange.
PEGylation and transport of chitosan-pDNA nanoparticles in an artificial extracellular matrix. The 2nd National PhD conference in Medical Imaging and the Annual MedViz conference; 2011-01-17 - 2011-01-18

Letnes, Paul Anton; Nerbø, Ingar Stian; Sandvik Aas, Lars Martin; Ellingsen, Pål Gunnar; Kildemo, Morten.
Genetic Invention of Fast and Optimal Broad-band Stokes/Mueller Polarimeter Designs. Genetic and Evolutionary Computation Conference (GECCO) 2011; 2011-07-12 - 2011-07-16

Liebig, Christian; Bayraktar, Gonca; Reitan, Nina Kristine; Nyström, Sofie; Jucker, Mathias; Wegenast-Braun, Bettina M.
Evaluation of the spectral properties of luminescent conjugated oligothiophenes (LCOs). Focus on Microscopy; 2011-04-17 - 2011-04-20

Lilledahl, Magnus Borstad.
Coherent anti-Stokes Raman scattering and stimulated Raman scattering microscopy. NorMic User meeting; 2011-10-20 - 2011-10-21

Lilledahl, Magnus Borstad; Davies, Catharina De Lange.
Non-linear optical microscopy of connective tissue. PhD samling for Forskerskolen for medisinsk teknologi; 2011-11-21 - 2011-11-22

Lilledahl, Magnus Borstad; Pierce, David M.; Ricken, Tim; Holzapfel, GA; Davies, Catharina De Lange.
Extracting quantitative biomechanical parameters for cartilage from second harmonic generation images. Photonics West; 2011-01-23 - 2011-01-28

Madessa, Habtamu Bayera; Veslum, Trygve; Løvseth, Jørgen; Nydal, Ole Jørgen.
Investigation of solar absorbers for small scale solar concentrating parabolic dish. Proceedings of ISES solar world congress 2011, Kassel,Germany; 2011-08-28 - 2011-09-02

Michels, L.; Ribeiro, L.; Mundim, M.S.P.; Sousa, M.; Fossum, Jon Otto; Da Silva, G.J.; Mundim, K.C..
Simultaneous XRD and EXAFS measurements of water diffusion in sinthetic Ni-Fluohectorite. Cooperative Phenomena in Flows, International Advanced Study School; 2011-04-04 - 2011-04-14

Mumm, Florian; Beckwith, Kai Muller; Sikorski, Pawel.
Cell impalement on transparent arrays of vertically aligned nanowires. 37th International Conference on Micro and Nano Engineering; 2011-09-19 - 2011-09-23

Munshi, Abdul Mazid; Dasa Lakshmi Narayana, Dheeraj; Todorovic, Jelena; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Insights into Growth Mechanisms of Self-catalyzed GaAs Nanowires Grown by Molecular Beam Epitaxy. MRS Spring Meeting; 2011-04-25 - 2011-04-29

Munshi, Abdul Mazid; Kim, D.C.; Dasa Lakshmi Narayana, Dheeraj; Todorovic, Jelena; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Positioned self-catalyzed GaAs nanowire arrays on Si substrates grown by molecular beam epitaxy. Nano-network Workshop; 2011-06-15 - 2011-06-15

Nee, Chen Hon; Siew, Wee Ong; Yap, Seong Shan; Reenaas, Turid Worren; Tou, Teck Yong.
Optical Emission Spectroscopy in Pulsed Laser Deposition of Silicon. The 6th Symposium on Vacuum based Science and Technology; 2011-09-19 - 2011-09-26

Nyström, Sofie; Åslund, Andreas; Klingstedt, Thérese; Mason, Jeffrey; Johansson, Leif BG; Lindgren, Mikael; Reitan, Nina Kristine; Liav, Oren; Jucker, Mathias; Wegenast-Braun, Bettina M; Liebig, Christian; Prokop, Stefan; Heppner, Frank L; Hornemann, Simone; Aguzzi, Adriano; Nilsson, Peter K; Hammarström, Per.
Structural comparisons of in vitro prepared amyloid fibrils and cerebral amyloids in Alzheimer's and prion diseases. IX European Symposium of The Protein Society; 2011-05-22 - 2011-05-26

Olsen, Øystein; Mørch, Yrr Asbjørg; Thuen, Marte; Brekken, Christian.
Dynamic Properties of Manganese-Alginate Gels for Controlled-Release of Mn2+. 19th Scientific Meeting, International Society for Magnetic Resonance in Medicine; 2011-05-07 - 2011-05-13

Rauwel, Erwan Yann; Nilsen, Ola; Fjellvåg, Helmer; Walmsley, John; Rytter, Erling.
ALD applied to ZnO coating of nanoporous γ-alumina particles: Conformal coating and spinel formation. inGAP seminar; 2011-12-01 - 2011-12-02

Rauwel, Erwan Yann; Nilsen, Ola; Galeckas, Augustinas; Rauwel, Protima; Walmsley, John; Rytter, Erling; Fjellvåg, Helmer.
ALD applied to conformal coating of nanoporous γ-alumina: Spinel formation and luminescence induced by europium doping. 12 Trends in Nanotechnology International Conference (TNT2011); 2011-10-21 - 2011-10-24

Ribeiro, L.; Michels, L.; Sousa, M.; Mundim, K.C.; Fossum, Jon Otto; Da Silva, G.J.; Mundim, M.S.P.
Studies of water intercalation and diffusion in nanosilicates by means of XAFS technique. Cooperative Phenomena in Flows, International Advanced Study School; 2011-04-04 - 2011-04-14

Rozynek, Zbigniew; Castberg, Rene; Fossum, Jon Otto; Måløy, Knut Jørgen; Flekkøy, Eirik Grude.
Electric field induced rotation of Clay particles. Cooperative Phenomena in Flows, International; 2011-04-04 - 2011-04-14

Rozynek, Zbigniew; Castberg, Rene; mikkelsen, Alexander; Fossum, Jon Otto; Måløy, Knut Jørgen.
WAXS studies of Clay/Paraffin Composites. Cooperative Phenomena in Flows, International Advanced Study Institute; 2011-04-04 - 2011-04-14

Sandru, Eugenia Mariana; Elgsaeter, Arnljot; Sliwka, Hans-Richard; Partali, Vassilia.
Controlling aggregation-aggregates of predifined size from highly unsaturated selena phospholipid. Organisk kjemisk vintermøte; 2011-01-06 - 2011-01-09

Sletmoen, Marit; Haugstad, Kristin Elisabeth; Brewer, Curtis Fred; Dam, Tarun K; Gerken, Thomas A; Stokke, Bjørn T..
porcine submaxillary mucin self interactions and their interaction with soybean agglutinin studied at the single molecular pair level. 21st internation symposium on glycoconjugates; 2011-08-21 - 2011-08-26

Sletmoen, Marit; Maurstad, Gjertrud; Nordgård, Catherine Taylor; Draget, Kurt Ingar; Stokke, Bjørn Torger.
Perturbation of mucin-alginate interactions by alginate fragments: Direct determination of forced unbinding of macromolecules in a model biological barrier. AFM for BioMed Conference; 2011-08-23 - 2011-08-27

Storebø, Asta Katrine; Brudevoll, Trond; Skåring, Øyvind; Kirkemo, Camilla Nestande; Norum, Ole Christian; Olsen, Øyvind.
Cooling dynamics of photo-excited carriers in HgCdTe. 17th international conference on Electron Dynamics in Semiconductors, Optoelectronics and Nanostructures (EDISON17); 2011-08-07 - 2011-08-12

Sæterli, Ragnhild; Selbach, Sverre Magnus; Ravindran, Ponniah; Grande, Tor; Holmestad, Randi.
Experimental and theoretical study of the electronic structure of multiferroic BiFeO3 and related compounds. SCANDEM 2011; 2011-06-08 - 2011-06-10

Walle, Lars Erik; Aase, John F.; Svenum, Ingeborg-Helene; Andersen, Trine; Gustafson, Johan; Andersen, Jesper N.; Lundgren, Edvin; Borg, Anne.
Oxidation of the Pd57Cu43(100) surface - a comparison with Pd(100) and Pd75Ag25(100). NordForsk workshop; 2011-11-21 - 2011-11-22

Walle, Lars Erik; Grönbeck, Henrik; Fernandes, Vasco Rafael P; Blomberg, Sara; Farstad, Mari Helene; Schulte, Karina; Gustafson, Johan; Lundgren, Edvin; Andersen, Jesper N.; Borg, Anne.
Core level shifts from Pd75Ag25 alloy surfaces. MAX-lab 24th Annual User Meeting; 2011-11-14 - 2011-11-16

Walle, Lars Erik; Grönbeck, Henrik; Fernandes, Vasco Rafael P; Blomberg, Sara; Farstad, Mari Helene; Schulte, Karina; Gustafson, Johan; Lundgren, Edvin; Andersen, Jesper N.; Borg, Anne.
Core level shifts from Pd75Ag25 alloy surfaces. ECOSS 28; 2011-08-28 - 2011-09-02

Walle, Lars Erik; Schulte, Karina; Gustafson, Johan; Lundgren, Edvin; Andersen, Jesper N; Borg, Anne.
Oxide formation and CO induced oxide reduction on the Pd75Ag25(100) surface. 4th International Conference on Women in Physics; 2011-04-04 - 2011-04-08

Yap, Seong Shan; Siew, Wee Ong; Nee, Chen Hon; Reenaas, Turid Worren; Tou, Teck Yong.
Laser ablation and growth of Si and Ge. 27th International Conference on Silicon Epitaxy and Heterostructures (ICSI-7); 2011-08-28 - 2011-09-02

POPULAR SCIENTIFIC TALKS

Falnes, Johannes.
Gamalt og nytt om energi frå havbølgjer. Torsdagsforedrag; 2011-10-13 - 2011-10-13

Falnes, Johannes.
Havbølgjeenergi og utvikling av bølgjekraftteknologi. SFFEs lunsjforelesning; 2011-05-04 - 2011-05-04

Falnes, Johannes.
Potensial og framgangsmåtar for bruk av bølgjeenergi. Edisondagen 2011. Energiforsyning i framtida - idéer mot knapphet og prisstigning; 2011-03-31 - 2011-03-31

Fredriksen, Åshild; Borg, Anne; Holst, Bodil.
Status of Women in Physics - Norway. Nordic Meeting of Women in Physics; 2011-09-28 - 2011-09-30

Holmestad, Randi.
Abels Tårn. Abels Tårn; 2011-04-29 - 2011-04-29

Samuelsen, Emil J.
Kvasi-krystallar: Nobelprisen i kjemi 2011. Torsdagsseminar; 2011-11-03 - 2011-11-03

PHYSICS PRESENTATION THROUGH MEDIA

Andersen, Pål Flodin; Sandnes, Bjørnar.
Fysikk i Sandkassa. Forskning.no [Internett] 2011-05-06

Bjørnæs, Ingvil; Sandnes, Bjørnar.
Nye mønstre for industrielle prosesser. Forskningsrådet [Internett] 2011-04-19

Davies, Catharina De Lange.
Nanotek+ultralyd+cellgift=ny kreftbehandling. [Avis] 2011-10-17

Fossheim, Kristian.
Announcing The Gunnerus Sustainability Award. Technoport [Internett] 2011-10-10

Lilledahl, Magnus Borstad.
Kroppstokt - en reise i kroppens indre. [Kunstnerisk og museal presentasjon] Forskningsdagene. ; . 2011-09-23 - 2011-09-24

Meland, Svein Inge; Espy, Patrick Joseph.
Radar «leser» stjerneskudd. Adresseavisen [Avis] 2011-08-16

Naqvi, Kalbe Razi.
Matematikkens historie : Al Khwarizmi. Ekko NRK P2 [Radio] 2011-09-19

Olderøy, Magnus Østgård; Strand, Berit Løkensgard.
Skeleton greenhouse. Gemini [Avis] 2011-03-01

Olderøy, Magnus Østgård; Strand, Berit Løkensgard; Sikorski, Pawel.
Skeleton greenhouse. GEMINI [Avis] 2011-03-01

Prasad, Jocelyn; Sandnes, Bjørnar.
New shapes in granular movement. University of Sydney [Internett] 2011-04-20

COOPERATING INSTITUTIONS

EUROPE

Andersen, J.O.:
*Frankfurt University, FIAS, Germany (Nan Su and Michael Strickland)
* Gettysburg college (Michael Strickland)

Borg, A.:
* Department of Physics and Materials Science, Uppsala University, Uppsala, Sweden (docent A. Sandell)
* Department of Synchrotron Radiation Physics, Lund University, Sweden (prof. J. N. Andersen, prof. E. Lundgren and docent J. Gustafson).
* Department of Chemistry (Lund University, Sweden (prof. P. Uvdal)
* Competence Centre for Catalysis and Dept. of Applied Physics, Chalmers Univ. of Technology, Gothenburg, Sweden (docent H. Grönbeck)

Brataas, A.:
* TU Delft, Kavli Institute of Nanoscience (Gerrit E. W. Bauer) (Nederland)
* University of Konstance, Department of Physics (Wolfgang Belzig) (Tyskland)

Breiby, D.W.:
* University of Copenhagen, Denmark (Prof. R. Feidenhans'l)
* Technical University of Denmark, Denmark (Dr. J.W. Andreasen, Prof. M. M. Nielsen)
* Swiss Light Source, Paul Scherrer Institute, Switzerland (Dr. O. Bunk, Dr. A. Diaz)
* Physik Department, Technical University of Munich, Germany (Prof. C.M. Papadakis, Prof. F. Pfeiffer)
* Max Planck Institut für Polymerforschung, Mainz, Germany (Prof. K. Müllen, Dr. W. Pisula)
* Imperial College, UK (Dr. N. Stingelin)
* Univ. Le Mans / CNRS, France (Prof. A. Gibaud)

Bungum, B.:
* Leeds University, Centre for Studies in Science and Mathematics Education, UK (Prof. Phil Scott)
* Göteborgs Universitet, Department of Pedagogical, Curricular and Professional Studies, Sweden (Dr. Anita Wallin)
* University of Copenhagen, Department of Science Education, Denmark (Dr. Jens Dolin)
* University of Helsinki, The Research Centre for Mathematics and Science Education, Finland (Prof. Jari Lavonen)
* University of Iceland, Science Education Research Group, School of Education, Iceland (Prof. Allyson Macdonald)

Davies; C. de L.:
*Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, Slovakia (Prof Tibor Hianik)
* Faculty of Medicine and Human Science, University of Manchester, UK (Lecturer Alain Pluen)
Mount Sinai School of Medicine, New York (Assoc prof. Willem Mulder)

Espy, P.:
* The British Antarctic Survey, Physical Sciences Division (Mark Clilverd), Cambridge, UK.
* The Max Planck Institute for Solar System Research, Department of Planets and Comets (Paul Hartogh), Katlenburg-Lindau, Germany.
* Department of Meteorology, Stockholm University (J. Stegman), Stockholm, Sweden.
* University of Leeds, School of Chemistry, (John Plane), Leeds, UK.

Fossum, J.O.:
* Universite Paris 7, Paris, France, (Prof. Paul Dommersnes)
* CEA-Saclay, France (Dr. Elisabeth Bouchaud)
* Ecole Normal Superieure, Paris, France (Prof. Daniel Bonn)
University of Amsterdam, Netherlands (Prof. Daniel Bonn)
*Universite de Rennes 1: Geosciences Rennes, France (Prof. Yves Meheust)
*Maxlab Lund University, Sweden (Dr. Tomas Plivelic)

Gibson, U.:
* Technische Hochschule Wildau, Berlin,Germany (A. Richter)
* University of Loughborough, United Kingdom (R. Smith)

Hansen, A.:
* Université de Nice-Sophia Antipolis, France (Batrouni)
* Université Louis Pasteur, Strasbourg, France (Schmittbuhl)
*Université de Rennes I, Rennes, France (Bideau, Davy)
*Université Paris-Sud, Orsay, France (Auradou and Talon).
*University College of London, UK (Gudmundsson)

van Helvoort, A.T.J.
* CNRS-LPN, Marcoussis, France (G. Patriarche).
* Institut til Festekoerperphysik, Universität Bremen, Bremen, Germany (A. Rosenauer)

Hibbins R.E.:
* The British Antarctic Survey, Climate Programme, Cambridge, UK. (Martin Jarvis)
* The British Antarctic Survey, Environmental Change and Evolution Programme, Cambridge, UK. (Mervyn Freeman)
* University of Bath, Department of Electronic and Electrical Engineering, Bath, UK. (Nick Mitchell)

Holmestad, R.:
* Rouen University /CNRS, France (W. Lefebvre)
*Denmark Technical University, Denmark (R. Dunin-Borkowski/ C. Boothroyd)
* University of Poltier, France (J. Pacaud)
* Helmholz Centre Berlin, Germany (J. Banhart)
* SuperSTEM, Daresbury, England (A. Bleloch)
* RIKEN Rutherford Appleton Laboratory, Oxfordshire, UK (T. Matsuzaki)

Høye, J.S.:
* Instituto de Quimica Fisica Rocasolano, CSIC, c/Serrano 119, 28006 Madrid, Spain (Enrique
Lomba)

Kachelriess, M.:
* APC (Laboratoire AstroParticule et Cosmologie), Paris, France (G. Giacinti, D. Semikoz)
* Institute for Nuclear Research, Moscow, Russia (V. Berezinsky, D. Semikoz)
* Laboratori Nazionali del Gran Sasso, Assergi, Italy (V. Berezinsky)
* University Hamburg, Germany (G. Sigl, R. Tomas)

Kildemo, M :
* Ecole Polytechnique (Paris), A. De Martino, Polarimetry
* E. Søndergård, UMR 125 Unité mixte CNRS/Saint-Gobain Laboratoire Surface du Verre et Interfaces, France, nanostructured surfaces
* CERN (Geneva), S. Calatroni, CLIC
* Dr. Christoph Cobet, VUV – synchrotron ellipsometry, ISAS - Institute for Analytical Sciences Department Berlin Albert-Einstein-Str. 9, 12489 Berlin, Germany

Lilledahl, M.B.:
* Graz Technical University (D. M. Pierce, G. Holzapfel)

Linder, J.:
* Dipartimento di Fisica, University of Salerno, Italy (M. Cuoco)
* NORDITA, Sweden (A. Black-Schaffer)

Lindgren, M.:
* Linköpings Universitet, IFM (Per Hammarström, Peter Nilsson, Patrick Norman)
* Umeå Universitet, Organisk kemi, Umeå (B. Eliasson)
* Université Claude Bernard (Lyon1), Laboratoire des Multimatériaux et Interfaces (Stephane Parola)
* ENS-Lyon (Ecole Normale Superieure), (Chantal Andraud)

Mathiesen, R.:
* University Paul Cezanne - Aix Marseille III, L2MP, France (H.N. Thi, G. Reinhart, B. Billia)
* Catholic University Leuven, Belgium (L. Froyen)
* Techn University Berlin, Germany (F. Garcia-Moreno, A. Greische,)
* ACCESS e.V. Aachen, Germany, (G. Zimmermann, L. Sturtz)
* University College Dublin, Ireland (D. Browne)
* Univ. Leicester, UK (H. Dong, E. Atkinson)
* Univ. Oxford, UK (A. Cocks, N. Marzari, S. Lozano-Perez)
* Tech. Univ. Delft (C. Kleijn, I. Richardson)
* KTH, Sweden (L. Høglund, J. Ågren)
* EPFL, Switzerland (J. Dantzig)

Melø, T.B., Naqvi, K. R.:
* ITQB, Universidade Nova de Lisboa, Oeiras, Portugal (E. Melo)
* Instituto de Recursos Naturales y Agrobiología, CSIC, Salamanca, Spain (J.B. Arellano)
* University of South Bohemia, Czech Republic (F. Vacha)

Olaussen, K.:
* IEEC/CSIC, Campus UAB, Barcelona (Sergei Odintsov)

Reenaas, T.W.:
* Chalmers University of Technology (Mahdad Sadeghi and Shumin Wang) Department of Microtechnology and Nanoscience
* Linköping University (Per-Olof Holtz) Materials Science
* Universidad Politécnica de Madrid (Antonio Martí) Instituto de Energía Solar – ETSIT

Sikorski, P.:
* Department of Biochemistry, School of Life Sciences, University of Sussex, UK (Dr. L. C. Serpell). Biophysics
* Bionanotechnology and Nanomedicine Laboratory, University of Copenhagen (Assoc. Prof. Karen Martinez)
*Eberhard Karls Universität Tübingen Department of Traumatology, Tübingen, Germany (Prof. A Nusler, Dr. S. Ehnert)
* School of Chemical Engineering, University of Birmingham, UK. (Prof. Zhibing Zhang)

Skagerstam, B.S.;
*Institut für Theoretische Physik der Universität Göttingen, Germany, (Prof. G.C. Hegerfeldt)
*Chalmers Tekniska Högskola och Göteborgs Universitet, Gøteborg, Sverige (Profs. G. Johansson, P.Salomonson, V. Shumeiko)
*NORDITA and Stockholm University, Stockholm (Prof. I. Bengtsson)
*University College of Molde, Molde (Assoc. Prof. P. K. Rekdal)
*University of Oslo, Institute of Theoretical Astrophysics and Centre for Ecological and Evolutionary Synthesis (CEES) (Dr. Ø. Langangen)

Stokke, B. T.:
* La Sapienza University, Roma, Italia (M. Dentini), Biophysics
* l'INPG-PHELMA de Grenoble, CNRS-UMR 5628, LMGP 3 parvis L. Neel, 38016 GRENOBLE, France (C. Picart).

Sudbø, A.:
* Universita di Catania, Italia (prof. Giuseppe Angilella)
* Freie Universitaet Berlin (dr. Flavio S. Nogueira)
* Kunglega Tekniska Høgskolan (prof. Mats Wallin)
* Department of physics, University of Salerno, Italy (prof. M. Cuoco).

Wahlström, E.:
* Chalmers tekniska högskola, Sweden, (Maj Hanson).
* Department of Physics, Uppsala University, Sweden, (Roland Mathieu, Per Nordblad, Olof Karis),.
* Max-Lab, Lund University, Sweden, (Balasubramanian Thiagarajan).
* Institute for the Storage Ring Facilities, University of Aarhus, Denmark, (Z..S. Li).
*Department of Materials Science, University of Cambridge, UK, (prof. J.L. MacManus-Driscoll)
* Institute of Mathematics and Physics, Aberystwyth University, Aberystwyth, UK, (prof. D.A. Evans).

AMERICA

Andersen, J.O.:
* Gettysburg College, Gettysburg, PA, USA (Michael Strickland).

Brataas, A.:
* Harvard University, (Bertrand I. Halperin)
* UCLA, (Yaroslav Tserkovnyak) (USA)
* New York University, (Andrew D. Kent) (USA)

Breiby, D.W.:
* Georgia Institute of Technology, USA (J.-L. Bredas)

Davies, C.:
* Harvard Medical School Boston, USA (R.K. Jain Y. Boucher)
* Mount Sinai School of Medicine New York, (W.Mulder)

Espy, P.:
*Hampton University, Center for Atmospheric Sciences (James M. Russell III), Virginia, USA

Fossum, J.O.:
* Universidade Federal de Pernambuco, UFPE, Recife, Brazil (Profs. Mario Engelsberg and Eduardo de Azevedo)
*UFABC, Sao Paulo, Brazil (Prof. Roosevelt Droppa)
* University of Brasilia, UnB, Brasilia, Brazil (Prof. Geraldo Jose da Silva)
*Universidade Federal de Campina Grande, UFCG-PB Brazil (Prof. Suedina Silva)
*PUC Rio de Janeiro Brazil (Prof. Marcio Carvalho)
*University Havana, Cuba (Profs. Ernesto Altshuler and Aramis Rivera)

Gibson, U.:
* Dartmouth College, Hanover NH USA (J. J. BelBruno)

Hansen, A.:
* Univesidade Federal do Céara, Fortaleza, Brazil (Soares)

Holmestad, R.
* University of Illinois, Urbana-Champaign, USA (JM. Zuo)

Høye, J.S.:
* Oklahoma University, Norman, Oklahoma, USA (K. A. Milton), Theoretical Physics
Lilledahl, M.B.:
* University of California, Irvine (E. Potma)

Lindmo, T.:
* Beckman Laser Institute, University of California, Irvine (B. Tromberg, J. S. Nelson, Z. Chen), Biomedical optics

Naqvi, K. R.:
* Upstate Medical University, Syracuse, USA, (E. A. Berry)

Reenaas, T.W.:
* University of Edmonton, Canada (Ying Tsui) Department of Electrical & Computer Engineering

Skagerstam, B.-S.:
* Universidade Federal do Rio de Janeiro, Departamento de Fisica Matematica - Instituto de Fisica, Rio de Janeiro, Brazil (Prof. Ruynet Lima de Matos Filho et al.)
*Universidade Federal do Ceará, Departamento de Física, Fortaleza, Brazil. (Prof. José Soares de Andrade Junior)
* University of Florida, USA (J.R. Klauder)
*Syracuse University, N.Y., USA (A.P. Balachandran).
* Temple University, P.A., USA (P.S. Riseborough)
* Departamento de F´ısica, Universidade Federal do Cear´a, Brazil (R.N. Costa Filho)
* Universidade Estadual do Cear´a, Faculdade de Educa¸ Brazil (G Alencar)

Sorokina, I.T.
* Kongsberg Seatex, Norway (J. Klepsvik)
* Stanford University, CA, USA (R. L. Byer, K. L. Vodopyanov)
* BAE Systems, NH, USA (P. G. Schunemann)
* Vienna University of Technology, Austria (E. Sorokin, V. L. Kalashnikov)
* University of Alabama at Birmingham (S. Mirov)
* Fiber Optics Research Center, RAS, Russia (. E. M. Dianov)
* Multiwave Photonics, Portugal (J. R. Salcedo)
* Belaraussian National technical University (N. Kuleshov)
* ORC Tampere University of technology, Finland (O. G. Okhotnikov)
* Lawrence Livermore National Laboratory, CA, USA (K. Schaffers)
* QPeak Inc., MA, USA (P. F. Moulton)
* Fastlite, France (P. Tournois)

Stokke, B.T.
* Albert Einstein College of Medicine, New York, USA (C F Brewer)
* Case Western Reserve University School of Medicine, Cleveland, Ohio, USA (T A Gerken)

Sudbø, A.:
* Johns Hopkins University (prof. Z. B. Tesanovic)
* University of Toronto (prof. John Wei)
* Department of physics, University of Massachussets at Amherst, Massachusetts, USA (prof. E. Babaev)
* Department of physics, University of California at Riverside, USA (prof. C. M. Varma).

Wahlström, E.:
* New York University (prof. Andy Kent).
*Brookhaven National Laboratory (Dario Arena)

AFRICA

Skagerstam, B.-S.:
* Institute of Theoretical Physics, University of Stellenbosch, South Africa (F.G. Scholtz)

ASIA

Brataas, A.:
* Tohoku University, Sendai, Japan (Gerrit E. W. Bauer)

Fossum, J.O.:
*Gwangju Institute of Science and Technology, South Korea (Prof. Do Young Noh)
* Pohang Accelerator Laboratory, South Korea (Prof. Do Young Noh)
*Postech Pohang, South Korea (Dr. Kanak Parmar)

Hansen, A.:
* Institute of Mathematical Sciences, Chennai, India (Ray)
* Saha Institute of Nuclear Physics, Kolkata, India (Chakrabarti).

Holmestad, R.
* Toyama University, Graduate school of Science and Engineering, Japan (K Matsuda, K. Nishimura)
* Tokyo Institute of Technology, Tokyo, Japan (T. Sato, S. Muraishi)

Kjeldstad, B.:
* Tribhuvan University, Kathmandu, Nepal (Sapkota, B., Bhattarai, B.)
* Lhasa University, Tibet, China (Gelsor, N.)

Linder, J.:
* Department of Physics, Tokyo Institute of Technology, Japan (T. Yokoyama)
* Department of Applied Physics, Nagoya University, Japan (Y. Tanaka)

Lindgren, M.:
* Riken Institute, Wako, Saitama, Japan (Dr. Tamotsu Zako)

Naqvi, K.R.:
*Mansoura University, Damietta, Egypt (A. El-Agamey)
* Yarmouk University, Irbd, Jordan (Y.A. Yousef)
* People's University of China, Beijing (J.-P-Zhang)
* Institute of Botany, Chinese Academy of Sciences (C. Yang)
*Division of Chemistry and Biological Chemistry, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore (R. D. Webster)

Reenaas, T.W.:
* Multimedia University, Malaysia (Teck Yong Tou)

Sikorski, P.:
* Department of Biomaterials Sciences, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan. (Dr. M. Wada). Biophysics

Skagerstam, B.-S.:
* Centre for High Energy Physics, Indian Institute of Science, Bangalore, India (S. Vaidya).

Stokke, B.T.:
* Osaka Prefecture Univ., Osaka, Japan (S. Kitamura), Biophysics
* Department of Polymer Chemistry, Graduate School of Engineering, Kyoto University, Katsura Nishikyo-ku, Kyoto 615-8510 Japan (Kazunari Akiyoshi) Biophysics

Sudbø, A:
*Department of Applied Physics, Nagoya University, Japan.
* Department of physics, University of Tokyo, Japan (prof. N. Nagaosa).

Wahlström, E:
* The Key Laboratory for Magnetism and Magnetic Materials of Ministry of Education Lanzhou University (D.Z . Yang)

AUSTRALIA

Davies, C.:
* Cancer Biology Laboratory, Peter Mac Callum Cancer Centre, Melbourne (Robin Anderson)

Holmestad, R.:
* Monash University, Melbourne, Australia (J. Etheridge, M. Weyland, P. Nakashima)

Mathiesen, R,;
*Univ. Queensland (A.K. Dahle)

National cooperation

* Naturfagsenteret (Nasjonalt senter for naturfag i opplæringen)
* NAROM (Nasjonalt senter for romrelatert opplæring)
* University of Oslo, Physics Education Research Group
*Hydro Aluminium Research Centre, Sunndalsøra (Jostein Røyset, Oddvin Reiso)
* Department of Chemistry, Biotechnology and Food Science, Norwegian University of Life Sciences, Ås, Norway (Prof. V.G.H. Eijsink)
* Institute for energy technology, Kjeller, Norway (senior scientists Arne Skjeltorp, Geir Helgesen, Kenneth D. Knudsen, Bjørn Hauback, Erik Marstein)
* Division of Biophysics and Medical Technology, Radium Hospital, Oslo (Ø. Bruland, A. Skretting, D.R. Olsen)
* Statoil Research Centre, Trondheim (F. Antonsen, H. Widerøe, Erling Rytter)
* University of Oslo (J.M. Leinaas, A. Dahlback, E.G. Flekkøy, K.J. Måløy, Johan Taftø, Øystein Prytz, Ame Olsen, Anette Gunnæs, H. Fjellvåg, O. Nilsen)
* University of Bergen (J.Stamnes, P. Osland)
* Optomed (R. Ellingsen, D.R. Hjelme, B. Falch)
* FMC Biopolymers (E. Onsøyen)
* Norwegian Radiation Protection Authority (Bjørn Johnsen, Terje Christensen)
* Tambartun National Resource Center for the Visually Handicapped, Melhus (P. Fosse)
* Centre for Viking and Medieval Studies, University of Oslo
* Finnmark University College (Bjørn Tore Esjeholm)
* Numerical Rocks AS, Trondheim (Ramstad, Øren)
* Høgskolen I Sør-Trøndelag, HiST (E. Munkeby)
* Vestfold University College (K.E. Aasmundtveit
* The Norwegian Polar Institute, (Kim Holmén), Tromsø Norway.
* Dept of Circulation and Medical Imaging, NTNU (Prof. Bjørn Angelsen, Prof Olav Haraldseth)
* Epitarget as (Sigrid Fossheim)
* Department of Oncology, St.Olav's Hospital (T. Strickert, J. Frengen)
* Høgskolen i Sør-Trøndelag, HIST (G. Oftedal, S. Ramstad)
* SINTEF Materials and Chemistry (C. Marioara, S. Andersen, J. Walmsley, B.S. Tanem, R. Fagerberg, Ø. Dahl, C. Ladam, P-E. Vullum, S. Pradhan,Y. Li, R. Bredesen)
* Institute of Neuroscience, St. Olav Hospital Norsk Lysteknisk komité
* Trondheim Science Centre
* SINTEF Energiforskning
* SINTEF Materials and Chemistry (R. Bredesen)
* SINTEF Petroleum Research (B. Bjørkvik, R.M. Holt)
* Sør-Trøndelag University College, Faculty of Technology (T.M. Thorseth)
* Sør-Trøndelag University College, Faculty of Teacher Education (E. Munkebye, K. Feren, J. Cyvin)
* Finnmark University College (D.A.Lysne, B.T. Esjeholm)
* Paper and Fiber Research Institute-PFI (G.Chinga)
* AXSESS, Molde (P.K. Rekdal)
* Norwegian Center for Stem Cell Research. Rikshospitalet. Oslo. (Prof. Jan E. Brinchma

EDUCATION

SUBJECTS AND STUDENT ATTENDANCE

Some subjects were self-study courses in 2011

Subjects		*Student Attendance*
MSc Technology 1st and 2nd year		
TFY4102	Physics for Product Design Engineering, Earth Sciences and Petroleum Engineering (incl. lab)	128
TFY4104	Physics for Product Design and Manufacturing, Marine Technology (incl. lab)	241
TFY4106	Physics for Civil and Transport Engineering, Industrial Economics and Technology Management (incl. lab)	180
TFY4115	Physics for Electronics Engineering, Engineering Cybernetics, Nanotechnology (incl. lab)	187
TFY4120	Physics for Chemical Engineering and Biotechnology, Materials Science and Engineering (incl. lab)	88
TFY4125	Physics f or C omputer Science, C ommunication Technology	201
TFY4145	Mechanical Physics (incl. lab)	115
TFY4155	Electromagnetism (incl. lab)	102
TFY4160	Wave Physics (incl. lab)	90
TFY4165	Thermal Physics (incl. lab)	93
TFY4215	Introduction to Quantum Physics	100
TFY4335	Nano Life Science	25
MSc Technology 3rd year		
TFY4170	Physics 2 for Electronics Engineering	36
TFY4185	Measurement Techniques (incl. lab)	79
TFY4190	Instrumentation (incl. lab)	58
TFY4195	Optics (incl. lab)	68
TFY4205	Quantum Mechanics II	59
TFY4230	Statistical Physics	71
TFY4240	Electromagnetic Theory	53
TFY4250	Quantum Mechanics I	53
TFY4260	Cell Biology and Cellular Biophysics (incl. lab)	22
MSc Technology 4th year		
TFY4200	Optics, Advanced Course (incl. lab)	4
TFY4210	Quantum Theory of Many-Particle Systems	10
TFY4220	Solid State Physics (incl. lab)	94
TFY4225	Nuclear and Radiation Physics (incl. lab)	57
TFY4235	Computational Physics	47
TFY4245	Solid State Physics, Advanced Course	19
TFY4255	Materials Physics (incl. lab)	8
TFY4275	Classical Transport Theory	14
TFY4280	Signal Processing (incl. lab)	16
TFY4292	Quantum Optics	13
TFY4300	Energy and Environmental Physics	84
TFY4305	Non-linear Dynamics	14
TFY4310	Molecular Biophysics (incl. lab)	11
TFY4315	Biophysics of Ionizing Radiation	10
TFY4320	Medical Physics (incl. lab)	14
TFY4340	Mesoscopic Physics	10
TFY4345	Classical Mechanics	49
TFY485x	Experts in Team, Interdisciplinary Project	57

MSc Technology 5th year

TFY4265	Biophysical Micromethods (incl. lab)	12
TFY4500	Biophysics, Specialization Project	7
TFY4505	Biophysics, Specialization Course	6
TFY4510	Physics, Specialization Project	34
TFY4515	Physics, Specialization Course	3
TFY4520	Nanotechnology, Specialization Project	6
TFY4525	Bionanotechnology, Specialization Course	7
TFY4900	Physics, Master's Thesis	38
TFY4905	Nanotechnology, Master's Thesis	10

BSc

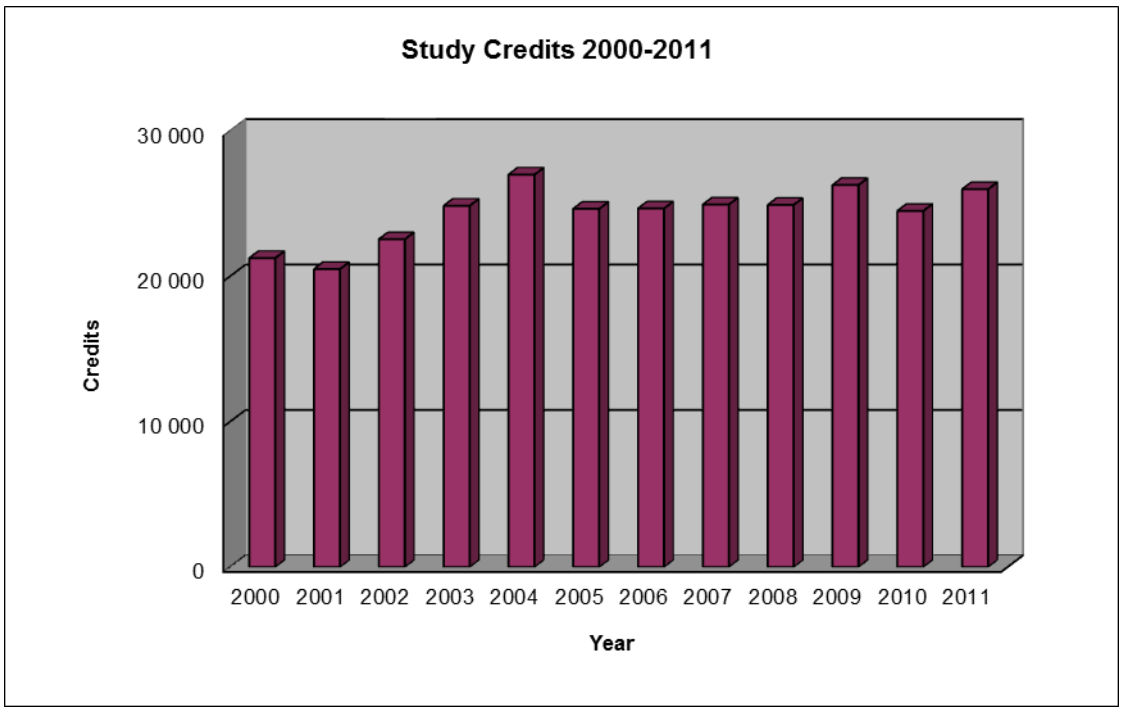
FY0001	Service Course in Physics (incl. lab)	46
FY1001	Mechanical Physics (incl. lab)	68
FY1002	Wave Physics (incl. lab)	41
FY1003	Electricity and Magnetism (incl. lab)	77
FY1005	Thermal Physics (incl. lab)	54
FY1006	Introduction to Quantum Physics	42
FY2045	Quantum Mechanics I	30
FY2302	Biophysics (incl. lab)	17
FY2450	Astrophysics	36
FY2800	Teacher Training/Dissemination Project in Physics	1
FY2900	Physics Education	1

MSc

RFEL3092	Research Methods in Science	5
FY2290	Energy Resources	6
FY3006	Sensors and Transducers	8
FY3114	Functional Materials	19
FY3201	Atmospheric Physics and Climate Change	21
FY3402	Subatomic Physics	21
FY3403	Particle Physics	20
FY3452	Gravitation and Cosmology	18
FY3464	Quantum Field Theory I	4
FY3466	Quantum Field Theory II	3
FY3900	Master Thesis in Physics	15
FY3950	Master Thesis in Physics (Teacher Education)	3

PhD

FY8104	Symmetry Groups in Physics	12
FY8105	Superconductivity: Physics and Technology	1
FY8201	Nanoparticle and Polymer Physics	1
FY8302	Quantum Theory of Solids	6
FY8402	Dosimetry of Ionizing Radation	4
FY8403	Biopolymer Gels and Networks	4
FY8407	Magnetic Resonance Imaging	1
FY8410	Light and Force Based Molecular Imaging	6
FY8504	Advanced Experimental Physics	1
FY8901	Sensors and Transducers	2
FY8902	Atmospheric Physics and Climate Change	6
FY8904	Computational Physics	8
FY8905	Materials Physics	3
FY8906	Biophysical Micromethods	5
FY8907	Classical Transport Theory	4
FY8908	Quantum Optics	1


Study Credits 2000-2011
30 000
20 000
10 000
0
Credits
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
Year

THESES – GRADUATE STUDIES

Master of Science in Technology – Applied Physics and Mathematics

Aanensen, Nina Sasaki
"Nonlinear Laser-induced Deformations and Forces at Liquid-Liquid Interfaces near the Critical Point"
Supervisor: Ingve Simonsen/Iver Brevik (EPT)

Aass, Mari
"Introduction of Electronic Personal Dosimeters as a Supplement to and Possible Replacement of Thermoluminescent Dosimeters in Norway"
Supervisor: Tore Lindmo/Ole Reistad (Statens strålevern)

Aursand, Peder Kristian
"Hyperbolic Conservation Laws with Relaxation Terms"
Supervisor: Ingve Simonsen/Tore Flåtten (SINTEF)

Austad, Karianne
"Characterization of Electrical Activity and Lifetime in Compensated Multicrystalline Silicon"
Supervisor: Ursula Gibson/Marisa Di Sabatino (IMT)

Brandsæter, Tord Bjørnevaagen
"Designing a Free-Form-Lens to Optimize the Illumination of Cylindrical Objects"
Supervisor: Ingve Simonsen/Andreas Nordbryhn (TOMRA)

Brende, Ole Martin
"Complex Networks. Development of a Three Particle Reaction-Diffusion Model on a Complex Network"
Supervisor: Ingve Simonsen

Cappelen, Beate Ulrikke Krefting
"Experimental Studies of Finger and Fracture Instabilities in Clays Throughout the Sol-Gel Transition"
Supervisor: Jon Otto Fossum

Eide, Anders Lund
"Take Part in Work to Develop, Document and Verify Equipment for Calorimetric Testing of Ice with Different Salt Content Levels"
Supervisors: Erik Wahlstrøm/Knut Høyland/Bernt Førre

Ervik, Martin
"Microstructural Studies of Al-Mg-Si-Cu Alloys with Respect to Corrosion"
Supervisor: Randi Holmestad

Fintland, Trygve Westlye
"Measurements of Young's Modulus on Rock Samples at Small Amplitude and Low Frequency"
Supervisor: Steinar Raaen/Jørn Stenebråten (SINTEF)

Flatabø, Silje
"Assessment of Sensitivity, Degradation and Treatment Response in Two Breast Cancer Xenograft Models Using HR MAS MRS"
Supervisor: Tore Lindmo/Ingrid Gribbestad (ISB)

Grieg, Bernt Milne
"Partial Discharges on an Epoxy Surface due to Water Droplets"
Supervisor: Steinar Raaen/Sverre Hvidsten (SINTEF)

Grøm, Vivian Aagesen
"UV Doses to Psoriasis Pasients and Treatment Effect during three Weeks Climatotherapy at the Canary Islands"
Supervisor: Tore Lindmo/Lise L. Randeberg

Hagen, Torbjørn Ruud
"Numerical Simulations of Flow Past a Truss Tower with an Evaluation of Tower Shadow Models for Wind Turbines"
Supervisors: John Skule Høye/Michael Muskulus

Hansen, Christoffer Berge
"A random Matrix Approach to collective Trends of falling and rising Stock Markets"
Supervisor: Ingve Simonsen

Hegge, Torstein Storflor
"Scalar Wave Scattering from Two-Dimensional, Randomly Rough Surfaces"
Supervisor: Ingve Simonsen

Håkonseth, Gunnar
"Water Diffusion in Semi-Conductive Outer Sheath Materials for Polymeric High Voltage Submarine Cables"
Supervisor: Ingve Simonsen/Sverre Hvidsten (SINTEF)

Jensen, Jens Tarjei
"Minimum Ignition Energy in a Hydrogen Combustible Mixture"
Supervisor: Ingve Simonsen/Nils E. L. Haugen (SEFAS)

Kiær, Anders Fredrik
"Pressure Evolution During CO2 Storage - Numerical Simulation on Sleipner Inspired Model"
Supervisor: Ingve Simonsen/Ola Eiken (Statoil Rotvoll)

Kleve, Ellen Elisabeth Sommernes
"Silicon Quantum Dots in a Silicon Dioxide Matrix"
Supervisor: Turid Worren Reenaas/Ingeborg Kaus (SINTEF)

Knutsen, Hege
"Characterization of GaN:ZnO p-n Junctions"
Supervisor: Ursula Gibson

Martinsen, Fredrik Aleksander
"Clustering during Natural Aging and its Effect on Precipitation Hardening in Al-Mg-Si Alloys"
Supervisor: Randi Holmestad

Mersland, Mailinn Blandkjenn
"Asymmetric Energy Fluctuations in Turbulence - Inverse Statistical Method for the Description of Asymmetric Energy Variation"
Supervisor: Ingve Simonsen

Myklatun, Ahne
"Production and Application of Micronsized Polysaccharide Particles - Studying Perturbation of a Model Mucus Barrier with Total Internal Reflection Fluorescence (TIRF) Microscopy and Atomic Force Microscopy (AFM) Indentation"
Supervisor: Bjørn Torger Stokke

Nord, Magnus Kristofer
"Quantitative (S)TEM Analysis of Intermediate Band Solar Cell Materials"
Supervisor: Randi Holmestad

Osnes, Christine Birgitte
"Planetary Wave Oscillations observed in Ozone and Temperature Data from Antarctica during 2009"
Supervisor: Patrick Joseph Espy

Rieber-Mohn, Eirik
"Quantification of Uncertainties in Wind Energy Projects and the Economical Implications"
Supervisor: Daniel Huertas Hernando (SINTEF)

Rivedal, Nikolai Hydle
"Two-dimensional Simulations of Particle Deposition on a Cylinder in a Turbulent Cross Flow at Intermediate Reynolds Numbers"
Supervisor: Jon Andreas Støvneng/Nils E. L. Haugen (SEFAS)

Sognnæs, Ida Andrea Braathen
"Maximum Entropy and Maximum Entropy Production in Macroecology"
Supervisor: Asle Sudbø/John Harte (UC Berkley)

Theisen, Erik Bjørge
"Experimental Mueller Matrix Images of Liquid Crystalline Domains in Synthetic Clay Dispersions"
Supervisor: Morten Kildemo

Tveiterås, Vebjørn
"Numerical Study of the Interaction of Flow over Two Airfoils in Relative Motion"
Supervisor: Jon Andreas Støvneng/Bernhard Muller (IEP)

Vilpponen, Eirik Timo Bøe
"Analysis of Intermediate Band Solar Cell Performance"
Supervisor: Turid Worren Reenaas

Voigt, Andre
"Fracturing of Optimal Paths in a Random Lattice"
Supervisor: Alex Hansen

Walle, Øystein
"Engineered Surfaces for Redirection of Light"
Supervisor: Ingve Simonsen

Walter, Erik Løkken
"Time Series Analysis of Electricity Prices. A Comparative Study of Power Markets"
Supervisor: Ingve Simonsen

Winjum, Ingebrigt
"Reconstruction of Images From a Compact Spectral Camera"
Supervisor: Ingve Simonsen/Torbjørn Skauli (FFI)

Master of Science in Technology – Nanotechnology

Helgesen, Emily
"Characterization of the Uptake and Trafficking of AvB3-targeted and Non-targeted Nanoemulsions in Human Endothelial Cells in vitro"
Supervisor: Davies, Catharina de Lange

Fosli, Carl Huseby
"Plasmonics for Light Trapping in Thin Silicon Solar Cells"
Supervisor: Simonsen, Ingve

Beckwith, Kai Muller
"A Study of Cultured Cells on a Nanowire-based Reverse Transfection Device"
Supervisor: Sikorski, Pawel Tadeusz

Tveten, Erlend Grytli
"Optical coatings for enhancement of the longitudinal Magneto-optic Kerr Effect from magnetic ultra-thin films"
Supervisor: Gibson, Ursula

Ervik, Ken Roger
"Application of focused ion beam (FIB) and scanning electron microscopy (SEM) for characterization of tissue, cells and biomaterials"
Supervisor: Sikorski, Pawel Tadeusz

Fauske, Vidar Tonaas
"Electron Microscopy Characterization of the Interface between a (111)-Si Substrate and GaAs Nanowires grown by Self-Catalysis by MBE"
Supervisor: Van Helvoort, Antonius Theodorus Johannes

Haugan, Einar
"Colloidal Crystals as Templates for Light Harvesting Structures in Solar Cells"
Supervisor: Simonsen, Ingve

Hobæk, Thor Christian
"Nanostructured PDMS surfaces with patterned wettability"
Supervisor: Sikorski, Pawel Tadeusz

Fabricius, Lars
"Human Exposure Assessment of Engineered Inorganic Nanoparticles in Food"
Supervisor: Sikorski, Pawel Tadeusz

Reiten, Andreas Lønning
"Diffuse Small Angle X-Ray Scattering From Thin Film Structures In the Distorted Wave Born Approximation"
Supervisor: Breiby, Dag Werner

Master of Science in Physics

Almelid, Øyvind
"Pion Condensation in the Linear Sigma Model"
Supervisor: Jens Oluf Andersen

Berge, Frank Terje
"Development of a Spectrometer System to Remotely Sense Mesospheric Temperature"
Supervisor: Patrick Joseph Espy

Dal, Lars Andreas
"Antideuterons as Signature for Dark Matter"
Supervisor: Michael Kachelriess

Hauge, Andreas
"A Geometrical and Computational Study of Entanglement Witnesses"
Supervisor: Jan Myrheim

Linge, Christer Andreas Rosendahl
"Modeling of the Intermediate Band Tandem Solar Cell"
Supervisor: Turid Worren Reenaas

Lisa, Martin
"Satellite Mapping of Particle Precipitation Effects on the Antarctic Middle Atmosphere"
Supervisor: Patrick Joseph Espy

Lundanes, Ingvild Olsen
"The Propagation and Energy Losses of Ultra High Energy Cosmic Rays"
Supervisor: Michael Kachelriess

Orvedal, Ingrid
"Measurement and Modelling of the Water Transport in Water Blocking Tapes for High Voltage Cables"
Supervisor: Jon Andreas Støvneng

Rolseth, Erlend Granbo
"Carbon Dioxide Intercalation in Sodium Fluorohectorite Clay"
Supervisor: Jon Otto Fossum

Skarshaug, Stine
"Dark Matter Contribution to the Isotropic Extragalactic Gamma-Ray Background"
Supervisor: Michael Kachelriess

Strand, Daniel
"Wave Scattering from Two-Dimensional Self-Affine Structures"
Supervisor: Ingve Simonsen

Tande, Jørgen Jensen
"CFD Study of a 10 MW Offshore Horizontal Axis Wind Turbine Blade"
Supervisor: Jon Andreas Støvneng

Master of Science in Condensed Matter Physics

Assuming-Gyimah, Kofi Tutu Addo
Time Domain Studies of Training Effects in Co/Cu/FeNi/FeMn Spin Valves
Supervisor: Erik Wahlstrøm

Dahesh, Mohsen
Complex Behaviors of Clay Particles in Air and CO2
Supervisor: Jon Otto Fossum

Inkoom, Godfred
Ferromagnetic Resonance of LSMO Thin Film
Supervisor: Erik Wahlstrøm

Hanif, Muhammad
Growth and Characterization of Germanium Quantum Dots and Crystalline Silicon
Supervisor: Turid Worren Reenaas

Master of Science in Medical Technology – Biophysics and Medical Physics

Acosta Roa, Ana María
Effects of Cyclic Hypoxia in Tumor Tissue
Supervisor: Einar K. Rofstad

Master of Science in Science Education

Aamodt, Tor Ingve
Characterization of ZnS:Cr films for Intermediate Band Solar Cells
Supervisor: Ursula Gibson

Hauge, Helene
The graduating physics Student. An investigation of their interests, sources of inspiration and future plans.
Supervisor: Berit Bungum

Aurlien, Ragnhild
A Density Functional Theory Study of Hydrogen Transfer and Rotational Barriers in Vitamin E-like Molecules
Supervisor: Jon Andreas Støvneng

PARTICIPATION IN COMMITTEES

EVALUATION COMMITTEES

Borg, A.:
* Faculty opponent at the PhD defense of Anneli Önsten, Department of Microelectronics and Applied Physics, School of Information and Communication Technology, KTH Royal Institute of Technology, May 2011.
* Member of examination committee, PhD defense of Evren Ataman, Department of Physics, Lund University, June 2011.
* Administrator for the PhD defense of Espen Eberg, Department of Electronics and Telecommunication, NTNU.
* External evaluator for the Göran Gustafsson Prize in Physics 2011, The Royal Swedish Academy of Sciences.
* External evaluator for the Ingvar Carlsson Award in 2011, Swedish Foundation for Strategic Research, SSF.

Bungum, B.:
* Opponent for the PhD defence of Maria Svensson, University of Gothenburg / FontD, Sweden, February 2010.

Davies C. de L.;
* Evaluation committee for application on infrastructure to the regional health authorities Helse Sør-Øst
* Evaluation committee for applications to The Norwegian Cancer Society
* Opponent for PhD defence Erik Hagtvet UiO, December 2011
* Evaluation committee/administrator for PhD thesis by Magnus Olderøy

Espy, P.:
* Opponent for PhD defence of Maria Smirnova, Department of Computer Science, Electral and Space engineering, Luleå University of Technology Sweden, October 2011.
* Opponent for PhD defence of Kerry Day, Department of Electronic and Electrical Engineering, University of Bath, UK, November 2011.

Gibson, U.:
* Faculty hiring board, American University of Kuwait

Hansen, A.:
*Evaluation committee for tenure track position in Computational Science (Complex Systems) at Aalto University, Finland
*Evaluation committee for Finland Distinguished Professorship, Academy of Finland.

Holmestad, R.:
*Administrator for PhD defense of Kenate Nemera Nigussa (Physics, April 2011)

Kachelriess, M.:
* Opponent for the PhD defence of Nils-Erik Bomark,,UiB,, December 2011.
* Administrator for the PhD defense of Lars Leganger, Physics, NTNU, June 2011.
* Evaluation committee for a tenure track position in Theoretical Astroparticle Physics, KTH Royal Institute of Technology, 2011.

Lindmo, T.:
* Administrator of evaluation committee for appointing professor at NTNU.
* Evaluation committee for appointing associate professor at HIST (Sør-Trøndelag County College)

Mathiesen, R. H.
* Opponent for the PhD thesis of Aziz Bogno, Universite Paul Cezanne Aix-Marseille, September 2011.
* Administrator for the PhD thesis of Ruben Bjørge, (Physics, NTNU), September 2011.

Olaussen, K.:
* Opponent and administrator for the PhD thesis of Simen Ellingsen, Institutt for energi- og prosessteknikk, NTNU.
* Opponent for the PhD thesis of Per Øyvind Sollid, Fysisk Institutt, UiO
* Opponent and administrator for the PhD thesis of Lars Tandle Kyllingstad, Institutt for fysikk, NTNU
* Opponent for the PhD thesis of Juha Soursa, Fysisk Institutt, UiO

Reenaas, T. W.:
* Evaluation committee for applications to a universitetslektor position at Uppsala University"

Stokke, B.T.:
* External examinor PhD thesis of **Erich Schuster,** Inst of Fundamental Sciences, Massey University, New Zealand, October 2011.

Wahlstrøm, E.:
* Kjetil Hals, PhD defence.

INTERNATIONAL COMMITTEES

Borg, A.:
* Member of "Beredningsgrupp för kondenserade materiens fysik", Swedish Research Council (VR), Sweden.
* Member of the IUPAP (International Union of Pure and Applied Physics) Working Group on Women in Physics.
* Member of the board of The Nanometer Consortium, Lund University, Sweden.
* Member of Administrative Council of SEFI (European Society for Engineering Education)

Bungum, B.:
* Coordinator of Nordic research network in science education, NorSEd.

Espy, P.:
* Member SCOSTEP Climate and Weather of the Sun-Earth System (CAWSES-II) Task Group 2, 2011.
* Member International ALOMAR Science Advisory Committee, 2011.

Fossum, J. O.:
* Project leader of a Nordforsk funded Nordic Researcher Network in Soft Matter Physics (2010-2013) involving ~100 scentists in ~10 groups in the Nordic countries (Denmark, Finland, Norway, Sweden)
* In International Scientific Advisory Board for Center of Physics, Minho University, Braga, Portugal
* In International Scientific Advisory Board for International Center for Condensed Matter Physics (ICCMP), Universidade de Brasilia (UnB), Brasilia, Brazil

Gibson, U.:
* Optical Society of America Tellers committee chair
* Editorial Board, Materials Characterization (Elsevier)
* Editorial Board, NanoEthics (Springer)
* International Commission for Optics, Board member

Hansen, A.:
* Secretary to the Board of European Physical Society's Computational Physics group.
*Chair of the Commission on Computational Physics (C20) of the International Union of Pure and Applied Physics (IUPAP).
*Vice President of the International Union of Pure and Applied Physics (IUPAP).
*Member of the Scientific Advisory Board to the Center of Excellence in Computational systems Research, Helsinki University of Technology.
*Member of the ESF Network "Exploring the Physics of Small Devices" steering committee.
*Member of the Editorial board of the European Journal of Physics.
*Member of the Editorial Board of the International Journal of Modern Physics C.
*Member of the Editorial Board of Journal of Computational Interdisciplinary Sciences.

Holmestad, R.:
* Member of the board of the Nordic microscopy society, SCANDEM.
* Leader of the Nordic network (NordForsk) within TEM – NorTEMnet

Kachelriess, M.:
* Member of the steering committee of "ISAPP: International School on AstroParticle Physics European Doctorate School".

Lilledahl, M.B.:
* International committees: Management committee member for Cost Action: Chemical imaging by coherent Raman microscopy.

Mathiesen, R. H.
* Member of the Program Advisory Committee of Max-laboratory, Lund University, Sweeden.
* Member of the Scientific Adivisory Comimittee of the European Synchrotron Radiation Facility, Grenoble, France

Sorokina, I.T.:
* Optical Sciences Division Chair of the Optical Society of America (OSA)

* Quantum Electronics and Optics Division Board of the European Physical Society
* International Council on Quantum Electronics (ICQE) member
* International Council of the Optical Society of America member
* Chair of the Conference on lasers and Electrooptics (CLEO) Program Sub-Committee "Ultrafast Optics, optoelectronics and Applications"

Stokke, B.T.:
* Editorial Advisory Board – Biopolymers (Wiley).

Sudbø, A.:
*Steering Committee Member, European Science Foundation Network on Nanoscience and Engineering in Superconductivity (NES).
Member of ESA' Physical Sciences Working Group, European Space Agency

NATIONAL COMMITTEES

Borg, A.:
* Member of the Board for the Niels Henrik Abel Memorial Fund

Davies, C. de L.:
* Node leader and Platform leader of the FUGEII supported nation network "Norwegian Molecular Imaging Consortium".
* Member of the board of the National Interdisciplinary Research School in Medical Technology

Espy, P.:
* Member, Committee for Co-operation in Space Related Activities between NTNU-National Centre for Space Related Education- Andøya Rocket Range, 2011.

Fossum, J.O:
* Member of the Board of the Norwegian Physical Society
* Chair of the Division for Condensed matter Physics with Atomic Physics in The Norwegian Physical Society

Gibson, U.J.:
* Gemini Center leadership committee
* NanoLab leadership committee

Hansen, A.:
*Member of Board of Trustees, National Museum of Applied Arts, Trondheim.

Hibbins, R.E.:
* Member UNIS advisory committee for Arctic Geophysics, 2011.

Holmestad, R.:
* Member of the board of 'Bardalfondet' (Fond for belønning av fremragende studentarbeid innen økologiske aspekt av materialteknologi ved NTNU)

Kjeldstad, B.J.:
* Member of advisory board of Sintef, Material and Chemistry
* Member of the Board of University of Svalbard
* Member of board of SINTEF
* Member of board of e-campus, UNINETT
* Member of UHR education advisory board

Stokke, B.T.:
* Board member, NANOMAT Research Program, The Norwegian Research Council
* Norwegian national committee for the evaluation of professor competence in physics, member.
* Chairman of the board, NORFAB, National large scale research infrastructure project.

UNIVERSITY AND DEPARTMENTAL COMMITTEES

Borg, A.:
* Member of FUS ("Forvaltningsutvalget for sivilingeniørutdanningen") at NTNU.
* Vice dean on education, Faculty of Natural Sciences and Technology.
* Member of FUL ("Forvaltningsutvalget for Lærerutdanningen") at NTNU.
* Member of Educational Committee of NTNU
* Member, "Studieprogramråd for Lærerutdanningen i Realfag".
* Member of the board at Department of Industrial Economics and Technology Management
* Member of the council for KOMPiS ("Kompetanse i skolen")

Bungum, B.:
* Member of the board "Studieprogramråd for Lærerutdanning i Realfag"

Davies, C. de L.:
* Director of NTNU's Strategic Area of Medical Technology.
* Member of the program committee in Bioinformatics.

Gibson, U.:
* Member leader group "Gemini Centre Solar Cell Materials"
* Member of the Nanolab leadership committee

Holmestad, R.:
* Leader of the TEM Gemini Centre
* Project leader of the largescale infrastructure project NORTEM.
* Member of Faculty of Natural Science and Technology (NT) board
* Member of NTs 'Forskningsutvalg'.
* Member of NTs 'Ansettelsesutvalg'

* Deputy Department head (Research), Department of Physics
*Chairman 'Formidlingsutvalget', Department of Physics.

Lilledahl, M.B.:
* Head of Network for biomedical

Linder, J.:
*Member of 'Formidlingsutvalget', Department of Physics

Lindmo, T.:
* Chairman, Division of Biophysics and Medical Technology.
* Member, "Studieprogramråd for fysikk og matematikk".
* Chairman, "Studieprogramråd for International MSc Medical Technology".

Mikkelsen, A.:
* Chairman, Division of Complex Materials

Reenaas, T.W.:
* Member, "Studieprogramråd for MSc Condensed Matter Physics".
* Substitute for the Elected member of the Departmental Board.

Stokke, B.T.:
* Chairman of the board, NTNU Nanolab, NTNU.

Støvneng, J.A.:
* Chairman, "Undervisningsutvalget ved institutt for fysikk".
* Member, "Studieprogramråd for MSc Fysikk og matematikk"

Sudbø, A.:
* Head of the Department of Physics

Wahlstrøm, E.:
* Chairman, Division of Condensed Matter Physics.
* Member, "Studieprogramråd for nanoteknologi".
* Member. NTNU NanoLab ledergruppen.

Øverbø, I.:
* Chairman, "Studieprogramrådet for Realfag".

ARRANGEMENT COMMITTEES

Borg, A.:
* Member of the International advisory committee of "4rd IUPAP International Conference on Women in Physics", Stellenbosch, South Africa, April 5-8, 2011.
* Member of the International Programme Committee of the 28th European Conference on Surface Science (ECOSS-28), Wroclaw, Poland, August 28 – September 2, 2011.

Fossum J.O.:
* In organizing committee of *1st Nordic Workshop on Soft Matter Physics*, (Nordforsk network), Århus, Denmark, June 28th – July 1st, 2011
* In scientific committee of *International Workshop on Complex Phenomena in Superconductors and Magnetic Systems*, Øystese, Norway Aug.29–Sept. 2, 2011

Hansen, A.;
*International Advisory Board Member of Conference on Computational Physics (CCP) 2011, Gatlinburg, Tennessee.

van Helvoort, A.T.J.:
* Member scientific committee 10th International Congress for Applied Mineralogy (ICAM) in Trondheim, Norway on 1-5 August 2011.

Holmestad, R:
* Conference co-chair for 6th International Conference on the Physical Properties and Application of Advanced MATerials (ICPMAT 2011), Shanghai, China, 11.-15. Oct. 2011

Mathiesen, R. H.
* Member of the Scientific Committee of ICASP 3 – the 3rd International Conference on Advances in Solidification Processes, Aachen/Rolduc, Germany, June 7-10, 2011.

FRIDAY COLLOQUIUM – ”Fredagskollokviet i fysikk”

Convenors: Kåre Olaussen og Jan Myrheim (spring)
Steinar Raaen (autumn)

Programme – spring term

21. januar: Jens Wentzel Andreasen, Solar Energy Program, Risø, DTH:
"Small and wide angle X-ray scattering (SAXS/WAXS) applications in thin film studies".

28. januar: Kimball Milton, University of Oklahoma:
"Casimir Energies and Forces: An Accelerating Subject".

4. februar: Yngve Inntjore Levinsen, CERN:
"Accelerator physics at CERN".

11. februar: Sergey Ostapchenko, Institutt for fysikk, NTNU:
"LHC and its first results".

18. februar: Nils Baas, Institutt for matematiske fag, NTNU:
"Make way for mathematical matter!".

4. mars: Ursula Gibson, Institutt for fysikk, NTNU:
"Magnetic vortices - a new twist for logic gates".

11. mars: Paolo Di Vecchia, NORDITA:
"How a little string can tell us so much".

18. mars: Reidar Stølevik, Institutt for kjemi, NTNU:
"Natural Science and World View".

25. mars, Ingunn Kathrine Wehus, Imperial College and UiO:
"Cosmology — from philosophy to science".

1. april, Yngve Hopstad, Institutt for fysikk, NTNU:
"The Drake equation; Search for intelligent life beyond our planet".

8. april: Jonas Persson, Institutt for fysikk, NTNU:
"What do you care what your students think?
What do you think what your students think?**"**

29. april: Stein Olav Skrøvseth, Telemedisin, Tromsø:
"Applied pattern recognition and statistics in Telemedicine".

6. mai: Asle Sudbø, Institutt for fysikk, NTNU:
!25 years with high-temperature superconductivity (and 100 years with superconductivity)
25 år med høy-temperatur superledning (og 100 år med superledning)!

13. mai: Michiel Postema, Institutt for fysikk og teknologi, UiB:
"Sonoporation".

Programme – autumn term

26. august: Maria Losurdo. University of Bari, Italy.:
"Charge-transfer Processes on the Nanoscale: Role in Plasmonic Hybrid Nanostructures".

9. september: Remi Lazzari, Institut des NanoSciences de Paris, Université Pierre et Marie Curie - CNRS, Paris France:
"Combining GISAXS with in situ techniques to unravel optical and chemical properties of nanoparticles" .

16. september: Katarzyna Sznajd-Weron, Complex Systems and Nonlinear Dynamics Division at the Institute of Theoretical Physics and UNESCO Chair of Interdisciplinary Studies, University of Wrocław, Poland:
"Social physics or sociophysics?".

23. september: Mark Rudner, Physics Department, Harvard University, USA.:
"Topological Transitions in Driven and Open Quantum Systems" .

30. september: Ernesto Altshuler, Physics Faculty, University of Havana, Cuba:
"Flow induced symmetry breaking of an active suspension through a funnel"

7. oktober: Iwan Rhys Morus. Department of History & Welsh History, Aberystwyth University, Ireland:
"The Theatre of Experiment: Performing the World of Victorian Physics"

14. oktober: Trygve Buanes, Department of Physics and Technology, University of Bergen:
"The Phantom of the OPERA"

21. oktober: Bjørnar Sandnes, Department of Physics, Norwegian University of Science and Technology:
"Displacement structures in multiphase frictional flows" **.**

28. oktober: Henri Van Damme, IFSTTAR and ESPCI ParisTech:
"A physical Approach to the Art of Building".

11. november: Zoltán Néda, Department of Theoretical and Computational Physics, Babeș-Bolyai University, Cluj, Romania:
"The unexpected synchronization".

18. november: Jaques Jupille, Institut des Nanosciences de Paris, Université Pierre et Marie Curie and CNRS:
"Oxide surfaces and interfaces".

25. november: Bodil Holst, Department of Physics and Technology, University of Bergen:
"Matter wave optics with nanostructures"**.**

2. desember: Pietro Ballone, Atomistic Simulation Centre, Queen's University, Belfast:
"Of chains and rings: The equilibrium polymerisation of sulphur".

9. desember: Kevin Smith, Department of Physics, Boston University, USA:
"Intrinsic Electron Quantum Well States in Solids".

Annual Report for Department of Physics 2011

NTNU
Norwegian University of Science and Technology

NTNU

The Norwegian University of Science and Technology (NTNU) in Trondheim represents academic eminence in technology and the natural sciences as well as in other academic disciplines ranging from the social sciences, the arts, medicine, teacher education, architecture to fine art. Cross-disciplinary cooperation results in innovative breakthroughs and creative solutions with far-reaching social and economic impact.

Address, contact information

Department of Physics, NTNU
N-7491 Trondheim,
Norway

E-mail: postmottak@phys.ntnu.no

Svanemerket trykksak fra Skipnes Kommunikasjon Lisensnr. 241 731

www.ntnu.no/fysikk