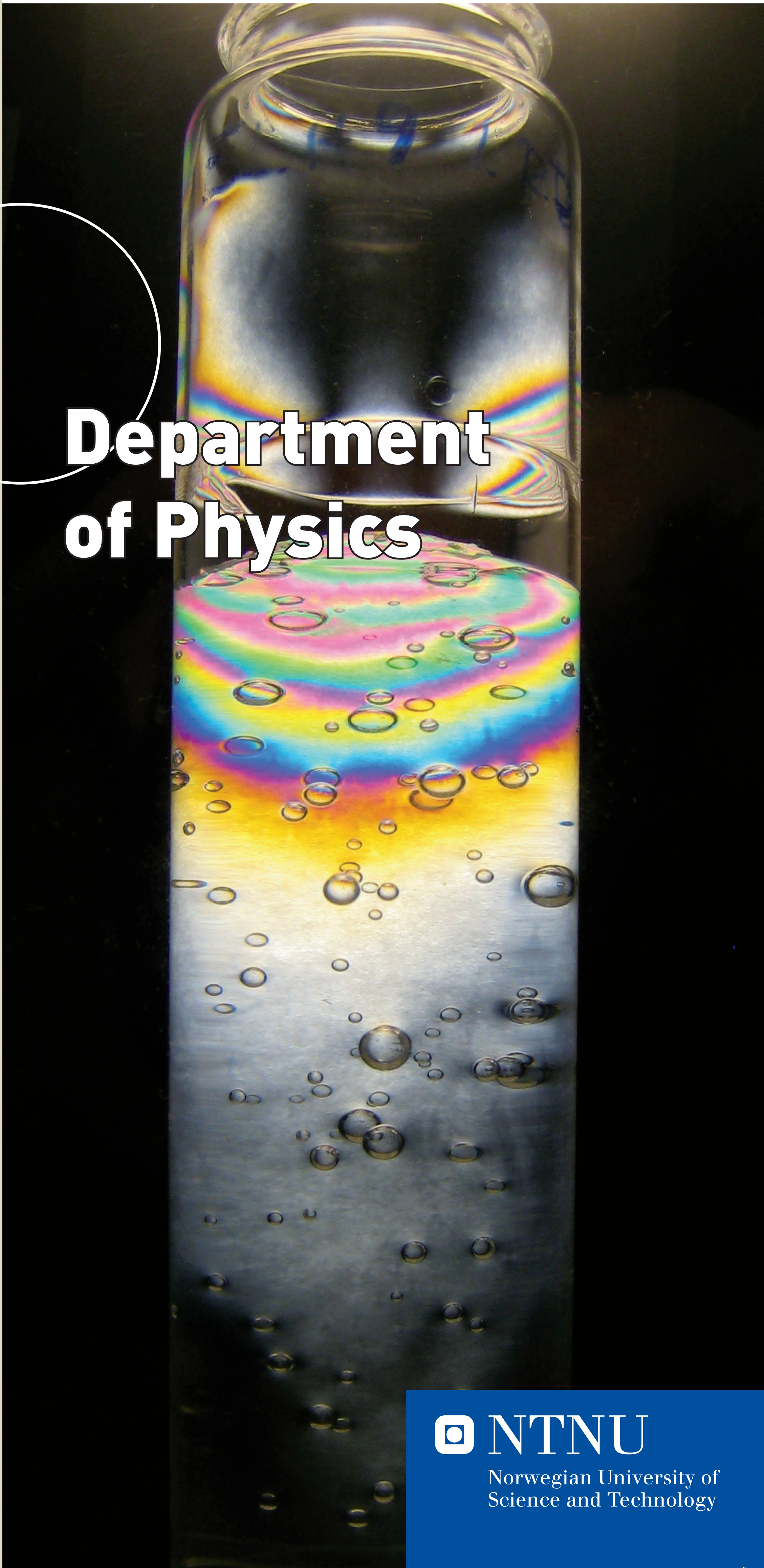
Department of Physics

Annual Report 2009



NTNU
Norwegian University of Science and Technology

DEPARTMENT OF PHYSICS, NTNU

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Head of Department:	Professor Berit J. Kjeldstad (until August) Professor Asle Sudbø (from August)
Deputy Head of Department:	Professor Kåre Olaussen(until August) Professor Randi Holmestad (from August) Ass. professor Jon Andreas Støvneng (from August)
Head of Administration:	Cand.scient Sylvi Vefsnmo

Departmental Council (until August)
Elected members:

Representing the permanent scientific staff	Professor Randi Holmestad Professor Catharina Davies Professor Alex Hansen Professor Mikael Lindgren
Representing the temporary scientific staff	Doctoral student Eirik Glimsdal
Representing the technical/administrative staff	Head Engineer Oddbjørn Grandum
Representing the students of the department	Student Jørgen Kristoffersen Student Aksel Jan Vestby
Appointed external member:	Research Manager Jostein Mårdalen (chair), SINTEF Petroleum Research. Professor Lisa Lorentzen, NTNU, Department of Mathematical Sciences.

Departmental Board (from August)
Elected members:

Head of Department	Professor Asle Sudbø (chair)
Representing the permanent scientific staff	Associated professor Dag Breiby
Representing the temporary scientific staff	Doctoral student Paul Anton Letnes
Representing the technical/administrative staff	Head Engineer Per Magne Lillebekken
Representing the students of the department	Student Armend Håti Student Aksel Jan Vestby
Appointed external member:	Research Manager Jostein Mårdalen (chair), SINTEF Petroleum Research. Professor Lisa Lorentzen, NTNU, Department of Mathematical Sciences.

COVER PAGE
Nematic ordering in a gel of anisotropic clay particles suspended in water. The image shows a macroscopic sample viewed through crossed polarizers where the colors are direct indications of the degree of order.

Image: Elisabeth Lindbo Hansen and Jon Otto Fossum

DEPARTMENT OF PHYSICS, NTNU

http://www.ntnu.no/fysikk

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Edited by:
Eli Monsøy, Arne Mikkelsen, Sylvi Vefsnmo og Asle Sudbø

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

A GLANCE AT 2009

This annual report provides a summary of the activities within teaching, research, and public outreach, in the Department of Physics throughout 2009.

During 2009, the department hired two new faculty members, associate professors Marit Sletmoen and Jonas Persson. The two new members of the faculty are in the process of establishing their own research programs and building up new laboratory facilities. The department is in the process of hiring several new faculty members, presenting a strategic opportunity to reshape its research profile. Two new members of the technical staff were also hired, Gjertrud Maurstad and Daniel Skåre. 17 new PhD students were welcomed to the department during the course of the year, while 15 PhD students completed and defended their dissertations. The total number of PhD students and postdocs increased substantially at the end of 2009, counting approximately 70.

The number of scientific papers published in international peer-reviewed journals has increased considerably since 2005. In 2009, the number reached a total of 153 (Frida). Of these, more than half (76) are published in so-called Level 2 journals, which count the most. (2005:117/56; 2006:126/48; 2007:123/60; 2008: 148/75).

The number of new projects funded by the Research Council of Norway, has increased somewhat from 2008. The success rate for applications in basic research is low, even for applications receiving excellent reviews. This is mainly due to underfunding of the Free Projects within the Research Council. There is a growing pressure on the scientific staff to provide external funding for their activities. EU continues to increase its strategic importance as a funding agency for most of our activities.

The quality of the students in the Physics Department is impressive, as evidenced by the student honours having been bestowed upon several of our MSc and PhD students in 2009 (for more details, see the annual report). The Department is also fortunate enough to be able to recruit outstanding students at the BSs, MSc, and PhD level.

In August 2009, the Department of Physics was responsible for organizing the annual Fysikermøtet, in co-operation with the Norwegian Physical Society. The meeting was held at Røros. Arne Brataas headed the organizing committee.

During 2009, the department also saw some of our long-time colleagues retiring. I would like to take this opportunity to thank Arnljot Elgsæter, Ola Hunderi, and Anders Johnsson, for the research they have performed, for the teaching they have done, and for the extensive services they have rendered to the department and to the university, through many years. Arnljot served as department head for two terms, and as dean for one term. Anders served as department head for one term and as vice rector for AVH for one term. Ola was one of the founders of the Division of Applied Physics in SINTEF.

In the fall of 2009, one of the founding fathers and pioneers of the transmission electron microscopy (TEM) activity at NTNU, and esteemed colleague in the department for more than 30 years, Professor Ragnvald Høier, passed away. Ragnvald's legacy continues to be with us, through the extensive TEM-research being carried out in the department in the division of condensed matter physics.

Asle Sudbø
Head of Department

STAFF

Head of Department:
Professor Asle Sudbø

Deputy research Randi Holmestad
Deputy education Jon Andreas Støvneng

PERMANENT STAFF

SCIENTIFIC STAFF:

Professors
Jens O. Andersen, Anne Borg, Arne Brataas, Catharina Davies, Arnljot Elgsæter, Patrick Espy, Jon Otto Fossum, Alex Hansen, Randi Holmestad, Ola Hunderi, Johan S. Høye, Anders Johnsson, Michael Kachelriess, Berit Kjeldstad, 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, Asle Sudbø.

Associate professors
Berit Bungum, Dag W. Breiby, Antonius Helvoort, Morten Kildemo, Jonas Persson, Pawel Sikorski, Marit Sletmoen, Knut Arne Strand, Jon A. Støvneng, Erik Wahlstrøm, Turid Worren Reenaas, Ingjald Øverbø.

Adjunct professors
Kenneth Dahl Knudsen, Einar Rofstad, Phil Scott, Arne Skretting, Roger Sollie, John Walmsley, Tor Wøhni.

TECHNICAL AND ADMINISTRATIVE STAFF:

Head of Administration
Sylvi Vefsnmo

Administrative staff
Margit C. Hagen, Snorre Hansen, Inger Kosberg, Inger J. Lian, Eli Monsøy, Tove G. Stavø.

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

TEMPORARY STAFF

Post- docs/research scientists
Mohamed Asbahi, Swarnali Bandopadhyay, David Barriet, Øyvind Borck, Julien Duboisset, Song Fei, Flemming Ehlers, Kamila Gawel, Daniel Huertas-Hernando, Dionne Klein, Sylvie Lélu, Magnus Borstad Lilledahl, Jacob Linder, Anatoly Malshukov, Ragnvald Mathiesen, Gjertrud Maurstad, Sergey Octapchenko, Katarzyna Maria Psonka-Antonczyk, Nina Reitan, Sinha Santanu, Stein Olav Skrøvseth, Marit Sletmoen, Maxim Solodyankin, Mathieu Taillefumier, Makoto Takemasa, Wakshum M. Tucho, Rene Vissers, Per Erik Vullum, Baoxiang Wang, Justin Wells, Minli Xie, DeZheng Yang, Seoung Shan Yap, Xiaofeng Yu, Chaolin Zha.

Doctoral students
Sigrun Saur Almberg, Christian Andresen, Mercy Afadzi, Asadollah Bagheri, Ruben Bjørge, Teferi Dejene, Roya Dehghan, Siv Eggen, Ming Gao, Henrik Enoksen, Bjørn-Tore Esjeholm, Amund Gjerde Gjendem, Knut Gjerden, Eirik Glimsdal, Maryam Mayami Gholami, Håvard Granlund, Morten Grøva, Kjetil Magne Dørheim Hals, Elisabeth Lindbo Hansen, Leif Ove Hansen, Yngve Hofstad Hansen, Håvard Haugen, Henrik Hemmen, Egil Vålandsmyr Herland, André Kapelrud, Hanne Kauko, Rashid Khan, Jacob Berent Kryvi, Lars Kyllingstad, Lars Erlend Leganger, Paul Anton Letnes, Jacob Rune Linder, Yun Liu, Hanne Mehli, Åsmund Fløystad Monsen, Florian Mumm, Kjetil Liestøl Nielsen, Ingar Stian Nerbø, Kenate Nemera Nigussa, Tor Nordam, Amna Noreen, Heidi Nordmark, Magnus Østgård Olderøy, Anna Maria Padol, Neelam Panjwani, Amutha Ramachandran, Nina Kristine Reitan, Zbigniew Rozynek, Jan Rødal, Severin Sadjina, Risi Ram Sharma, Magne Saxegaard, Hans Joakim Skadsem, Marius Aase Solberg, Bjarte Gees Bokn Solheim, Iver Bakken Sperstad, Frantz Stabo-Eeg, Einar Stiansen, Arne Stormo, Rune Strandberg, Ingeborg-Helene Svenum, Ragnhild Sæterli, Sven Tierney, Sedsel Fretheim Thomassen, Henrik Tollefsen, Jelena Todorovic, Malin Torsæter, Wakshum M. Tucho, Glenn Tørå, Asle Heide Vaskinn, Lars Erik Walle, Lars Martin Sandvik Aas.

PROFESSOR EMERITI

Johannes Falnes, Per C. Hemmer, Kristian Fossheim, Eivind Hiis Hauge, Ola Hunderi, Anders Johnsson, Hans Kolbenstvedt, Ole J. Løkberg, Jørgen Løvseth,Tore H. Løvaas, Frode Mo, Kjell Mork, Emil J. Samuelsen, R. Svein Sigmond, Helge R. Skullerud, Ivar Svare, Arne Valberg, Sigmund Waldenstrøm.

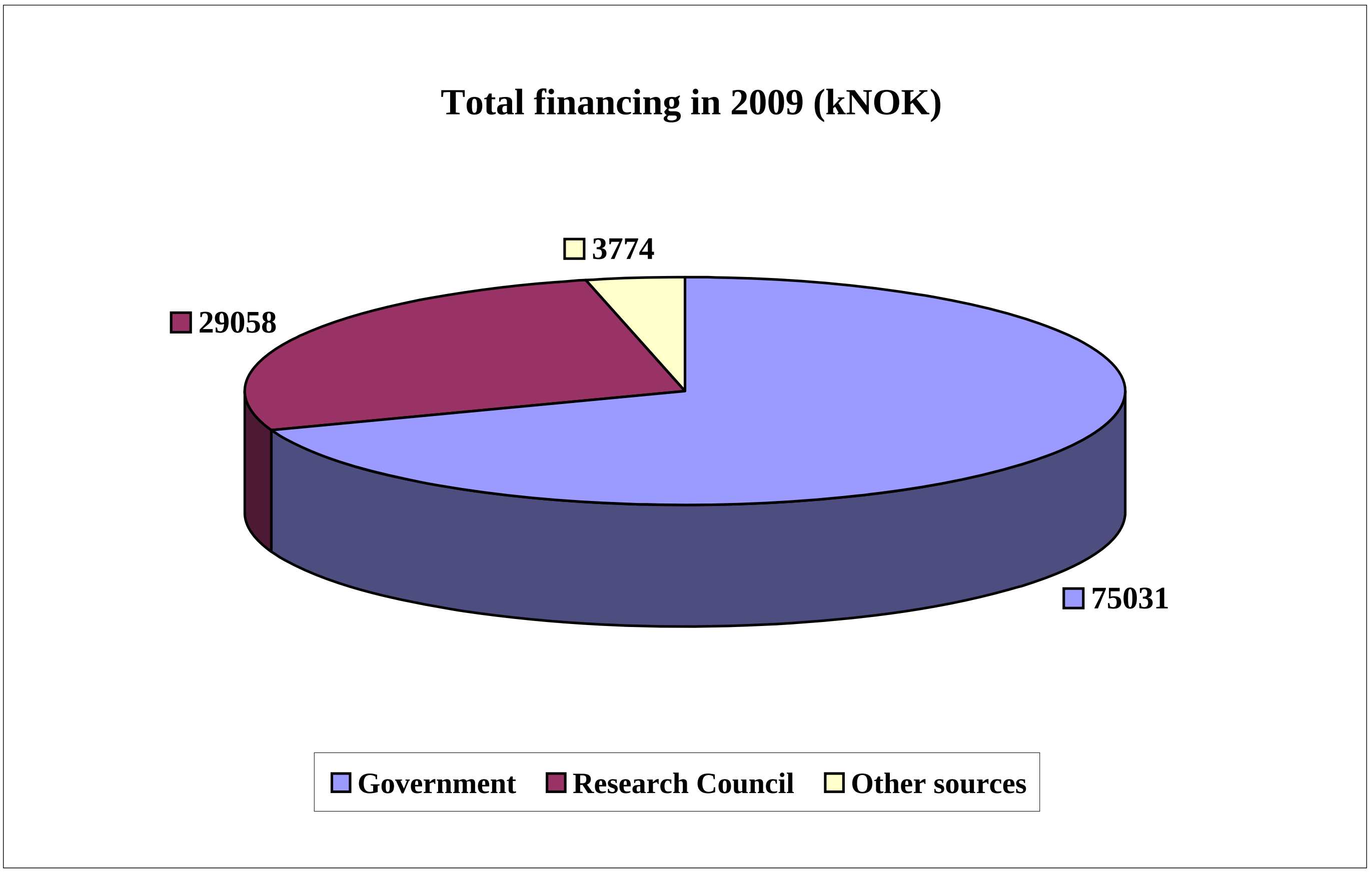
ACCOUNTS 2009

	Amount kNOK
Government University Funding (including NTNU strategy projects)	**75 031**

Projects financed by the Research Council of Norway	Project manager	Amount kNOK
Structural, Electronic and Optical Properties of Atomic Overlayers on Surfaces	Borg Anne	22
Materials for Hydrogen Technology	Borg Anne	176
Materials for Hydrogen Technology	Borg Anne	165
Fundamentals of Nanoscale Systems	Brataas Arne	1 105
Fundamentals of Condensed Matter	Brataas Arne	1 756
ColdWear	Breiby Dag Werner	30
Intravital Microscopy and MRI	Davies Catharina	80
Norwegian Molecular Imaging Consortium	Davies Catharina	943
Interconnected Physical Phenomena	Fossum Jon Otto	1 548
Complex systems and soft materials	Fossum Jon Otto	589
Nanostructured Soft and Complex Materials	Hansen Alex	1
Metal Printing	Hansen Alex	81
Mapping of Residual Oil between Wells	Hansen Alex	479
Role of Bursts in Fracture Front Propagation	Hansen Alex	1 252
Physics of Oil Recovery	Hansen Alex	10
Fracture-Failure Phenomena	Hansen Alex	21
Stimulated production: Steady and NonSteady State	Hansen Alex	38
Nanosolar	Helvoort, Antonius van	165
Membranes for hydrogen separation	Holmestad Randi	7
Studies of the Electronic Structure of Materials at the Nanoscale	Holmestad Randi	785
Kimdanningskontroll for Optimaliserte Egenskaper	Holmestad Randi	831
Fundamental investigations of Solute Clustering and Nucleation of Precipitation	Holmestad Randi	2 138
Optimisation of Aluminium Alloys in a Recyckling Context	Holmestad Randi	60
Novel nanomaterials and nanostructured materials for hydrogen storage applications	Holmestad Randi	620
Norwegian-Japanese Al-Mg-Si Alloy	Holmestad Randi	400
Light metal surface Science	Hunderi Ola	161
Posisjoneringstiltak EUs 7 RP	Sorokina/Kildemo/Mathiese	259
Clinical applications of multiphoton microscopy	Lilledahl Magnus B.	724
The mechanisms of photoprotection in natural and artificial photosynthetic systems	Naqvi Kalbe Razi	1 652
Study of Entanglement and Quantum Information in Condensed Matter Sys.	Olaussen Kåre	572
Thin-film III-V Semiconductors	Reenaas Turid Worren	275
Nanomaterials for 3rd Generation Solar Cells	Reenaas Turid Worren	2 018
Nanoscale Control of Mineral Deposition within Polysaccharide Gel Networks	Sikorski Pawel	1 324
Ultra-short pulsed Tm-doped fiber laser systems	Sorokina Irina	732
Polymer Gel Signal Transducers	Stokke Bjørn Torger	133
Structure Formations and Properties of Polyelectrolyte Complexes	Stokke Bjørn Torger	582
Activation of toll-like reseptors	Stokke Bjørn Torger	812
Biopolymer Engineering, KMB	Stokke Bjørn Torger	457
Responsive (bio)polymer matrices as Fabry-Perot	Stokke Bjørn Torger	286
IKT-Oxides	Sudbø Asle	400
Point Contact Investigations	Wahlstrøm Erik	1 746
Magnetodynamics of Nanostructured Metal Oxides	Wahlstrøm Erik	1 495
Advanced transmission electron microscopy in catalysis	Walmsley John	671
Equisol	Head of department	845
Småforsk	Several	379
Aurora, French-Norwegian researcher cooperation	Several	233
	Sum	**29 058**

Contribution from other financial sources

Contributors	Project name	Project manager	Amount kNOK
SIU	PhD Programme	Andersen	64
EU FP6	Dynamax, Dynamic Magnoelectronics	Brataas Arne	184
EU FP6	SFINX	Brataas Arne	19
Sør-Trøndelag Fylkeskommune	Force-in-Action	Bungum Berit	1
NordForsk	research	Bungum Berit	145
Kreftforeningen	tumorvev	Davies Catharina	33
ESA Communication	Fly your Thesis	Fossum Jon Otto	95
Statoil	Prof II, Roger Solli	Head of Department	234
Statens Strålevern	Prof II, Tor Wøhni	Head of Department	121
IFE	Prof II, Kenneth Knudsen	Head of Department	121
Other customers		Head of Department	23
EU FP7	C2CR - High Energy Interactions	Kachelriess Michael	1 060
Deutche Forschungsgemeinschaft	Kosmische Strahlung als Prove für Teilchenphysikjenseits des Standartmodels	Kachelriess Michael	52
SIU, NUFU	Spatial and Seasonal variation in solar radiation	Kjeldstad Berit	1 072
FOI, Totalforsvarets foskningsinstitutt	Sensorskydd	Lindgren Mikael	178
EU FP7	MIntWeld - Modelling of Interface Evolution in Advanced Welding	Mathiesen Ragnvald	45
Nordic Energy Research	Nordic Centre of Excellence in Photovoltaics	Reenaas Turid Worren	327
		Sum	**3 774**
Total external accounts in 2009			**32 832**



AWARDS


ExxonMobil's Research Prize 2009
Two prizes are awarded: One for basic research and one for applied research. Each prize is worth 50 000 NOK. The prize for basic research was awarded to **Jan Petter Morten**, who presented his doctoral thesis in physics in March 2008. The thesis is titled "Coherent and Correlated Spin Transport in Nanoscale Superconductors". The work was carried out at the Department of Physics, under the supervision of Professor Arne Brataas.

Professor **Alex Hansen** was appointed Honorary Doctor at the University of Rennes 29 June 2009. Since 1918 when the dr. honoris causa was introduced at the University of Rennes, 55 honorary doctors have been appointed.

The **"Hydro Challenge Technology Competition"** was held 22–23 April 2009, and among the visitors to NTNU was Hydro's CEO. There were 3 different categories and each winning participant (teamed in pairs) would receive a MacBook Air laptop. One of the winning teams in the category "Better Building Challenge" consisted of **Paul Anton Letnes and Tor Nordam**, both PhD students at the Department of Physics.

Arne Valberg awarded the prize AIC Judd Award 2009

Professor **Arne Valberg** was awarded the prize "The Dean B. Judd Award" for 2009. The prize from the International Colour Association (AIC) was awarded for Valberg's research, publications and contributions on the understanding of processes regarding light and colour vision. The prize was presented under the 11th Congress of the AIC 2009 in Sydney 30 September.

Research prizes at the NT Faculty 2009

Under the graduation ceremony in auditorium R1 5 June 2009, the following prizes were awarded:

The prize for the best doctor's degree at the NT Faculty was awarded to PhD **Jacob Linder**, Department of Physics (left). Supervisor was Professor Asle Sudbø.

The prize for the best science student at the NT Faculty was awarded to **Einar B. Stiansen** (right). Supervisor for his thesis was Professor Asle Sudbø.

HIGHLIGHTS FROM THE ACTIVITY

Hydro, NTNU, SINTEF and the Research Council of Norway are going to cooperate with Toyama University and Tokyo Institute of Technology in Japan on challenging developments in aluminium alloys.

The agreement on research cooperation was signed at the Norwegian Embassy in Tokyo 2 October 2009. The project is budgeted with 10 million NOK and will run for 4 years.

For several years NTNU, SINTEF and Hydro have had a close collaboration on aluminium research, and together they have had many national projects and also participated in EU projects.

The Japanese industry is not directly involved in the project, but participates via close partnerships with the two Japanese universities. Project manager and Professor at NTNU, Randi Holmestad, considers this type of project to be important for the industry as well as for academia; both for increasing the knowledge related to the development of new and improved aluminium alloys, and to extend the width of experience and to see challenges and possibilities from different angles.

Fysikermøtet 2009

Fysikermøtet - Røros 12–14 August 2009

The goal of the biennial physicists' meeting "Fysikermøtet" is to gather and stimulate everyone who works with or teaches physics in Norway.

Fysikermøtet 2009 was arranged by the Department of Physics, NTNU, in cooperation with the Norwegian Physical Society. It was held at Røros Hotell.

The Department of physics has in 2009 taken part in two new projects within EU 7FP. Project managers are Mikael Lindgren and Ragnvald Mathiesen.

LUPAS Project (EU)

The name of Lindgrens project is “LUPAS”, Luminiscent polymers for in vivo imaging of amyloid signatures. The group is responsible for photo-physical characterization of luminescent properties of the LCPs, and for carrying out multiphoton exitation laser scanning imaging. This project will propose to develop novel agents and methods for diagnosing Alzheimer and other age-related neurodegenerative disorders.

MintWelt Project (EU)

Mathiesens project is called “MINTWELD”, Modelling of Interface Evolution in Advanced Welding. This project will establish the capability to design and engineer welding processes with a multi-scale, multi-physics computational modelling approach. It will deliver an accurate, predictive, and cost-effective tool for intelligent design of high performance welded systems and interfaces.

Recognition of Fysikkløypa (from the Rector’s blog)

In the World Year of Physics of 2005, Fysikkløypa (”The Physics Trail”) was established in collaboration between the Department of Physics, the Department of Electronics and Telecommunications, the Programme for Teacher Education and the Science Center, and became a huge success from day one. The success meant that there was no option other than to continue with the concept, beyond the World Year of Physics. Several thousand 12 year olds have since had the opportunity to visit NTNU and try exciting experiments with e.g. lasers, magnets and electric circuits.

This year the number of applicants to our three year Bachelor of Physics study programme has almost doubled. I am tempted to cite “Hallo i uken”: ”Incidental? Probably not!" Honours go to the enthusiasts behind Fysikkløypa. This is science communication and recruitment at its best!

RESEARCH

DIVISION OF APPLIED PHYSICS AND DIDACTIC PHYSICS

Staff

Professor Patrick Espy
Professor Morten Kildemo
Professor Berit Kjeldstad
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

Professor emeritus Johannes Falnes
Professor emeritus Ole Johan Løkberg
Assoc. professor emeritus Tore Løvaas
Assoc. professor emeritus Jørgen Løvseth
Professor emeritus R. Svein Sigmond
Professor emeritus Helge Skullerud

Non-tenured staff
Julien Duboisset (Post-doc)
Seoung Shan Yap (Post-doc)

Overview

The Division of Applied Physics and Didactic Physics consists of several research teams carrying out research within the fields of *applied optics and laser physics, electron and ion physics, energy, atmospheric 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 works with femtosecond lasers based on optical fibers *(Sorokina)*.
Energy and environmental physics includes studies of climate processes, including the influence of solar radiation and energetic particles on atmospheric composition, dynamics and ground-UV irradiance (*Kjeldstad, Espy*), as well as renewable energy sources such as wind and ocean waves *(Falnes, Løvseth*). Research on new (third generation) solar cell technologies is also carried out *(Reenaas)*.
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 and curriculum development in physics and technology education, in a contemporary as well as in a historical perspective.

For 2009 we have chosen to give a more thorough account of specific research projects carried out by our groups with interest in applied optics, surface analysis, solar cells and physics education.

Characterization of nanostructured surfaces
(M. Kildemo, I. Nerbø, L. M. Aas)
The optics section develops optical instrumentation and methods suitable for solar-cell applications. In particular, experiments are underway to study light scattering from various wafer surface preparations using Mueller matrix scattering ellipsometry, while various near infra-red polarimetric imaging systems are currently adapted to study strain in multicrystalline silicon wafers. We are also developing a sensitive optical method (photo-reflectance spectroscopy) to be applied in order to study intermediate band gap solar cells and alike, produced within the solar cell group of applied physics.

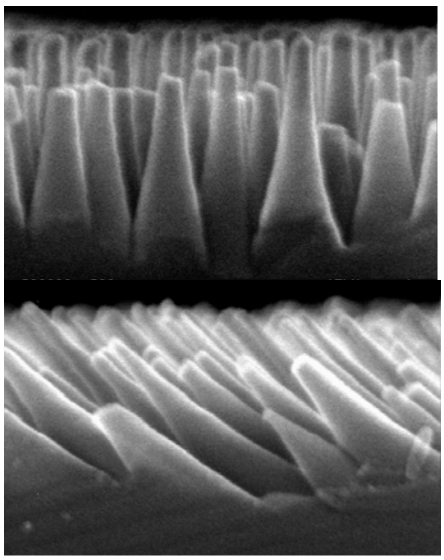


Fig. 1. Example of cross-section SEM image of GaSb nanocones formed upon sputtering at normal incidence (top figure), and at 45 degrees incidence (bottom Figure).

Spectroscopic Ellipsometry (SE) is a particularly surface sensitive technique that can be used both in-situ and ex-situ in order to study many of the "thin film" stages in the process of producing high quality solar cells. SE may also successfully be applied to study the formation of nanopillars, nanorods or nanocones, which can be used as light harvesting surfaces (both antireflective and absorbing depending on the material). SE can be quantitatively used when appropriate optical models are applied to analyze the measurements. We have particularly focused on studying the self-organized formation of densely packed GaSb cones forming upon low ion energy sputtering, see Figure 1. By studying this material with real time in-situ ellipsometry and appropriate in-house developed optical models, we have been able to understand the formation mechanism, see Figure 2. The optical results have been thoroughly verified by using alternative techniques such as Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), see Figure 1, and Transmission Electron Microscopy (TEM). Our results have been used alongside with computer simulation models for the formation process, from collaborating institutes, and have resulted in a new theory and understanding of the formation of GaSb nanocones and alike.

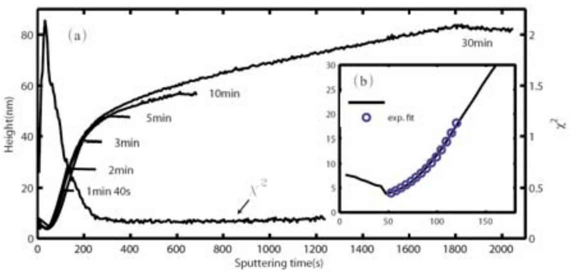


Fig. 2. Height evolution, as determined from in-situ spectroscopic ellipsometry, of GaSb nanocones forming during sputtering at normal incidence. Ref. Nerbø et al. APL 94, 213105 (2009).

Multiphoton spectroscopy of triplet states

(M. Lindgren, E. Glimsdal)

Nonlinear absorption refers to the change in transmittance of a material as a function of the intensity of the radiation. Two-photon absorption is one of several multi-photon absorption (MPA) processes showing nonlinear effects in molecules. It is no doubt that the invention of the laser in 1960 was the key to observing such nonlinear optical phenomena, and numerous nonlinear effects have been discovered since.

Multi-photon transitions have several characteristic properties, such as intensity, wavelength and polarization dependence. Organic molecules containing conjugated pi-electron systems with charge asymmetry in a donor-acceptor structure, or in conjugated polymers, have been shown to have large second- and third-order nonlinearities. Like organic molecules, organometallic complexes can possess large NLO responses, due to the large molecular polarizability originating from the strong metal-ligand charge transfer in these molecules. With an even greater flexibility in the design stage and the possibility for variation in metal-ligand environment and geometry, it became possible to tune the NLO responses in organometallic complexes in ways not possible for purely organic or inorganic molecules.

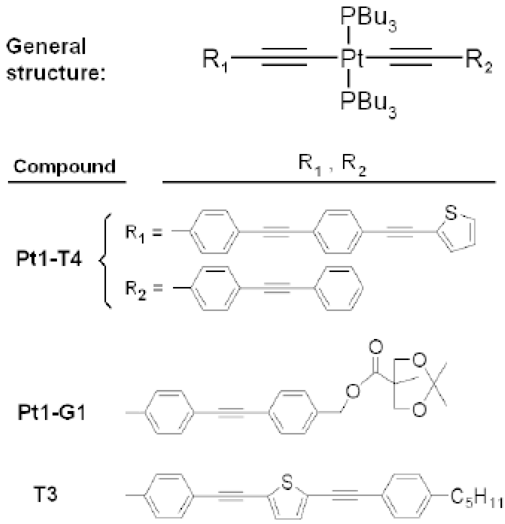


Fig. 3. Examples of compounds studied in the thesis of Dr. Eirik Glimsdal.

Typical examples of organometallic system we worked with is square planar Pt(II) acetylides, often abbreviated Pt1, shown in Figure 2. A series of more than 20 different variants of the Pt-acetylides were studied in the thesis of Eirik Glimsdal during 2006-2009.

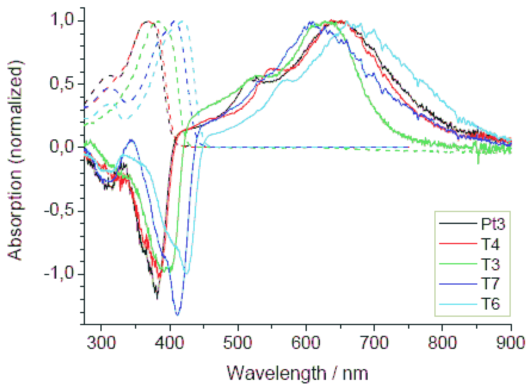


Fig. 4. Normalized ground state and triplet state absorption of the T3, T4, T6, T7 and Pt3 chromophores in THF solution studied in the thesis of Dr. Eirik Glimsdal.

The spectra in Figure 4 show some of the most important results: by employing a flash photolysis system it was possible to determine the kinetics and absorbance properties of the triplet-excited states and assess their importance in applications of optical power limiting (laser protection devices). For more details, it is referred to the thesis of Eirik Glimsdal: [Spectroscopic characterization of some platinum acetylide molecules for optical power limiting applications, NTNU, Thesis 2009:165, ISBN: 978-82-471-1723-1]

Research in physics and technology education

(B. Bungum, J. Persson)

The group has in 2009 doubled by the employment of Jonas Persson. The group also has 3 phd students. Research activities involve studies of how science can play a part in Design & Technology projects in schools, how physics teaching can reflect the authentic practices of science, how teachers make use of participation in authentic practices in their teaching and how the choice of science at university level forms part of young people's identity construction. The group is involved in the S-TEAM project, financed by EU's Seventh Framework Programme. This project involves science educators from 14 countries, and its' main focus is on inquiry-based learning in science.

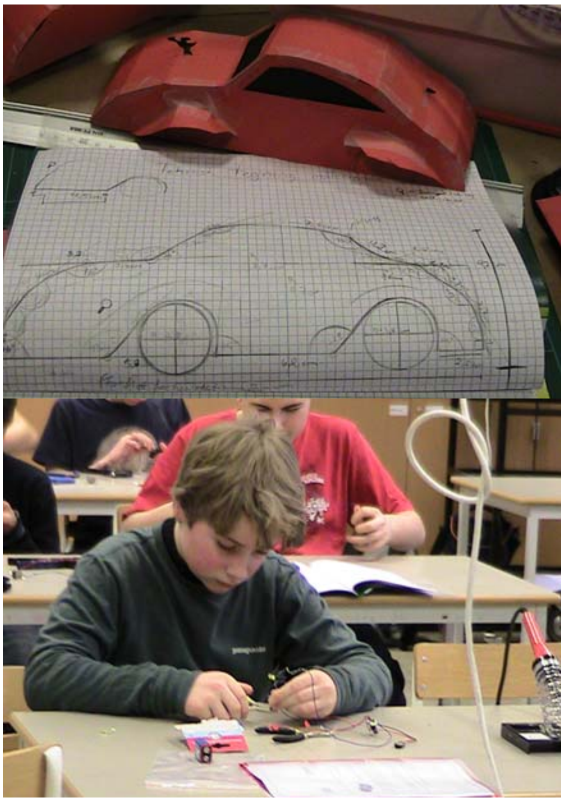


Fig. 5. Pupils working with model cars with electric motors in Technology and Design.

The group's contribution in the project is to document how technology may form an authentic context for inquiry-based learning, where pupils investigate scientific principles on a need-to-know basis in a cross-curricular project on building model cars. This work is done in co-operation with the school Ruseløkka Skole, forming a case of best practice in the study. While the S-TEAM project is situated in lower secondary school, the group is also involved in curriculum development in the subject "Technology and Theory of Research" as an elective in upper secondary school. Studies related to this subject investigate how pupils and teachers benefit from a university-school co-operation, and how this can provide students with a realistic picture of how scientists work.

Intermediate band solar cells

(T. W. Reenaas, R. Strandberg, S. F. Thomassen, M. Gholami, S.S. Yap)

Intermediate band (IB) solar cells is a relatively new solar cell concept, that have efficiency limits that are 50% higher than for conventional solar cells, but so far very attempts have been made to realize the concept. The Solar cell physics group is involved in both theoretical studies of such cells and in fabrication of new materials for the realization of these devices.

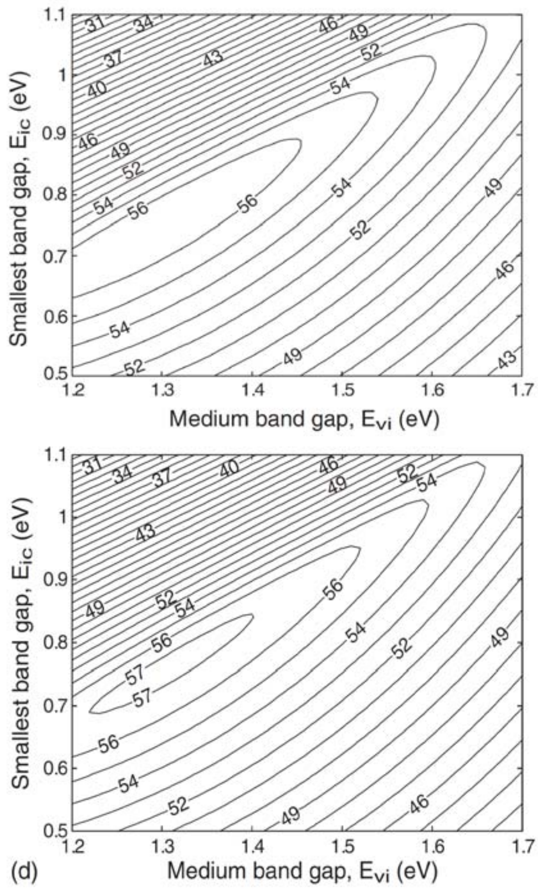


Fig. 6. Calculated limiting efficiencies for a photo-filled (upper panel) and pre-filled (lower panel) intermediate band solar cell.

The most important result from the theoretical studies is that the partial filling of the intermediate band can be achieved through photo-filling. For high light exposure the efficiency is similar for a photo-filled and prefilled (e.g. due to doping) IB solar cell, see figure 6 [Ref. Strandberg and Reenaas, J. Appl. Phys. **105**, 124512 (2009)].
The theoretical investigations have also included development of a drift-diffusion model for photo-filled IB solar cells, studies of how thermalization of the population in the IB affects the cell performance for a finite IB width and finally, how the IB solar cell can perform better if spectrally selective filters are being used.

For the relization of IB solar cells the group has focussed on materials that utilized quantum confinement in quantum dots (QDs) for the introduction of an intermediate band in the bandgap. The material system studied has been InAs QDs in an AlGaAs matrix. The QDs are fabricated using molecular beam epitaxy (MBE). The focus has been on optimizing the growth parameters to achieve as high QD density as possible. Densities above 10^{11} cm^{-2} were achieved with is in the range of what is needed. The first attempts to make solar cells (based on not optimal materials) have resulted in quite poor efficiencies, but relatively high open-circuit voltage as compared to what has been reported by others, see figure 7.

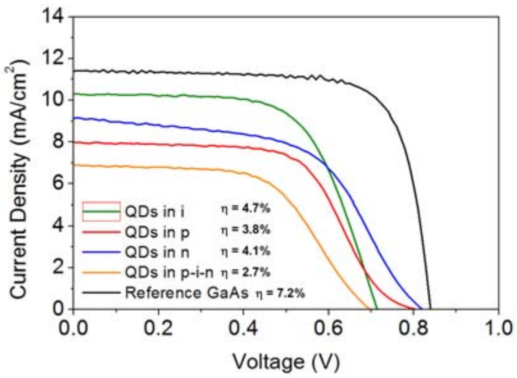


Fig. 7. Measured current-voltage character-istics of four different QD based IBSCs, where the placing of the QD layers has been in either the intrinsic (i), p- or n-doped or all three regions of the cell.

DIVISION OF BIOPHYSICS AND MEDICAL TECHNOLOGY

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Overview

The research is presented under the following headings: *Medical physics and technology*, *Bio-polymers and bionanotechnology*, and *Photo-biophysics*. A brief overview is given below, and one project is presented in more detail.

Survey of research activities

Medical physics and technology

Superficial dose in breast cancer radiotherapy
(S. Saur, J. Frengen, T. Lindmo)
Dose distributions in an anthropomorphic female thorax phantom were studied for three breast irradiation techniques (Fig. 1), all using 6 MV photons. Good agreement between film dosimetric measurements and calculations were observed in the clinical target volume (CTV) and build-up region. Due to the difference in field directions (gantry angles), the superficial doses were different for the three breast irradiation techniques evaluated. An important aspect if changing from a tangential technique to a technique more like the 7-field IMRT is a reduction of the central skin and central superficial CTV dose, i.e. in regions 2 and 5 shown in Fig. 2. The hybrid IMRT technique, originally

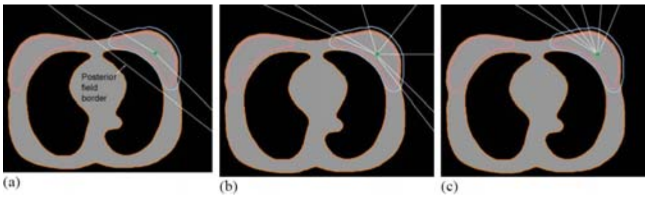

Fig. 1. Three techniques for radiotherapy of breast cancer, studied in an anthropomorphic phantom.
(a) standard tangential irradiation, (b) 7-field intensity-modulated radiotherapy (IMRT), (c) hybrid IMRT technique combining medial field and IMRT fields.

designed for optimum sparing of the contralateral breast, results in a reduction of the medial skin dose and an increase of the lateral skin dose, but when the superficial CTV is concerned, the differences from the tangential technique were minor.

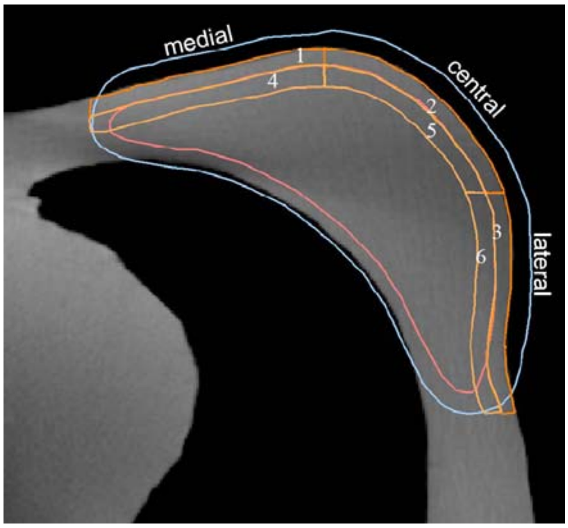

Fig. 2. Clinical target volume (CTV) delineated by pink line. Medial, central and lateral superficial regions of interest (skin) indicated by 1, 2 and 3, and corresponding superficial CTV regions 4, 5, and 6.

Transport of therapeutic macromolecules in tumour tissue and cells
(C. de Lange Davies, N. Reitan, S. Lelu, Y. Hansen, M. Afadzi)
Successful therapy requires that the therapeutic agent reaches its target. The high interstitial fluid pressure and the extracellular matrix consisting of a structural network of collagen embedded in a gel of glycosaminoglycans are potent barriers to delivery of therapeutic macromolecules. Diffusion of various macromolecules in the extracellular matrix is studied by fluorescence correlation microscopy (FCS) and fluorescence recovery after photo-bleaching (FRAP). Cellular uptake and intracellular trafficking represents further barriers.

Two projects have been in the focus in 2009:
Ultrasound mediated drug delivery:
Ultrasound may improve the uptake of encapsulated drugs in tumours. We have found that ultrasound increases the release of drugs from liposomes in solution and we characterize the various exposure parameters (frequency, pulse length, duration, acoustic pressure) to obtain optimal release. We are also studying how ultrasound can increase the release of drugs in collagen gels being a model for extracellular matrix.

Chitosan as a DNA carrier in gene therapy
Chitosans are positively charged polysaccharides

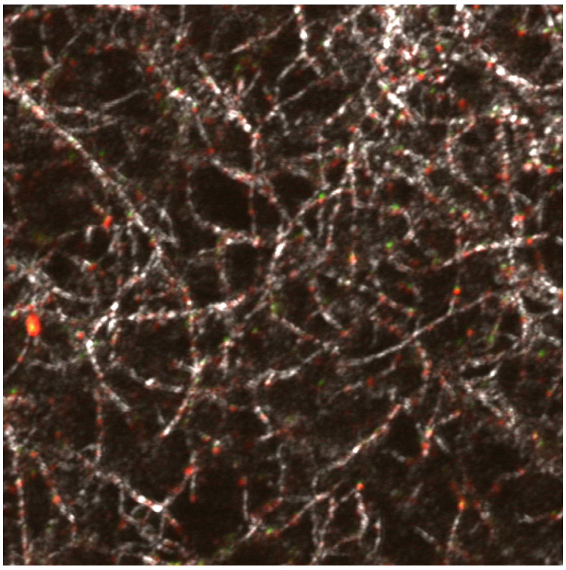

Fig. 3. DNA (green)-chitosan (red), binding to collagen fibers in a gel.

which interact with the negatively charged DNA, forming nanoparticles. The interactions with DNA and ability to transfect cells depend on intrinsic chitosan properties such as chain length, charge density, and molecular structure, as well as the relative ratio between DNA and chitosan. We have been studying the intracellular trafficking and distribution of DNA-chitosan particles formed by various chitosans. Especially the escape from early endosomes has been studied. Furthermore, the penetration of DNA-chitosan in gels of collagen fibres has been studied, and we see clearly that the charged nanoparticles interact with collagen fibres preventing penetration through the extracellular matrix (see Fig. 3). Thus, it is of importance to shield the charge for instance by chemical modification using pegylation to reduce the interactions with extracellular matrix constituents.

Clinical applications of multiphoton microscopy
(C de Lange Davies, M. Lilledahl)
Multiphoton microscopy and the second harmonic signal can be used to image the three-dimensional structure of connective tissue proteins without exogenous staining. This information is valuable in characterizing many types of pathologies. The connective tissue is what imparts mechanical strength to tissue and the mechanical properties are important in many clinical applications. We have been imaging collagen fibres from chordae tendinea and studied their behaviour during mechanical stress. Furthermore collagen and cells in cartilage have been imaged to understand mechanical properties of cartilage. We are working closely with

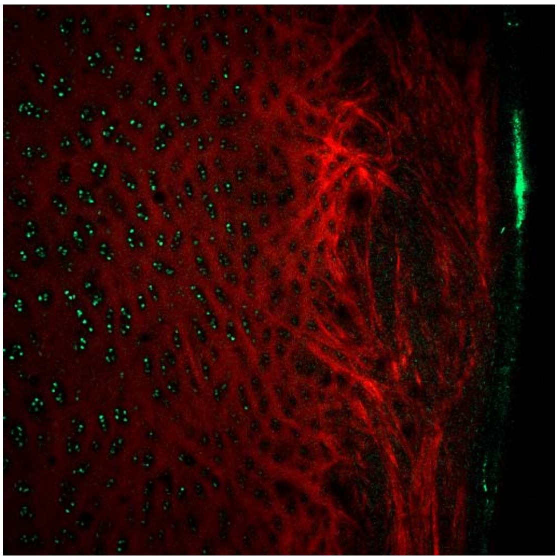

Fig. 4. Collagen (red) and cells (green) in cartilage.

biomechanics groups in Norway and Austria to investigate how multiphoton microscopy can be used to improve mechanical, mathematical models and better understand the mechanical properties of tissue.

Biopolymers and bionanotechnology

Biopolymer mesoscale structural organization and interactions
(B. T. Stokke, M. Sletmoen, D. Klein, G. Maurstad, K. Psonka-Antonczyk, M. Takemasa, D. Barriet, K. Gawel, A. Padol, M. Gao, S. Tierney)
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.

In 2009, the focus on the development of glucose responsive polymeric materials integrated on a high resolution interferometric platform (Fig. 5) was extended to include research approaching the in vivo conditions. Thus, the possibility to detect glucose in blood was addressed by first developing anti-coagulation procedures that do not interfere with the glucose sensing principle, and secondly performing measurements in glucose depleted plasma with various level of glucose subsequently added.

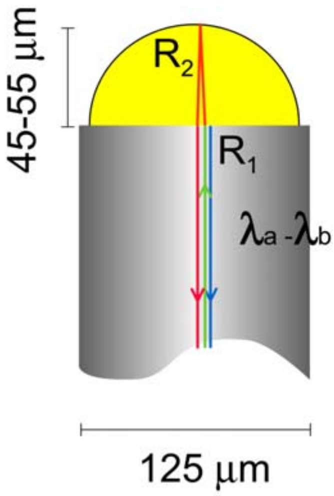

Fig. 5. Schematic illustration of hemispherical hydrogel immobilised at the end of an optical fiber. Biospecific changes in the hydrogel swelling were monitored by the interference wave arising from the reflections of the incident light at glass-fiber hydrogel and hydrogel – surronding media.

Also in 2009, the first result of high resolution determination of biospecific responsive hydrogels based on oligonucleotide sensing elements (Fig. 6) was reported. In particular, it was found that including a partly duplex dsDNA as a physical crosslink can be used to sense free ssDNA in solution. This resulting readjustment to a new equilibrium swelling state for this network topology is larger than for a grafted ssDNA used to bind complementarity to a ssDNA probe.

Single-molecule studies of the interaction between hydrophobically modified hydroxyethyl cellulose and amylose have been performed in order to elucidate molecular interactions contributing to the rheological properties of these materials. These results indicate clear differences in the interaction profiles monitored at the single-molecule level between the molecular pairs included. In 2009, we also reported on the first results on single-molecule interactions studies using the AFM based platform on interactions between a model mucin and a lectin. Interpretation of the kinetic parameters obtained from the force spectroscopy approach indicates a bind – and –jump mechanism of the lectin. We are also in the process of establishing single-molecule techniques for the study of search strategy of DNA binding proteins in reaching their specific target.

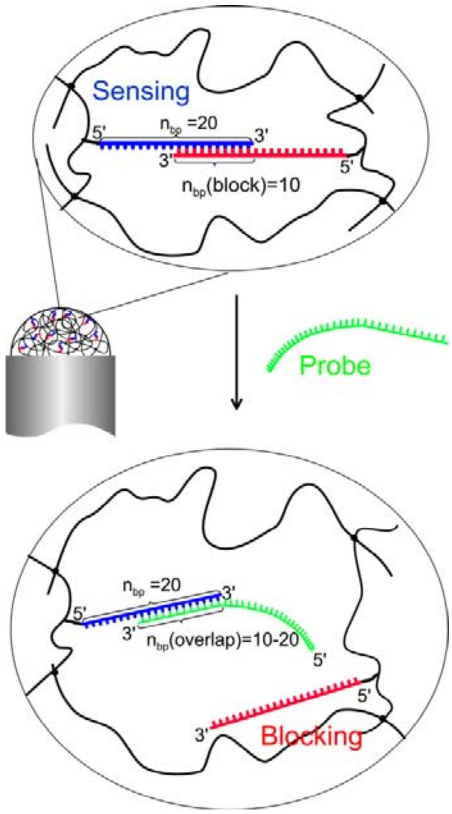

Fig. 6. Schematic illustration of oligonucleotide sensing principle of biospefic hydrogel on a fiber optic readout platform. A partial duplex structure anchored to topologically separate network chains constitutes a physical crosslink. The destabilised crosslink by competitive displacement of the sequence specific oligonucleotide, induces a swelling of the hydrogel.

The research on (1,3)-β-D-glucans aims at an understanding of stability, structure and biological activity of (1,3)-β-D-glucans exposed to different pre-treatments. In 2009 we reported on moelcular information of complexes formed between (1,3)-β-D-glucans and polynucleotides. This is the first example of a specific polysaccharide-polynucleotide interaction.

Bionanotechnology

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

In the biomineralisation project, the main focus in 2009 has been on making biomedically relevant composite materials, by combining alginate and calcium phosphate, in addition to calcium carbonate studied earlier. Using biomineralisation, nature is able to make intriguing composite organic-inorganic structures (oyster shells and corals, magnetic crystals in bacteria, and human bones) These are highly complex and dynamic materials composed of inorganic minerals (such as calcite, aragonite, or hydroxylapatite) and organic macromolecules (such as proteins, polysaccharides, and proteoglycans). The formation of such materials from the nano- to macro- scales at ambient conditions with distinguished properties is a unique inspiration for advanced material design and fabrication.

During 2009, we have developed a one-step method to make nano-structured composites from alginate and calcium minerals. Nano-scale mineral phase was successfully formed within the gel network of alginate gel beads. A combination of electron microscopy, fourier-transform infrared spectroscopy, thermogravimetric analysis and powder X-ray diffraction showed that alginate played an active role in controlling mineral size, morphology and polymorph. We expect these mineralised hydrogels to have a potential as cell carriers, with applications towards bone-modelling in vitro and implantable biomaterials.

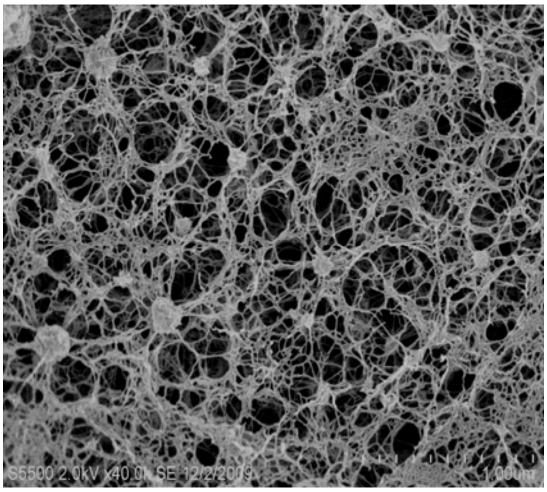

Fig. 7. Alginate gel network mineralised with calcium carbonate.

In addition, by doing controlled crystallization experiments of calcium carbonate with small concentrations of various alginates or oligomers of alginate present, we have investigated growth kinetics and nucleation in addition to polymorph selection by these alginates.

In similar bio-inspired approach, we have made and studied nano-structured superhydrophobic surfaces for digital microfluidic systems. Digital microfluidics is a variation of the idea of integrating a fluidic lab on a chip. In contrast to more commonly used microfluidics systems, which work with continuous flows in predefined channels, digital microfluidics is based on the manipulation and analysis of individually controllable droplets. One method of realizing such a system, is based on self confined droplets on a superhydrophobic surface. Those were produce by introducing nanoscale surface roughness on Cu or CuO surfaces, by etching of polycrystalline samples along the grain boundaries, by electrodeposition of copper films with subsequent nanowire decoration based on thermal oxidization, or by a combination of both. Part of the motivation for using Cu based system, was to develop inexpensive and versatile method of making superhydrophobic surfaces, for which low resolution patterning techniques could be adopted from printed circuit board fabrication technology.

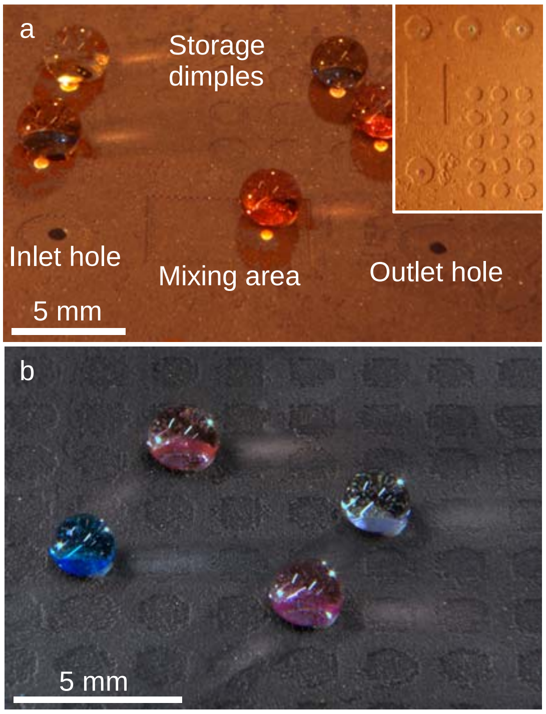

Fig. 8. Cu based chip (a) and CuO based chip (b) with coloured water droplets.

Photobiophysics

Photo induced reactions in cancer cells.

(A. Johnsson, T.B.Melø, O. Gederaas)

In a study of rat bladder cancer cells, parameters to increase cell destruction by light irradiation and simultaneous addition of a photosensitizer (hexyl-aminolevulinic acid) have been identified. Blue and red light are tested, dose response curve for destruction mapped and cell destruction mechanisms are now studied. The destruction is efficient in rat model systems and it is anticipated that the experiments will have clinical value.

Photosynthetic systems and pigments
(R. Naqvi, T.B. Melø)
One of our main contributions last year was the development of an all-optical method for generating singly charged radical ions of a hydrophilic carotenoid (Car). It relies on photolyzing an aqueous mixture of Car and a photoionizable auxiliary solute (*A*), and making conditions conducive to the capture, by Car, of the hydrated electron (e_{aq}), or the positive hole in $A^{\bullet +}$, or both. Triplet-triplet absorption of molecules containing heavy atoms were also investigated in a separate study.

Comprehending the difference between the absorption spectrum of a leaf and that of a suspension of chlorplasts (isolated from the same leaf) has been a preoccupation of many workers in photosynthesis. Leaf spectra are modified by the extent of the 'package' effect and the lengthening of the effective optical path due to scattering. The difference between leaf and isolated chloroplast absorption was quantitatively described by adapting Duysens's treatment of flattening. It was found that the accumulation of chlorophyll in leaves is accompanied by a monotonous enhancement of the package effect. The results were discussed with special reference to the role of light scattering in leaf optics, light utilization in photosynthesis and wavelength-dependent light gradients in a leaf.

Much time was spent in setting up a new laser spectroscopy laboratory funded by an NFR grant for investigating photoprotection in natural and artificial photosynthesis. The equipment has now been assembled and, judging from the first round of results, the effort has not been in vain.

Example of research carried out in 2009

Plant growth and movements in weightlessness.
(A. Johnsson and B. Solheim)
An experiment on the International Space Station, ISS, was accepted by the European Space Agency and has been performed as briefly mentioned in earlier reports. The aim was to map the growth patterns of plants in weightlessness and to test hypotheses on the importance of gravity for growth patterns and movements. The about 75-day-experiment produced a large video material. It allowed characterization of the responses to centrifugal accelerations, since the plants were mounted on slow centrifuges, controlled from the base station on Earth. The evaluation of the main body of the pictures was finished in 2009. Three papers were published and B. Solheim passed his ph.d.-degree in the same year.

Helical movements of plant stems were recorded and the amplification of such oscillatory growth motions by centrifugal forces (and consequently by gravity on Earth) was unequivocally demonstrated on ISS. Refined model simulations of these movements will be performed and extended. The model is based on the concept of water transport in the stems, leading to cellular growth extensions travelling like a wave around the stem and causing the observable movements.

Leaf movements – usually of up and down type - in weightlessness were recorded for the first time, the periods being of the order of 90, or 40 min or even shorter duration. These movements are also generated by a "shuttling" of water between cells at opposite parts of the leaf stalks, but in this case the movements are not coupled to cellular growth. The oscillatory water transport is generated under constant conditions, being an example of a self-excitatory biological system.

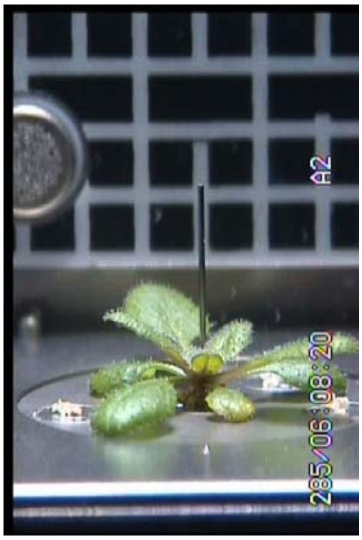

Fig. 9. Image of plant on thed ISS

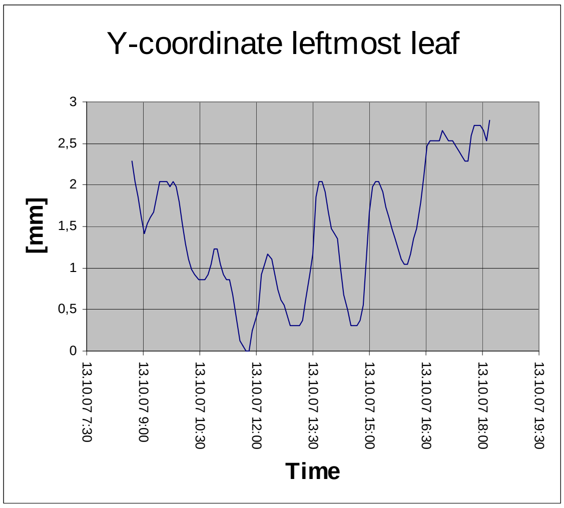

Fig. 10. Recording of tip movements of one of the leaves of the plant in Fig. 9.

DIVISION OF COMPLEX MATERIAL

Staff
Professor Arnljot Elgsæter (to 31.3.09)
Professor Jon Otto Fossum
Professor Alex Hansen
Professor Arne Mikkelsen
Professor Steinar Raaen
Professor Bo Sture Skagerstam
Adjunct professor Kenneth D. Knudsen

Professor emeritus Frode Mo

Non-tenured staff
Santanu Sinha (Post-doc) (from 1.9.09)
Baoxiang Wang (Post-doc)
Xiaofeng Yu (Post-doc) (to 31.5.09)

Overview

The division carries out research within *physics of soft and complex material*s including *biological physics.* The phenomena studied include: The structure and dynamics of nanostructured surface alloys, clay-containing systems and biopolymers; atomic and domain structure in ferroelectric thin films; spontaneous and guided selfassembly of nano-particles of various kinds; diffusion properties in nanoporous media; folding and conformational dynamics of proteins and other biopolymers; 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; preparation of soft aqueous samples for transmission electron microscopy; measurements of static and dynamic viscoelastic properties of soft materials (rheology); micro- and nanocalorimetry; thermo-gravimetry; studies of 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 and Brownian dynamics.

The *theoretical studies* are mainly on condensed matter physics and statistical physics. For details, see below under Survey of research activities.

Survey of research activities

Experimental and theoretical studies of the dynamics and structure of nanoparticles and polymers
(*A. Elgsæter and A. Mikkelsen*)
The primary goal of the research is to gain a deeper understanding of the interplay between functions and structural dynamics of polymer and nanoparticle systems. The research consists of three closely integrated parts: I) Formal theoretical basis for the nanoscale dynamics using realistic molecular models. II) Numerical algorithms to carry out numerical Brownian dynamics simulations. III) Experimental studies of molecular dynamics using methods such as electron microscopy, circular dichroism and electrically induced transient birefringence. Research in 2009 has been focused on electron microscopy and electron diffraction of carbon nanocones and nanodisks. In April 2009 prof. A. Elgsæter retired and accordingly the research activity was lower.

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. During the past couple of years the activity has moved into including similar phenomena in other types of nanoparticle systems, such as paperfibers, surface modified clays, gold, silver, and ZnO. 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 Sao Paulo, Brazil, PAL in Pohang, South Korea, Max-lab Lund universitet in Sweden and other sources. 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, University Rennes 1 in France, University of Amsterdam, Universidade de Brasilia and other institutions in Brazil.

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. The steady state is a state in the sense that it only depends on the macroscopic parameters and not on how the fluids were distributed initially. This leads to relations between the macroscopic flow parameters which have a certain resemblance to thermodynamic relations.

Within the same project, we also study the instability that occurs when two immiscible fluids flow in parallel. We then see the development of a foam layer moving with constant speed and thickness in the direction normal to the average fluid flow. This is a soliton.

Another subproject is to study what happens when the fluids suddenly change their wetting properties with respect to local pores. Does this lead to the mobilization of stuck fluid droplets?

Finally, we have constructed a model for describing film flow in porous media. This allows us to study imbibition processes quantitatively.

Our work on brittle fracture continues with a focus on the possible transition between a percolation-like fracture process on small scales to a fluctuating elastic line process on larger scales. We use numerical models for this work. Another project under the heading of fracture is to continue our work on devising a description of fracture networks using a duality transformation. This leads to the possibility of using all the new tools that have been developed over the last years for describing complex networks. We envision developing a descriptive tool for fracture networks as the concept of fractals were to complex geometries.

We are in collaboration with Bo-Sture Skagerstam studying the stability of wetting films when there is flow. We find diffusive processes developing shocks and diffusive-convective processes under other conditions creating solitary waves.

Nanostructured surfaces: carbon cones, rare earth doped surfaces, shape memory alloys

(*S. Raaen*)

A range of experimental surface analytical tools (XPS, UPS, LEED, PEEM, TPD) are used to investigate electronic and structural properties.

It was found that hydrogen adsorbs on carbon nanocones in a temperature region which is suitable for hydrogen storage applications. The nature of adsorption for doped and undoped carbon material has been characterized.

We have demonstrated that the surface properties may vary dramatically for different rare earth doped transition metal surfaces, and have explored the temperature stability of such systems. Gas adsorption has also been explored.

Shape memory alloys (SMA) have many applications within several fields of materials technology, and are also used in biocompatible applications. Oxidation studies of NiTi SMA indicate that oxide growth and stability may be enhanced in the presence of small amounts of K at the surface, which in turn is of consequence for biocompatibility.

Cavity quantum electrodynamics and anomalous diffusion in granular/traffic flows

(*Bo-Sture Skagerstam*)

We have focused our attention on the large-time statistical properties of granular flows (work done in collaboration with J.O. Fossum and A. Hansen and project/master students). In this study use has been made of the so-called Hurst exponent to classify the large-time properties of granular/traffic flows and 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.

In the field of cavity quantum electrodynamics we have studied various collective effects of atoms interacting with a micro-cavity radiation field. We have also 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. 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.

Example of research carried out in 2009

Flow birefringence in a complex fluid consisting of synthetic clay particles dispersed in saline water.

(Henrik Hemmen, Elisabeth Lindbo Hansen, Eirik Voje Blindheim and Jon Otto Fossum)

Sodium fluorohectorite is a synthetic clay consisting of polydisperse nanoplatelets with diameters up to the micron range [D.M. Fonseca et. al, Phys.Rev.E 79, 021402, 2009; H. Hemmen et. Al, Langmuir 25, 12507, 2009]. When left for sedimentation the clay particles arrange themselves in size dependent layers. The particles take on different degrees of orientation in the different layers as shown in Fig.1.

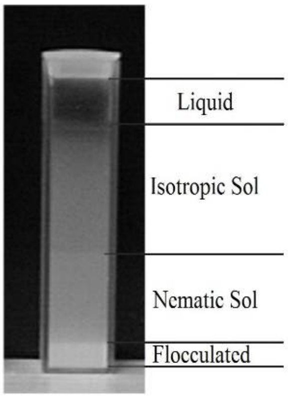

Fig. 1. In the isotropic phase the particles have no preferred orientation or position. The nematic phase has orientational, but no positional order. Large particles and aggregates make up the bottom flocculated sediment.

Shaking of the sample induces internal flows in the isotropic phase, making the particles align temporarily nematically [E.L.Hansen, Master's thesis, NTNU, 2008]. This anisotropy of the isotropic phase layer turns the polarization of linearly polarized light, allowing different wavelengths to pass through an experimental set-up where the sample is placed in between crossed polarizers, see Fig. 2.

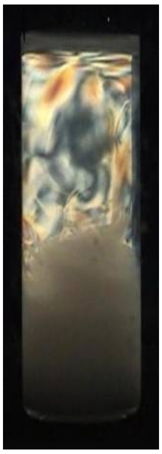

Fig. 2. Shaking of a sample such as the one shown in Fig. 1 induces internal flows in the isotropic phase, making the particles align [H. Hemmen et. Al, Langmuir 25, 12507, 2009]. The anisotropy of the isotropic phase layer turns the polarization of linearly polarized light, allowing different wavelengths to pass when the sample is placed in between crossed polarizers.

This system was studied by us during a Zero-G parabolic flight campaign organized by the European Space Agency (ESA): October 26th to November 6th 2009 in Bordeaux, France (Fig. 3). Our student team was selected in hard competition with other European teams to fly their experiments during a new ESA programme called 'Fly Your Thesis!', which offered a rare opportunity for our students to design, build, and eventually fly, a scientific experiment that requires an investigation to be performed in microgravity, as part of their Masters or PhD thesis.

Fig. 3. Our flow birefringence experiments were carried out in a microgravity environment inside a Novespace Zero-G aircraft.

Our experiments performed during the ESA flights were with concerned flow-induced order in aqueous suspensions of synthetic sodium fluorohectorite clay, see Fig. 4. In particular, we studied the decay of flow-induced nematic ordering under microgravity conditions, due to Brownian rotational motion. The study in a weightless environment is important because it eliminates problems related to sedimentation and convection that could interfere with the pure Brownian dynamics of the system. In Fig. 5 you find a photo of the Zero-G experimentalists.

The experiment involved shining linearly polarised light onto a sample in which a flow had been induced prior to the flight onset of microgravity. Light transmitted from the sample passes a second polariser that is oriented with its transmission axis at 90 degrees to the axis of the first polariser. This light was then recorded by a high definition video camera in order to map the anisotropy induced by the flow.

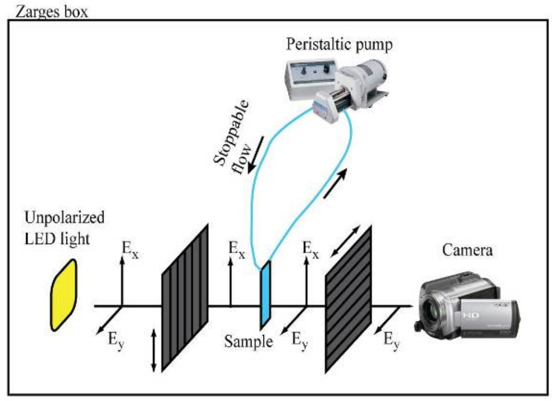

Fig. 4. During the Zero-G flights, the sample flow was induced with a peristaltic pump. Stopping the flow in microgravity allowed return to isotropy due to Brownian motion, without interference from sedimentation.

This research may be relevant for a number of practical applications. For example, a more fundamental understanding of the properties of nanoparticles in flow is essential in key industries, such as storage of nuclear waste, crude oil extraction, and in the development of new, smart, nanocomposite materials. In addition, the role of flow and orientation of clay particles in soil stability (clay avalanches) is not yet properly understood.

Fig. 5. PhD-student Elisabeth Lindbo Hansen and Master student Eirik Voje Blindheim performing flow birefringende experiments in the Novespace Zero-G aircraft.

DIVISION OF CONDENSED MATTER PHYSICS

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DeZheng Yang (Post-doc)
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Wakshum M. Tucho (Post-doc)
Rene Vissers (Research scientist)
Chaolin Zha (Pst-doc)

Overview

The research activities include topics both in experimental and theoretical condensed matter physics. The members of the division work with a variety of experimental techniques, ranging from scanning tunneling microscopy, transmission electron microscopy, X-ray diffraction and optical spectroscopy to synchrotron radiation, for studying physical properties of materials and material structures. A large fraction of the research is focused on nanoscale structure studies and the connection to macroscopic physical properties. A brief survey of the research is given. One research project is described in more detail.

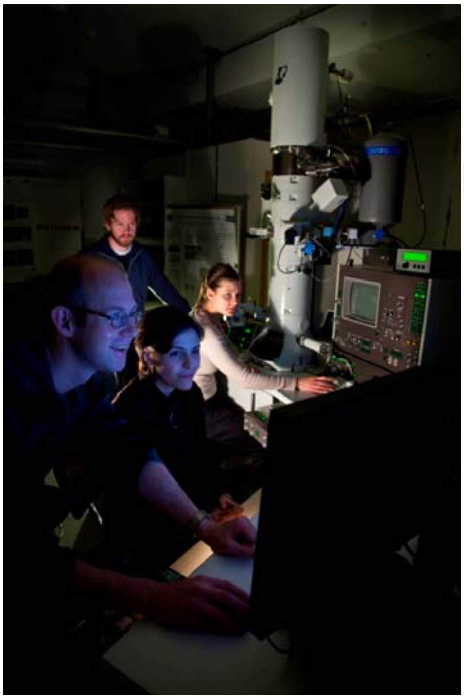
Survey of research activities

X-ray scattering
(D.W. Breiby, R.H. Mathiesen, E. J. Samuelsen)
The X-ray group is active in several ongoing projects over a wide range of materials, from organic electronics to various functional and structural inorganic oxides and metallic nano- and microstructured materials. In 2009 the group has consolidated its activities within national and European research projects, such as FME Solar Cells, ColdWear, SUP Improvement, SUP Light metals, Nasjonal Forskerskole "Nanoteknologi for Mikrosystem" and FP7 MIntWeld. A new project on X-ray imaging of catalytic nanoparticles was initiated together with the Department of Chemical Engineering. The group currently (February 2010) has two PhD students, and is about to hire two post docs. The X-ray laboratory has been undergoing substantial upgrades, and presently consists primarily of two microfocus sources equipped with multilayer optics, and a Pilatus 1M detector. The experimental setup is designed to be generic, covering experiments ranging from imaging and tomography, via reflectivity 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.

Current research activities include:
- Structure-properties relations in soft-condensed matter, mainly conjugated polymers and liquid crystals for organic electronics.
- Raster scanning WAXS and SAXS measurements of thin films and fibres.
- Studies of catalytic nanoparticles ex situ and under working conditions by incoherent and coherent X-ray scattering.
- Modeling of grazing-incidence small- and wide angle X-ray scattering (GISAXS / GIWAXS).
- Micro- and mesoscale transport during unconstrained dendritic growth
- Pattern selection and interfacial instabilities in regular eutectic solidification microstructures
- Microstructure formation and chemical modification in irregular eutectic systems
- Convective-diffusive interaction during non-equilibrium transport in metal solidification processes.
- Recrystallisation kinetics in ultra-fine grained metals.
- Diffuse scattering studies of strained ferroelectric thin films.

Transmission electron microscopy (TEM)
(R. Holmestad, A.T.J. van Helvoort, J.Walmsley, , B.G. Soleim, P.E. Vullum,. F. Ehlers)
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 7 PhD students and 2 post-docs, and work in close collaboration with SINTEF through the TEM Gemini centre.

In 2009 the TEM Gemini centre was involved in 22 journal publications, and educated 2 PhD students; Heidi Nordmark within silicon solar cell materials and Wakshum Mekonnen Tucho within palladium membranes. The main objective of the TEM group now is to secure funding for new state-of-the-art TEMs to Norway. We have in 2009 joined forces with the TEM environment at UiO and applied for a nationally coordinated investment plan in the Research Council's large scale infrastructure program. Within this call we hope to get a probe aberration corrected TEM to Trondheim.



The group has for many years worked with SINTEF and Hydro on alloy development and nucleation of precipitates in aluminum alloys, including structure determination of metastable hardening phases by combining experiments (high resolution TEM, scanning TEM, quantitative diffraction and atom probe) and modeling (density functional theory). In 2009 a bilateral project with Japan within these topics was secured. 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
- Palladium membranes for hydrogen gas separation – microstructure evolution
- 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
- High temperature corrosion in steels
- Nanowires of III-V semiconductors
- Intermediate band solar cell materials
- Aluminum surface properties related to corrosion
- High quality TEM sample preparation - tripod polishing

Scanning tunnelling microscopy

(E. Wahlström, DeZheng Yang, Justin Wells, Fei Song, Chaolin Zha, A. Borg,)

The scanning tunnelling microscopy group has two major lines of research activities primarily based on the scanning tunnelling microscopy instruments in the department, namely nanomagnetics and surface science. There are two ultra high vacuum STM's operated by the group, one of which has been upgraded with sources and electron energy analyser for UPS/XPS analysis during the last year. In addition to this two scanning probe microscopes are being constructed and during 2009 one was commissioned.

Surface science

The surface science activities are primarily directed to experimental investigations of adsorption behaviour at bimetallic surfaces by scanning tunnelling microscopy (STM) and high-resolution photoelectron spectroscopy (HRPES). The HRPES studies are performed at MAX-lab, the Swedish National Synchrotron Facility in Lund, in collaboration with groups at Lund University and Uppsala University. The experimental work is complemented with density functional theory calculations. Specific projects have been:

- Adsorption at NiAl single crystal surfaces
- Adsorption at PdAg single crystal surfaces and surface properties of PdAg membranes
- Adsorbates at anatase and rutile surfaces

Experimental Nanomagnetics

The research on nanomagnetics is dedicated to understanding the physics of magnetic structures at the nanoscale. In particular STM-based transport measurements are utilised to understand how charge and spin currents within materials interplay with the magnetisation of materials. A main line of research is performed in conjunction with the Department of Electronics and Telecommunications (Prof. T. Tybell) to study functional metal oxides. In addition to this we have active collaborations with groups in Sweden (Uppsala, Göteborg), Denmark (Aarhus) and China (Shanghai). The specific activities are during the last year has been performed mainly along these lines:

- Nanostructuring and magnetic properties of $La_{1-x}Sr_xMnO_3$
- Model systems for current induced magnetisation reversal investigated through laterally resolved point contact studies.
- STM studies of the Bi(114) surface.

Interactions between functional groups and bimetallic NiAl surfaces
(I-H. Svenum, Ø. Borck, L. E. Walle, K. Schulte and A. Borg)
The adsorption of atoms and molecules on surfaces is a key step in a wide range of technologically important areas including catalysis, adhesion, corrosion inhibition, electrochemistry and microelectronics. The field of surface science is to a large extent devoted to providing a better understanding of processes within these areas through investigations of appropriate model systems. As compared to their elemental counterparts bimetallic surfaces offer different geometric and electronic properties. The arrangement of the dissimilar surface atoms may alter adsorption properties and reaction pathways. The present work focuses on the adsorption of molecules containing specific functional groups on NiAl alloy surfaces. NiAl(110) and $Ni_3Al(111)$, having ordered and well-defined surfaces, serve as excellent model systems for experimental and theoretical studies.

The interactions of OH-groups, through methanol (CH_3OH), NH_2-groups realized by methylamine (CH_3NH_2) and CO with NiAl(110) and $Ni_3Al(111)$ surfaces have been investigated using high resolution photoemission spectroscopy (HR-PES) combined with density functional theory (DFT) calculations. The experimental work was performed at MAX-lab, The Swedish National Synchrotron Facility in Lund, and the theoretical calculations have been performed through NOTUR, The Norwegian Metacenter for Computer Science. HR-PES provides information about chemical composition, chemical states and the relative amount of each element. It can also be used to distinguish between adsorbates situated in different adsorption sites on a surface. DFT calculations allow determination of adsorption energies, preferred adsorption geometries, bonding mechanisms and core level binding energy shifts. Combining HR-PES with DFT provide detailed understanding of the interactions and adsorption behaviour in these systems.

The clean NiAl(110) surface consists of alternating rows of Al and Ni atoms. A surface contribution is observed in the Al 2*p* core level spectra, which is predicted by DFT to originate from Al atoms in the two topmost surface layers. No surface contribution was found for the $Ni_3Al(111)$ surface, where every Al atom is surrounded by six Ni atoms. Two adsorption products are formed on the NiAl alloy surfaces upon exposure to methanol at low temperature (~100 K), identified as methanol and methoxy (CH_3O) species. These species give rise to a new contribution in the Al 2*p* core level spectra shifted by 0.48 eV towards higher binding energy relative to the bulk contribution consistent with adsorption in Al related sites. On NiAl(110), a additional contribution at the low binding energy side relative to the Al 2*p* bulk contribution is also observed, from DFT attributed to surface Al atoms not bonded to methanol or methoxy. Upon heating to 200 K, further decomposition of methanol to methoxy occurs. DFT calculations predict that methanol adsorbs preferentially in the Al on-top site on both $Ni_3Al(111)$ and NiAl(110), whereas methoxy prefers a 2Ni+Al hollow site on $Ni_3Al(111)$ and a slightly off Al bridge site on NiAl(110). While methanol bond through its lone-pair orbital, methoxy is found to form a combined ionic and covalent bond to Al. Calculated surface and adsorbate induced binding energy shifts in the Al 2*p* states are in good agreement with the experimental HR-PES results.

The interactions between the NiAl(110) and $Ni_3Al(111)$ surfaces and the NH_2-group are analogous to those observed for the OH-group in methanol, with similar Al 2*p* core level shifts recorded by HR-PES. DFT calculations predict that methylamine adsorb through its N atom in on-top sites on both surfaces. The lone pair orbital of methylamine plays an important role in the bonding of the molecules to the substrates.

On $Ni_3Al(111)$, CO is known to adsorb in Ni dominated sites. A strong preference for the Ni-hcp threefold as compared to the Ni-fcc hollow site at low coverage is found from DFT. This implies that CO is only adsorbed in Ni-hcp sites at low coverage. Despite no direct interaction between CO and surface Al atoms in the $Ni_3Al(111)$ surface, CO induces a shifted Al 2*p* core level contribution. This shift increases and broadens with increasing CO coverage. The DFT calculations predict that this shift is due to Al atoms located in the two outermost surface layers, where the Al atoms undergo a large inward relaxation, demonstrating that spectral features may occur also for atoms not directly interacting with adsorbed species at alloy surfaces. Figures 1 to 3 show some examples from these studies.

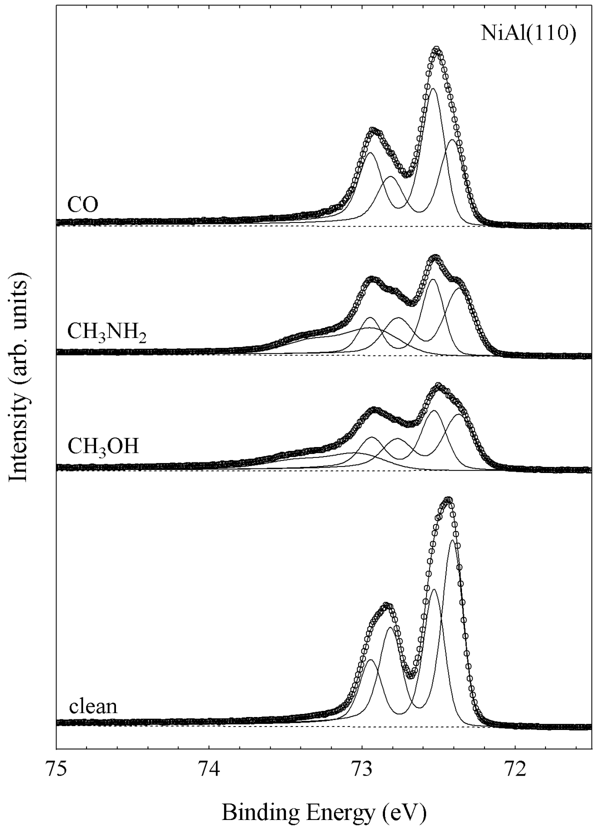


Fig. 1. Al 2*p* photoemission spectra from clean NiAl(110) and after exposure to methanol (CH_3OH), methylamine (CH_3NH_2) and carbon monoxide (CO) measured at a photon energy of 160 eV.

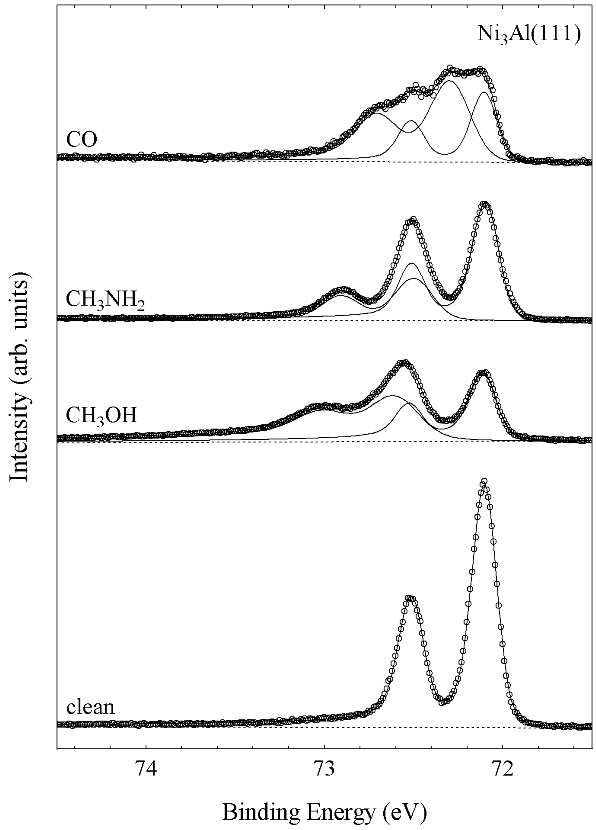


Fig. 2. Al 2*p* photoemission spectra from clean $Ni_3Al(111)$ and after exposure to methanol (CH_3OH), methylamine (CH_3NH_2) and carbon monoxide (CO) measured at a photon energy of 160 eV.

This work received financial support from the Research Council of Norway through Project number 148869/V30 (IHS) and the European Community - Research Infrastructure Action under the FP6 ”Structuring the European Research Area” Program (through the Integrated Infrastructure Initiative ”Integrating Activity on Synchrotron and Free Electron Laser Science”). Computing time was granted through the Norwegian Metacenter for Computer Science (NOTUR).

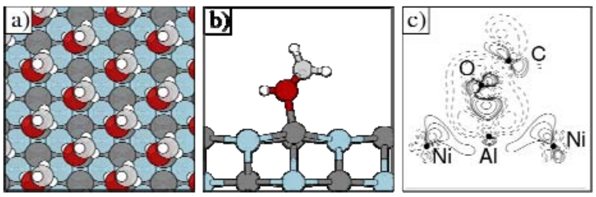


Fig. 3. Schematic illustration of methanol adsorbed in the Al on-top site on NiAl(110) shown in a) top view and b) side view. c) Contour plot of the valence electron density. Solid (dashed) lines indicate gain (loss) of electron density as compared to methanol in the gas phase and the clean surface.

DIVISION OF THEORETICAL PHYSICS

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Mathieu Taillefumier (Post-doc)
Anatoly Malshukov (Res. scientist)

Overview

The research is mainly carried out within the broad fields of condensed matter physics, statistical physics, quantum physic, 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 2009

Transport of spin and charge in nanostructures.
(A. Brataas, S. Bandopadhyay, H. Haugen, K. Hals, and S. Sadjina).
Understanding nano-structures 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 magnetization excitations, 2) two-dimensional "Dirac fermions" in graphene, 3) spin flow into superconductors, 4) transport in magnetic semiconductors, 5) fluctuations and dissipation in ferromagnets. We published 7 papers in 2009, among which two in Physical Review Letters and five in The Physical Review B.

Quantum condensed matter systems
(*A. Sudbø, J. Linder, M. Grønsleth, E. K. Dahl,I. B. Sperstad, T. Bergh Nilssen, E. B. Stiansen*).
During 2009 we published 11 papers in Physical Review B, 1 paper in Physical Review A, and 1 paper in Physical Review Letters. 2 of the papers published in Physical Review B were Rapid Communications. The topics range from. 1) quantum transport in novel pnictide superconductors, 2) crossed Andreev-reflection in graphene-superconductor junctions 3) superconducting spin-valves, 4) pairing-symmetry conversion in novel superconductor-magnet-metal heterostructures, 5) novel thermodynamic properties near a hidden-order transition in cuprate high-Tc superconductors. In particular, we have investigated the Josephson current in a graphene superconductor/normal/superconductor junction, where superconductivity is induced by means of the proximity effect from external contacts. We have taken into account the possibility of anisotropic pairing by also including singlet nearest-neighbor interactions, and investigate how the transport properties are affected by the symmetry of the superconducting order parameter. This corresponds to an extension of the usual on-site interaction assumption, which yields an isotropic *s*-wave order parameter near the Dirac points employing a full numerical solution as well as an analytical treatment. We have shown that the proximity effect may induce exotic types of superconducting states near the Dirac points, e.g., p_x- and p_y-wave pairing or a combination of *s*- and $p+ip$-wave pairing. The Josephson current exhibits a weakly damped, oscillatory dependence on the length of the junction when the graphene sheet is strongly doped. The analytical and numerical treatments are found to agree well with each other in the *s*-wave case when calculating the critical current and current-phase relationship. For the scenarios with anisotropic superconducting pairing, there is a deviation between the two treatments, especially for the effective p_x-wave order parameter near the Dirac cones which features zero-energy states at the interfaces. This indicates that a numerical, self-consistent approach becomes necessary when treating anisotropic superconducting pairing in graphene.

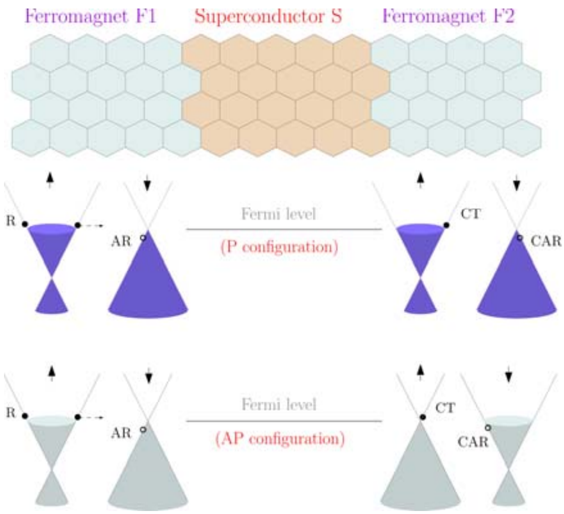


Fig. 1. Possible experimental setup for a study of the interplay between ferromagnetism and superconductivity in a graphene layer. The two orders are induced by the proximity effect to a host material. Depending on the whether the magnetization configuration is parallel or antiparallel, the non-local quantum transport properties are substantially altered. Above, we have defined the scattering processes R: normal reflection, AR: Andreev reflection, CT: electron co-tunneling, CAR: crossed Andreev reflection.

High-Energy Astrophysics

(K. Dolag, M. Kachelriess, S. Ostapchenko, R. Tomas)

We performed for the nearest active galactic nucleus (AGN), Centaurus A, a multi-messenger study. Normalizing the flux of high energy cosmic rays, we predicted the accompanying secondary photons and neutrinos expected from hadronic interactions in the source. Our predictions for the photon spectrum are in good agreement with subsequently published measurements of the H.E.S.S. experiment. We studied how TeV gamma-rays can escape from AGN cores despite large IR and UV backgrounds.

For the case of more distant AGNs, we studied if interactions of high energy photons with the extragalactic photon background can be used to learn about the strength of extragalactic magnetic fields.

Dark Matter

(V. Berezinsky, V. Dokuchaev, Yu. Eroshenko, M. Kachelriess, P.D. Serpico, M.Aa. Solberg)

We continued our investigation of superheavy neutralinos as a possible dark matter candidate, studying in particular the small-scale clustering and the formation of superdense clumps. The role of electroweak bremsstrahlung for indirect dark matter signatures with masses in the TeV range was discussed.

Quantum Zeno Effect

(*M. Drangfelt, K. Olaussen, I. Øverbø).*

The Fermi golden rule is a cornerstone of quantum mechanics, although not included among its basic axioms. It gives a prescription for calculating constant transition ratios by e.g. perturbation theory, and predicts that a fraction of unstable particles will decay according to an exponential law. But it is known that exact calculations may lead to results which differ from the Fermi golden rule both for very long and very short times. The latter is often referred to as the quantum zeno effect. It would under certain conditions imply that a sample of unstable particles will have a time-varying decay rate, depending on their age since creation. This is at variance with the principle of absolute identity of elementary particles (implying that there is no way to distinguish young and old particles of the same type from each other) and seems to lead to a paradox. A model of this situation has been analysed within the second quantization formalism, which enforces the identity principle. It reveals the possibility of quantum mechanical rule for combining lifetimes.

Studies of entanglement

(*J. Myrheim, L.O. Hansen J.M. Leinaas, P.Ø. Sollied*).

Entanglement in mixed quantum states is studied from a geometric point of view.

Casimir effect with free charges

(J.S. Høye and I. Brevik)

The Casimir effect between dielectric plates with free charges in bulk has been investigated. The methods and reasoning of classical statistical mechanics again have been used. With low charge density the Debye shielding length becomes large compared with the separation between the plates. This explains the lack of metallic behavior contribution to the Casimir force for low ionic concentration. Although this investigation was limited to the classical high temperature case it gives additional support to the lack of a possible zero frequency TE (transverse electric) mode for metals. The latter has been an issue of controversy and heavy debate in later years.

Model with water-like phase diagram

(J.S. Høye and E. Lomba)

Our previous work on an exactly solvable one-dimensional lattice gas model with a soft repulsive core and staggered mean field interaction has been continued and extended. Earlier we found that the model exhibited a liquid-solid-liquid phase transition besides the usual gas-liquid transition. Then this model showed a melting curve that started with the usual increase of melting temperature with increase of pressure. However, for large pressures the melting temperature reached a maximum and then decreased further on. This is a singular phase behavior that is found in substances like phosphorus, silica, and germanium oxide.

In our continued work we have varied and further tuned the parameters of the model, and the even more unusual characteristic features of water and silicon too at freezing were obtained. Thus we find a melting curve where the melting temperature decreases with increasing pressure, and this feature starts right at the triple point where the vapor, liquid, and solid coexist. This unusual feature then also has the consequence that the solid phase has lower density than the liquid phase like the situation with ice and water.

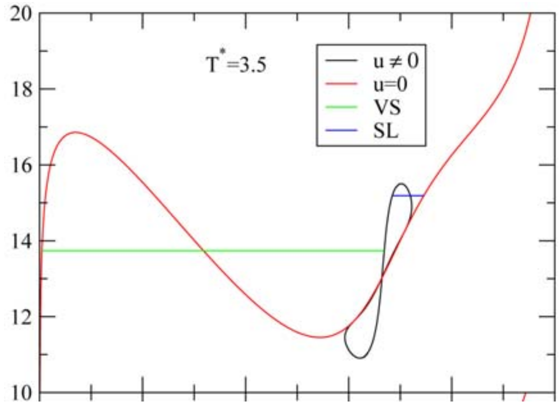


Fig. 2. Isotherm for the chemical potential (or magnetic field) as function of density (magnetization). Red curve is fluid (gas/liquid) isotherm while dark curve is solid (ordered state) isotherm. Green horizontal line is gas-solid phase transition while the blue horizontal line is solid-liquid transition.

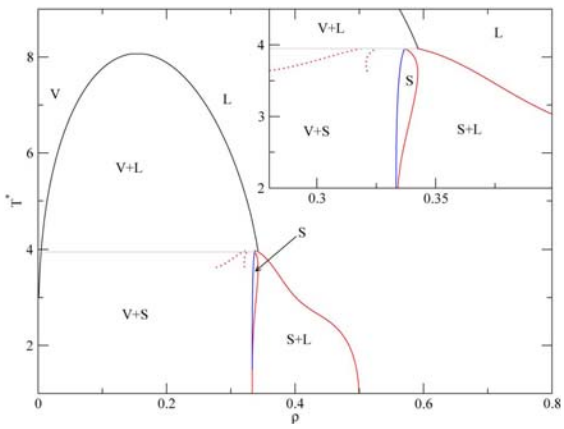


Fig. 3. The water-like phase diagram of the one-dimensional model where temperature versus density is given along phase boundaries. The V is vapor phase, L is liquid phase, and S is solid phase. The red dotted curves are metastable phases that, if fully drawn, will meet the solid red curves right above the triple point. The inset shows details near the triple point.

Dynamical correlations of classical and quantum fluids; molecular ab initio computations
(J. S. Høye)
The path integral representation of a quantum mechanical system at thermal equilibrium can be interpreted as a classical polymer problem where imaginary time is a forth dimension. Due to this equivalence methods developed in classical statistical mechanics for fluids can be applied. An added non-trivial complication is of course the polymer structure of the problem.

Since time is involved, it turns out that dynamical properties also are obtained from the path integral. By taking the classical limit it further turns out that the dynamical properties can be kept. To test how this works we have compared with known results of kinetic theory. The cases considered are the time dependent density correlations of an ideal classical gas and the ideal gas perturbed by the electrostatic Coulomb interaction where damped plasma oscillations are present classically as well as quantum mechanically. In any case known results are recovered. These test cases thus give an indication of the accuracy of the statistical mechanical method.

The statistical mechanical method is then applied to a couple of new situations. First the Casimir effect with plates filled with an ionic fluid is considered. With dynamical correlations the previous purely electrostatic derivation can be extended to non-zero Matzubara (imaginary) frequencies and thus to arbitrary temperatures. However, the pair interaction was limited to the electrostatic one since use of the electromagnetic vector potential will require that current correlations are taken into account in some way.

Secondly the statistical mechanical method is applied to ab initio calculations on the ionic fluid of fermions formed by the electrons of molecules. The additional complication in this case is that the fluid density is non-uniform in space. However, the correlation functions that are needed, can be constructed from the eigenfunctions and eigen-values obtained from using the well known Hartree-Fock or density functional methods. For this purpose excited one-particle states are needed too. The correction obtained in this way will be a Casimir type free energy contribution due to non-local electron correlations where Debye shielding is involved. A more complete description would also include the electromagnetic vector potential that will have increasing influence over longer distances where retardation effects due to the finite speed of light, become more pronounced.

Surface structure and reactivity
(*Ø. Borck, K. Nigussa, K. L. Nielsen, J. A. Støvneng*)
Density functional theory (DFT) is used to investigate the geometrical and electronic structure of various crystal surfaces, as well as their reactions with atoms and small molecules. Of particular interest are chromium oxide, with numerous applications within catalysis and corrosion resistance, and titanium nickel "shape memory" alloys, with applications within biomedicine and a variety of industries.

Reactive forcefield parametrization
(*G. Oftedal, K. T. Olsen, K. A. Jensen, P. O. Åstrand, A. v. Duin, J. A. Støvneng*).
For studies of the dynamics of large, reactive systems, quantum mechanical methods like DFT are usually computationally too expensive. An alternative, then, is to construct empirical reactive force fields which allow breaking and forming chemical bonds. Accurate DFT calculations are initially performed on small molecular systems and perfect crystals, and the DFT results are used as input for parametrization of the force field. The resulting force field may then be used in molecular dynamics investigations of systems that are too large for DFT calculations. Systems of interest are III-V and group IV semiconductors, with applications to e.g. solar cell materials, and perovskites such as $PbTiO_3$ and $SrTiO_3$.

QCD Phase Diagram
(J. O. Andersen, L. T. Kyllingstad and 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 colour superconducting state if the temperature is low enough and the baryon density is high enough. This part of the phase diagram (see Fig. 2) is relevant in astrophysics as compact stars are the only known candidate for containing quark matter in its interior.

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 studying the
sign problem in QCD and the possibility for Bose-Einstein condensation of kaons in dense matter. 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 three papers and two conference proceedings in 2009.

PUBLICATIONS

<u>Journals in Level 1 and 2</u> (total 153 articles)

Albin, J.M.; Baker, D.J.; Allen, Cary G.; Furtak, Tom; Collins, Reuben; Olson, Dana C.; Ginley, David S.; Weigand, Christian Carl; Vardøy, Astrid-Sofie Borge; Ladam, Cecile.
Comparison of Molecular Monolayer Interface Treatments in Organic-inorganic Photovoltaic Devices. *Materials Research Society Symposium Proceedings* 2009;Vol. 1154(B10) Suppl. 40 s.

Andersen, Jens Oluf.
Bose-Einstein condensation in dense quark matter. *Nuclear Physics A* 2009;Vol. 820. p. 171C-174C

Andersen, Jens Oluf; Kyllingstad, Lars Tandle; Leganger, Lars Erlend.
Pressure to order g^8\log(g) in phi^4-theory at weak coupling \. *Journal of High Energy Physics (JHEP)* 2009;Vol. 08. p. 066-094

Andersen, Jens Oluf; Leganger, Lars Erlend.
Kaon condensation in the color-flavor-locked phase of quark matter, the Goldstone theorem, and the 2PI Hartree approximation. *Nuclear Physics A* 2009;Vol. 828(3-4) p. 360-389

Andersen, Jens Oluf; Strickland, Michael; Su, Nan.
Three-loop hard-thermal-loop free energy for QED. *Physical Review D. Particles and fields* 2009;Vol. 80(8)

Andersen, Trine; Svenum, Ingeborg-Helene; Gabrielsen, Andreas; Borg, Anne.
Investigation of 1,1-dichloroethene interacting with the Si(111)–7x7 surface studied by scanning tunneling microscopy. *Surface Science* 2009;Vol. 603. p. 84-90

Anthonysamy, Fervin Moses; Hoang, Thang Ba; Dasa, Lakshmi Narayana; Zhou, Hailong; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Micro-photoluminescence study of single GaAsSb/GaAs radial and axial heterostructured core-shell nanowires. *Journal of Physics, Conference Series* 2009

Balog, Richard; Jørgensen, Bjarke; Wells, Justin W; Lægsgaard, Erik; Hofmann, Philip; Besenbacher, Flemming; Hornekær, Liv.
Atomic Hydrogen Adsorbate Structures on Graphene. *Journal of the American Chemical Society* 2009;Vol. 131(25) p. 8744-8745

Binetti, S; Libal, J; Acciarri, M; Di Sabatino, Marisa; Nordmark, Heidi; Øvrelid, E. J.; Walmsley, John C; Holmestad, Randi.
Study of defects and impurities in multicrystalline silicon grown from metallurgical silicon feedstock. *Materials Science & Engineering: B. Solid-state Materials for Advanced Technology* 2009;Vol. 159-60. p. 274-277

Borck, Øyvind; Svenum, Ingeborg-Helene; Borg, Anne.
Adsorption of methanol and methoxy on NiAl(110) and Ni3Al(111): A DFT study. *Surface Science* 2009;Vol. 603(16) p. 2378-2386

Breiby, Dag Werner; Chin, PTK; Andreasen, Jens wenzel; Grimsrud, Kim Anja; Di, Zhenyu; Janssen, Rene A.J.
Biaxially Oriented CdSe Nanorods. *Langmuir* 2009;Vol. 25(18) p. 10970-10974

Bretzel, Stefan; Bauer, Gerrit E. W.; Tserkovnyak, Yaroslav; Brataas, Arne.
Barnett effect in thin magnetic films and nanostructures. *Applied Physics Letters* 2009;Vol. 95(12)

Bungum, Berit.
Teknologi og forskningslære i videregående skole: Hvem er lærerne og hvordan former de faget?. *Acta Didactica Norge - tidsskrift for fagdidaktisk forsknings- og utviklingsarbeid i Norge* 2009;Vol. 3(1)

Chu, XZ; Yamashita, C; Espy, Patrick Joseph; Nott, GJ; Jensen, EJ; Liu, HL; Huang, WT; Thayer, JP.
Responses of polar mesospheric cloud brightness to stratospheric gravity waves at the South Pole and Rothera, Antarctica. *Journal of Atmospheric and Solar-Terrestrial Physics* 2009;Vol. 71(3-4) p. 434-445

Cottet, A; Huertas-Hernando, Daniel; Belzig, Wolfgang; Nazarov, Yu. V.
Spin-dependent boundary conditions for isotropic superconducting Green's functions. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(18), p. -

Cottet, A; Linder, Jacob.
Superconducting/ferromagnetic diffusive bilayer with a spin-active interface: A numerical study. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 79(5)

Cuoco, A; Hannestad, S; Haugbolle, T; Kachelriess, Michael; Serpico, PD.
A Global Autocorrelation Study After The First Auger Data: Impact On The Number Density Of Uhecr Sources. *The Astrophysical Journal* 2009;Vol. 702(2) p. 825-832

Dam, Tarun K; Brewer, F; Sletmoen, Marit; Stokke, Bjørn Torger; Gerken, T.
Carbohydrate-Carbohydrate Trans Interactions in the A-Galnac (Tn-Antigenic) form of Porcine Submaxillary Mucin. *Glycobiology* 2009;Vol. 19(11) p. 1324-1325

Darko, Charles; Botiz, I; Reiter, G; Breiby, Dag Werner; Andreasen, Jens wenzel; Roth, Stefan V.; Smilgies, Detlef-M.; Metwalli, E; Papadakis, Christine M.
Crystallization in diblock copolymer thin films at different degrees of supercooling. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2009;Vol. 79(4)

Delaleau, Pierre; Mathiesen, Ragnvald; Schaffer, Paul; Arnberg, Lars.
Impact of buoyancy on the growth of equiaxed grains in Al-Cu. *International Journal of Cast Metals Research* 2009;Vol. 22(1-4) p. 51-53

Dolag, K; Kachelriess, Michael; Semikoz, DV.
UHECR observations and lensing in the magnetic field of the Virgo cluster. *Journal of Cosmology and Astroparticle Physics* 2009 (1)

Dolag, Klaus; Kachelriess, Michael; Ostapchenko, Sergey; Tomas, R.
Blazar Halos As Probe For Extragalactic Magnetic Fields And Maximal Acceleration Energy. *The Astrophysical Journal* 2009;Vol. 703(1) p. 1078-1085

Evensen, Tom Richard; Næss, Stine Nalum; Elgsaeter, Arnljot.
Use of the Rotation Vector in Brownian Dynamics Simulation of Transient Electro-Optical Properties. *Macromolecular Theory and Simulations* 2009;Vol. 18(1) p. 50-60

Fonseca, Davi de Miranda; Meheust, Yves; Fossum, Jon Otto; Knudsen, Kenneth Dahl; Parmar, Kanak.
Phase diagram of polydisperse Na-fluorohectorite--water suspensions: A synchrotron small-angle x-ray scattering study. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2009;Vol. 79(2) p. 021402

Foros, Jørn; Brataas, Arne; Bauer, Gerrit E. W.; Tserkovnyak, Yaroslav.
Noise and dissipation in magnetoelectronic nanostructures. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 79(21)

Fredriksen, Åshild; Borg, Anne.
Report from Norway on the Participation of women in Physics. *AIP Conference Proceedings* 2009;Vol. 1119(1) p. 149-150

Frette, Vidar; Hemmer, Per Christian.
Velocity and cluster distributions in a bottleneck system. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2009;Vol. 80(5)

Glimsdal, Eirik; Dragland, Ingunn; Carlsson, Marcus; Eliasson, Bertil; Melø, Thor Bernt; Lindgren, Mikael.
Triplet excited states of some thiophene and triazole substituted platinum(II) acetylide chromophores. *Journal of Physical Chemistry A* 2009;Vol. 113(14) p. 3311-3320

Glimsdal, Eirik; Norman, Patrick; Lindgren, Mikael.
Excitation and emission properties of Platinum(II) Acetylides at high and low concentrations. *Journal of Physical Chemistry A* 2009;Vol. 113(42) p. 11242-11249

Grønsleth, Martin; Bergh-Nilsen, Trond; Dahl, Eskil Kulseth; Stiansen, Einar Bertin; Varma, Chandra m.; Sudbø, Asle.
Thermodynamic properties near the onset of loop-current order in high-T-c superconducting cuprates. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 79(9)

Hals, Kjetil Magne Dørheim; Nguyen, Kiet Anh; Brataas, Arne.
Intrinsic Coupling between Current and Domain Wall Motion in (Ga,Mn)As. *Physical Review Letters* 2009;Vol. 102(25)

Hansen, Alex; Ramstad, Thomas.
Towards a thermodynamics of immiscible two-phase steady-state flow in porous media. *Computational Geosciences* 2009;Vol. 13(2) p. 227-234

Hasting, Håkon Stokka; Frøseth, Anders Gudmund; Andersen, Sigmund J; Vissers, Rene; Walmsley, John C; Marioara, Calin D; Danoix, Frederic; Lefebvre, Williams; Holmestad, Randi.
Composition of beta" precipitates in Al-Mg-Si alloys by atom probe tomography and first principles calculations. *Journal of Applied Physics* 2009;Vol. 106(12)

He, Li; Berntsen, H; Ochoa-Fernandez, Esther; Walmsley, John C; Blekkan, Edd Anders; Chen, De.
Co-Ni Catalysts Derived from Hydrotalcite-Like Materials for Hydrogen Production by Ethanol Steam Reforming. *Topics in catalysis* 2009;Vol. 52(3) p. 206-217

Hemmen, Henrik; Azevedo, Eduardo N.; Engelsberg, Mario; Hansen, Elisabeth Lindbo; Meheust, Yves; Fossum, Jon Otto; Knudsen, Kenneth Dahl; Ringdal, Nils Ivar.
The Isotropic-Nematic Interface in Suspensions of Na-Fluorohectorite Synthetic Clay. *Langmuir* 2009;Vol. 25(21) p. 12507-12515

Hoang, Thang Ba; Zhou, Hailong; Anthonysamy, Fervin Moses; Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Optical properties of single wurtzite GaAs nanowires and GaAs nanowires with GaAsSb inserts. *Materials Research Society Symposium Proceedings* 2009;Vol. 1144

Hofmann, Philip; Wells, Justin.
Surface sensitive conductance measurements. *Journal of Physics: Condensed Matter* 2009;Vol. 21. p. 013003

Hope, Sigmund Mongstad; Hansen, Alex.
Burst distribution in noisy fiber bundles and fuse models. *Physica A: Statistical Mechanics and its Applications* 2009;Vol. 388(21) p. 4593-4599

Huertas-Hernando, Daniel; Guinea, Fransisco; Brataas, Arne.
Spin-orbit mediated spin relaxation in graphene. *Physical Review Letters* 2009;Vol. 103(14)

Hvidsten, Sverre; Kvande, Stine; Ryen, A; Larsen, PB.
Severe Degradation of the Conductor Screen of Service and Laboratory Aged Medium Voltage XLPE Insulated Cables. *IEEE transactions on dielectrics and electrical insulation* 2009;Vol. 16(1) p. 155-161

Høye, Johan Skule.
Unification of hierarchical reference theory and self-consistent Ornstein-Zernike approximation: Analysis of the critical region for fluids and lattice gases. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2009;Vol. 79(2)

Høye, Johan Skule; Brevik, Iver Håkon.
Casimir force between dielectric media with free charges. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2009;Vol. 80(1)

Høye, Johan Skule; Lomba, E; Almarza, NG.
One- and three-dimensional lattice models with two repulsive ranges: simple systems with complex phase behaviour. *Molecular Physics* 2009;Vol. 107(4-6) p. 321-330

Høyland, Knut Vilhelm; Gabrielsen, Magnus; Moslet, Per Olav; Sæbø, Are Opstad.
Relaxation Tests and Young's Modulus. *Proceedings - International Conference on Port and Ocean Engineering under Arctic Conditions* 2009

Johnsson, Anders; Solheim, Bjarte Gees Bokn; Iversen, Tor-Henning.
Gravity amplifies and microgravity decreases circumnutations in Arabidopsis thaliana stems: results from a space experiment. *New Phytologist* 2009;Vol. 182(3) p. 621-629

Kachelriess, Michael; Ghia, Piera.
Exploring the range from TeV to ZeV. *Nuclear physics B, Proceedings supplements* 2009;Vol. 188. p. 388-393

Kachelriess, Michael; Ostapchenko, Sergey; Tomas, R.
High energy radiation from Centaurus A. *New Journal of Physics* 2009;Vol. 11

Kachelriess, Michael; Ostapchenko, Sergey; Tomas, Ricard.
High energy neutrinos from Centaurus A. *Nuclear physics B, Proceedings supplements* 2009;Vol. 188. p. 286-288

Kachelriess, Michael; Ostapchenko, Sergey; Tomas, Ricard.
Multi-messenger astronomy with Centaurus A. *International Journal of Modern Physics D* 2009;Vol. 18(10) p. 1591-1595

Kachelriess, Michael; Serpico, PD; Solberg, Marius Aase.
Role of electroweak bremsstrahlung for indirect dark matter signatures. *Physical Review D. Particles and fields* 2009;Vol. 80(12)

Karlsen, Morten; Einarsrud, Mari-Ann; Lein, Hilde Lea; Grande, Tor; Hjelen, Jarle; Vullum, Per Erik.
Backscatter electron imaging and electron backscatter diffraction characterization of $LaCoO_3$ during in situ compression. *Journal of The American Ceramic Society* 2009;Vol. 92(3) p. 732-737

Khaldoun, A; Moller, P; Fall, A; Wegdam, G; De Leeuw, B; Meheust, Yves; Fossum, Jon Otto; Bonn, D.
Quick Clay and Landslides of Clayey Soils. *Physical Review Letters* 2009;Vol. 103(18)

Kildemo, Morten; Nerbø, Ingar Stian; Hagen, Sindre; Leroy, Sebastien; Søndergård, Elin.
Spectroscopic ellipsometry of nanostructured GaSb surfaces consisting of densely packed 80-230 nm long cones. *Materials Science & Engineering: B. Solid-state Materials for Advanced Technology* 2009;Vol. 165(3) p. 217-220

Kildemo, Morten; Levinsen, Yngve Inntjore; Le Roy, S; Sondergard, E.
Staircase and saw-tooth field emission steps from nanopatterned n-type GaSb surfaces. *Journal of Vacuum Science & Technology. A. Vacuum, Surfaces, and Films* 2009;Vol. 27(5) p. L18-L23

Kvande, Ingvar; Chen, De; Zhao, Tiejun; Skoe, Inger Marie; Walmsley, John C; Rønning, Magnus.
Hydrogen Oxidation Catalyzed by Pt Supported on Carbon Nanofibers with Different Graphite Sheet Orientations. *Topics in catalysis* 2009;Vol. 52. p. 664-674

Kyllingstad, Lars.
Screened perturbation theory at four loops. *Nuclear Physics A* 2009;Vol. 820. p. 167C-170C

Lacroix, C; Taillefumier, Mathieu; Dugaev, VK; Canals, B; Bruno, P.
Two-dimensional electron gas in a periodic magnetic field. *Journal of Magnetism and Magnetic Materials* 2009;Vol. 321(7) p. 906-908

Lelu, Sylvie; Davies, Catharina de Lange; Reitan, Nina Kristine; Strand, Sabina P.
Gene delivery with chitosan: influence of chain length on intracellular trafficking and dissociation. *European Biophysics Journal* 2009;Vol. 38. Suppl. 1 p. S89-

Lilledahl, Magnus Borstad; Skallerud, Bjørn Helge; Davies, Catharina De Lange.
Mechanical properties of tissue determined by multiphoton microscopy. *Proceedings of SPIE, the International Society for Optical Engineering* 2009;Vol. 7183. p. 718325

Lind, Per; Carlsson, Marcus; Eliasson, Bertil; Glimsdal, Eirik; Lindgren, Mikael; Lopes, Cesar; Boman, Linus; Norman, Patrick.
A theoretical and experimental study of non-linear absorption properties of substituted 2,5-di(phenylethynyl)thiophenes and structurally related compounds. *Molecular Physics* 2009;Vol. 107(7) p. 629-641

Linder, Jacob; Black-Shaffer, Annica M.; Yokoyama, Takehito; Doniach, Sebastian; Sudbø, Asle. Josephson current in graphene: Role of unconventional pairing symmetries. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(9)

Linder, Jacob; Sperstad, Iver Bakken; Sudbø, Asle.
0-pi phase shifts in Josephson junctions as a signature for the s(+/-)-wave pairing state. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(2)

Linder, Jacob; Sudbø, Asle.
Calculation of drag and superfluid velocity from the microscopic parameters and excitation energies of a two-component Bose-Einstein condensate in an optical lattice. *Physical Review A. Atomic, Molecular, and Optical Physics* 2009;Vol. 79(6)

Linder, Jacob; Sudbø, Asle.
Theory of Andreev reflection in junctions with iron-based high-Tc superconductors. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 79(020501)

Linder, Jacob; Yokoyama, Takehito; Sudbø, Asle.
Anomalous finite size effects on surface states in the topological insulator Bi2Se3. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(20)

Linder, Jacob; Yokoyama, Takehito; Sudbø, Asle.
Spin-transfer torque and magnetoresistance in superconducting spin valves. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 79(22)

Linder, Jacob; Yokoyama, Takehito; Sudbø, Asle.
Theory of superconducting and magnetic proximity effect in S/F structures with inhomogeneous magnetization textures and spin-active interfaces. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 79(5)

Linder, Jacob; Yokoyama, Takehito; Sudbø, Asle; Eschrig, Matthias.
Pairing Symmetry Conversion by Spin-Active Interfaces in Magnetic Normal-Metal–Superconductor Junctions. *Physical Review Letters* 2009;Vol. 102(10)

Linder, Jacob; Zareyan, Malek; Sudbø, Asle.
Proximity effect in ferromagnet/superconductor hybrids: From diffusive to ballistic motion. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 79(064514)

Linder, Jacob; Zareyan, Malek; Sudbø, Asle.
Spin-switch effect from crossed Andreev reflection in superconducting graphene spin valves. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(1)

Marcon, Valentina; Breiby, Dag Werner; Wojciech, Pisula; Dahl, Julie; Kirkpatrick, James; Patwardhan, Sameer; Grozema, Ferdinand; Andrienko, Denis.
Understanding Structure-Mobility Relations for Perylene Tetracarboxydiimide Derivatives. *Journal of the American Chemical Society* 2009;Vol. 131(32) p. 11426-11432

Matam, Santhosh Kumar; Chen, De; Holmen, Anders; Walmsley, John C.
Dehydrogenation of propane over Pt-SBA-15 and Pt-Sn-SBA-15: Effect of Sn on the disperion of Pt and catalytic behavior. *Catalysis Today* 2009;Vol. 142(1-2) p. 17-23

Matam, Santhosh Kumar; Hammer, Nina; Rønning, Magnus; Holmen, Anders; Chen, De; Walmsley, John C; Øye, Gisle.
The nature of active chromium species in Cr-catalysts for dehydrogenation of propane: New insights by a comprehensive spectroscopic study. *Journal of Catalysis* 2009;Vol. 261(1) p. 116-128

Maurstad, Gjertrud; Prass, Marcus; Serpell, Louise C.; Sikorski, Pawel.
Dehydration stability of amyloid fibrils studied by AFM. *European Biophysics Journal* 2009;Vol. 38(8) p. 1135-1140

Merzlyak, M. N.; Chivkunova, OB; Zhigalova, TV; Naqvi, Kalbe Razi.
Light absorption by isolated chloroplasts and leaves: effects of scattering and 'packing'. *Photo-synthesis Research* 2009;Vol. 102(1) p. 31-41

Mihail, Silaev; Yokoyama, Takehito; Linder, Jacob; Tanaka, Yukio; Sudbø, Asle.
Tunneling conductance and local density of states in time-reversal symmetry breaking supercon-ductors under the influence of an external magnetic field. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 79(054508)

Minaev, Boris; Lindgren, Mikael.
Vibration and Fluorescence Spectra of Porphyrin-Cored 2,2-Bis(methylol)-propionic Acid Dendrimers. *Sensors* 2009;Vol. 9(3) p. 1937-1966

Mo, Frode; Ramsøskar, Kjell.
A sample cell for diffraction studies with control of temperature, relative humidity and applied electric field. *Journal of applied crystallography* 2009;Vol. 42. p. 531-534

Mohammed, Abdelsalam; Minaev, Boris; Ågren, Hans; Lindgren, Mikael; Norman, Patrick.
Classification of Raman active modes of platinum(II) acetylides: A combined experimental and theoretical study. *Chemical Physics Letters* 2009;Vol. 481(4-6) p. 209-213

Mokkelbost, Tommy; Lein, Hilde Lea; Vullum, Per Erik; Holmestad, Randi; Grande, Tor; Einarsrud, Mari-Ann.
Thermal and mechanical properties of $LaNbO_4$-based ceramics. *Ceramics International* 2009;Vol. 35(7) p. 2877-2883

Mumm, Florian; Van Helvoort, Antonius; Sikorski, Pawel.
Easy Route to Superhydrophobic Copper-Based Wire-Guided Droplet Microfluidic Systems. *ACS Nano* 2009;Vol. 3(9) p. 2647-2652

Naqvi, Kalbe Razi; Melø, Thor Bernt; Jávorfi, Tamás; Gonzalez-Perez, Sergio; Arellano, Juan B.
Facile method for spectroscopic examination of radical ions of hydrophilic carotenoids. *Physical Chemistry, Chemical Physics - PCCP* 2009;Vol. 11(30) p. 6401-6405

Nerbø, Ingar Stian; Le Roy, S; Kildemo, Morten; Søndergård, Elin.
Real-time in situ spectroscopic ellipsometry of GaSb nanostructures during sputtering. *Applied Physics Letters* 2009;Vol. 94(21)

Nordmark, Heidi; Holmestad, Randi; Walmsley, JC; Ulyashin, A.
Transmission electron microscopy study of hydrogen defect formation at extended defects in hydrogen plasma treated multicrystalline silicon. *Journal of Applied Physics* 2009;Vol. 105(3)

Nordmark, Heidi; Nagayoshi, H; Matsumoto, N; Nishimura, S; Terashima, K; Marioara, CD; Walmsley, John C; Holmestad, Randi; Ulyashin, A.
Si substrates texturing and vapor-solid-solid Si nanowhiskers growth using pure hydrogen as source gas. *Journal of Applied Physics* 2009;Vol. 105(4)

Olderøy, Magnus Østgård; Xie, Minli; Strand, Berit Løkensgard; Flaten, Ellen Marie; Sikorski, Pawel; Andreassen, Jens-Petter.
Growth and nucleation of calcium carbonate vaterite crystals in presence of alginate. *Crystal Growth & Design* 2009;Vol. 9(12) p. 5176-5183

Paula, FLO; da Silva, GJ; Aquino, R; Depeyrot, J; Fossum, Jon Otto; Knudsen, KD; Helgesen, G; Tourinho, FA.
Gravitational and Magnetic Separation in Self-Assembled Clay-Ferrofluid Nanocomposites. *Brazilian journal of physics* 2009;Vol. 39(1A) p. 163-170

Peters, TA; Tucho, Wakshum Mekonnen; Ramachandran, Amutha; Stange, M; Walmsley, JC; Holmestad, Randi; Borg, Anne; Bredesen, R.
Thin Pd-23%Ag/stainless steel composite membranes: Long-term stability, life-time estimation and post-process characterisation. *Journal of Membrane Science* 2009;Vol. 326(2) p. 572-581

Pouzet, Eric; De Cupere, Vinciane; Heintz, Christophe; Andreasen, Jens wenzel; Breiby, Dag Werner; Nielsen, Martin Meedom; Viville, Pascal; Lazzaroni, Roberto; Gbabode, Gabin; Geerts, Yves H.
Homeotropic Alignment of a Discotic Liquid Crystal Induced by a Sacrificial Layer. *The Journal of Physical Chemistry C* 2009;Vol. 113(32) p. 14398-14406

Pradhan, Srutarshi; Hemmer, Per Christian.
Breaking-rate minimum predicts the collapse point of overloaded materials. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2009;Vol. 79(4)

Ramstad, Thomas; Hansen, Alex; Øren, Pål-Eric.
Flux-dependent percolation transition in immiscible two-phase flows in porous media. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2009;Vol. 79(3)

Reitan, Nina Kristine; Maurstad, Gjertrud; Davies, Catharina de Lange; Strand, Sabina P.
Characterizing DNA condensation by structurally different chitosans of variable gene transfer efficacy. *Biomacromolecules* 2009;Vol. 10(6) p. 1508-1515

Rozynek, Zbigniew; Wang, Bao-Xiang; Zhou, Min; Fossum, Jon Otto.
Dynamic Column Formation in Na-FLHC Clay Particles: Wide Angle X-ray Scattering and Rheological Studies. *Journal of Physics, Conference Series* 2009;Vol. 149. p. 012026

Russell, JM; Bailey, SM; Gordley, LL; Rusch, DW; Horanyi, M; Hervig, ME; Thomas, GE; Randall, CE; Siskind, DE; Stevens, MH; Summers, ME; Taylor, MJ; Englert, CR; Espy, Patrick Joseph; McClintock, WE; Merkel, AW.
The Aeronomy of Ice in the Mesosphere (AIM) mission: Overview and early science results. *Journal of Atmospheric and Solar-Terrestrial Physics* 2009;Vol. 71(3-4) p. 289-299

Ruvalcaba, Demian; Eskin, Dmitry; Mathiesen, Ragnvald; Arnberg, Lars; Katgerman, Laurens.
Influence of dendrite arrangement on coarsening during solidification of high-solute Al alloys. *International Journal of Cast Metals Research* 2009;Vol. 22(1-4) p. 271-274

Ruvalcaba, Demian; Mathiesen, Ragnvald; Eskin, Dmitry; Arnberg, Lars; Katgerman, Laurens.
In-situ analysis of coarsening during directional solidification experiments in high-solute aluminium alloys. *Metallurgical and materials transactions. B, process metallurgy and materials processing science* 2009;Vol. 40(3) p. 312-316

Sandow, Barbara; Marks, Ann; Borg, Anne.
Attracting Girls to Physics. *AIP Conference Proceedings* 2009;Vol. 1119. p. 11-13

Saur, Sigrun; Fjellbø, Lise Marie; Lindmo, Tore; Frengen, J.
Contralateral breast doses measured by film dosimetry: tangential techniques and an optimized IMRT technique. *Physics in Medicine and Biology* 2009;Vol. 54(15) p. 4743-4758

Schaefer, Andreas; Zielasek, V.; Schmidt, Th.; Sandell, Anders; Schowalter, M.; Seifarth, Olaf; Walle, Lars Erik; Schulz, Christian; Wollschläger, J.; Schroeder, T.; Rosenauer, A.; Falta, J.; Bäumer, Marcus.
Growth of praseodymium oxide on Si(111) under oxygen-deficient conditions. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(4)

Schaffer, Paul; Mathiesen, Ragnvald; Arnberg, Lars.
Liquid decomposition, droplet coagulation and droplet-interface interactions in hypermonotectic Al-Bi alloys. *Transactions of the Indian Institute of Metals* 2009;Vol. 62. p. 437-442

Schaffer, Paul; Mathiesen, Ragnvald; Arnberg, Lars.
L2 droplet interaction with alpha-Al during solidification of hypermonotectic Al–8 wt.% Bi alloys. *Acta Materialia* 2009;Vol. 57(10) p. 2887-2895

Seim, Torstein; Valberg, Arne; Lee, Barry B.
The relationship between parvocellular cell firing and prepotentials in the macaque LGN. *Perception* 2009;Vol. 38. Suppl. 1 p. 123-123

Sikorski, Pawel; Hori, Ritsuko; Wada, Masahisa.
Revisit of α-Chitin Crystal Structure Using High Resolution X-ray Diffraction Data. *Biomacromolecules* 2009;Vol. 10(5) p. 1100-1105

Simonsen, Ingve; Larsen, A; Andreassen, E; Ommundsen, E; Nord-Varhaug, K.
Haze of surface random systems: An approximate analytic approach. *Physical Review A. Atomic, Molecular, and Optical Physics* 2009;Vol. 79(6)

Skagerstam, Bo-Sture; Rekdal, Per Kristian; Vaskinn, Asle Heide.
Theory of Casimir-Polder forces. *Physical Review A. Atomic, Molecular, and Optical Physics* 2009;Vol. 80(2)

Skrøvseth, Stein Olav; Bartlett, Stephen D.
Phase transitions and localizable entanglement in cluster-state spin chains with Ising couplings and local fields. *Physical Review A. Atomic, Molecular, and Optical Physics* 2009;Vol. 80(2) p. 022316

Sletmoen, Marit; Dam, Tarun K; Gerken, Thomas A; Stokke, Bjørn Torger; Brewer, Curtis Fred.
Single-Molecule Pair Studies of the Interactions of the alpha-GalNAc (Tn-Antigen) Form of Porcine Submaxillary Mucin with Soybean Agglutinin. *Biopolymers* 2009;Vol. 91(9) p. 719-728

Sletmoen, Marit; Næss, Stine Nalum; Stokke, Bjørn Torger.
Structure and stability of polynucleotide-(1,3)-beta-D-glucan complexes. *Carbohydrate Polymers* 2009;Vol. 76(3) p. 389-399

Solheim, Bjarte Gees Bokn.
3D information from 2D images recorded in the European Modular Cultivation System on the ISS. *Advances in Space Research* 2009;Vol. 44(12) p. 1382-1391

Solheim, Bjarte Gees Bokn; Johnsson, Anders; Iversen, Tor-Henning.
Ultradian rhythms in Arabidopsis thaliana leaves in microgravity. *New Phytologist* 2009;Vol. 183(4) p. 1043-1052

Song, F; Wells, Justin; Handrup, K; Li, ZS; Bao, SN; Schulte, K; Ahola-Tuomi, M; Mayor, LC; Swarbrick, JC; Perkins, EW; Gammelgaard, L; Hofmann, P.
Direct measurement of electrical conductance through a self-assembled molecular layer. *Nature Nanotechnology* 2009;Vol. 4(6) p. 373-376

Sperstad, Iver Bakken; Linder, Jacob; Sudbø, Asle.
Quantum transport in ballistic s(+/-)-wave superconductors with interband coupling: Conductance spectra, crossed Andreev reflection, and Josephson current. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(14)

Strandberg, Rune; Reenaas, Turid Worren.
Photofilling of intermediate bands. *Journal of Applied Physics* 2009;Vol. 105(12) p. 124512-1-124512-8

Svenum, Ingeborg-Helene; Borck, Øyvind; Schulte, Karina; Walle, Lars Erik; Borg, Anne.
Adsorption of methanol on Ni3Al(111) and NiAl(110): A high resolution PES study. *Surface Science* 2009;Vol. 603(16) p. 2370-2377

Sæterli, Ragnhild; Flage-Larsen, E.; Prytz, Ø.; Taftø, J.; Marthinsen, Knut; Holmestad, Randi.
Electron energy loss spectroscopy of the L2,3 edge of phosphorus skutterudites and electronic structure calculations. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(7) p. 075109-1-075109-7

Taillefumier, Mathieu; Dahl, Eskil Kulseth; Brataas, Arne; Hofstetter, W.
Hall effect in spinor condensates. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(2)

Takemasa, Makoto; Sletmoen, Marit; Stokke, Bjørn Torger.
Single Molecular Pair Interactions between Hydrophobically Modified Hydroxyethyl Cellulose and Amylose Determined by Dynamic Force Spectroscopy. *Langmuir* 2009;Vol. 25(17) p. 10174-10182

Tallakstad, Ken Tore; Knudsen, Henning Arendt; Ramstad, Thomas; Løvoll, Grunde; Måløy, Knut Jørgen; Toussaint, Renaud; Flekkøy, Eirik Grude.
Steady-State Two-Phase Flow in Porous Media: Statistics and Transport Properties. *Physical Review Letters* 2009;Vol. 102(7)

Tallakstad, KT; Lovoll, G; Knudsen, HA; Ramstad, Thomas; Flekkoy, EG; Maloy, KJ.
Steady-state, simultaneous two-phase flow in porous media: An experimental study. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2009;Vol. 80(3)

Tamamis, Phanourios; Adler-Abramovich, Lihi; Reches, Meital; Marshall, Karen; Sikorski, Pawel; Serpell, Louise C.; Gazit, Ehud; Archontis, Georgios.
Self-Assembly of Phenylalanine Oligopeptides: Insights from Experiments and Simulations. *Biophysical Journal* 2009;Vol. 96(12) p. 5020-5029

Tanem, Bjørn Steinar; Lunder, Otto; Borg, Anne; Mårdalen, Jostein.
AFM adhesion force measurements on conversion-coated EN AW-6082-T6 aluminium. *International Journal of Adhesion and Adhesives* 2009;Vol. 29(5) p. 471-477

Tierney, Sven; Falch, Berit H.; Hjelme, Dag Roar; Stokke, Bjørn Torger.
Determination of Glucose Levels Using a Functionalized Hydrogel-Optical Fiber Biosensor: Toward Continuous Monitoring of Blood Glucose in Vivo. *Analytical Chemistry* 2009;Vol. 81(9) p. 3630-3636

Tierney, Sven; Stokke, Bjørn Torger.
Development of an Oligonucleotide Functionalized Hydrogel Integrated on a High Resolution Interferometric Readout Platform as a Label-Free Macromolecule Sensing Device. *Biomacromolecules* 2009;Vol. 10(6) p. 1619-1626

Tierney, Sven; Volden, Sondre; Stokke, Bjørn Torger.
Glucose sensors based on a responsive gel incorporated as a Fabry-Perot cavity on a fiber-optic readout platform. *Biosensors & bioelectronics* 2009;Vol. 24(7) p. 2034-2039

Tollefsen, Henrik; Laastad, Erik Olav; Raaen, Steinar.
Surface alloying and mixed valence in thin layers of Ce and Pd on Ru(0001). *Surface Science* 2009;Vol. 603. p. 197-202

Tollefsen, Henrik; Raaen, Steinar.
Initial oxidation of pure and K doped NiTi shape memory alloys. *Journal of Applied Physics* 2009;Vol. 105(12)

Tollefsen, Henrik; Raaen, Steinar.
Properties of the Ce-Pd-Pt(111) overlayer system. *Philosophical Magazine* 2009;Vol. 89(12) p. 1035-1049

Tucho, Wakshum Mekonnen; Venvik, Hilde Johnsen; Stange, Marit; Walmsley, John C; Holmestad, Randi; Bredesen, Rune.
Effects of thermal activation on hydrogen permeation properties of thin, self-supported Pd/Ag membranes. *Separation and Purification Technology* 2009;Vol. 68(3) p. 403-410

Tucho, Wakshum Mekonnen; Venvik, Hilde Johnsen; Walmsley, John C; Stange, M; Ramachandran, Amutha; Mathiesen, Ragnvald; Borg, Anne; Bredesen, R; Holmestad, Randi.
Microstructural studies of self-supported (1.5-10 mu m) Pd/23 wt% Ag hydrogen separation membranes subjected to different heat treatments. *Journal of Materials Science* 2009;Vol. 44(16) p. 4429-4442

Tørå, Glenn; Ramstad, Thomas; Hansen, Alex.
Anomalous diffusion on clusters in steady-state two-phase flow in porous media in two dimensions. *Europhysics letters* 2009;Vol. 87(5)

Vullum, Per Erik; Pitt, M; Walmsley, John C; Hauback, Bjørn-Christian; Holmestad, Randi.
Observations of nanoscopic, face centered cubic Ti and TiH (x). *Applied Physics A: Materials Science & Processing* 2009;Vol. 94(4) p. 787-793

Walle, Lars Erik; Borg, Anne; Uvdal, Per; Sandell, Anders.
Experimental evidence for mixed dissociative and molecular adsorption of water on a rutile $TiO_2(110)$ surface without oxygen vacancies. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(23)

Wallin, Anita; Bungum, Berit; Andersson, Björn.
Ett jubileum: Det tionde numret av NorDiNa. *NorDiNa: Nordic Studies in Science Education* 2009;Vol. 5(1) p. 1-2

Wallin, Anita; Bungum, Berit; Andersson, Björn.
NorDiNa 5(2): An extensive issue. *NorDiNa: Nordic Studies in Science Education* 2009;Vol. 5(2) p. 113-114

Wang, Bao-Xiang; Rozynek, Zbigniew; Zhou, Min; Fossum, Jon Otto.
Wide angle scattering study of nanolayered clay/-gelatin electrorheological elastomer. *Journal of Physics, Conference Series* 2009;Vol. 149.

Wang, Bao-Xiang; Zhou, Min; Rozynek, Zbigniew; Fossum, Jon Otto.
Electrorheological properties of organically modified nanolayered laponite: influence of intercalation, adsorption and wettability. *Journal of Materials Chemistry* 2009;Vol. 19(13) p. 1816-1828

Weigand, Christian Carl; Bergren, Matt; Ladam, Cecile; Vullum, Per Erik; Walmsley, John C; Fagerberg, Ragnar; Furtak, Tom; Collins, Reuben; Grepstad, Jostein; Weman, Helge.
Characterization of ZnO Nanostructures Grown by Pulsed Laser Deposition. *Materials Research Society Symposium Proceedings* 2009;Vol. 1174(V07) Suppl. 09

Wells, Justin; Dil, JH; Meier, F; Lobo-Checa, J; Petrov, VN; Osterwalder, J; Ugeda, MM; Fernandez-Torrente, I; Pascual, JI; Rienks, EDL; Jensen, MF; Hofmann, P.
Nondegenerate Metallic States on Bi(114): A One-Dimensional Topological Metal. *Physical Review Letters* 2009;Vol. 102(9)

Willibald, Julian; Rennebaum, Sandra; Breukers, Stefanie; Abdel-Hafez, Shams H; Øpstad, Christer Lorentz; Schmid, Rudolf; Næss, Stine Nalum; Sliwka, Hans-Richard; Partali, Vassilia; Patel, Anjan.
Hydrophilic carotenoids: facile syntheses of carotenoid oxime hydrochlorides as long-chain, highly unsaturated cationic (bola)amphiphiles. *Chemistry and Physics of Lipids* 2009;Vol. 161(1) p. 32-37

Xiao, Jiang; Bauer, GEW; Maekawa, S; Brataas, Arne.
Charge pumping and the colored thermal voltage noise in spin valves. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 79(17)

Yamashita, C; Chu, XZ; Liu, HL; Espy, Patrick Joseph; Nott, GJ; Huang, WT.
Stratospheric gravity wave characteristics and seasonal variations observed by lidar at the South Pole and Rothera, Antarctica. *Journal of Geophysical Research - Atmospheres* 2009;Vol. 114

You, Chang Chuan; Takahashi, Ryota; Borg, Anne; Grepstad, Jostein; Tybell, Thomas.
The fabrication and chracterization of PbTiO3 nanomesas realized on nanostructured SrRuO3/SrTiO3 templates. *Nanotechnology* 2009;Vol. 20(25)

Zako, T; Kobayashi, T; Sakono, M; Lindgren, Mikael; Hammerstrom, P; Nilsson, P; Maeda, M.
Structure and cytotoxicity of novel insulin 'noodle'-like filamentous amyloids. *The FEBS Journal* 2009;Vol. 276. p. 173-173

Zhang, XC; Mazzeo, G; Brataas, Arne; Xiao, M; Yablonovitch, E; Jiang, HW.
Tunable electron counting statistics in a quantum dot at thermal equilibrium. *Physical Review B. Condensed Matter and Materials Physics* 2009;Vol. 80(3)

Zhou, Hailong; Hoang, Thang Ba; Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Liu, L; Harmand, J.C.; Fimland, Bjørn-Ove; Weman, Helge.
Wurtzite GaAs/AlGaAs core-shell nanowires grown by molecular beam epitaxy. *Nanotechnology* 2009;Vol. 20(41)

Zhou, Min; Gao, Yanan; Wang, Bao-Xiang; Rozynek, Zbigniew; Fossum, Jon Otto.
Carbonate-Assisted Hydrothermal Synthesis of Nanoporous CuO Microstructures and Their Application in Catalysis. *European Journal of Inorganic Chemistry* 2009;Vol. 2010(5) p. 729-734

Zhou, Min; Wang, Bao-Xiang; Rozynek, Zbigniew; Xie, Zhaohui; Fossum, Jon Otto; Yu, Xiaofeng; Raaen, Steinar.
Minute synthesis of extremely stable gold nanoparticles. *Nanotechnology* 2009;Vol. 20. p. 505606-505616

Zieba, R; Desroches, C; Chaput, F; Carlsson, M; Eliasson, B; Lopes, C; Lindgren, Mikael; Parola, p.
Preparation of Functional Hybrid Glass Material from Platinum (II) Complexes for Broadband Nonlinear Absorption of Light. *Advanced Functional Materials* 2009;Vol. 19(2) p. 235-241

Øpstad, Christer Lorentz; Melø, Thor Bernt; Sliwka, Hans-Richard; Partali, Vassilia.
Formation of DMSO and DMF radicals with minute amounts of base. *Tetrahedron* 2009;Vol. 65(36) p. 7616-7619

Ådnøy Ellingsen, Simen Andreas; Brevik, Iver Håkon; Høye, Johan Skule; Milton, Kimball A.
Low temperature Casimir-Lifshitz free energy and entropy: The case of poor conductors. *Journal of Physics, Conference Series* 2009;Vol. 161

Åslund, Andreas; Sigurdson, Christina; Klingstedt, Thérese; Grathwohl, Stefan; Bolmont, Tristan; Dickstein, Dara; Glimsdal, Eirik; Prokop, Stefan; Lindgren, Mikael; Konradsson, Peter; Holtzman, David; Hof, Patrick; Heppner, Frank; Gandy, Samuel; Jucker, Mathias; Aguzzi, Adriano; Hammarström, Per; Nilsson, Peter.
Novel Pentameric Thiophene Derivatives for in Vitro and in Vivo Optical Imaging of a Plethora of Protein Aggregates in Cerebral Amyloidoses. *ACS Chemical Biology* 2009;Vol. 4(8) p. 673-684

Tsao, Hoi Nok; Cho, Don; Andreasen, Jens wenzel; Rouhanipour, Ali; Breiby, Dag Werner; Pisula, Wojciech; Müllen, Klaus.
The influence of morphology on high-performance polymer field-effect transistors. *Advanced Materials* 2009;Vol. 21. p. 209-212

<u>Other Journals</u> (total 16 articles)

Bungum, Berit.
Lys i pepperkakehuset. *Naturfag* 2009 (2) p. 27

Falnes, Johannes.
Dataterminologi: beretelja eller fangdat. *Dag og Tid* 2009;Vol. 48(19) p. 27-27

Hopstad, Yngve.
Drakeligningens betydning for leting etter intelligent liv i galaksen. *Fra Fysikkens Verden* 2009;Vol. 71(3) p. 79-84

Lindgren, Mikael; Bushee, Margaret W.
Molecular probe may signal cure for Alzheimer's. *Biophotonics* 2009;Vol. 9. p. 13-14

Lindgren, Mikael; Oksholen, Tore; Tunstad, Hege J.
Secrets of forgetting. *Gemini - Spring 2009 (English Edition)* 2009 p. 20-23

Løvseth, Jørgen.
Vindkraft. *Naturen* 2009 (6) p. 301-312

Matusiak, Barbara; Kolås, Tore; Hunderi, Ola.
Ny metode for evaluering av dagslyssystemer. *Lys, magasin for belysning og lysdesign* 2009 (3)

Nerbø, Ingar Stian.
Spectroscopic Ellipsometry for Real-time in situ Characterization of Nanostructures. *Nanocharm Newsletter* 2009 (3) p. 8-9

Reenaas, Turid Worren; Foss, Sean Erik; Marstein, Erik Stensrud.
Solceller. *Naturen* 2009;Vol. 133(6) p. 280-289

Samuelsen, Emil J.
Bokmelding: A. Furrer, J. Mesot and T. Strassle: Neutron Scattering in Condensed Matter Physics; World Scientific 2009 og B. Terry, W. Willis and C. J. Carlile: Experimental Neutron Scattering; Oxford University Press 2009. *Fra Fysikkens Verden* 2009;Vol. 71(4) p. 133-134

Samuelsen, Emil J; Borg, Anne.
Ola Hunderi 70 år. *Fra Fysikkens Verden* 2009 (2) p. 41-41

Samuelsen, Emil J; Breiby, Dag W.
Røntgenlaser. *Fra Fysikkens Verden* 2009 (2) p. 42-47

Samuelsen, Emil J; Breiby, Dag W.
Solceller av organisk materiale. *Fra Fysikkens Verden* 2009 (2) p. 47-51

Seim, Thorstein; Valberg, Arne; Lee, Barry B.
Do power functions describe spatial sensitivity of cells in the parvocellular pathway better than DOGs?. *SJOVS* 2009;Vol. 2(2) p. 3-4

Sudbø, Asle.
Nobelprisen i fysikk 2009. *Fra Fysikkens Verden* 2009;Vol. 71(4) p. 105-107

Wells, Justin.
Direct Measurement Of Electrical Conductance Through A Self-Assembled Molecular Layer. *Elettra Highlights* 2009;Vol. 2008-9. p. 28-29

BOOKS, BOOK CHAPTERS AND REPORTS

Books and Part of books at Level 1 and 2

Glimsdal, Eirik; Westlund, Robert; Lindgren, Mikael.
Photophysical properties and triplet-triplet absorption of platinum(II) acetylides in solid PMMA matrices. I: *Nonlinear Optics and Applications III*. SPIE - International Society for Optical Engineering 2009 ISBN 978-0-8194-7628-9. p. 73540H-1-73540H-9

Sletmoen, Marit; Klein, Dionne; Stokke, Bjørn Torger.
Single-molecule characterization of microbial polysaccharides. I: *Microbial Glycobiology. Structures, Relevance and Applications*. Academic Press 2009 ISBN 978-0-12-374546-0. p. 253-268

Sorokina, Irina T.
Principles, advances and applications of ultrafast mid-infrared lasers. IEEE conference proceedings 2009 (ISBN 978-1-4244-3830-3) 2 p.

Valberg, Arne.
Fargenes verden. Tapir Akademisk Forlag 2009 (ISBN 9788251923743) 148 p.

Other Books / Reports (total 19)

Artur, Celia; Cuamba, Boaventura; Pillay, Sadha; Løvseth, Jørgen.
Asesment of the Efficiency of an Oil Based Solar Radiation Concentrating System. I: *International Solar Energy Society Solar World Congress 2009 - Renewable Energy Shaping our Future*. Johannesburg: Internationl Solar Energy Society (ISES) 2009 ISBN 978-1-920017-42-2. p. 638-638

Chikukwa, Actor; Løvseth, Jørgen.
Modelling of a Novel Volumetric Absorber Suitable for Compact Solar Concentrators with Rock Storage. I: *International Solar Energy Society Solar World Congress 2009 - Renewable Energy Shaping our Future*. Johannesburg: Internationl Solar Energy Society (ISES) 2009 ISBN 978-1-920017-42-2. p. 650-659

Chikukwa, Actor; Løvseth, Jørgen.
Optimisation and Modelling of a High Temperature Solar Thermal Storage Adapted for Hotplate Operation. I: *International Solar Energy Society Solar World Congress 2009 - Renewable Energy Shaping our Future*. Johannesburg: Internationl Solar Energy Society (ISES) 2009 ISBN 978-1-920017-42-2. p. 650-660

Chikukwa, Actor; Løvseth, Jørgen.
Temporal and Spatial Availability of Solar Energy Resources in Zimbabwe. I: *International Solar Energy Society Solar World Congress 2009 - Renewable Energy Shaping our Future*. Johannesburg: Internationl Solar Energy Society (ISES) 2009 ISBN 978-1-920017-42-2. p. 49-58

Johansson, Erik; Plogmaker, Stefan; Walle, Lars Erik; Rensmo, Håkan; Borg, Anne; Sandell, Anders.
Surface molecular structure of the maleic anhydride dye attachment group on single crystalline anatase TiO_2. I: *MAX-lab Activity Report 2008*. Lund, Sverige: MAX-lab 2009 p. 426-427

Macome, Marcelino; Cuamba, Boaventura; Pillay, Sadha; Løvseth, Jørgen.
Design, Construction and Characterisation of a Multiple Sensor Solar Radiation Detector. I: *International Solar Energy Society Solar World Congress 2009 - Renewable Energy Shaping our Future*. Johannesburg: Internationl Solar Energy Society (ISES) 2009 ISBN 978-1-920017-42-2. p. 11026-1032

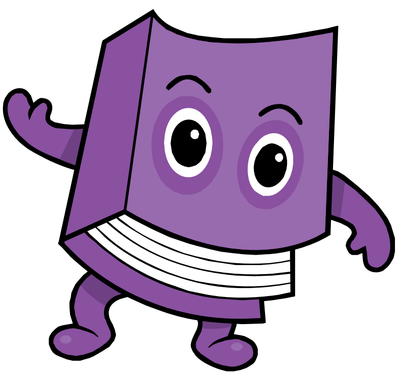
Madessa, Habtamu Bayera; Løvseth, Jørgen; Nydal, Ole Jørgen.
Experimental Investigation of a Rock-Bed for High Temperature Solar Thermal Storage. I: *International Solar Energy Society Solar World Congress 2009 - Renewable Energy Shaping our Future*. Johannesburg: Internationl Solar Energy Society (ISES) 2009 ISBN 978-1-920017-42-2. p. 639-645

Nyeinga, Karidewa; Banda, Eldad; Løvseth, Jørgen; Nydal, Ole Jørgen; Madessa, Habtamu Bayera.
Dynamic Model for Small Scale Concentrating Solar System with Heat Storage. I: *International Solar Energy Society Solar World Congress 2009 - Renewable Energy Shaping our Future*. Johannesburg: Internationl Solar Energy Society (ISES) 2009 ISBN 978-1-920017-42-2. p. 758-764

Okello, Denis; Banda, Eldad; Løvseth, Jørgen; Nydal, Ole Jørgen.
Temperature Profile in Rock Bed Heat Storage for Food Preparation. I: *International Solar Energy Society Solar World Congress 2009 - Renewable Energy Shaping our Future*. Johannesburg: Internationl Solar Energy Society (ISES) 2009 ISBN 978-1-920017-42-2.

Ramachandran, Amutha; Borg, Anne.
Surface studies of palladium based membranes and model systems. NTNU, Trondheim: NTNU-trykk 2009 (ISBN 978-82-471-1504-6) 170 p.

Schulte, Karina; Walle, Lars Erik; Weststrate, C. J.; Gustafson, Johan; Borg, Anne; Lundgren, Edvin; Andersen, Jesper N.
Oxide formation at the Pd75Ag25(100) surface. I: *MAX-lab Activity Report 2008*. Lund, Sverige: MAX-lab 2009 p. 154-155



Solheim, Bjarte Gees Bokn; Iversen, Tor-Henning; Johnsson, Anders.
Prodex-Project: Multigen-1. Trondheim: Institutt for biologi, NTNU 2009 73 p.

Sorokina, Irina T; Sorokin, Evgeni.
Ultrashort-pulsed Kerr-lens modelocked Cr: ZnSe laser. European Physical Society 2009 (ISBN 978-1-4244-4080-1) 1 p.

Sorokina, Irina T; Sorokin, Evgeni.
Principles, advances and applications of ultrafast mid-infrared lasers. I: *Principles, advances and applications of ultrafast mid-infrared lasers*. IEEE conference proceedings 2009 ISBN 978-1-4244-3830-3. p. 1-2

Svenum, Ingeborg-Helene; Borg, Anne.
Interactions of Functional Groups with Surfaces. Trondheim: NTNU-trykk 2009 (ISBN 978-82-471-1641-8) 158 p.

Svenum, Ingeborg-Helene; Walle, Lars Erik; Schulte, Karina; Borg, Anne.
Mehylamine adsorption on Ni3Al(111) and NiAl(110). I: *MAX-lab Activity Report 2008*. Lund, Sverige: MAX-lab 2009 p. 442-443

Walle, Lars Erik; Borg, Anne; Sandell, Anders.
Surface science studies of TiO2 single crystal systems. Trondheim: NTNU-trykk 2009 (ISBN 978-82-471-1887-0) 146 p.

Walle, Lars Erik; Plogmaker, Stefan; Borg, Anne; Sandell, Anders.
Growth of Au on Single Crystalline Anatase TiO2(101) and (001): Probing Under-Coordinated Sites. I: *MAX-lab Activity Report 2008*. Lund, Sverige: MAX-lab 2009 p. 166-167

DOCTORAL THESES

Andresen, Christian André. *Properties of fracture networks and other network systems.*
ISBN: 978-82-471-1376-9

Bagheri, Asadollah. *Ground-Based UV Measurements, Aerosol Effects on UV Radiation.*
ISBN: 978-82-471-1448-3

Glimsdal, Eirik. *Spectroscopic charaacterization of some platinum acetylide molecules for optical power limiting applications.*
ISBN: 978-82-471-1723-1

Linder, Jacob. *Quantum transport and proximity effects in unconventional superconducting hybrid systems.*
ISBN: 978-82-471-1457-5

Nordmark, Heidi. *Microstructure studies of silicon for solar cells – Defects, impurities and surface morphology.*
ISBN: 978-82-471-1400-1

Ramachandran, Amutha. *Surface studies of palladium based membranes and model systems.*
ISBN: 978-82-471-1504-6

Reitan, Nina Kristine. *Methods for studying critical barriers to the delivery of nanomdeicine – The potential of fluorescence correlation spectroscopy, confocal microscopy and MRI.*
ISBN: 978-82-471-1620-3

Skadsem, Hans Joakim. *Transport and Magnetisation Dynamics in Ferromagnetic Nanostructures.*
ISBN: 978-82-471-1782-8

Solheim, Bjarte Gees Bokn. *Oscillatory, ultradian movements in Arabidopsis – Biophysical studies of rhythms in plants onboard the International Space Station and on Earth.*
ISBN: 978-82-471-1382-0

Stabo-Eeg, Frantz. *Development of instrumentation for Mueller matrix ellipsometry.*
ISBN: 978-82-471-1432-2

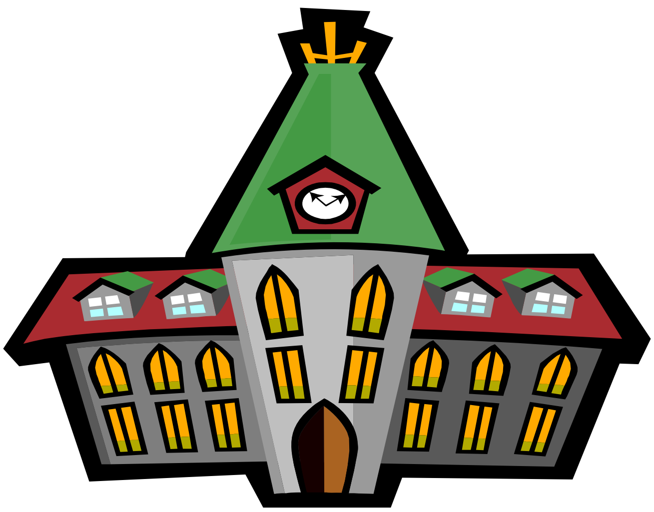
Svenum, Ingeborg-Helene. *Interactions of Functional Groups with Surfaces.*
ISBN: 978-82-471-1641-8

Tierney, Sven. *Development and Characterization of Bioresponsive Hydrogel Materials.*
ISBN: 978-82-471-1441-4

Tollefsen, Henrik. *Surface properties of Ce and K doped transition metal systems.*
ISBN: 978-82-471-1510-7

Tucho, Wakshum Mekonnen. *Self-supported, thin Pd/Ag membranes for Hyudrogen separation – Microstructure and permeation studies.*
ISBN: 978-82-471-1459-9

Walle, Lars Erik. *Surface science studies of TiO_2 single crystal systems.*
ISBN: 978-82-471-1887-0



CONFERENCES AND TALKS

Scientific Talks (total 167)

Andersen, Jens Oluf.
Chiral symmetry restoration in strongly interacting matter. seminar; 2009-10-23 - 2009-10-23

Andersen, Jens Oluf.
Cold atoms versus QCD. PhD defense; 2009-05-28 - 2009-05-28

Andersen, Jens Oluf.
Convergent hard-thermal-loop resummation for thermal gauge theories. teoriseminar; 2009-10-26 - 2009-10-26

Andersen, Jens Oluf.
Fasediagrammet i QCD. Fredagskollokvium; 2009-02-06 - 2009-02-06

Andersen, Jens Oluf.
Phase diagram of QCD. foredrag; 2009-01-28 - 2009-01-29

Andersen, Jens Oluf.
QCD thermodynamics at intermediate coupling. Teoriseminar Nordita; 2009-10-27 - 2009-10-27

Andersen, Jens Oluf.
Resummation: Weak-coupling expansion vs screened perturbation theory. Renormalization and Resummation; 2009-04-02 - 2009-04-04

Anthonysamy, Fervin Moses; Hoang, Thang Ba; Dasa, Lakshmi Narayana; Zhou, Hailong; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Micro-photoluminescence study of single GaAsSb/GaAs radial and axial heterostructured core-shell nanowires. E-MRS 2009; 2009-06-08 - 2009-06-12

Anthonysamy, Fervin Moses; Hoang, Thang Ba; Dasa, Lakshmi Narayana; Zhou, Hailong; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Optical properties of axial and radial heterostructured III-V semiconductor nanowires. 4th NTNU Nanolab User Meeting; 2009-05-13

Azevedo, Eduardo N.; Engelsberg, Mario; Fossum, Jon Otto; Souza, R.
Self-Assembly and Dynamics of Clay Platelets in a Magnetic Field. 14th International Clay Conference: Session NM8: Self-assembly from Clay Particles: From Nano to Macro; 2009-06-14 - 2009-06-20

Babaev, Egor; Dahl, Eskil Kulseth; Sudbø, Asle.
Unusual states of vortex matter in interacting multicomponent Bose-Einstein condensates. March Meeting of the American Physical Society; 2009-03-16 - 2009-03-20

Bjørge, Ruben; Holmestad, Randi; Marioara, Calin D; Andersen, Sigmund J.
Precipitation in two Al-Mg-Ge alloys. SCANDEM 2009; 2009-06-08 - 2009-06-10

Borck, Øyvind; Svenum, Ingeborg-Helene; Walle, Lars Erik; Andersen, Trine H.; Borg, Anne.
Adsorption of methylamine on NiAl(110) and Ni3Al(111) surfaces. Fysikermøtet 2009; 2009-08-12 - 2009-08-14

Boschker, Jos Emiel; Monsen, Åsmund Fløystad; Folven, Erik; McEnroe, Suzanne; Grepstad, Jostein; Wahlström, Erik; Tybell, Thomas.
In-plane modulations in La0.7Sr0.3MnO3 thin films: effect of substrate and initial growth. STINT Workshop on Oxide and Interface Magnetism; 2009-11-16 - 2009-11-17

Brataas, Arne.
Magnetization Noise and Damping in Magnetoelectronic Circuits. Invitert foredrag til CEA; 2009-09-08

Brataas, Arne.
Magnetization Noise and Damping in Magnetoelectronic Devices. Seminar ved Universitetet i Konstance; 2009-11-06

Brataas, Arne.
Magnetization Noise and Damping in Magnetoelectronic Devices. Workshop on Spin Caloritronics; 2009-02-13

Brataas, Arne.
Magnetization Noise and Damping in Magnetoelectronics Circuits. EU DynaMax Review Meeting; 2009-09-29

Brataas, Arne.
Scattering Theory of Gilbert Damping. APS March Meeting 2009; 2009-03-18

Breiby, Dag Werner.
Biaxially Oriented CdSe Nanorods. NanoMat; 2009-06-16 - 2009-06-17

Breiby, Dag Werner.
New X-ray Techniques Applied to Nanostructured Organic Materials. Synkrotronbrukermøte; 2009-06-18 - 2009-06-19

Bungum, Berit; Lykknes, Annette.
What brought them into science? University students' interest profiles and motivation for choosing science on university level. ESERA conference 2009, European Science Education Research Association; 2009-08-31 - 2009-09-04

Chen, Yongjun; Li, Yanjun; Walmsley, John C; Dumoulin, S.; Roven, Hans Jørgen.
Microstructural evolution of commercial pure Ti fabricated by Equal channel angular pressing (ECAP). 2nd Int. Symp BULK NANOSTRUCTURED MATERIALS from fundamentals to innovations; 2009-09-22 - 2009-09-26

Dasa, Lakshmi Narayana; Hoang, Thang Ba; Anthonysamy, Fervin Moses; Zhou, Hailong; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Heterostructured III-V Nanowires with Mixed Crystal Phases: New Possibilities for Heterostructure Engineering. Nordic Semiconductor Meeting; 2009-06-14 - 2009-06-17

Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Zhou, Hailong; Anthonysamy, Fervin Moses; Hoang, Thang Ba; Rogstad, Espen; Scheffler, Martha; Fimland, Bjørn-Ove; Weman, Helge.
Tailoring of semiconductor heterostructure nanowires for photonic applications by molecular beam epitaxy. 4th NTNU Nanolab User Meeting; 2009-05-13

Davies, Catharina De Lange.
Delivery of Nanomedicine in Tumour Tissue. Fysikermøtet 2009; 2009-08-12

Davies, Catharina De Lange; Reitan, Nina Kristine; Maurstad, Gjertrud; Olderøy, Magnus Østgård; Berg, Lars S; Strand, Sabina P.
Barriers for delivery of pDNA-chitosan vectors. The Norwegian Biochemical Society 45th Contact Meeting; 2009-01-29 - 2009-02-01

Dehghan-Niri, Roya.
In-situ electron microscopy study of catalyst nanoparticles reduction. 4th NTNU Nanolab User Meeting; 2009-05-13

Dehghan-Niri, Roya; Walmsley, John C.
Electron microscopy study of cobalt supported on alumina during reduction. Norwegian catalysis symposium; 2009-12-01 - 2009-12-01

Delaleau, Pierre; Mathiesen, Ragnvald; Schaffer, Paul; Arnberg, Lars; Beckermann, Christoph.
Modeling and in-situ X-ray video microscopy of confined equiaxed grain growth and buoyant motion in Al-Cu. Modelling of Casting, Welding and Advanced Solidification Processes, MCWASP XII; 2009-06-07 - 2009-06-14

Delaleau, Pierre; Mathiesen, Ragnvald; Schaffer, Paul; Bellmann, Martin; Arnberg, Lars.
Impact of confinement on the growth of equiaxed grains in Al-Cu during X-ray radiography. TMS2009; 2009-02-15 - 2009-02-19

Ehlers, Flemming.
Atomistic modelling of precipitate interfaces with Al. Fysikermøtet 2009; 2009-08-12 - 2009-08-14

Ehlers, Flemming; Holmestad, Randi.
Direct Approach to Atomistic Ab Initio Studies of Precipitate Growth in Alloys. MRS Fall Meeting 2009; 2009-11-30 - 2009-12-04

Eschrig, Matthias; Linder, Jacob; Yokoyama, Takehito; Sudbø, Asle.
Even- to Odd-frequency Pair Conversion by Magnetic Interfaces in SC/N Junctions. March Meeting of the American Physical Society; 2009-03-16 - 2009-03-20

Fossheim, Kristian.
Conference summary: Vortex matter in nanostructured superconductors. Vortex VI. Vortex matter in nanostructured superconductors; 2009-09-17 - 2009-09-24

Fossum, Jon Otto.
Complex Physical Phenomena in a Clay. 14th International Clay Conference: Session UM3: General topics; 2009-06-14 - 2009-06-20

Fossum, Jon Otto.
Synchrotron X-ray Scattering from Self-organized Soft Nanostructures in Clays. European Geosciences Union-EGU, General Assembly 2009: Session SSS24 on Synchrotron radiation in soil and geosciences; 2009-04-19 - 2009-04-21

Fossum, Jon Otto; Alme, Lars Ramstad; Hemmen, Henrik; Meheust, Yves.
Humidity Transport in a Material of Interconnected Meso- and Nanopores: X-ray Studies of a Model Clay. Symposium JJ: Multiscale Dynamics in Confining Systems MRS Boston; 2009-11-30 - 2009-12-04

Fossum, Jon Otto; Meheust, Yves; Schelderupsen, Børge; Parmar, Kanak Pal Singh.
The Electro-Rheology of Suspensions of Synthetic Smectites in Oil. 14th International Clay Conference: Session CE4: Colloids & Rheology; 2009-06-14 - 2009-06-20

Gederaas, Odrun Arna; Husebye, Harald; Hjelde, Astrid; Larsen, Eivind La Puebla; Randeberg, Lise Lyngsnes; Helander, Linda; Arum, Carl-Jørgen; Brunsvik, Anders; Johnsson, Anders; Svaasand, Lars O.; Krokan, Hans Einar.
In vivo and in vitro detection of PpIX after treatment with hexyl 5-aminolevulinate and light. european society for Photobiology; 2009-09-05 - 2009-09-10

Glimsdal, Eirik; Westlund, Robert; Lindgren, Mikael.
Photophysical properties and triplet absrption of platinum(II) acetylides in solid PMMA matrices. SPIE Europe Optics + Optoelectronics 2009; 2009-04-20 - 2009-04-23

Hansen, Elisabeth Lindbo; Ringdal, Nils I; Kjelling, Bård Martin; Hemmen, Henrik; Fossum, Jon Otto; Azevedo, Eduardo N.; Engelsberg, Mario; Meheust, Yves; Kim, Chan; Shasisdara, M; Wha, Cho; Noh, Dong Young.
Highly Ordered Nematic Phases and Emerging Positional Ordering in Aqueous Dispersions of Na-Fluorohectorite. 14th International Clay Conference: Session NM8: Self-assembly from Clay Particles: From Nano to Macro; 2009-06-14 - 2009-06-20

Hemmen, Henrik; Azevedo, Eduardo N.; Nielsen, C.A.; Magnus, Knut; Souza, R.; Engelsberg, Mario; Fossum, Jon Otto.
Roughness of Fractures in Laponite Gels Determined from Magnetic Resonance Imaging. 14th International Clay Conference: Session CE5: Desiccation and Fracture in Clay; 2009-06-14 - 2009-06-20

Hemmen, Henrik; Ringdal, Nils I; Azevedo, Eduardo N.; Hansen, Elisabeth Lindbo; Hager, M.; Meheust, Yves; Fossum, Jon Otto; Engelsberg, Mario; Knudsen, Kenneth Dahl.
Isotropic-Nematic Interfaces in Suspensions of Na-Fluorohectorite Synthetic Clay-Order, Orientation and Magnetic Field Response. 14th International Clay Conference: Session NM8: Self-assembly from Clay Particles: From Nano to Macro; 2009-06-14 - 2009-06-20

Hoang, Thang Ba; Anthonysamy, Fervin Moses; Zhou, Hailong; Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Crystal phase dependent photoluminescence polarization in single semiconductor nanowires. 3rd International conf. on One-dimensional Nanomaterials; 2009-12-07 - 2009-12-09

Hoang, Thang Ba; Anthonysamy, Fervin Moses; Zhou, Hailong; Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Polarized micro-photoluminescence imaging of single GaAs/AlGaAs core-shell nanowires with GaAsSb inserts. Materials Res. Soc. 2009 Fall Meeting, Symposium O: Excitons and Plasmon Resonances in Nanostructures II; 2009-11-29 - 2009-12-04

Hoang, Thang Ba; Anthonysamy, Fervin Moses; Zhou, Hailong; Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Wurtzite GaAs and zinc blende GaAsSb nanowires: New possibilities for heterostructure engineering. NANOMAT conference 2009; 2009-06-16 - 2009-06-17

Holmestad, Randi.
TEM activities in materials science in Trondheim. NORTEM Workshop; 2009-05-07 - 2009-05-08

Iversen, Tor-Henning; Johnsson, Anders; Solheim, Bjarte Gees Bokn.
Hadde Darwin rett når det gjelder planter og tyngdekraftens betydning? - Resultater fra et forsøk på Den Internasjonale Romstasjonen. Romvirksomhet i Norge og ved NTNU; 2009-03-25 - 2009-03-25

Khaldoun, A; Moller, P; Wegdam, G; De Leeuw, B; Meheust, Yves; Fossum, Jon Otto; Bonn, D.
Quickclay and Landslides of Clayey Soils. 14th International Clay Conference: Session GG5: Clays in Geological Processes; 2009-06-14 - 2009-06-20

Klein, Dionne; Øvrebø, Kirsti Marie; Latz, Eicke; Stokke, Bjørn Torger; Espevik, Terje.
Immunostimulatory CpG DNA studied by atomic force microscopy and fluorescence correlation spectroscopy. 2nd annual NorMIC meeting; 2009-11-12 - 2009-11-13

Kobayashi, Takahiro; Zako, Tamotsu; Sakano, Masafuni; Lindgren, Mikael; Nilsson, Peter; Hammarström, Per; Maeda, Mizuo.
Cell toxicity and inner structure analysis of novel insulin filaments using novel luminescent conjugate polymers. 47th Annual Meeting of the Biophysical Society of Japan; 2009-10-30 - 2009-11-01

Ladam, Cecile; Weigand, Christian Carl; Skåre, Daniel; Vardøy, Astrid-Sofie Borge; Dahl, Øystein; Bergren, Matt; Fagerberg, Ragnar; Weman, Helge; Furtak, T.E.; Collins, Reuben.
Nanostructured ZnO layers grown by pulsed laser deposition for hybrid inorganic/organic solar cells. NANOMAT conference 2009; 2009-06-15 - 2009-06-17

Le Roy, S; Søndergård, Elin; Brun, N; Plapp, Mathis; Nerbø, Ingar Stian.
Self-sustained etch masking: a new concept to initiate the formation of nanopatterns during ion erosion. Nanoscale Modification of Surfaces and Thin Films; 2009-08-30 - 2009-09-03

Leganger, Lars Erlend.
Kaon condensation in the color-flavor-locked phase of quark matter, the Goldstone theorem, and the 2PI Hartree approximation. Resummation and Renormalization; 2009-04-02 - 2009-04-05

Letnes, Paul Anton; Simonsen, Ingve.
Spectrally dependent hot-spot locations in metallic nano-clusters. Optics of Surfaces and Interfaces 8; 2009-09-07 - 2009-09-11

Li, Yanjun; Chen, Yongjun; Walmsley, John C; Dumoulin, S.; Roven, Hans Jørgen.
Microstructure evolution in commercially pure titanium during ECAP processing. The 2nd Int. Symposium on BULK NANOSTRUCTURED MATERIALS: from fundamentals to innovations; 2009-09-22 - 2009-09-26

Lilledahl, Magnus Borstad; Davies, Catharina De Lange.
Second harmonic generation of collagen structures. Norsk fysikermøte; 2009-08-12 - 2009-08-14

Lindgren, Mikael.
Novel oligomeric luminescent conjugated polythiophenes for diagnostics of amyloid fibrils. International workshop on emerging materials and active polymer patterning 2009; 2009-11-25 - 2009-11-27

Lindgren, Mikael.
Spectroscopy and imaging of oligomeric luminescent polythiophenes for diagnostics of amyloid proteins. 2nd annual NorMIC meeting; 2009-11-12 - 2009-11-13

Lindgren, Mikael; Glimsdal, Eirik; Åslund, Andreas; Simon, Rosalyn; Hammarström, Per; Nilsson, K. Peter R.
Luminescent Conjugated Polymers and Oligomers for TPA-based Detection and Diagnostics of Amyloid Protein Deposits. 5th International Symposium on Materials and Devices for Nonlinear Optics; 2009-06-26 - 2009-07-01

Maradudin, Alexei; Leskova, Tamara; Simonsen, Ingve.
Scattering of electromagnetic waves from two-dimensional randomly rough perfectly conducting surfaces. Annual Review of Progress in Applied Computational Electromagnetics; 2009-03-08 - 2009-03-12

Mathiesen, Ragnvald.
In situ X-ray videomicroscopy on evolving alloy solidification microstructures. Instituttseminar; 2009-07-01

Mathiesen, Ragnvald.
Microstructure evolution and fundamental characteristics in solidification of metals and alloys - a comparison of modelling and experiments. TMS2009; 2009-02-15 - 2009-02-19

Mathiesen, Ragnvald; Arnberg, Lars.
In situ X-ray videomicroscopy on evolving solidification microstructures in eutectic alloys. Insitituttseminar; 2009-12-15 - 2009-12-15

Mathiesen, Ragnvald; Arnberg, Lars.
Real-time X-ray imaging of diffusive and convective mass transport in alloy solidification processing. MaxLab User Meeting; 2009-11-02 - 2009-11-04

Mehli, Hanne; Bungum, Berit.
When in science, do like the scientists? A study of teachers' gain from participating in the authentic practice of space research. ESERA conference 2009, European Science Education Research Association; 2009-08-31 - 2009-09-04

Morin, Alexandre; Aursand, Peder Kristian; Flåtten, Tore; Munkejord, Svend Tollak.
Numerical Resolution of CO2 Transport Dynamics. Mathematics for industry '09; 2009-10-09 - 2009-10-10

Mumm, Florian; Van Helvoort, Antonius; Sikorski, Pawel.
Structured, copper based superhydrophobic surfaces for digital microfluidics. 4th NTNU Nanolab User Meeting; 2009-05-13

Nerbø, Ingar Stian; Kildemo, Morten; Le Roy, S; Søndergård, Elin.
Characterization of inclined GaSb nanocones by Mueller matrix ellipsometry. Northern Optics 2009; 2009-08-26 - 2009-08-28

Nerbø, Ingar Stian; Kildemo, Morten; Le Roy, S; Søndergård, Elin.
Real-time in-situ observation of growing nanostructures by spectroscopic ellipsometry. E-MRS; 2009-06-08 - 2009-06-12

Nerbø, Ingar Stian; Kildemo, Morten; Le Roy, S; Søndergård, Elin.
Real-time in-situ observation of growing nanostructures by spectroscopic ellipsometry. 4. Nanolab brukermøte; 2009-05-12 - 2009-05-14

Nerbø, Ingar Stian; Kildemo, Morten; Le Roy, S; Søndergård, Elin.
Real-time in-situ observations of growing nanostructures by spectroscopic ellipsometry. Oppdal PV workshop; 2009-03-19 - 2009-03-31

Nevidomskyy, Andriy; Linder, Jacob; Sudbø, Asle.
Ferromagnets without inversion symmetry - room for superconductivity?. March Meeting of the American Physical Society; 2009-03-16 - 2009-03-20

Olderøy, Magnus Østgård.
Alginate/CaCO3 Composite Biomaterials. The 4th KIFEE Symposium on Environment, Energy, Materials and Education; 2009-09-06 - 2009-09-09

Olderøy, Magnus Østgård.
Biomineralisation and CaCO3. 1st Workshop on Biomineralisation; 2009-08-27 - 2009-08-27

Olderøy, Magnus Østgård; Mumm, Florian.
S(T)EM options in the clean room - with examples from the biophysics group. NTNU Nanolab seminar series fall 2009; 2009-10-27 - 2009-10-27

Olderøy, Magnus Østgård; Xie, Minli; Østnæs, Simen; Andreassen, Jens-Petter; Strand, Berit Løkensgard; Sikorski, Pawel.
Alginate/CaCO3 Biomaterials. Bone-Tec 2009; 2009-10-08 - 2009-10-11

Reenaas, Turid Worren.
Solar cell physics. Light and Energy from Nanostructured Semiconductors (LENS) Summerschool; 2009-06-11 - 2009-06-14

Reitan, Nina Kristine.
Characterization of tumor microvascular structure and permeability by MRI and intravital confocal imaging. NorMIC User Meeting; 2009-11-11 - 2009-11-12

Reitan, Nina Kristine.
Characterizing DNA condensation by structurally different chitosans of variable gene transfer efficacy. Fysikermøtet 2009; 2009-08-12 - 2009-08-14

Reitan, Nina Kristine; Thuen, Marte; Goa, Pål Erik; Davies, Catharina De Lange.
Characterization of tumor microvascular structure and permeability: comparison between MRI and intravital confocal imaging. Second national NorMIC meeting; 2009-11-12 - 2009-11-13

Rozynek, Zbigniew; Wang, Bao-Xiang; Plivelic, T; Fossum, Jon Otto.
Wide Angle X-Ray Scattering Studies of Guided Assembled Organoclay Electro-rheological Suspensions. Symposium QQ: Responsive Gels and Biopolymer Assemblies MRS Boston; 2009-11-30 - 2009-12-04

Rozynek, Zbigniew; Wang, Bao-Xiang; Zhou, Min; Fossum, Jon Otto.
Dynamic Column Formatiom of Na-Fluorohectorite Clay Particles: Wide Angle X-Ray Scattering and Rheological Studies. 14th International Clay Conference:Session NM8: Self-assembly from Clay Particles: From Nano to Macro; 2009-06-14 - 2009-06-20

Rozynek, Zbigniew; Wang, Bao-Xiang; Zhou, Min; Fossum, Jon Otto.
WAXS and Rheological Studies of Dynamic Column Formation in Na-FLHC Clay Particles. 6th Nordic Workshop on Scattering from Soft Matter; 2009-01-28 - 2009-01-29

Rørvik, Per Martin; Sæterli, Ragnhild; Almli, Åsmund; You, Chang Chuan; Van Helvoort, Antonius; Holmestad, Randi; Tybell, Thomas; Grande, Tor; Einarsrud, Mari-Ann.
Hierarchical growth of ferroelectric PbTiO3 nanorods. 4th NTNU NanoLab User Meeting; 2009-05-13 - 2009-05-13

Rørvik, Per Martin; Sæterli, Ragnhild; Almli, Åsmund; You, Chang Chuan; Van Helvoort, Antonius; Holmestad, Randi; Tybell, Thomas; Grande, Tor; Einarsrud, Mari-Ann.
Hierarchical growth of ferrolectric PbTiO3 nanorods. NANOMAT Conference 2009; 2009-06-16 - 2009-06-17

Seim, Thorstein; Valberg, Arne.
Hue angles of elementary colours. 11th Congress of the International Colour Association; 2009-09-28 - 2009-10-02

Seim, Thorstein; Valberg, Arne.
Hue angles of elementary hues. 11th Congress of the International Colour Association; 2009-09-28 - 2009-10-02

Seim, Thorstein; Valberg, Arne; Lee, Barry B.
Do power functions describe spatial sensitivity of cells in the parvocellular pathway better than DOGs?. Kongsberg Vision Meeting; 2009-11-26

Simonsen, Ingve.
Deregulated Power Markets: Their Characteristic Stylized Facts. Net 2009: Evolution and Complexity Rome, Sapienza Universita di Roma, Italy; 2009-05-29

Simonsen, Ingve.
Optics of Surface Disordered Systems; No Disorder --- No Fun!. Department Colloquium, Institut des NanoSciences de Paris, Paris, France; 2009-09-03

Simonsen, Ingve.
Optics of Surface Disordered Systems; No Disorder--- No Fun!. Optics of Surfaces and Interfaces VIII (OSI-8), Ischia, Italy; 2009-09-08

Simonsen, Ingve; Maradudin, Alexei; Leskova, Tamara.
Scattering of electromagnetic waves from two-dimensional randomly rough surfaces. Workshop on Waves in Complex Media, Nappa Valley Lodge, Yountville, California, USA; 2009-06-28

Sorokina, Irina T.
Cr2+:ZnSe as Ti:Sapphire Laser of the Infrared: What's the Difference?. seminar at Max-Planck Inst. for Quantum Optics; 2009-11-19 - 2009-11-19

Sorokina, Irina T.
Mid-infrared ultrafast lasers. The Rank Prize Minisymposium on Ultrashort Pulse Sources 2009; 2009-08-17 - 2009-08-20

Sorokina, Irina T.
Ultrashort pulsed mid-infrared fiber lasers: from dream to reality. Nobel Prize 2009 celebration workshop "Light on Fibers"; 2009-12-08 - 2009-12-09

Sorokina, Irina T; Sorokin, Evgeni.
Mid-infrared femtosecond frequency comb generation and application: advances and perspectives. Mid-Infrared Coherent Sources'2009 conference; 2009-06-07 - 2009-06-12

Sorokina, Irina T; Sorokin, Evgeni.
Principles, advances and applications of ultrafast mid-infrared lasers. CLEO/Pacifik Rim 2009; 2009-08-30 - 2009-09-03

Stokke, Bjørn Torger.
Application of high resolution monitoring of hydrogel swelling. 4th KIFEE Symposium; 2009-09-06 - 2009-09-08

Stokke, Bjørn Torger.
Determination and application of swelling of biospecific hydrogel materials with nanometer precision. iNano Lecture; 2009-08-28 - 2009-08-28

Stokke, Bjørn Torger.
Interacting biopolymers: A basis for higher order organisation and biosensing,. Gjesteforelesning; 2009-06-05 - 2009-06-05

Sudbø, Asle.
Novel phases and phase transitions in multicomponent Bose-Einstein condensates. Condensed matter physics seminar; 2009-04-27 - 2009-04-27

Sudbø, Asle.
Novel quantum phases of cold compressed hydrogen. Physik Kollokvium; 2009-05-15 - 2009-05-15

Tenorio, Romulo P.; Alme, Lars Ramstad; Engelsberg, Mario; Fossum, Jon Otto; Hallwass, Fernando.
NMR Spectroscopy studies of Water Intercalation in Na-fluorohectorite. 14th International Clay Conference: Session UM3: General topics; 2009-06-14 - 2009-06-20

Thomassen, Sedsel Fretheim; Reenaas, Turid Worren; Zhou, Dayong; Fimland, Bjørn-Ove; Dufaker, Daniel; Holtz, Per Olof.
Quantum dot density studies for quantum dot intermediate band solar cells. NTNU Nanolab user meeting; 2009-05-12 - 2009-05-13

Tierney, Sven; Hjelme, DR; Stokke, Bjørn Torger.
Application of a high resolution interferometric fiber-optic technology platform for development of (bio)polymer hydrogels as signal transducers in biosensing. 3rd NANOMAT Conference; 2009-06-14 - 2009-06-16

Tierney, Sven; Stokke, Bjørn Torger.
Development of biologically specific sensing and transducing hydrogel materials. Fysikermøtet; 2009-08-13 - 2009-08-15

Tierney, Sven; Stokke, Bjørn Torger.
High resolution monitoring of swelling of biospecific hydrogel materials. Material Research Society Fall Meeting; 2009-11-29 - 2009-12-04

Tierney, Sven; Stokke, Bjørn Torger.
Molecular amplification of oligonucleotide sequence recognition employing bioresponsive hydrogels. EBSA 2009 Congress; 2009-07-11 - 2009-07-15

Torsæter, Malin.
Atom Probe Tomography of Alloy Systems. Fysikermøtet 2009; 2009-08-12 - 2009-08-14

Valberg, Arne.
Colour vision: Different roads from perception to neuroscience. 11th Congress of the International Colour Association; 2009-10-30

Valberg, Arne.
Fargesyn: To veier fra persepsjon til nevrovitenskap. Fredagskollokvium; 2009-03-06

Van Helvoort, Antonius.
Short introduction Focused Ion Beam techniques in NTNU NanoLab's cleanroom. NTNU NanoLab’s Seminar series; 2009-04-28

Van Helvoort, Antonius; Dasa, Lakshmi Narayana; Grønsberg, Sondre; Patriarche, G.; Zhou, Hailong; Fimland, Bjørn-Ove; Weman, Helge.
Dark field transmission electron microscopy techniques for structural characterization of semiconductor nanowire heterostructures. EMAG 2009; 2009-09-08 - 2009-09-11

Van Helvoort, Antonius; Dasa, Lakshmi Narayana; Grønsberg, Sondre; Patriarche, G.; Zhou, Hailong; Hoang, Thang Ba; Anthonysamy, Fervin Moses; Fimland, Bjørn-Ove; Weman, Helge.
Semiconductor nanowire heterostructures characterization by dark field TEM. 4th NTNU Nanolab User Meeting; 2009-05-13

Vullum, Per Erik.
Specimen Preparation Techniques. School and Workshop on Electron Microscopy for Ceramic Materials; 2009-10-08 - 2009-10-13

Vullum, Per Erik; Eberg, Espen; Sæterli, Ragnhild; Horvli, Mari E; Van Helvoort, Antonius; Soleim, Bjørn Gunnar; Monsen, Åsmund Fløystad; Holmestad, Randi.
TEM specimen preparation of ceramic materials by tripod wedge polishing and Ar-ion milling. Electron Microscopy for Ceramic Materials (EMCM); 2009-08-08 - 2009-08-13

Vullum, Per Erik; Thomassen, Sedsel Fretheim; Holmestad, Randi; Fimland, Bjørn-Ove; Reenaas, Turid Worren.
TEM characterization of intermediate band quantum dot solar cell materials. 4th NTNU Nanolab user meeting; 2009-05-13 - 2009-05-13

Vullum, Per Erik; Thomassen, Sedsel Fretheim; Holmestad, Randi; Fimland, Bjørn-Ove; Reenaas, Turid Worren.
TEM characterization of quantum dot intermediate band solar cell materials. SCANDEM 2009, Annual Meeting of the Nordic Microscopy Society; 2009-06-08 - 2009-06-10

Vullum, Per Erik; Thomassen, Sedsel Fretheim; Sadeghi, Mahdad; Holmestad, Randi; Fimland, Bjørn-Ove; Wang, Shumin; Reenaas, Turid Worren.
Transmission electron microscopy characterization of quantum dot intermediate band solar cell materials. NanoMat meeting; 2009-06-15 - 2009-06-19

Wahlström, Erik.
STM based point contacts for laterally resolved transport measurements. Nordic spin´08; 2009-04-22 - 2009-04-24

Wahlström, Erik.
STM for high resolution characterisation and definition of spin polarised model systems. Spin-Up; 2009-05-29 - 2009-06-04

Wahlström, Erik.
Towards a fundamental understanding of size effects in LSMO. Invited lecture; 2009-12-10

Wahlström, Erik.
Towards a fundamental understanding of size effects in LSMO. Seminar; 2009-12-11 – 2009-12-11

Wahlström, Erik; Borg, Anne; Tybell, Thomas.
Towards a fundamental understanding of size effects in LSMO. Invited Seminar; 2009-06-09 – 2009-06-09

Wang, Bao-Xiang; Rozynek, Zbigniew; Hemmen, Henrik; Hansen, Elisabeth Lindbo; Fossum, Jon Otto.
Small Angle X-ray Scattering Studies of Double Responsive Co Doped TiOx Nanorods. ChinaNANO 2009; 2009-09-01 – 2009-09-03

Wang, Bao-Xiang; Rozynek, Zbigniew; Zhou, Min; Fossum, Jon Otto.
Wide Angle X-Ray Scattering Studies of Guided Assembled Organoclay Electrorheological Suspensions. 14th International Clay Conference: Session CE7:Modified Clays & New Applications; 2009-06-14 – 2009-06-20

Wang, Bao-Xiang; Zhou, Min; Rozynek, Zbigniew; Fossum, Jon Otto.
Electrorheological Properties of Organically Modified Laponite Intercalation: Adsorption and Wettability. 14th International Clay Conference: Session CE4: Colloids & Rheology; 2009-06-14 – 2009-06-20

Wang, Bao-Xiang; Zhou, Min; Rozynek, Zbigniew; Fossum, Jon Otto.
Electrorheological Properties of Organically Modified Nanolayered Laponite:Influence of Intercalation: Adsorption and Wettability. 2nd International Conference on Smart Materials and Nanotechnology in Engineering; 2009-07-08 – 2009-07-11

Weigand, Christian Carl; Bergren, Matt; Ladam, Cecile; Vullum, Per Erik; Walmsley, John C; Fagerberg, Ragnar; Furtak, Tom; Collins, Reuben; Grepstad, Jostein; Weman, Helge.
Characterization of ZnO Nanostructures Grown by Pulsed Laser Deposition. MRS Spring Meeting 2009; 2009-04-13 – 2009-04-17

Wells, Justin.
Performing Conductivity Measurements on Clean and Adsorbate- Covered Semiconductor Surfaces. Invited talk; 2009-05-05

Wells, Justin.
Spin and charge transport in surfaces and thin films. Invited talk; 2009-11-23

You, Chang Chuan; Liu, Yun; Takahashi, Ryota; Wahlström, Erik; Grepstad, Jostein; Borg, Anne; Tybell, Thomas.
A new route to controlled nanostructures of complex oxides based on STM surface manipulation and subsequent physical deposition. Nanomat conference 2009; 2009-06-16 – 2009-06-17

Zhao, Tiejun; Boullosa, Eiras Sara; Yu, Yingda; Yu, Xiaofeng; Raaen, Steinar; Rønning, Magnus; Chen, De; Holmen, Anders.
Synthesis and catalytic performance of high-temperature stable nanocomposites by a versatile nanoparticle-mediated Pechini method. Europcat IX; 2009-08-30 – 2009-09-04

Zhao, Tiejun; Yu, Yingda; Yu, Xiaofeng; Raaen, Steinar; Chen, De; Rønning, Magnus.
Preferential oxidation of CO in H2-rich gases over the Pechini-method- derived Cu-CeO2 nanocomposite and monolith catalysts. China-North America Workshop on Fuel Cell Science and Technology; 13-15.8.09

Zhou, Hailong; Hoang, Thang Ba; Dasa, Lakshmi Narayana; Anthonysamy, Fervin Moses; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge; Patriarche, G; Harmand, J.C.
Self-organized wurtzite AlGaAs core-shell nanowires with GaAs inserts grown by molecular beam epitaxy. GdR Nanofils et Nanotubes Semiconducteurs - Workshop 2009; 30.6-3.7-09

Scientific Posters (total 61)

Albin, J.M.; Baker, D.J.; Allen, Cary G.; Furtak, Tom; Collins, Reuben; Olson, Dana C.; Ginley, David S.; Weigand, Christian Carl; Vardøy, Astrid-Sofie Borge; Ladam, Cecile.
Comparison of Molecular Monolayer Interface Treatments in Organic-inorganic Photovoltaic Devices. MRS Spring Meeting 2009; 2009-04-13 - 2009-04-17

Chen, Yongjun; Roven, Hans Jørgen; Li, Yanjun; Dumoulin, S.; Walmsley, John C; Liu, Manping; Yu, Yingda.
Deformation structures of pure Ti during shear deformation. TMS Annual Meeting 2009; 2009-02-15 - 2009-02-19

Dam, Anh Hoang; Wang, Hongmin; Dehghan, Roya; Walmsley, John C; Holmen, Anders; Chen, De.
Preparation and characterization of Ni based bimetallic catalysts for steam reforming of methane. Norwegian Catalysis Symposium 2009; 2009-11-30 - 2009-12-01

Dam, Anh Hoang; Wang, Hongmin; Dehghan, Roya; Walmsley, John C; Holmen, Anders; Chen, De.
Preparation and characterization of Ni-Ag surface alloy catalysts. 21st North American Catalysis Society Conference; 2009-06-07 - 2009-06-12

Dasa, Lakshmi Narayana; Patriarche, G; Van Helvoort, Antonius; Zhou, Hailong; Fimland, Bjørn-Ove; Weman, Helge.
Growth and structural characterization of axial heterostructured GaAs/GaSb nanowires grown by molecular beam epitaxy. 3rd International conf. on One-dimensional Nanomaterials; 2009-12-07 - 2009-12-09

Dasa, Lakshmi Narayana; Rogstad, Espen; Scheffler, Martha; Van Helvoort, Antonius; Zhou, Hailong; Patriarche, G.; Harmand, J.C.; Fimland, Bjørn-Ove; Weman, Helge.
Diffusion-limited growth of GaAs nanowires by Au-assisted molecular beam epitaxy. 4th GDR meeting; 2009-06-30 - 2009-07-03

Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Anthonysamy, Fervin Moses; Zhou, Hailong; Hoang, Thang Ba; Fimland, Bjørn-Ove; Weman, Helge.
Effect of growth-interruption on structural and optical properties of GaAs/GaAsSb axial heterostructured nanowires. Materials Res. Soc. 2009 Fall Meeting, Symposium M: Multifunction at the Nanoscale through Nanowires; 2009-11-29 - 2009-12-04

Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Anthonysamy, Fervin Moses; Zhou, Hailong; Hoang, Thang Ba; Fimland, Bjørn-Ove; Weman, Helge.
Optimization of heterointerfaces in axial heterostructured nanowires grown by molecular beam epitaxy. 4th Nanowire growth workshop; 2009-10-26 - 2009-10-27

Davies, Catharina De Lange; Berg, Lars S; Reitan, Nina Kristine; Lelu, Sylvie; Maurstad, Gjertrud; Olderøy, Magnus Østgård; Strand, Sabina P.
DNA-chitosan nanoparticles in gene delivery: Chitosan structure and physiological barriers for efficient delivery. 100th Annual Meting 2009; 2009-04-18 - 2009-04-22

Dehghan, Roya; Walmsley, John C; Holmen, Anders; Midgley, Paul A.; Hungria, Ana B.; Hernandez-Garrido, Juan C.; Chen, De.
TEM study of hydrotalcite derived Ni catalysts. EuropaCat IX: Catalysis for a Sustainable World; 2009-08-30 - 2009-09-04

Dehghan-Niri, Roya; Hansen, Thomas W.; Walmsley, John C; Holmen, Anders; Rytter, Erling; Holmestad, Randi.
Advanced TEM study of Co Fischer-Tropsch catalysts. InGap summer school; 2009-06-22 - 2009-06-26

Dehghan-Niri, Roya; Holmestad, Randi; Walmsley, John C; Holmen, Anders; Rytter, Erling; Hansen, Thomas W.
Advanced TEM study of Co Fischer-Tropsch catalyst. NanoMat meeting; 2009-06-15 - 2009-06-19

Dehghan-Niri, Roya; Walmsley, John C; Holmen, Anders; Midgley, Paul A.; Hungria, Ana B.; Hernandez-Garrido, Juan C.; Chen, De.
TEM study of hydrotalcite derived Ni catalysts. EuropaCat IX, Catalysis for a sustainable world; 2009-08-30 - 2009-09-04

Fossum, Jon Otto; Alme, Lars Ramstad; Hemmen, Henrik; Meheust, Yves.
Humidity Transport in Quasi One-Dimensional Na-Fluorohectorite Powders. 14th International Clay Conference: Session HE5: Moisture transport through clay; 2009-06-14 - 2009-06-20

Fossum, Jon Otto; Fonseca, Davi de Miranda; Meheust, Yves; Knudsen, Kenneth Dahl.
Phase Diagram of Polydisperse Na-fluorohectorite-Water Suspensions: A Synchrotron Small Angle X-Ray Scattering Study. 14th International Clay Conference: Session NM8: Self-assembly from Clay Particles: From Nano to Macro; 2009-06-14 - 2009-06-20

Fossum, Jon Otto; Hemmen, Henrik; Azevedo, Eduardo N.; Nielsen, C.A.; Magnus, Knut; Souza, R.; Engelsberg, Mario.
Rougness of Fracture Surfaces in a Model Nanosilicate Gel Determined from Magnetic Resonance Imaging. Symposium FF: Mechanical Behavior of Nanomaterials-Experiments and Modeling MRS Boston; 2009-11-30 - 2009-12-04

Glimsdal, Eirik; Westlund, Robert; Lindgren, Mikael.
Photo-physics of Platinum(II) acetylides in hybrid polymer organometallic nanomaterials. NTNU Nano-Lab Opening and 4th User Meeting; 2009-05-12 - 2009-05-14

Hansen, Elisabeth Lindbo; Azevedo, Eduardo N.; Meheust, Yves; Hemmen, Henrik; Kjelling, Bård Martin; Fossum, Jon Otto; Noh, Dong Young; Kim, Chan; Shasisdara, M; Wha, Cho; Engelsberg, Mario.
Liquid Crystalline Ordering In Gravitationally Settled And Evaporating Aqueous Dispersions Of Clay Nanoplatelets Studied By Small Angle X-Ray Scattering. 6th Nordic Workshop on Scattering from Soft Matter; 2009-01-28 - 2009-01-29

Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fossum, Jon Otto.
Magnetic field effects on liquid crystalline phases in the synthetic clay Na-Fluorohectorite studied by synchrotron SAXS. SAS 2009, XIV International Conference on Small-Angle Scattering; 2009-09-13 - 2009-09-18

Hansen, Elisabeth Lindbo; Ringdal, Nils I; Kjelling, Bård Martin; Hemmen, Henrik; Fossum, Jon Otto; Azevedo, Eduardo N.; Engelsberg, Mario; Meheust, Yves; Kim, Chan; Shasisdara, M; Wha, Cho; Noh, Dong Young.
Highly Ordered Nematic Phases and Emerging Positional Ordering of Nanosized Clay Platelets in Water. Symposium QQ: Responsive Gels and Biopolymer Assemblies MRS Boston; 2009-11-30 - 2009-12-04

Hansen, Elisabeth Lindbo; Ringdal, Nils I; Kjelling, Bård Martin; Hemmen, Henrik; Fossum, Jon Otto; Azevedo, Eduardo N.; Engelsberg, Mario; Meheust, Yves; Kim, Chan; Shasisdara, M; Wha, Cho; Noh, Dong Young.
SAXS Studies of Highly Ordered Nematic Phases in Aqeous Dispersions of Sodium-Fluorohectorite Nanodiscs. SAS2009, XIV International Conference on Small-Angle Scattering; 2009-09-13 - 2009-09-18

Hemmen, Henrik; Ringdal, Nils I; Azevedo, Eduardo N.; Hansen, Elisabeth Lindbo; Hager, M.; Meheust, Yves; Fossum, Jon Otto; Engelsberg, Mario; Knudsen, Kenneth Dahl.
Isotropic-Nematic Interfaces In Suspensions of Na-Fluorohectorite Synthetic Clay. 6th Nordic Workshop on Scattering from Soft Matter; 2009-01-28 - 2009-01-29

Holmestad, Randi; Olsen, Arne; Walmsley, John C.
Norwegian TEM environment sourcing out – NORTEM initiative needed. NanoMat Meeting; 2009-06-15 - 2009-06-19

Klein, Dionne; Latz, Eicke; Stokke, Bjørn Torger; Espevik, Terje.
Immunostimulatory CpG-DNA studied by AFM and FCS. 12th Carl Zeiss sponsored workshop on FCS and related methods; 2009-10-12 - 2009-10-16

Klein, Dionne; Øvrebø, Kirsti Marie; Latz, Eicke; Espevik, Terje; Stokke, Bjørn Torger.
Immunostimulatory CpG-DNA and its interaction with Toll-like receptor 9 investigated by AFM. International Scanning Probe Microscopy Conference; 2009-06-17 - 2009-06-19

Lacerda, Felipe G,; Mundim, Maria Suely Pedrosa; da Silva, Geraldo J.; Souza, Marcelo H.; Fossum, Jon Otto.
Studiesof water diffusion and intercalation in synthetic nanosilicates by means of EXAFS technique. Encontro Nacional de Física da Matéria Condensada (ENFMC) da Sociedade Brasileira de Física; 2009-05-11 - 2009-05-15

Le Roy, S; Søndergård, Elin; Plapp, Mathis; Brun, N; Nerbø, Ingar Stian.
The role Ga in the formation of nanostructures by ion sputtering on Ga-Sb Semiconductors. EMRS; 2009-06-08 - 2009-06-12

Leander, Eduard M.; Mundim, Maria Suely Pedrosa; da Silva, Geraldo J.; Souza, Marcelo H.; Fossum, Jon Otto.
Room Temperature studies of the relative humidity in synthetic clays by means of synchrotron XRD technique. Encontro Nacional de Física da Matéria Condensada (ENFMC) da Sociedade Brasileira de Física; 2009-05-11 - 2009-05-15

Leinaas, Jon Magne; Sollid, Per Øyvind; Myrheim, Jan.
Numerical and geometric studies of entanglement - Classification of lowest rank entangled PPT states in the 3x3-system. 2nd Vienna Symposium on the Foundations of Modern Physics: June 11-14 2009 – in honour of Daniel Greenberger and Helmut Rauch; 2009-06-11 - 2009-06-14

Lilledahl, Magnus Borstad; Skallerud, Bjørn Helge; Davies, Catharina De Lange.
Mechanical properties of tissue determined by multi-photon microscopy. Photonics West; 2009-01-24 - 2009-01-31

Lindgren, Mikael; Glimsdal, Eirik; Åslund, Andreas; Simon, Rosalyn; Hammarström, Per; Nilsson, K. Peter R. Detection and diagnostics of amyloidic protein aggregates using luminescent conjugated polymers. VIII European Symposium of the protein society; 2009-06-14 - 2009-06-18

Madessa, Habtamu Bayera; Nydal, Ole Jørgen; Løvseth, Jørgen.
Experimental Investigation on Rockbed for High Temperature Solar Thermal Storage. Solar world Congress 2009-Renewable Energy Shaping Our Future; 2009-10-11 - 2009-10-14

Matam, Santhosh Kumar; Hammer, Nina; Rønning, Magnus; Holmen, Anders; Chen, De; Walmsley, John C; Øye, Gisle.
The nature of active Cr species in Cr-cataysts for de-hydrogenation of propane: Neew insights by a compre-hensive spectoscopi study. EuropaCar IX: Catalysis for a Sustainable Wold; 2009-08-30 - 2009-09-04

Mehli, Hanne.
Verdensrommet. Forskningstorget 2009; 2009-09-25 - 2009-09-26

Mumm, Florian; Van Helvoort, Antonius; Sikorski, Pawel.
Structured, copper based superhydrophobic surfaces for digital microfluidics. NANOMAT conference 2009; 2009-06-16 - 2009-06-17

Nerbø, Ingar Stian; Foldyna, Martin; Kildemo, Morten; De Martino, Antonello; Le Roy, S; Søndergård, Elin.
Characterization of inclined GaSb nanopillars by angle resolved Mueller polarimetry. First NanoCharm Workshop on Advanced Polarimetric Instrumentation; 2009-12-07 - 2009-12-09

Plivelic, T; Rozynek, Zbigniew; Silva, Suedina M.L.; Wang, Bao-Xiang; Azevedo, Eduardo N.; da Silva, Geraldo J.; Fossum, Jon Otto.
Electric field manipulation of polymer nanocomposite morphologies. Maxlab 22nd Annual User Meeting; 2009-11-02 - 2009-11-04

Plivelic, T; Rozynek, Zbigniew; Silva, Suedina M.L.; Wang, Bao-Xiang; Azevedo, Eduardo N.; da Silva, Geraldo J.; Fossum, Jon Otto.
Electric field manipulation of polymer nanocomposite morphologies. SAS 2009, XIV International Conference on Small-Angle Scattering; 2009-09-13 - 2009-09-18

Plivelic, T; Silva, Suedina M.L.; Azevedo, Eduardo N.; da Silva, Geraldo J.; Rozynek, Zbigniew; Wang, Bao-Xiang; Fossum, Jon Otto.
Structural Changes in Polymer/Clay Melted Nanocomposites Induced by Electric Field: Synchrotron X-ray Studies of Structure Dynamics and Rheology. Symposium QQ: Responsive Gels and Biopolymer Assemblies MRS Boston; 2009-11-30 - 2009-12-04

Plivelic, T; Silva, Suedina M.L.; Rozynek, Zbigniew; Wang, Bao-Xiang; Azevedo, Eduardo N.; da Silva, Geraldo J.; Fossum, Jon Otto.
Structural Changes in Polymer/Clay Melted Nanocomposites Induced by Electric Fields. 14th International Clay Conference: Session NM7:Polymer-clay nanocomposites: preparation techniques and theoretical formulations; 2009-06-14 - 2009-06-20

Plivelic, T; Silva, Suedina M.L.; Rozynek, Zbigniew; Wang, Bao-Xiang; Azevedo, Eduardo N.; da Silva, Geraldo J.; Fossum, Jon Otto.
Structural changes in polymer/clay melted nanocomposites induced by electric fields. 6thNordic Workshop on Scattering from Soft Matter; 2009-01-28 - 2009-01-29

Psonka-Antonczyk, Katarzyna Maria; Akbari, Mansour; Otterlei, Marit; Krokan, Hans Einar; Stokke, Bjørn Torger.
Uracil-DNA glycosylase (UNG) interacting with mismatched DNA – a single molecule approach. European Biophysics Congress; 2009-07-11 - 2009-07-15

Rozynek, Zbigniew; Fossum, Jon Otto; Wang, Bao-Xiang; Castberg, R.; Måløy, Knut Jørgen.
Fast Speed Camera Imaging and Synchrotron X-ray Studies of Dynamic Structuring from Nano-layered Clay Particles. Symposium MM: Ultrafast Processes in Materials Science MRS Boston; 2009-11-30 - 2009-12-04

Rozynek, Zbigniew; Wang, Bao-Xiang; Plivelic, T; Fossum, Jon Otto.
X-ray Scattering Study of a Clay/Gelatine Hybrid Electrorheological Elastomer. Symposium QQ: Responsive Gels and Biopolymer Assemblies MRS Boston; 2009-11-30 - 2009-12-04

Santos, Marcus B.L.; da Silva, Geraldo J.; Souza, Marcelo H.; Fernandez, Paulo R.G.; Fossum, Jon Otto.
Self-similarity structures in clay gel samples induced by a controlable aging effect. Encontro Nacional de Física da Matéria Condensada (ENFMC) da Sociedade Brasileira de Física; 2009-05-11 - 2009-05-15

Skåre, Daniel; Weigand, Christian Carl; Ladam, Cecile; Vardøy, Astrid-Sofie Borge; Dahl, Øystein; Bergren, Matt; Fagerberg, Ragnar; Weman, Helge; Grepstad, Jostein; Furtak, Tom; Collins, Reuben.
Pulsed laser deposition of ZnO nanostructures for hybrid inorganic/organic solar cells. Renewable Energy R&D-seminar, OPV2009: PV-materials; 2009-03-19 - 2009-03-21

Sletmoen, Marit.
Single-molecule pair interactions of porcine submaxillary mucin with soybean agglutinin. The NANOMAT conference 2009; 2009-06-15 - 2009-06-19

Sletmoen, Marit; Dam, Tarun K; Gerken, Thomas A; Stokke, Bjørn Torger; Brewer, Curtis Fred.
Single-molecule pair interactions of porcine submaxillary mucin with soybean agglutinin. European Biophysics Congress; 2009-07-11 - 2009-07-15

Strand, Sabina P.; Berg, Lars S; Lelu, Sylvie; Davies, Catharina De Lange; Artursson, Per; Vårum, Kjell Morten.
Molecular design of chitosan gene delivery systems with an optimized balance between polyplex stability and unpacking. Congress of European Society of Gene and Cell Therapy; 2009-11-20 - 2009-11-25

Strandberg, Rune; Reenaas, Turid Worren.
Photofilling of Intermediate Bands. 24th. EUPVSEC; 2009-09-21 - 2009-09-25

Thomassen, Sedsel Fretheim; Reenaas, Turid Worren; Fimland, Bjørn-Ove; Vullum, Per Erik; Holmestad, Randi; Wang, Shumin; Sadeghi, Mahdad.
Material studies for quantum dot intermediate band solar cells. Euro MBE 2009; 2009-03-08 - 2009-03-11

Walle, Lars Erik; Blomquist, Jacob; Borg, Anne; Sandell, Anders.
Lithium insertion in anatase TiO_2 films on Si(111) Studied by Synchrotron based Photoelectron Spectroscopy. Synchrotron User Meeting, Lillehammer; 2009-06-19 - 2009-06-20

Walle, Lars Erik; Borg, Anne; Uvdal, Per; Sandell, Anders.
Experimental evidence for mixed dissociative and molecular adsorption of water on a rutile $TiO_2(110)$ surface without oxygen vacancies. 22nd Annual User Meeting, MAX-lab; 2009-11-02 - 2009-11-04

Wang, Bao-Xiang; Rozynek, Zbigniew; Hemmen, Henrik; Hansen, Elisabeth Lindbo; Fossum, Jon Otto.
Electrorheological Behaviour of Nematically Phase Separated Na-Fluorohectorite. 14th International Clay Conference: Session NM8: Self-assembly from Clay Particles: From Nano to Macro; 2009-06-14 - 2009-06-20

Wang, Bao-Xiang; Rozynek, Zbigniew; Hemmen, Henrik; Hansen, Elisabeth Lindbo; Fossum, Jon Otto.
Small Angle X-ray Scattering Studies of Double Responsive Co Doping TiOx Nanorods. 6th Nordic Workshop on Scattering from Soft Matter; 2009-01-28 - 2009-01-29

Wang, Bao-Xiang; Rozynek, Zbigniew; Zhou, M.; Fossum, Jon Otto.
Wide Angle Scattering Study of a Clay/Gelatin Electrorheological Elastomer. 14th International Clay Conference: Session NM7: Polymer-clay nanocomposites: preparation techniques and theoretical formulations; 2009-06-14 - 2009-06-20

Xie, Minli; Olderøy, Magnus Østgård; Strand, Berit Løkensgard; Andreassen, Jens-Petter; Sikorski, Pawel.
Alginate/$CaCO_3$ Composite Biomaterials. NTNU Nanolab Usermeeting 2009; 2009-05-12 - 2009-05-14

Xie, Minli; Olderøy, Magnus Østgård; Strand, Berit Løkensgard; Andreassen, Jens-Petter; Sikorski, Pawel.
Alginate/$CaCO_3$ Composite Biomaterials. NANOMAT conference 2009; 2009-06-16 - 2009-06-17

Yap, Seong Shan; Ladam, Cecile; Dahl, Øystein; Reenaas, Turid Worren.
Pulsed laser ablation and deposition of silicon. 10th International Conference on Laser Ablation, Singapore; 2009-11-22 - 2009-11-27

Zhou, Hailong; Dasa, Lakshmi Narayana; Hoang, Thang Ba; Anthonysamy, Fervin Moses; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Characterization of heterostructured III-V nanowires grown by molecular beam epitaxy. 4th NTNU Nanolab User Meeting; 2009-05-13

Øpstad, Christer Lorentz; Partali, Vassilia; Sliwka, Hans-Richard; Melø, Thor Bernt.
The secret properties of DMF and DMSO. organisk kjemisk vintermøte; 2009-01-08 - 2009-01-11

Popular Scientific Talks (total 8)

Andersen, Jens Oluf.
Verdsrommet – svarte hol. Etterutdanning for lærarar i VgS; 2009-02-03 – 2009-02-03

Bungum, Berit.
Kunnskap og kreativitet i oppfinnelser og vitenskap. Videreutdanningskurs: Teknologi og entreprenørskap; 2009-02-25 – 2009-02-26

Fossheim, Kristian.
Fakta og refleksjonar om Darwin og hans lære, med 150 års etterfølgjande utvikling. Forelesing; 2009-09-09 – 2009-09-09

Fossheim, Kristian.
Fysikkens bidrag til medisinsk utvikling i det siste hundreåret. Foredrag; 2009-02-13

Iversen, Tor-Henning; Johnsson, Anders; Solheim, Bjarte Gees Bokn.
Hvem hadde rett om planters circumnutasjoner - Charles Darwin eller Anders Johnsson, NTNU ? - Et innblikk i resultater fra et plante-eksperiment på Den Internasjonale Romstasjonen. Seminar; 2009-11-05 - 2009-11-05

Iversen, Tor-Henning; Solheim, Bjarte Gees Bokn; Johnsson, Anders.
Darwin and The International Space Station: Gravity amplifies Arabidopsis thaliana circumnutations. ESA Minisymposium; 2009-02-19 - 2009-02-20

Iversen, Tor-Henning; Solheim, Bjarte Gees Bokn; Johnsson, Anders.
Darwin og bevegelser hos planter: Har tyngdekraften betydning for sirkelbevegelser ? - Resultater fra et forsøk på Den Internasjonale Romstasjonen. Kurs i Romteknologi II; 2009-05-05 - 2009-05-05

Samuelsen, Emil J.
"Grafen - meir enn ei skive grafitt". Torsdagsseminar; 2009-03-05 - 2009-03-05

PHYSICS PRESENTATION THROUGH MEDIA

Hunderi, Ola.
Mellom himmel og jord, NRK P1. NRK, P1 1.11.09

Hunderi, Ola.
Murphys lov fyller 60 år. NRK P3 13.1.09

Leganger, Lars Erlend.
Uillustrert Vitenskap. Radio Revolt, Studentradioen i Trondheim. 13.10.09

Okkenhaug, Knut; Espy, Patrick Joseph.
Når himmelen spiller lysorgel. Ukeadressa (Adresseavisen) 24.12.09

Samuelsen, Emil J.
Kvantemedisin - "ein fiende av fornuft". Dag og Tid 17.4.09

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* Chalmers tekniska högskola (Maj Hanson, Janusz Kanski) Teknisk fysik.
* University of Aarhus (Philip Hoffman)
*Department of Physics, Uppsala University, (Roland Mathieu, Per Nordblad), Sweden

Walmsley, J.:
* Cambridge University, Cambridge, UK
(P. Midgley)

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)

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

Fossum, J.O.:
* Universidade Federal de Pernambuco, UFPE, Recife, Brazil (Prof. Mario Engelsberg and Prof. Ricardo Souza)
* LNLS, Campinas, Brazil (Dr. Roosevelt Droppa)
* University of Brasilia, UnB, Brasilia, Brazil (Prof. Geraldo Jose da Silva and Prof. Kleber Mundim)
*Universidade Federal de Campina Grande, UFCG-PB Brazil (Prof. Suedina Silva)

Hansen, A.:
* Univesitade Federal do Ceara, Fortaleza, Brazil (Soares)

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

Høye, J.S.:
* Stony Brook University, New York, USA. (G. Stell), Theoretical Physics
* Oklahoma University, Norman, Oklahoma, USA (K. A. Milton), Theoretical Physics

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

Matheisen, R.:
* University of Iowa, USA, (C. Beckermann)

Skagerstam, B.S.:
* University of Florida, USA (J.R. Klauder)
* Syracuse University, N.Y., USA (A.P. Balachandran).
* Temple University, P.A., USA (P.S. Riseborough).

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).

Støvneng, J.A.:
* Pennsylvania State University, USA (A. C. T. van Duin)

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.:
* Argonne national laboratory, Chicago, (Matthias Bode) USA.

ASIA

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)
*Xuzhou Noral University, China (Prof. Zhou Min)

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)
*Tokyo Institute of Technology, Tokyo, Japan (T. Sato)
*Tokyo National College of Technology, Tokyo, Japan (Nagayoshi)

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

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

Naqvi, K.R.:
* Yarmouk University, Irbd, Jordan (Y.A. Yousef)
* Department of Chemistry, Kyoto University, Japan (A. Osuka)
* People's University of China, Beijing (J.-P-Zhang)
* Institute of Botany, Chinese Academy of Sciences (C. Yang)

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).
* Institute of Theoretical Physics, University of Stellenbosch, South Africa (F.G. Scholtz)

Stokke, B.T.:
* Osaka Prefecture Univ., Osaka, Japan (S. Kitamura), Biophysics
* Institute of Biomaterials and Bioengineering, Tokyo Medical and Dental University, Tokyo, Japan (K. Akiyoshi) Biophysics.

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

Wahlström, E:
* Department of physics, Fudan University Shanghai (Shiming Zhou) China.

AUSTRALIA

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

Skagerstam, B.S.:
* Department of Physics and Astronomy University of Canterbury, Christchurch, New Zealand (Dr Dharamvir Ahluwalia).

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)
* 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, 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 (C. Marioara, S. Andersen, B.S. Tanem, R. Fagerberg, S. Pradhan, R.M. Holt)
* 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)
* 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)

EDUCATION

SUBJECTS AND STUDENT ATTENDANCE

Some subjects were self-study courses in 2009

Subjects		*Student Attendance*
MSc Technology 1st and 2nd year		
TFY4102	Physics for Product Design Engineering, Marine Technology, Earth Sciences and Petroleum Engineering (incl. lab)	258
TFY4104	Physics for Product Design and Manufacturing (incl. lab)	174
TFY4106	Physics for Civil and Transport Engineering, Industrial Economics and Technology Management (incl. lab)	230
TFY4115	Physics for Electronics Engineering, Engineering Cybernetics, Nanotechnology	171
TFY4120	Physics for Chemical Engineering and Biotechnology, Materials Science and Engineering (incl. lab)	115
TFY4125	Physics for Computer Science, Communication Technology	223
TFY4145	Mechanical Physics (incl. lab)	103
TFY4155	Electromagnetism (incl. lab)	110
TFY4160	Wave Physics (incl. lab)	94
TFY4165	Thermal Physics (incl. lab)	116
TFY4180	Physics for Energy and Environment (incl. lab)	137
TFY4215	Chemical Physics and Quantum Mechanics	122
TFY4330	Nano Tools	24
TFY4335	Nano Life Science	26
MSc Technology 3rd year		
TFY4170	Physics 2 for Electronics Engineering	53
TFY4185	Measurement Techniques (incl. lab)	77
TFY4190	Instrumentation (incl. lab)	48
TFY4195	Optics (incl. lab)	81
TFY4205	Quantum Mechanics	44
TFY4230	Statistical Physics	82
TFY4240	Electromagnetic Theory	64
TFY4250	Atomic and Molecular Physics	77
TFY4260	Cell Biology and Cellular Biophysics (incl. lab)	22
MSc Technology 4th year		
TFY4200	Optics, Advanced Course (incl. lab)	8
TFY4210	Applied Quantum Mechanics	9
TFY4220	Solid State Physics (incl. lab)	48
TFY4225	Nuclear and Radiation Physics (incl. lab)	38
TFY4235	Computational Physics	24
TFY4245	Solid State Physics, Advanced Course	13
TFY4255	Materials Physics (incl. lab)	5
TFY4275	Classical Transport Theory	3
TFY4280	Signal Processing (incl. lab)	13
TFY4292	Quantum Optics	6
TFY4300	Energy and Environmental Physics	48
TFY4305	Non-linear Dynamics	16
TFY4310	Molecular Biophysics (incl. lab)	7
TFY4315	Biophysics (special)	4
TFY4320	Medical Physics (incl. lab)	15
TFY485x	Experts in Team, Interdisciplinary Project	59

MSc Technology 5th year

TFY4265	Biophysical Micromethods (incl. lab)	10
TFY4500	Biophysics, Specialization Project	5
TFY4505	Biophysics, Specialization Course	5
TFY4510	Physics, Specialization Project	26
TFY4515	Physics, Specialization Course	14
TFY4900	Physics, Master's Thesis	35

BSc

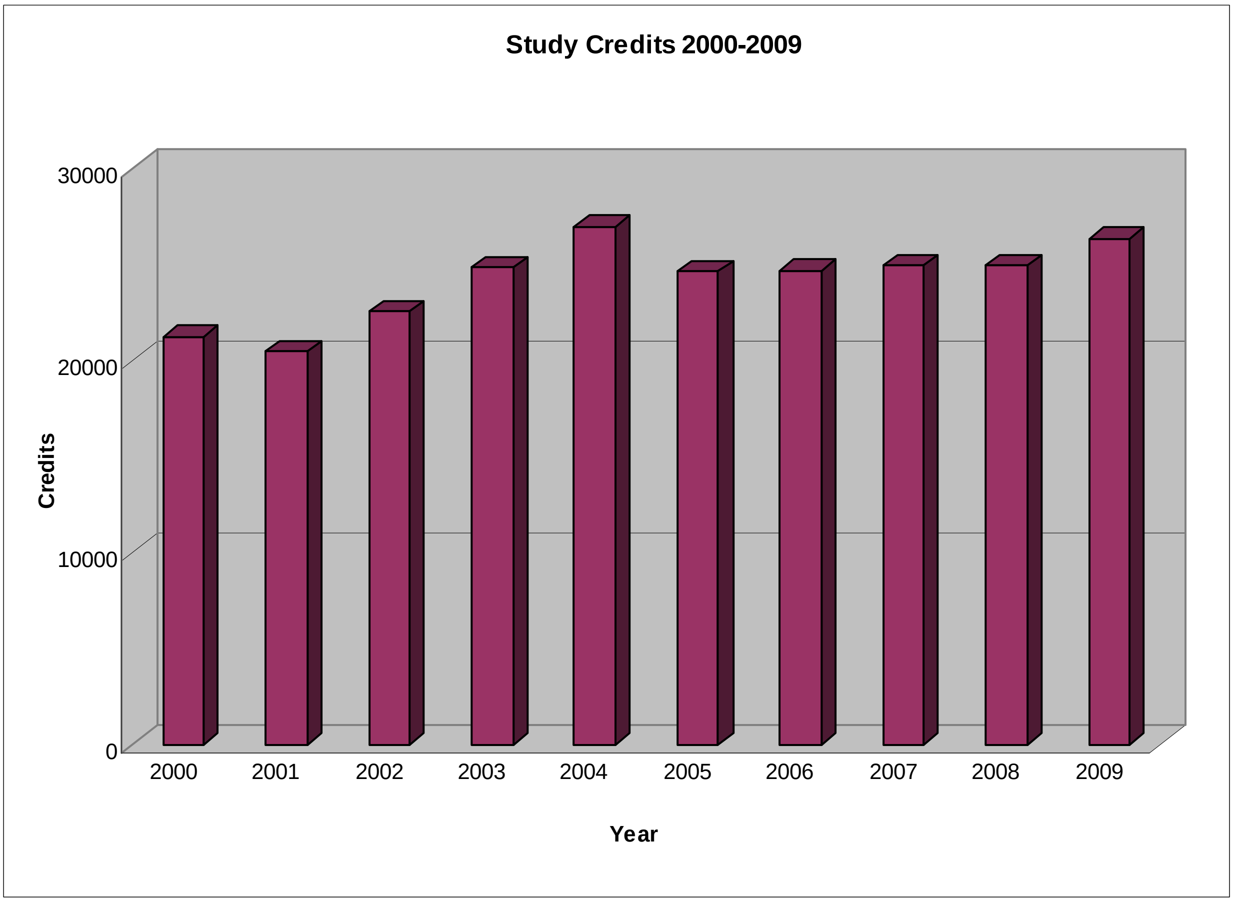
FY0001	Service Course in Physics (incl. lab)	48
FY1001	Mechanical Physics (incl. lab)	71
FY1002	Wave Physics (incl. lab)	33
FY1003	Electricity and Magnetism (incl. lab)	46
FY1005	Thermal Physics (incl. lab)	21
FY1006	Introduction to Quantum Physics	16
FY2045	Quantum Physics	15
FY2302	Biophysics (incl. lab)	13
FY2450	Astrophysics	24

MSc

RFEL3092	Research Methods in Science	20
FY2290	Energy Resources	17
FY3006	Sensors and Transducers	5
FY3114	Functional Materials	19
FY3201	Atmospheric Physics and Climate Change	19
FY3402	Subatomic Physics	15
FY3452	Gravitation and Cosmology	11
FY3464	Quantum Field Theory I	13
FY3466	Quantum Field Theory II	10
FY3900	Master Thesis in Physics	6

PhD

FY8102	Electron Microscopy and Diffraction	3
FY8104	Application of Symmetry Groups in Physics	11
FY8105	Superconductivity: Physics and Technology	2
FY8201	Nanoparticle and Polymer Physics	2
FY8302	Quantum Theory of Solids	5
FY8407	Magnetic Resonance Imaging	1
FY8503	Advanced Theoretical Physics	4
FY8902	Atmospheric Physics and Climate Change	3
FY8904	Computational Physics	7
FY8905	Materials Physics	9
FY8907	Classical Transport Theory	2
FY8908	Quantum Optics	1



Study Credits 2000-2009
30000
20000
10000
0
Credits
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Year

THESES – GRADUATE STUDIES

Master of Science in Technology – Applied Physics and Mathematics

Aksnes, Aleksander Eikenes
Degradation of XLPE and PEEK under High Pressure by Partial Discharges
Supervisor: Erik Wahlström / Gunnar Berg

Christensen, Ole Martin
Atmospheric Dynamics over Antarctica Studied by the Use of a Microwave Radiometer
Supervisor: Patrick Espy

Dørheim, Sverre
Track Reconstruction in a Setup for the Characterization of a GEM-TPC at ELSA
Supervisor: Michael Kachelriess / Bernhard Ketzer

Eiesland, Jon Wostryck
Communities in a Large Social Network - Visualization and Analysis
Supervisor: Alex Hansen / Kimmo Kaski

Ekroll, Ingvild Kinn
Light Induced Cell Death in the Cancer Cell Line AY-27: Modes of Cell Death after Red-Light Hexylaminolevulinate Photodynamic Therapy and Effects of Fractionated Light Delivery
Supervisor: Anders Johnsson

Enoksen, Henrik
Theoretical and Numerical Studies of Diffractive Scattering of Polarized Light from a Relaxing Periodic Nanostructured Highly Viscous Fluid Surface
Supervisor: Asle Sudbø

Farstad, Mari Helene
Atomic Force Microscopy Studies of Wool Fibre Structures
Supervisor: Dag Breiby

Feness, Kristine
Temperature Induced Cell Death in the Bladder Cancer Cell Line AY-27 and Effects of Combined Hyperthermia and Photodynamic Treatment
Supervisors: Anders Johnsson and Thor Bernt Melø

Flatøy, Guro
High Accuracy Optical Power Measurements - Using Silicon Photodetectors as Primary Standards
Supervisor: Berit Kjeldstad / Jarle Gran

Hansen, Kristin Karthum
A Study of 1998-2008 Brewer Mk V Spectrophotometer UV-Measurements in Oslo
Supervisor: Berit Kjeldstad / Arne Dahlback

Hansen, Ole Martin
Wave Scattering and Transmission from Penetrable Self-Affine Surfaces
Supervisor: Ingve Simonsen

Haukås, Solveig
Optimization of IMRT Plans for Head and Neck Cancer
Supervisor: Tore Lindmo / Jomar Frengen

Holmestad, Jon
High-Temperature Stability of Al-Mg-Si Alloys
Supervisor: Randi Holmestad

Horvli, Mari Ellefsen
Crystal Defect Studies of Silicon for Solar Cells – Scanning and Transmission Electron Microscopy
Supervisor: Randi Holmestad

Jakobsson, Lars Klemet
A Study about the Effect of Burnup Tilt in Fuel Assemblies on Power Distribution Calculations of Light Water Reactor Cores
Supervisor: Kåre Olaussen / Makoto Tsuiki

Kapelrud, Andre
A Scanning Tunneling Microscope for Point Contact Investigations of Magnetodynamics in FeMn/FeNi Bilayers
Supervisor: Erik Wahlström

Kristoffersen, Jørgen
Synchronization of Pulse-Coupled Oscillators
Supervisor: Ingve Simonsen

Kvanes, Kirsti
Modeling of Intermediate Band Solar Cells
Supervisor: Turid Worren Reenaas

Langdal, Ingrid
Dosimetry and Evaluation of Algorithm for Inverse Optimized Doseplanning for Brachytherapy
Supervisor: Tore Lindmo / Anne Dybdahl Wanderås

Lund, Halvor
Epidemic Spreading on Complex Networks: A Reaction-Diffusion Approach
Supervisor: Ingve Simonsen

Marskar, Robert
Nonlinear Vibration-Rotation Modes of Inviscid Droplets
Supervisor: Johan Høye / Iver Brevik

Myhre, Frøydis Johanne Nystedt
2D Fourier Analysis of Stress-Induced Changes in Collagen Structure
Supervisor: Catharina Davies / Magnus Lilledahl

Nilsen, Emil Nygaard
Controlled Humidity and Temperature Sample Cell for X-Ray Scattering on Textile Samples
Supervisor: Dag Breiby

Norum, Ole Christian
Monte Carlo Simulation of Semiconductors - Program Structure and Physical Phenomena
Supervisor: Jon Andreas Støvneng / Trond Brudevoll

Oftedal, Gaute
Towards a DFT-Based Reactive Force Field for Lead, Strontium, Titanium and Oxygen
Supervisor: Jon Andreas Støvneng

Olsen, Øyvind
Construction of a Transport Kernel for an Ensemble Monte Carlo Simulator
Supervisor: Jon Andreas Støvneng / Trond Brudevoll

Olsen, Kjetil Tesaker
Towards a DFT-Based Reactive Force Field for Strontium, Lead, Titanium and Oxygen
Supervisor: Jon Andreas Støvneng

Resell, Martin
Studies of Precipitates in an Al-Mg-Si-Ge Alloy
Supervisor: Randi Holmestad

Rypestøl, Marianne
Casimir Effect in Randall-Sundrum Models
Supervisor: Johan Høye / Iver Brevik

Smedsrud-Halvorsen, Guro
In Vivo Comparison of Bone Densitometry
Supervisor: Tore Lindmo / Arnulf Langhammer

Stormo, Arne
Integration of Numerical Calculations in Basic Physics Courses
Supervisor: Alex Hansen, Jon Andreas Støvneng, Ingve Simonsen

Syversen, Øivind Brodal
Modern Enrichment Technologies and New Fuel Options: Consequences for Non-Proliferation Aspects Associated with Future Nuclear Industry
Supervisor: Ingve Simonsen / Jon Samseth

Vardøy, Astrid-Sofie Borge
Growth and Characterization of ZnO Thin Films to be utilized in Organic/Inorganic Solar Cells
Supervisor: Ton van Helvoort / Helge Weman

Viggen, Erlend Magnus
The Lattice Boltzmann Method with Applications in Acoustics
Supervisor: Alex Hansen / Ulf Kristiansen

Aas, Lars Martin Sandvik
Mueller Matrix Ellipsometric Imaging; Instrumentation and Applications
Supervisor: Morten Kildemo

Master of Science in Physics

Eriksen, Martin Børstad
Dark Energy from Quantum Gravity
Supervisor: Kåre Olaussen

Kryvi, Jacob Berent
Time Dependent Study of Quantum Dots
Supervisor: Jon Andreas Støvneng

Mellingsæter, Magnus Strøm
Hva kan animasjoner bidra med i fysikkundervisning? En litteraturstudie og en kasusstudie fra forkurs til ingeniørutdanning
Supervisor: Berit Bungum

Morgenstierne, Ole Henrik von Munthe af
Universets utvikling
Supervisor: Jens Oluf Andersen

Stiansen, Einar Bertin
Non-Universal Critical Exponents of a Generalized Ashkin-Teller model
Supervisor: Asle Sudbø

Wahl, Andreas Solberg
Kan du velge fysikk uten å vite hva det er? En undersøkelse av fysikkens posisjon i naturfaget
Supervisor: Berit Bungum

Master of Science in Condensed Matter Physics

Sah, Hari Kishor
Surface Studies of As-Cut Silicon for Solar Cells
Supervisor: John Walmsley

Yadav, Ram Narayan
Investigation of Dose Distributions in Inhomogeneous Media, A Phantom Study of Lung Cancer Radiotherapy Comparing Results From Dose Planning Algorithms with Film Dosimetry
Supervisor: Tore Lindmo

Master of Science in Medical Technology – Biophysics and Medical Physics

Denjean, Benjamin
FRET Probes for cAMP/pKA Cascade Imaging in Striatal Neurons
Supervisor: Catharina Davies / Pierre Vincent

Master of Science in Science Education

Ingvaldsen, Morten
Weakly Interacting Bose Gasses at Low Temperatures. A Study of Bose-Einstein Condensation by use of Effective Field Theory
Supervisor: Jens Oluf Andersen

Jensen, Kari Alvilde
Optimization of ReaxFF Forcefield Parameters for Germanium
Supervisor: Jon Andreas Støvneng

THESES - DOCTORAL STUDIES

Andresen, Christian André. *Properties of fracture networks and other network systems.*
Supervisor: Alex Hansen

Bagheri, Asadollah. *Ground-Based UV Measurements, Aerosol Effects on UV Radiation.*
Supervisor: Berit Kjeldstad

Glimsdal, Eirik. *Spectroscopic charaacterization of some platinum acetylide molecules for optical power limiting applications.*
Supervisor: Mikael Lindgren

Linder, Jacob. *Quantum transport and proximity effects in unconventional superconducting hybrid systems.*
Supervisor: Asle Sudbø

Nordmark, Heidi. *Microstructure studies of silicon for solar cells – Defects, impurities and surface morphology*.
Supervisor: Randi Holmestad

Ramachandran, Amutha. *Surface studies of palladium based membranes and model systems.*
Supervisor: Anne Borg

Reitan, Nina Kristine. *Methods for studying critical barriers to the delivery of nanomdeicine – The potential of fluorescence correlation spectroscopy, confocal microscopy and MRI.*
Supervisor: Catharina de Lange Davies

Skadsem, Hans Joakim. *Transport and Magnetisation Dynamics in Ferromagnetic Nanostructures.*
Supervisor: Arne Brataas

Solheim, Bjarte Gees Bokn. *Oscillatory, ultradian movements in Arabidopsis – Biophysical studies of rhythms in plants onboard the International Space Station and on Earth.*
Supervisor: Anders Johnsson

Stabo-Eeg, Frantz. *Development of instrumentation for Mueller matrix ellipsometry.*
Supervisor: Mikael Lindgren

Svenum, Ingeborg-Helene. *Interactions of Functional Groups with Surfaces.*
Supervisor: Anne Borg

Tierney, Sven. *Development and Characterization of Bioresponsive Hydrogel Materials.*
Supervisor: Bjørn Torger Stokke

Tollefsen, Henrik. *Surface properties of Ce and K doped transition metal systems.*
Supervisor: Steinar Raaen

Tucho, Wakshum Mekonnen. *Self-supported, thin Pd/Ag membranes for Hyudrogen separation – Microstructure and permeation studies.*
Supervisor: Randi Holmestad

Walle, Lars Erik. *Surface science studies of TiO_2 single crystal systems.*
Supervisor: Anne Borg

PARTICIPATION IN COMMITTEES

Evaluation committees:

Andersen J.O:
Opponent for PhD thesis of Tomi Paananen, Technical University of Helsinki, May 2009.

Bungum, B.:
* Member of PhD evaluation committee (3rd opponent) for Rodrigo Vicente de Miguel de Juan, Faculty of Information Technology, Mathematics and Electrical Engineering, Department of Electronics and Telecommunications, NTNU. February 2009.

Davies C. de L.;
* Opponent for PhD thesis of Lasse Evensen, Dept of Biomedicine, University of Bergen, October 2009
* Evaluation committee for application on infrastructure to the regional health authorities Helse Sør-Øst

Espy, P.:
* Member UNIS advisory committee for Arctic Geophysics, 2009.

Fossum, J. O.:
***** Administrator for the PhD defence of Henrik Tollefsen, NTNU

Hansen, A.:
*Opponent for PhD defence by Tuomas Tallinen, University of Jyväskylä, Finland, December, 2009.

Holmestad, R.:
* Opponent for PhD defence Johan Börjasson, Chalmers University of Technology, Sweden, March 2009.
*External evaluator for Christian Doppler Laboratory ‘Early stages of precipitation’, Vienna/Leoben, Austria, September 2009.
*Evaluation committee for professorship at UMB, Ås, September 2009.
*Administrator for PhD defence of Egil Fjeldberg, Materials Science and Engineering,, NTNU, March 2009 and Liyuan Deng, Chemical Engineering, NTNU, October 2009.

Johnsson, A.:
***** Opponent at PhD defence Ane V. Vollsnes (thesis: “Biophysical aspects of root growth dynamics and leaf responses to environmental stimuli: spectral, temporal and spatial investigations”). University of Life Sciences, Ås, Norway. January 2009.

Skagerstam, B.S.:
***** Administrator of Ph.D. exam evaluation committee on a thesis in physics, Department of Physics, Norwegian University of Science and Technology, Norway, January 30:th, 2009.

International committees

Borg, A.:
* Member of the ”Beredningsgrupp 2” under the Committee of Research Infrastructure (KFI), The Swedish Research Council, Sweden.
* Member of the IUPAP (International Union of Pure and Applied Physics) Working Group on Women in Physics.
* Member of the board of MAX-lab, Lund University, Sweden.
* Member of the board of The Nanometer Consortium, Lund University, Sweden.
* Member of the evaluation committee for strategic research grants in Materials Science, Swedish Foundation for Strategic Research.

Brataas, A:
* Member of the International Union of Pure and Applied Physics (IUPAP), Commision on Quantum Electronics.

Bungum, B.:
* Editor of scientific journal NorDiNa (Nordic Studies in Science Education).
* Member of evaluation committee for contributions to ESERA conference, Istanbul, Turkey, September 2009.

Fossum, J. O.:
* Member of Physics panel of The Foundation for Science and Technology in Portugal: FCT - Fundacao para a Ciencia e a Tecnologia; Ministeiro Ciencia, Tecnologia e Ensino Superior, Portugal (Portuguese Research Council)) for deciding Physics grants in Portugal
* Member of an evaluation panel of for the Swedish Research Council for a
senior Research Position in experimental soft matter physics
* Convener of Session NM8: Self-assembly from Clay Particles: From Nano to Macro, at 14th International Clay Conference, Castellaneta M., Italy, June 14-20, 2009
* In the Scientific Committee of 14th International Clay Conference, Castellaneta M., Italy, June 14-20, 2009

Hansen, A.:
* Secretary to the Board of European Physical Society's Computational Physics group.
*Member of the International Union of Pure and Applied Physics (IUPAP), Commission of Computational Physics (C20).
*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

Holmestad, R.:
* Member of the board of theNordic microscopy society, SCANDEM.

Kachelriess, M.:
* Member of the steering committee of "ISAPP: International School on AstroParticle Physics European Doctorate School".
* Chair of the scientific and of the local organizing committee for the workshop ''Searching for the Origins of Cosmic Rays'', Trondheim 2009.

Kjeldstad, B.J.:
***** Member of World Meteorological Organisation, Scientific advisory Group for Ultraviolet Radiation measurements (WMO UVSAG).

Stokke, B.T.:
* Editorial Advisory Board – Biopolymers (Wiley).
* Member of administrative group of NORDTEK
* Member of Administrative Council of SEFI.
* Board of Directors, CESAER.
* Core expert, study program accreditation in Nanoscience and Applied Physics, ACE Denmark
* Research application reviewer, Swiss National Science Foundation (SNSF), Sinergia.

A. Sudbø:
*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

Andersen, J.O.:
* Member of the board of the group for subatomic and astrophysics in the Norwegian Physical Society.

Borg, A.:
* Chair of "Programme for Synchrotron Research", Research Council of Norway.

Brataas, A.:
* Member of "Ressursfordelingskomiteen for tungregning", Norwegian Research Council.

Bungum, B.:
* Member of the board for "Nasjonalt nettverk for naturfagutdanning" (National network for science education).
* Member of committee for proposing in-service teacher education in engineering colleges, organised by the National council for technological education.

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

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

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

Johnsson, A.:
* Member of steering group (Norwegian Defence Research Establishment) for project: "Electromagnetic fields and human reproduction health" (Univ. of Bergen).

Kjeldstad, B.J.:
* Member of advisory board of Sintef, Material and Chemistry
* Member of the Board of University of Svalbard

Lindmo, T.:
* Chairman of Norwegian national committee for the evaluation of professor competence in physics.

Stokke, B.T.:
* Chairman of the board (to summer 2009), Board member (from summer 2009), NANOMAT Research Program, The Norwegian Research Council
* Chairman, National council for technological education, The Norwegian Association of Higher Education Institutions (to nov 2009)
* "Publiseringsutvalget", The Norwegian Association of Higher Education Institutions.

Sudbø, A.:
*Member, National Working Group for FUNMAT.

University and Departmental committees

Andersen J.O.:
* Organizer of Friday Colloquia at the Department of Physics.

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".

Brataas, A.:
* Chairman of the board of "Realfagsbiblioteket".

Breiby, D.W.
* Elected member of the Departmental Board.

Bungum, B.:
* Member of the board for "Programråd for Lærerutdanning i Realfag"

Davies, C. de L.:
* Director of NTNU's Strategic Area of Medical Technology.
* Member of the program committee in Bioinformatics.

Holmestad, R.:
* Chair/co-chair of the TEM Gemini Centre .
* Chairman, "Studieprogramråd for MSc Condensed Matter Physics".
* Member of Faculty of Natural Science and Technology (NT) board (from August).
*Member of NTs 'Forskningsutvalg' (from August).
*Member of NTs 'Ansettelsesutvalg' (from August)
*Deputy Department head (Research), Department of Physics (from August).
*Chairman 'Formidlingsutvalget', Department of Physics (from August).

Johnsson, A.:
* Member, board of the Faculty of Natural Science and Technology (until August).
* Member of "Committee for Space Science activities at NTNU".

Kjeldstad, B.:
* Head of the Department of Physics (until August).
* Member, board Geminisenter for PV materials
* Member, board TEM Geminisenter
* Member of NT leadergroup

Lindgren, M.:
* Chairman, Division of Applied Physics and Didactic 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

Olaussen, K.:
* Deputy Head of the Department of Physics.
* Member "Forskningsutvalget", Faculty of Natural Science and Technology.

Reenaas, T.W.:
* Member leader group "Senter for fornybar energi"
* Member leader group "Gemini Centre Solar Cell Materials"
* Member, "Studieprogramråd for MSc Condensed Matter Physics and Biophysics".

Sikorski, P.:
* Acting chairman of detail planning committee for the bionanotechnology clean room, NTNU Nanolab.
* Member, Ledergruppen NTNU Nanolab.

Stokke, B.T.:
* Chairman of the board, NTNU Nanolab, NTNU.
* Dean of Engineering Education, NTNU; Chairman of the executive committee of engineering education, NTNU (FUS) (to 1st of Augusts 2009).

Støvneng, J.A.:
* Chairman, "Undervisningsutvalget ved institutt for fysikk".
* Member, "Studieprogramråd for MSc Fysikk og matematikk"

Sudbø, A.:
* Chairman, Division of Theoretical Physics (until A.ugust)
* Head of the Department of Physics (from August).

Wahlstrøm, E.:
* Acting director/ Director NTNU NanoLab
* Chairman, Division of Condensed Matter Physics
* Member, "Studieprogramråd for nanoteknologi".

Øverbø, I.:
* Chairman, "Studieprogramrådet for Realfag".

Arrangement committees:

Brataas, A.:
***** Chairman, Biannual meeting of the Norwegian Physical Society, Røros, August 12-14, 2009.
***** Chairman, Spin-Up 2009, Longyearbyen, May 31st-June 4, 2009.

Breiby, D.W.:
* Co-organizer of the biannual meeting of the Norwegian Physical Society, Røros, 12-14 August 2009

Bungum, B.:
* Member of program committee for the NKUL conference 2009.

Davies, C. de L.:
* Main organizer of the symposium "Trends and Needs in Medical Technology and Health Care" organized by the Strategic Area of Medical Technology, at NTNU, November 5-6, 2009.

Fossum J.O.:
* In organizing committee of Bi-annual meeeting of the Norwegian Physical Society Røros, Norway, August 12-14, 2009

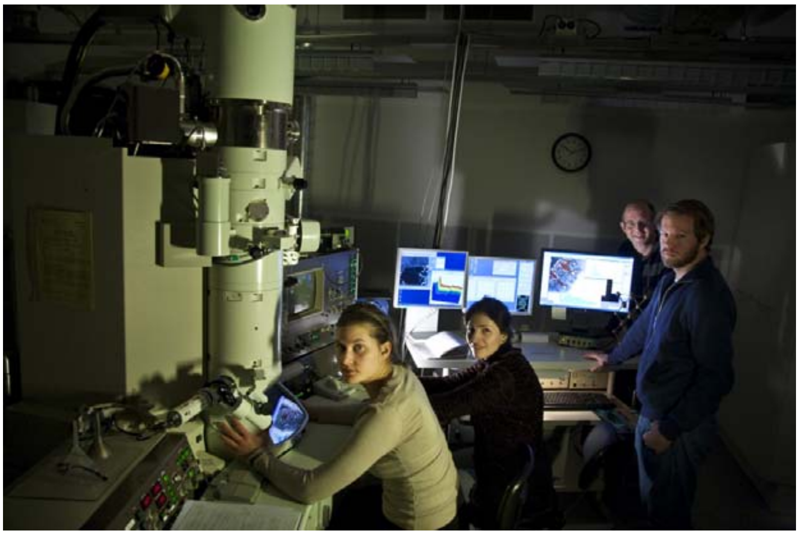
Hansen, A.;
*Member of International Scientific Committee of CCP2009, Taiwan.

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:
* Program committee Nordic Microscopy Meeting.

Olaussen, K.:
* Organizer of symposium on Iver Breviks 70th birthday.

Reenaas, T.W.:
* Organizer national workshop "Oppdal Photovoltaic", March 2010.



Fra TEM-laben.
Foto: Thor Nielsen

FRIDAY COLLOQUIUM - "Fredagskollokviet i fysikk"

Convenors: Johan Skule Høye and Arne Mikkelsen (spring)
Razi Naqvi and Jens Oluf Andersen (autumn)

Programme – spring term

6. February, Jens Oluf Andersen, Inst. for fysikk, NTNU: "Fasediagrammet i QCD (Quantum chromodynamics)."

13. February, Morten Hjorth-Jensen, Fysisk institutt, UiO: "Datamaskiner i realfagsopp-læringen, en ny måte å undervise realfag på?"

20. February, Are Korneliussen, Norges geologiske undersøkelse, Trondheim: "Elektrisk-puls fragmentering av stein."

27. February, Alex Hansen, Inst. for fysikk, NTNU: "Om nanovitenskap rundt 1900."

6. March, Arne Valberg , Inst. for fysikk, NTNU: "Fargesyn: fra Leonardo da Vinci, via Edwin Land til nevrovitenskap".

13. March, Knut Jørgen Måløy, Fysisk institutt, UiO: "Pattern formation: Building mazes with grains".

20. March, Margrethe Wold, Inst. teoretisk astrofysikk, Universitetet i Oslo: "Supermassive black holes in galaxies".

27. March, Bruce Patterson , Paul Scherrer Institut, Villigen, Sveits: "The X-Ray Free Electron Laser Project at PSI: Fundamentals, Implementation and Possible Applications".

24. April, Erik Alfsen, Matematisk institutt, UiO: "I suppose there is no problem. But I am not sure there is no problem. So that is why I want to investigate things" (Richard Feynman). Om grunnlagsproblemer i kvantemekanikken.

15. May, Johannes Skaar, Institutt for Elektronikk og telekommunikasjon, NTNU: "Kvantekryptografi, kvantehacking og sikkerhet".

Programme – autumn term

4. September, Asle Sudbø, Institutt for Fysikk, NTNU: "Novel quantum fluids in cold compressed hydrogen".

11. September, Bjørn Angelesen, Biomed. teknikk, Medisinsk fakultet/Ultralyd, NTNU: "SURF - en ny metode for ultralyd måling og avbildning".

25. September, Michael Gausa, Director for Science and Technology Andøya Rocket Range: "Lidar Technologies at ALOMAR on Andøya Island challenging research in all atmosphere layers".

16. October, Helge Kragh, Århus Universitet: "When Cosmology became a branch of physics: The period 1945-1966".

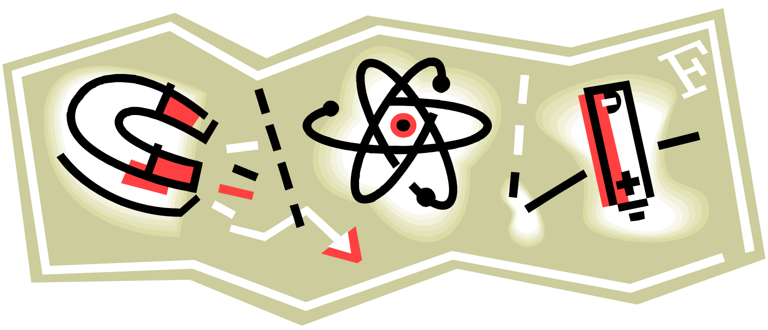
23. October, Kristian Fossheim, NTNU: "Fakta og refleksjonar om Darwin og hans lære, med 150 års etterfølgjande utvikling".

13. November, Mats Carlsson, Institute of Theoretical Astrophysics, University of Oslo: "The Sun, our closest star".

20. November, Signe Kjelstrup, Institutt for kjemi, NTNU: "Bringing thermodynamics to the nanolevel".

27. November, Johan Moan, University of and Oslo University Hospital: "Solar radiation, skin colour and cancer".

4. December, Kjell Bløtekjær, Institutt for elektronikk og telekommunikasjon, NTNU: "Nobelprisen i Fysikk 2009".



Annual Report for Department of Physics 2009

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.

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