Annual Report for Department of Physics 2010

NTNU
Norwegian University of Science and Technology

NTNU
The Norwegian University of Science and Technology (NTNU) in Trondheim represents academic eminence in technology and the natural sciences as well as in other academic disciplines ranging from the social sciences, the arts, medicine, teacher education, architecture to fine art. Cross-disciplinary cooperation results in innovative breakthroughs and creative solutions with far-reaching social and economic impact.

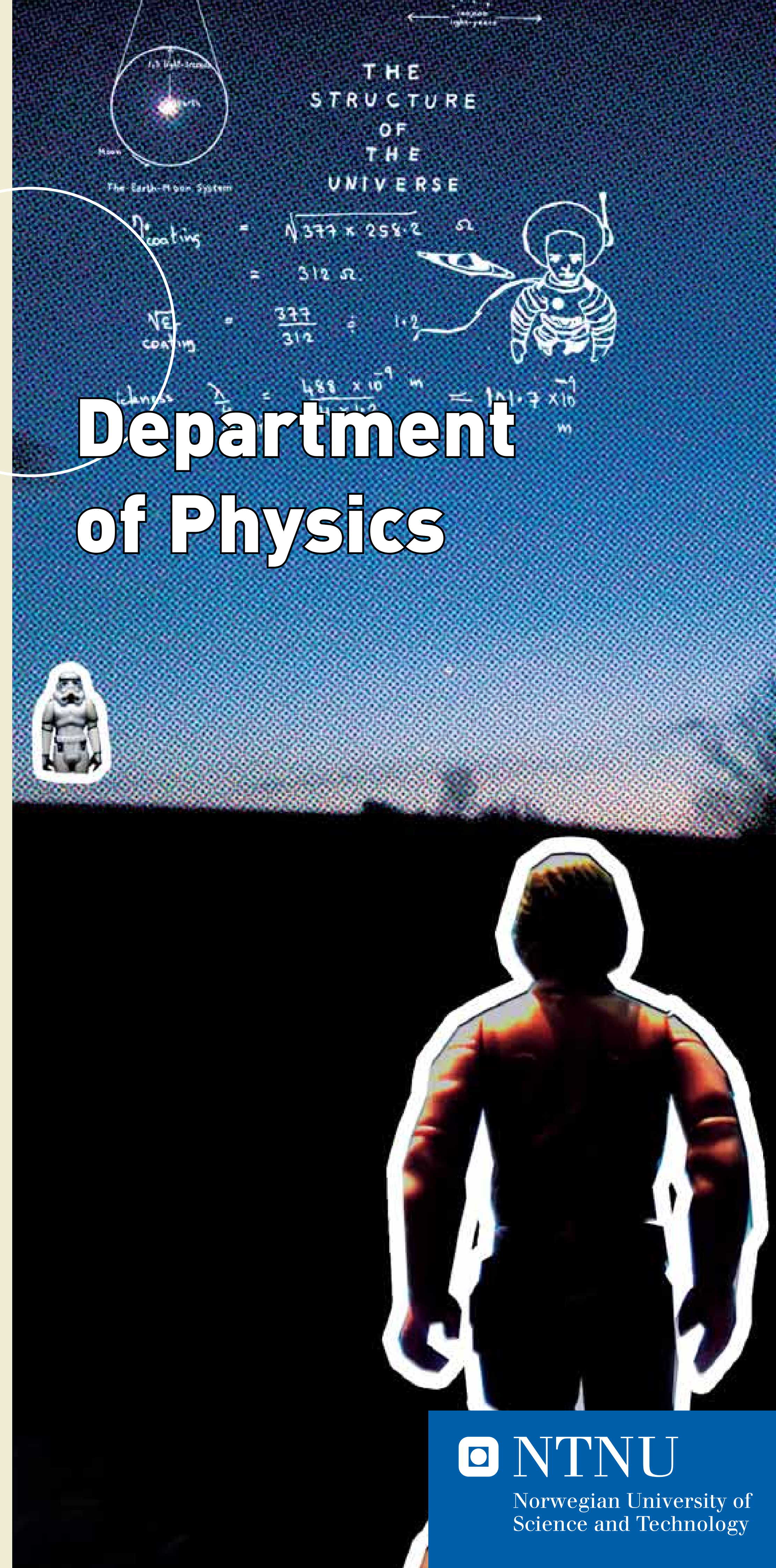
Address, contact information
Department of Physics, NTNU
N-7491 Trondheim,
Norway

E-mail: postmottak@phys.ntnu.no

www.ntnu.no/fysikk

Svanemerket trykksak fra Skipnes Kommunikasjon Lisensnr. 241 731

Annual Report 2010



Department of Physics

NTNU
Norwegian University of Science and Technology

DEPARTMENT OF PHYSICS, NTNU

Høgskoleringen 5, 7491 Trondheim, Norway

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

Head of the Department:	Professor Asle Sudbø
Deputy Head of the Department:	Professor Randi Holmestad Associate professor Jon Andreas Støvneng
Head of Administration:	Sylvi Vefsnmo

Departmental Board

Elected members:

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

COVER PAGE:
Space

Illustration: NTNU Info/Ole Kristian Øye

DEPARTMENT OF PHYSICS, NTNU

www.ntnu.no/fysikk

CONTENTS

Edited by:

Eli Ljøkelsøy Monsøy, Trond Henningsen, Peder Kristian Brenne og Asle Sudbø

The Annual Report is also available on:

www.ntnu.no/fysikk/arsrapporter

THE DEPARTMENT OF PHYSICS

A GLANCE AT 2010

During 2010, the department welcomed three new faculty members, associate professors Ragnvald Mathiesen and Jacob Linder, and professor Ursula Gibson. The three new members of the faculty are in the process of vigorously 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. 21 new PhD students were welcomed to the department during 2010, while 9 PhD students completed and defended their dissertations. The number of PhD students in the department at the end of 2010 counted 69, while the number of postdocs at the end of 2010 counted 23. This totals 92, significantly up from 70 at the end of 2009.

The number of scientific papers published in international peer-reviewed journals has increased considerably since 2005. In 2010, the number reached a total of 173 (Cristin) in so-called Level 1 and Level 2 scientific journals. Of these, 73 were published in Level 2 journals, which count the most. A search in Cristin yields, for the previous 5 years (2005:117/56; 2006:128/45; 2007:125/53; 2008: 149/69; 2009:153/70). These numbers appear to differ (only) slightly from those that appeared in the previous database Frida. The picture is nevertheless quite clear: The scientific output from the department is very strong, and we publish an impressively large proportion of our scientific papers in Level 2 journals.

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 level of external funding has increased in 2010 compared to 2009, from approximately 35MNOK to approximately 40MNOK. While this is encouraging, we have a long way to go if we are to reach the goals set out in the long term strategic plan of the department. That said, it is important to keep in mind that external funding is not a goal in itself, but a means of realizing goals. In a physics department, this can only be to perform high-quality *basic research on physical phenomena*.

Our department was one out of 10 Norwegian institutes carrying out research in physics, that were evaluated in 2009 by an international evaluation committee. This was done at the request of the Norwegian Research Council (NRC). The committee handed over the report on their findings to the NRC in 2010. In our department 8 groups were evaluated, 2 of which were rated excellent, namely Biophysical and Medical Technology, and Condensed Matter Theory. Returning to the remark in the previous paragraph, the evaluation showed that there was no obvious correlation between the groups that fared best in the evaluation and the groups that had most external funding. A lack of state-of-the-art equipment in several experimental groups was however pointed out by the committee. Some of the weaker groups also need to focus more on phenomena, and less on analytical tools *per se*.

The quality of the students in the Physics Department continues to be impressive, as evidenced by the student honours having been bestowed upon several of our MSc and PhD students in 2010 (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 June 2010, the Department of Physics hosted the 22nd CCP2010 – International Conference on Computational Physics. The meeting was held at NTNU, with Alex Hansen heading the organizing committee.

In 2010, Jacob Linder, received the Trond Lykkes Prize for outstanding research from the Royal Norwegian Society of Science and Letters (DKNVS). The prize was presented to Linder by His Majesty King Harlad VI and the preses of the DKNVS, professor Kristian Fossheim, at the 250th anniversary of the Society. See the annual report for further details.

Moreover, in 2010, professor Arne Brataas, was awarded a large grant from the EU 7FP for research on spin-transport and spin-dynamics. Brataas is the coordinator of this project. Receiving such grants contributes significantly to realizing the ambitions and strategic goals of the Department.

Asle Sudbø
Head of Department

STAFF

Head of Department:
Professor Asle Sudbø

Deputy Head of Department:
Professor Randi Holmestad
Associate Professor Jon Andreas Støvneng

PERMANENT STAFF

SCIENTIFIC STAFF:

Professors
Jens O. Andersen, Anne Borg, Arne Brataas, Catharina Davies, Patrick Espy, Jon Otto Fossum, Ursula Gibson, Alex Hansen, Randi Holmestad, Ola Hunderi, Johan S. Høye, Anders Johnsson, Michael Kachelriess, Morten Kildemo, 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, Arne Valberg.

Associate Professors
Berit Bungum, Dag W. Breiby, Antonius Helvoort, Jacob Linder, Ragnvald Mathiesen, Jonas Persson, Pawel Sikorski, Marit Sletmoen, Knut Arne Strand, Jon A. Støvneng, Tore H. Løvaas, Erik Wahlstrøm, Turid Worren, Ingjald Øverbø.

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

TECHNICAL AND ADMINISTRATIVE STAFF:

Head of Administration
Sylvi Vefsnmo

Administrative staff
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, Daniel Skåre, Bjørn Gunnar Soleim, Bertil O. Staven, Kristin Grendstad Sæterbø.

TEMPORARY STAFF:

Post Doc/Research Scientist
Swarnali Bandopadhyay, Øyvind Borck, Vladislav Dvoyrin, Flemming Ehlers, Song Fei, Davi Fonseca, Askhat Gazizow, Kristin Høydalsvik, Bjørn Skjetne, Heng Li, Magnus Borstad Lilledahl, Ragnvald Mathiesen, Takemasa Makoto, Jerome Maria, Yrr Mørch, Sylvie Lélu, Sergey Ostapchenko, Katarzyna Maria Psonka-Antonczyk, Santanu Sinha, Ragnhild Sæterli, Per Erik Vullum, Bao-xiang Wang, Lars Erik Walle, Justin Wells, Minli Xie, Min Zhou, Seoung Shan Yap, Chaolin Zha.

Doctoral Students
Mercy Afadzi, Arturo Amador, Ruben Bjørge, Troels Bojesen, Kjetil Børkje, Roya Dehghan, Marianne Daae, Pål G. Ellingsen, Bjørn-Tore Esjeholm, Morteza Esmaeili, Siv Eggen, Mari H. Farstad, Vasco Fernandes, Jostein Bø Fløystad, Ming Gao, Maryam Gholami Mayami, Amund Gjerde Gjendem, Knut Gjerden, Arne Løhre Grimsmo, Morten Grøva, Armen Julukian, Kjetil Magne Dørheim Hals, Yngve Hofstad Hansen, Leif Ove Hansen, Håvard Haugen, Kristin Haugstad, Henrik Hemmen, Egil Vålandsmyr Herland, Jon Holmestad, Sigmund Mongstad Hope, André Kapelrud, Lars Husdal, Hanne Kauko, Rashid Khan, Lars Kyllingstad, Dmitry Klimentov, Jacob Berent Kryvi, Lars Erlend Leganger, Paul Anton Letnes, Hanne Mehli, Åsmund Fløystad Monsen, Astrid Muggerud, Florian Mumm, Mohammadreza Nematollahi, Kjetil Liestøl Nielsen, Ingar Stian Nerbø, Kenate Nemera Nigussa, Tor Nordam, Amna Noreen, Magnus Østgård Olderøy, Anna Padol, Neelam Panjwani, Zbigniew Rozynek, Jan Rødal, Severin Sadjina, Sigrun Saur, Risi Ram Sharma, Tatjana Sherstova, Magne Saxegaard, Marius Aase Solberg, Iver Bakken Sperstad, Einar Stiansen, Arne Stormo, Rune Strandberg, Ragnhild Sæterli, Sedsel Fretheim Thomassen, Malin Torsæter, Jelena Todorovic, Glenn Tørå, Asle Heide Vaskinn, 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, Frode Mo, Kjell Mork, Emil Samuelsen, R. Svein Sigmond, Helge R. Skullerud, Ivar Svare, Arne Valberg, Sigmund Waldenstrøm.

ACCOUNTS 2010

	Amount kNOK
GOVERNMENT UNIVERSITY FUNDING (including NTNU strategy projects)	**80 788**

PROJECTS FINANCED BY THE RESEARCH COUNCIL OF NORWAY

Project	Project manager	Amount kNOK
Membranes for hydrogen separation	Borg Anne	27
Preparatory project: Norwegian participation in MAX IV	Borg Anne	299
Understanding catalytic effects i Pd alloy model systems	Borg Anne	69
Fundamentals of Nanoscale Systems	Brataas Arne	762
Fundamentals of Condensed Matter	Brataas Arne	328
ColdWear	Breiby Dag Werner	724
Towards nanoscale 3D imaging of working catalyst nanoparticles	Breiby Dag Werner	291
Norwegian Molecular Imaging Consortium	Davies Catharina	1 029
Gravity-wave sources and scales in the Polar Regions	Espy Patrick Joseph	740
Interconnected Physical Phenomena	Fossum Jon Otto	734
Complex systems and soft materials	Fossum Jon Otto	896
Sorption and Migration of CO2 in Porous Media	Fossum Jon Otto	2 295
Fracture-Failure Phenomena	Hansen Alex	215
Mapping of Residual Oil between Wells	Hansen Alex	355
Role of Bursts in Fracture Front Propagation	Hansen Alex	1 093
Stimulated production: Steady and NonSteady State	Hansen Alex	65
Efficient CO2 Absorption in Water-Saturated Porous Media	Hansen Alex	2 622
Nanosolar	Helvoort, Antonius van	595
Membranes for hydrogen separation	Holmestad Randi	26
Studies of the Electronic Structure of Materials at the Nanoscale	Holmestad Randi	393
Modelling towards Value-added Recycling Friendly Aluminium Alloys	Holmestad Randi	228
Kimdanningskontroll for Optimaliserte Egenskaper	Holmestad Randi	1 063
Fundamental investigations of Solute Clustering and Nucleation of Precipitation	Holmestad Randi	1 417
SUP -Improvement	Holmestad Randi	7
Novel nanomaterials and nanostructured materials for hydrogen storage applications	Holmestad Randi	114
Norwegian-Japanese Al-Mg-Si Alloy	Holmestad Randi	1 397
Clinical applications of multiphoton microscopy	Lilledahl Magnus B.	836
The mechanisms of photoprotection in natural and artificial photosynthetic systems	Naqvi Kalbe Razi	865
Probing the soyrces of ultrahigh-energy cosmic rays	Kachelriess Michael	772
Study of Entanglement and Quantum Information in Condensed Matter Sys.	Olaussen Kåre	162
Thin-film III-V Semiconductors	Reenaas Turid Worren	64
Nanomaterials for 3rd Generation Solar Cells	Reenaas Turid Worren	2 889
FME SOL - Norwegian Research Centre for Solar Cell Technology	Reenaas Turid Worren	2 448
Nanoscale Control of Mineral Deposition within Polysaccharide Gel Networks	Sikorski Pawel	1 457
Ultra-short pulsed Tm-doped fiber laser systems	Sorokina Irina	954
Biopolymer Engineering, KMB	Stokke Bjørn Torger	466
Responsive (bio)polymer matrices as Fabry-Perot	Stokke Bjørn Torger	1 586
IKT-Oxides	Sudbø Asle	397
Point Contact Investigations	Wahlstrøm Erik	451
Magnetodynamics of Nanostructured Metal Oxides	Wahlstrøm Erik	2 978
Advanced transmission electron microscopy in catalysis	Walmsley John	80
Equisol	Head of department	467

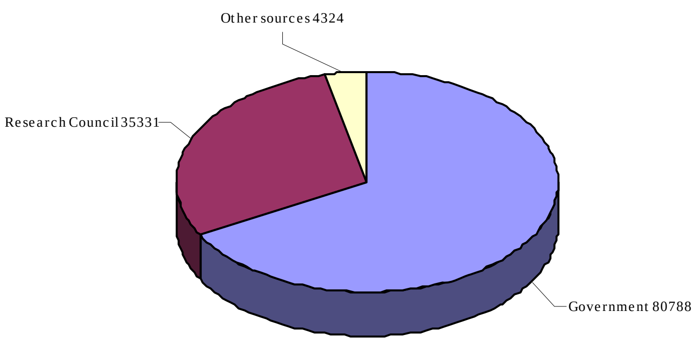
Småforsk	Several	654
Aurora, French-Norwegian researcher cooperation	Several	21
	Sum	**35 331**

CONTRIBUTION FROM OTHER FINANCIAL SOURCES

Contributors	Project name	Project manager	Amount kNOK
SIU	PhD Programme	Andersen, Kachelriess	47
EU FP6	Dynamax, Dynamic Magnoelectronics	Brataas Arne	358
EU FP6	SFINX	Brataas Arne	203
EU FP7	Magneto Caloritronics	Brataas Arne	223
Sør-Trøndelag Fylkeskommune	Force-in-Action	Bungum Berit	4
Nordiske Fond	NORSED	Bungum Berit	39
Kreftforeningen	Transport av terapeutiske makromolekyl i tumorvev	Davies Catharina	20
Nordiske Fond	Nordic Network in Soft matter Physics	Fossum Jon Otto	10
Statoil	Prof II, Roger Solli	Head of Department	38
Statens Strålevern	Prof II, Tor Wøhni	Head of Department	124
IFE	Prof II, Kenneth Knudsen	Head of Department	130
IFE	PCT2	Head of Department	21
Nordiske Fond	NorTEMnet	Holmestad Randi	39
EU FP7	C2CR - High Energy Interactions	Kachelriess Michael	220
Deutche Forschungsgemeinschaft	Kosmische Strahlung als Prove für Teilchenphysikjenseits des Standartmodels	Kachelriess Michael	85
EU FP6	INSPECTRO	Kjeldstad Berit	9
SIU, NUFU-allocation	Spatial and Seasonal variation in solar radiation	Kjeldstad Berit	827
FOI, Totalforsvarets foskningsinstitutt	Sensorskydd	Lindgren Mikael	479
EU FP7	Luminescent polymers for in vivo imaging of amyloid signatures	Lindgren Mikael	1 089
EU FP7	MIntWeld - Modelling of Interface Evolution in Advanced Welding	Mathiesen Ragnvald	90
Nordic Energy Research	Nordic Centre of Excellence in Photovoltaics	Reenaas Turid Worren	316
SINTEF	XPS-analyse	Raaen Steinar	5
NTNU sentralt	Posisjoneringstiltak EUs 7 RP	Kildemo	18
		Sum	**4 324**

Total external accounts in 2010	**39 655**

Total financing in 2010 (kNOK)



AWARDS

Linder's dissertation received three awards

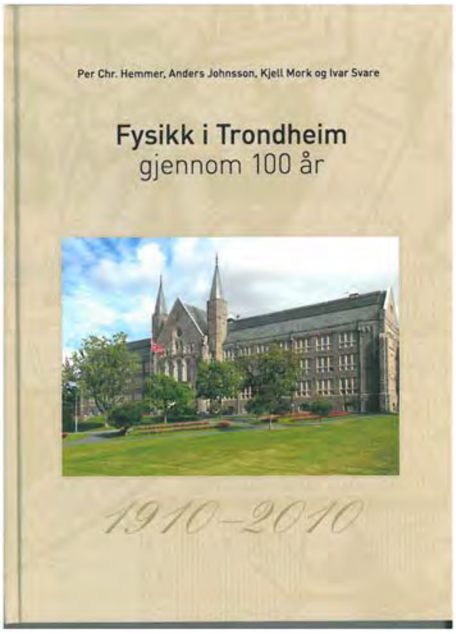
In 2010 Jacob Linder received not less than three awards for his PhD dissertation. Linder completed his thesis in March 2009, half a year earlier than meant to. His dissertation, "Quantum transport and proximity effects in unconventional superconducting hybrid systems" - supervised by Professor Asle Sudbø – consists of 25 articles, all published in the reputable journal Physical Review.

Linder was first awarded with the **I. K. Lykkes Pris for Yngre Forskere 2010** (I.K. Lykkes Prize for Younger Scientists 2010) on March 12. The ceremony took place at the 250 years anniversary for The Royal Norwegian Society for Sciences and Letters. His Majesty King Harald V was present at the ceremony.

On May 20, Linder was awarded the **ExxonMobil's Research Prize 2010** for basic research. The prize is worth NOK 50 000,-

In September Linder received his third prize, this time by The Norwegian Physical Society. **Yara's Birkeland Prize** annually awards the best PhD dissertations carried out in Norway. The award includes both physics and chemistry, and is given to each subject every second year.

HIGHLIGHTS FROM THE ACTIVITY



NTNU's 100 years anniversary

Friday October 8, The Department of Physics celebrated 100 years of education and research in physics in Trondheim. The celebration started with a scientific seminar and ended with a banquet at the Britannia Hotel in central Trondheim.

Besides the scientific part of the program, much of the emphasis during the celebration was put on the proud history that NTH/NTNU has within the field of physical research and education.

In relation to the anniversary The Department of Physics launched the book **"Fysikk i Trondheim gjennom 100 år"** ("Physics in Trondheim through 100 years").

The book maps the history; from the beginning in 1910 to the current Department of Physics at NTNU. Central topics to the book are developments connected to education and research. Integrated in the history is honoring of former profiles and pioneers who have contributed to the positive reputation the physics environment in Trondheim has.

The book is edited by Professor Emeritus Per Chr. Hemmer, Professor Emeritus Anders Johnsson, Professor Emeritus Kjell Mork and Professor Emeritus Ivar Svare.

Photo: Geir Mogen

Department of Physics coordinates its first EU project.

Professor **Arne Brataas** at the Department of Physics heads the coordination of EU's 7. Framework Program

The prestigious duty as coordinator for a framework program that is in front within the field, makes it possible to conduct advanced basic scientific research with access to the best technological facilities, and cooperation with the most skilled working staff.

The Project, MACALO - Magneto Caloritronics, intends to study heat, charging and spin, and magnetization dynamics in magnetic nano structures.

The project's duration is three years, budgeted to €3.2 millions. Other cooperating partners are two firms (NanoOSc (SE) and In Silicio (FR)) plus academic partners from Delft, Wurzburg, Twente, CEA Grenoble and Groningen.

Department of Physics international leading

An international committee initiated by The Research Council of Norway has scrutinized the quality of research within the field of physics. Of the 45 research groups studied, two divisions at the Department of Physics are labeled "excellent"; Biophysical and Medical Technology and Condenced Matter Physics.

The committee concludes that the groups have a leading international role within their respective fields, and that they conduct advanced and original research that manages to be published in the most reputable international journals. The strategic work is well planned, the productivity is high, and the activity is relevant for both national and international research.

The intentions with the evaluation are to get a critical study of the research in an international perspective, and to get international feedback on how research in Norway should face future challenges.

.

RESEARCH

DIVISION OF APPLIED PHYSICS AND DIDACTIC PHYSICS

Staff
Professor Patrick Espy
Professor Ursula Gibson
Professor Robert Hibbins
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

Staff Engineer Daniel Skåre
Post.doc. Maria Jerôme
Post.doc. Yap Seong Shan

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

For 2010 we have chosen to give a more thorough account of two specific research projects carried out on electromagnetic nanostructures, and particle precipitation and climate research in Antarctica respectively.

Electromagnetic Nanostructures
(*Ursula Gibson, Fredrik Martinsen)*
Prof. Gibson moved to NTNU from the USA in August of 2010, and has established a laboratory for the fabrication and characterization of restricted dimension materials. We study the electromagnetic response of structures with nanometer dimensions – thin films, nanorods and nanoparticles, primarily for applications in solar energy, but including interests in optical waveguides and magneto-optics.
The emphasis is on the development of new solar absorber materials with reduced cost and low toxicity, and the group collaborates extensively with that of Assoc. Prof. Reenaas and others at NTNU.

Present work concentrates on the production of zinc oxide and sulfides, and we expect to bring online an ultra high vacuum system dedicated to these materials by the end of 2011. Recent work on ZnO nanorods demonstrated that the increased surface area of these materials in a p-n heterojunction solar cell can increase the efficiency, as shown in Fig 1. Copper oxides and related materials are of significant interest for future low-cost solar absorbers, and an understanding of the fundamental interface states with materials such as ZnO are being undertaken.

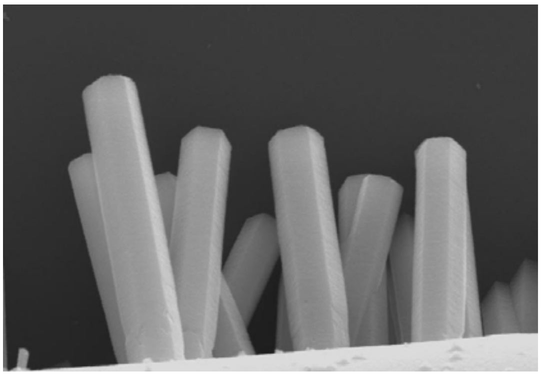


Fig 1. ZnO nanorods (200 nm diameter), grown by electrodeposition

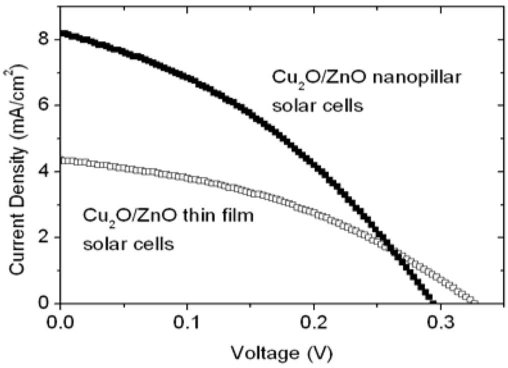


Fig 2 Current- voltage characteristics for electrodeposited planar and nanorod solar cells

Particle precipitation and climate research in Antarctica

(P.J. Espy, M. Daae, R.E. Hibbins)

In the Polar regions, radiation-belt and auroral particles enter the atmosphere and create highly reactive chemical species such as nitric oxide (NO) that catalytically destroy ozone. During winter, atmospheric winds transport these species into the stratosphere where the changes in the ozone, thermal balance and dynamics may affect the lower atmosphere and climate system. As part of an international collaboration between the NTNU Department of Physics, the British Antarctic Survey, the Max-Planck Institute for Solar System Research and the Norwegian Polar Institute, a 250 GHz radiometer observed profiles of ozone and nitric oxide between 30 and 80 km, deep within the Antarctic polar vortex at Troll Station, Antarctica (72^{o}S, 2.5^{o}E). The instrument is now giving us the first time-resolved picture of how naturally occurring high altitude auroral energy enters and affects the atmosphere, and the extent to which the changes it causes couple into the lower atmosphere and climate system.

Initial results show for the first time that even relatively minor particle precipitation events, which occur frequently and throughout the solar cycle, create significant reactive species that subsequently propagate downward into the stratosphere. As can be seen in the top panel of the following figure, an impulsive particle precipitation event began on 22 July. The event was short lived and of only moderate intensity. However, the particle energy caused an immediate ~15 K increase of the temperature at 90 km, which is shown on the second panel of the figure. The event also created changes in the atmospheric chemistry, creating reactive species that catalytically destroyed ozone.

Fig. 1. The Troll Research Station in Antarctica as seen from the air (photo courtesy NPI)

The third panel shows a 30% ozone loss that occurred as the particles created highly reactive, ozone-destroying species such as NO. As shown in the forth panel, the NO and other reactive species created in the particle precipitation event, and their corresponding ozone destruction, are transported downward into the stratosphere where they can continue to affect atmospheric chemistry, circulation and climate.

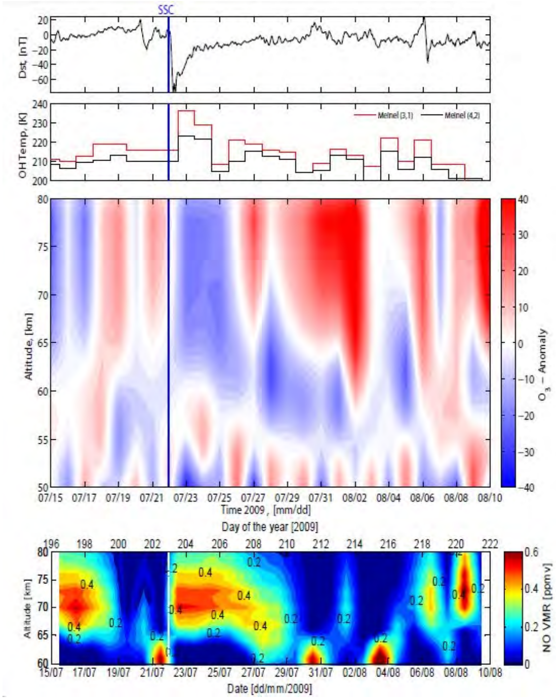


Fig. 2. Ozone loss occurring during a moderate particle precipitation event over Troll Station, Antarctica. The top panel shows the solar storm reaching the earth on 22 July, while the second panel shows an immediate increase of temperature at 90 km. The third panel shows a 30% ozone loss that occurs as the particles create highly reactive species such as NO, shown in the forth panel, and these species, and their corresponding ozone destruction, are transported downward into the stratosphere.

DIVISION OF BIOPHYSICS AND MEDICAL TECHNOLOGY

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

Professor emeritus Anders Johnsson
Professor emeritus Arne Valberg

Non-tenured staff
Mohamed Asbahi (Post-doc)
David Barriet (Post-doc)
Kamila Gawel (Post-doc)
Sylvie Lelu (Post-doc)
Heng Li (Post-doc)
Magnus Lilledahl (Post-doc)
Katarzyna Psonka-Antonczyk (Post-doc)
Nina Reitan (Post-doc)
Minli Xie (Post-doc)
Yrr Mørch (Res. scientist)
Justyna Cybulska (Visiting post-doc)

Overview

The research is presented under the following headings: *Medical physics and technology*, *Bio-polymers and bionanotechnology*, and *Photo-biophysics*.

Medical physics and technology

Monte Carlo simulation of 6 MV linear accelerator photon beams
(S. Saur Almberg, J. Frengen, T. Lindmo)
As a first step towards establishing Monte Carlo (MC) simulation as a tool for studying surface doses in radiotherapy of breast cancer, the essential elements of Elekta linear accelerators have been implemented in the BEAMnrc MC code, with dose calculations performed by the DOSXYZnrc code. Relevant parts of the linear accelerator, such as electron beam target, primary collimator, flattening filter, backscatter plate, multi-leaf collimator, backup collimator, and main collimator, were implemented using appropriate component modules of the BEAMnrc code. In MC simulation of linear accelerators using this code, the electron energy and the electron radial intensity (width of the electron beam incident on the linac target) have to be adjusted by the user such that both parameters are in accordance with the actual linear accelerator. For this purpose depth-dose and cross-field dose profiles in a 60 x 60 x 30 cm³ water phantom were simulated by MC and compared to corresponding dose measurements obtained by the use of an ionization chamber. The incident electron energy of the linac was determined by matching of simulated and measured depth dose profiles for the field size 5 x 5 cm² (see Fig. 1). Width of the electron beam incident on the linac target was estimated by comparing simulated and measured crossline dose profiles of a 40 x 40 cm² field obtained at 1.5 and 10 cm depth (Fig. 2).

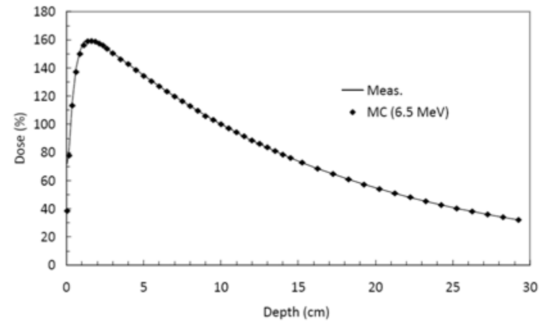


Fig. 1. Measured (ionization chamber) and MC calculated depth doses for optimal electron energy (6.5 MeV). Field size: 5 x 5 cm^2, source–surface distance (SSD): 90 cm.

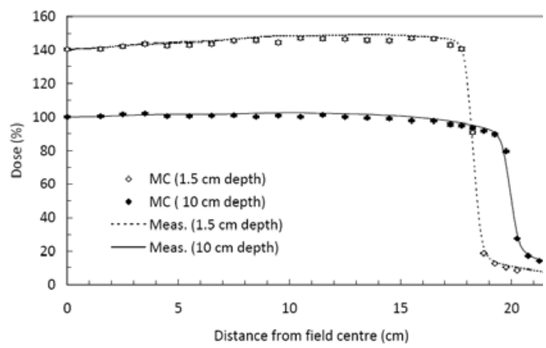


Fig. 2. Measured and calculated cross-profiles for a 40 x 40 cm^2 field. The profiles were calculated using 6.5 MeV electrons and radial intensity distribution (standard deviation of a Gaussian distribution) equal to 0.4 mm and 0.8 mm in the inline and crossline directions, respectively.

Delivery of nanoparticles in tumour tissue and cells

(C. de Lange Davies, N. Reitan, S. Lelu, Y. Hansen, M. Afadzi, S. Eggen, S. Hak, H. Hektoen, Z. Garaiova, B. Staley)

Nanomedicine such as liposomes, nanoemulsion, polymers or proteins carrying drugs are promising cancer therapeutic agents. Due to the leaky blood vessels in tumour tissue, there is a higher accumulation of the therapeutic agent in tumour tissue than in normal tissue. However, the tumour uptake is low and the distribution heterogeneous. The aim of our research is to study the mechanism and improve the delivery of nanoparticles. In 2010 we have established new tools and instrumentation to strengthen our research and have focused on three main projects:

Characterization of nanoemulsions and their behaviour in cells and in tumours growing in mice.
Multifunctional nanoparticles combining contrast agents for imaging and therapeutic agents for therapy have opened new possibilities in cancer therapy. Nanoemulsions containing contrast agents for magnetic resonance imaging and optical probes for laser scanning microscopy have been synthesized and characterized. The nanoemulsion was successfully targeted to endothelial cells in culture. In tumours growing in window chambers microscopy showed accumulations of the targeted nanoemulsion in angiogenic vessel walls in vivo.

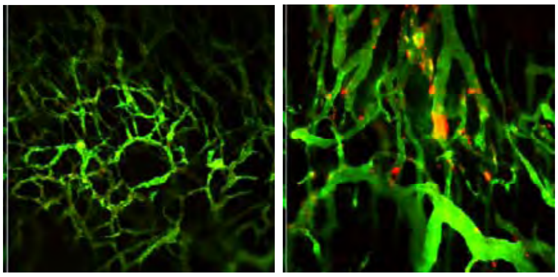


Fig. 3. Confocal laser scanning images of tumour tissue and blood vessels (green) in mice, comparing untargeted (left) and targeted (right) nanoemulsions (red).

Ultrasound mediated drug delivery.
Ultrasound may improve the uptake and the distribution of encapsulated drugs in tumours. The exposure parameters (frequency, pulse length, duration, acoustic pressure) to obtain optimal release of drugs from liposomes in solution have been studied and the enhanced release is found to be caused by cavitation. Cavitation is the oscillation of gas bubbles upon exposure to pressure wave and when gas bubbles collapse shock waves and micro-jet streams are formed. We also found that when gas bubbles were added to cells, ultrasound enhanced the cellular uptake of liposomes and dextrans considerably.

Chitosan as a DNA carrier in gene therapy.
Chitosans are positively charged polysaccharides which interact with the negatively charged DNA thereby forming nanoparticles. Chitosans with low and high ability to transfect cells were compared, and the cellular uptake, endocytotic pathway and intracellular trafficking were studied. Furthermore photochemical internalization was found to enhance the transfection considerably.

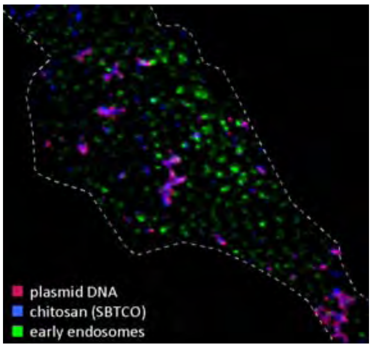


Fig. 4. Colocalization of DNA-chitosan and early endosomes in HeLa cells.

Clinical applications of multiphoton microscopy

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

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

Coherent anti-Stokes Raman scattering to study macrophage effect on extracellular matrix.
Atherosclerosis is a disease characterized by the development of lipid-rich plaques in the artery walls. The rupture of such plaques is believed to be the primary cause of heart attacks. A high content of macrophages in these plaques is believed to make them more vulnerable to rupture, since the macrophages release enzymes which degrade the supporting collagen matrix. Macrophages are rich in lipids and are therefore easily imaged using Coherent anti-Stokes Raman scattering (CARS) with the lasers tuned to probe the CH_2 stretching vibration. Combining this with imaging of the collagen network using second harmonic generation

(SHG) we are able to study the relationship between the structure of the collagen matrix and the enzymatic effect of the macrophages. This work was a collaboration with the Beckman Laser Institute in the US, as CARS microscopy is not presently available in Norway.

Clinical applications of multiphoton microscopy
(C. de Lange Davies, M. Lilledahl, M. Kildemo, P.G. Ellingsen)
Multiphoton microscopy is an ideal tool for studying many biological molecules. Many important such molecules like collagen, elastin and many lipids can be imaged without any exogenous stains, thereby simplifying in vivo imaging and the potential for clinical applications. Our research aims to identify such clinical applications, develop the necessary analysis tools, and understand the biological relevance of the data to develop multiphoton microscopy as a clinical tool.

Coherent anti-Stokes Raman scattering to study macrophage effect on extracellular matrix.
Atherosclerosis is a disease characterized by the development of lipid-rich plaques in the artery walls. The rupture of such plaques is believed to be the primary cause of heart attacks. A high content of macrophages in these plaques is believed to make them more vulnerable to rupture, since the macrophages release enzymes which degrade the supporting collagen matrix. Macrophages are rich in lipids and are therefore easily imaged using Coherent anti-Stokes Raman scattering (CARS) with the lasers tuned to probe the CH_2 stretching vibration. Combining this with imaging of the collagen network using second harmonic generation (SHG) we are able to study the relationship between the structure of the collagen matrix and the enzymatic effect of the macrophages. This work was a collaboration with the Beckman Laser Institute in the US, as CARS microscopy is not presently available in Norway.

Structural characterization of cartilage for biomechanical modelling.
Degradation of cartilage is a major health problem

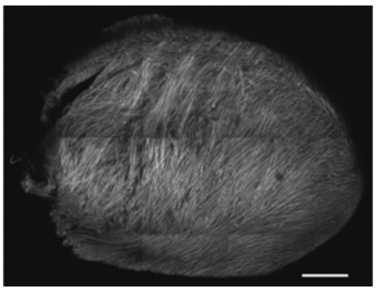


Fig. 5. SHG image of a transversal section from the superficial layer of articular cartilage in the knee, illustrating the directionality of the collagen fibers which is a necessary parameter for accurate mechanical modelling of cartilage.

in the western world. Osteoarthritis is characterized by changes in the collagen structure of the cartilage leading to painful and debilitating conditions. We have used SHG imaging to quantify the three-dimensional microstructure of the collagen network in cartilage and use this data in finite element modelling of the mechanical response of the tissue.

This will lead to a better understanding of how the changes in the collagen structure changes the mechanical loading in the tissue, providing a better idea of how the disease will progress. As some collagen fibrils and other structural proteins are below the resolution limit of optical microscopy we are combining multiphoton microscopy with Mueller matrix imaging which allows us to quantify the structure of the matrix of molecules which are not obtainable by microscopy.

Biopolymers and bionanotechnology

Biopolymer mesoscale structural organization and interactions
(B. T. Stokke, D. Klein, K. Psonka-Antonczyk, D. Barriet, K. Gawel, A. Padol, Y. Mørch, M. Gao, T. Sherstova)
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 2010, the high resolution interferometric platform for monitoring changes in optical length within hydrogel materials was extended from the biosensor field to explore characterisation of biopolymer gels in a more general context. Thus, the ionic strength dependence of a covalent crosslinked alginate hydrogel on the fiber before and following impregnation with a commonly used polycation, were reported. The data indicates that the hydrogel swelling as a function of the ionic strength is different for the impregnated hydrogels compared to the non-impregnated ones. Based on such data and also combined with additional approaches, it was suggested that appropriate modelling of the material behaviour can lead to determination of the mechanical properties of the outermost layer. This line will be pursued in the following.

In 2010, we reported on application of oligoguluronates as modulators of ionotropic gelation of alginates. The oligoguluronate oligomers are able to be involved in the binding of Ca^{2+}, but sufficiently short not to mediate connectivity through their chains. The results indicate that the oligoguluronate oligomers perturb the gelation of alginate differently in the Ca^{2+}-limited and non-Ca^{2+}-limited regimes. In the calcium limited regime, the oligoguluronate oligomers appear to sequester calcium either by binding to oligoguluronate sequences of the network, or between the free oligoguluronates, yielding an overall net effect of reduced gel strength. In the non-Ca^{2+} limited regime, the experimental data shows increased gel strength in the presence of oligoguluronate blocks.

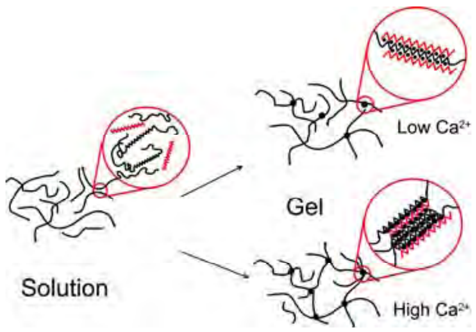


Fig. 6. Schematic illustration of relevant Ca-induced alginate chain associations for calcium limited and non-calcium limited situation, and effects of adding oligoguluronates in these cases.

In 2010, we reported on results obtained here by high-resolution atomic force microscopy of class A and B CpG-DNA that reflect differences in secondary structure of these immunostimulatory, bacterial DNAs. Immunostimulatory CpG-DNA activates the innate immune system by binding to Toll-like receptor 9. Structurally different CpG-containing oligonucleotides trigger a different type of immune response while activating the same receptor. The higher order structure of two different classes of immunostimulatory CpG-DNA class A and class B were investigated. Class A, which contains a partly self-complementary sequence and poly-G ends, forms duplexes and nanoparticles in salt solution, while class B, which does not contain these features and is purely linear, does not form a duplex or nanoparticles.

Single molecule techniques in bionanotechnology
(K. E. Haugstad, M. Sletmoen)
At the most fundamental level, all biological reactions occur via the action of single enzymes, DNA molecules, or RNA molecules. Studying one biological macromolecule at a time can provide clear and often surprising views of these molecules in action. In 2010, optical tweezers allowing 3D nanoscale force measurements with sub picoNewton sensitivity and sub-nanometer spatial resolution were established in the group. This is a new sensitive force probe complementing AFM.

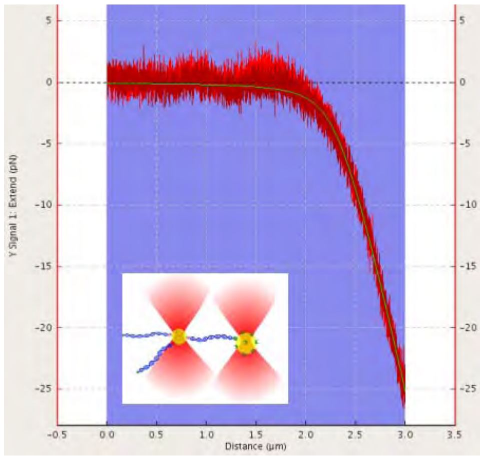


Fig. 7. Force-extension relation for a single DNA molecule obtained using optical tweezers.

Procedures to obtain the force-extension relation of single DNA strands using dual trap optical tweezers were developed. The DNA-tether was prepared in collaboration with Svein Valla and Rahmi Lale, Dept of Biotechnology, NTNU. Biotin and DIG labelled primers used in PCR allowed generation of toeholds at the ends of dsDNA to bridge anti-DIG and streptavidin coated microspheres. The positions of the microspheres bridged by a dsDNA were controlled by the optical trap. DNA force-extension curves were obtained by moving one of the beads while recording the force acting on the beads. Fitting the extended worm-like chain model to the experimental data (Fig 7, green line) allowed determining the contour length and persistence length of DNA of different lengths (20, 14 or 8 kbp).

Another optical tweezers based study, performed at the Niels Bohr Institute in collaboration with Lene Oddershede and co-workers, published in 2010, concerned optical trapping and manipulation of single quantum dots. Due to their small size and strong luminescence, quantum dots are optimal for single molecule assays where, optimally, the presence of the tracer particle should not dominate the dynamics of the system. The study included tracking of the thermal fluctuations of a DNA tether using an individual colloidal quantum dot as marker (Fig 8).

Mucins are large glycoproteins that promote cell survival in different ways. We are using AFM based dynamic force spectroscopy to study the self-interaction abilities of these glycoproteins as a function of their oligosaccharide decoration patterns.

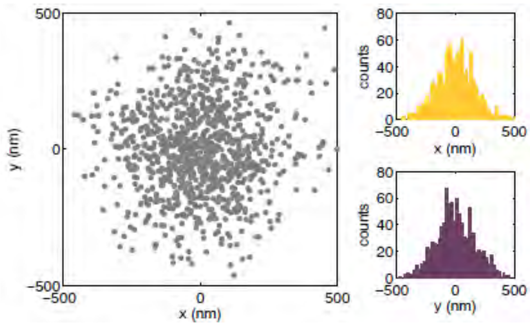


Fig. 8. Positions visited by a QD tethered to a surface with DNA (L ~ 1.36 µm). The 2D projected positions visited are plotted to the left. The position distributions of the two lateral directions are shown to the right.

Bionanotechnology
(P. Sikorski, F. Mumm, M. Olderøy, M. Xie)
In the biomineralisation project, the main focus in 2010 has been on testing the applicability of developed hydrogel/calcium phosphate composite materials for cell encapsulation and directing differentiation of stem cells. In collaboration with the Technical University of Munich, we have shown that developed composite materials are suitable for encapsulation of stem cells, and more work in this direction is under way. Another development in 2010 was to mineralise alginate gels using the enzyme alkaline phosphatase, which allows for better control of alginate-mineral interactions at close to physiological conditions.

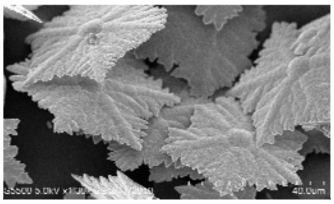


Fig. 9. Calcium carbonate crystals obtained in experiments where influence of biopolymer on crystallisation kinetics was investigated. Photo: M. Olderøy, Department of Physics, NTNU.

In our research we extensively use NTNU Nanolab, both for characterisation of biomaterials, as well as for development of new nanotechnology based devices for controlled delivery of molecules into living cells. In 2010 we developed a procedure to fabricate large arrays of vertically aligned copper oxide nanowires. These arrays could then be integrated into cell-friendly, lithogragraphically patterned epoxy structures (Fig. 10 top left and right) to be used as substrates for culturing cells. Due to the much smaller diameter of the nanowires compared to the cells, the cells are able to grow on the surface while being impaled by the wires (see Fig. 10 bottom left). We are currently working to show that material attached to the nanowires can in this way be delivered across the cell membrane into the cell.

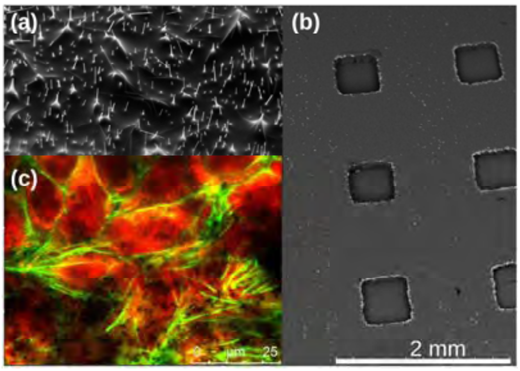


Fig. 10. Epoxy surface with CuO nanowires. (a) nanowires sticking out of epoxy surface (b) low magnification micrograph of a device with relatively large wells, bottom of which is covered with nanowires; (c) confocal laser scanning microscopy image of cells growing on surface with nanowires. Nanowires are visible on the cell micrograph as dark points. Photo: Kai M. Beckwith, MTNANO Master student. Department of Physics, NTNU

Photobiophysics

Photosynthetic systems and pigments
(H. Li, T.B. Melø, K.R. Naqvi)
The main focus of attention last year was the investigation of photoprotection provided by α-tocopherol (or closely related molecules) and carotenoids. Four lines of investigation were pursued, all of which have proved to be exceedingly fruitful.
1) *Photophysical and photochemical properties of a-tocopherol and related molecules*. We noticed that, notwithstanding the facile occurrence of one-electron oxidation in α-tocopherol and its acetate (ToH and TOAc, respectively), and despite the remarkable stability, under appropriate conditions,

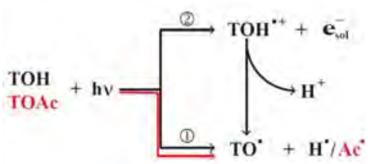


Fig. 11. Reaction pathways after excitation of vitamin E and vitamin E acetate.

of the oxidation products ($TOH^{\bullet+}$, $TO^{\bullet}$ and $TOAc^{\bullet+}$), their spectroscopic characterization was in such an unsatisfactory state as to justify a fresh attempt at acquiring reliable data. A new, model-free method was developed for analyzing time-resolved spectra showing the progress of the reaction $TOH + R^{\bullet} \rightarrow TO^{\bullet} + RH$, where $R^{\bullet}$ is a stable free radical. Absorption spectra of the radical cations were determined by combining EPR and optical spectroscopy. Armed with this knowledge, we were able to show that photoexcitation of TOH in polar solvents leads, contrary to what has been assumed for the last two decades, to photoionization as well as dissociation of the hydroxyl bond.

2) *Photoprotection in systems containing flavins and carotenoids*. Though long-lived transient photoproducts of flavins have received much attention over the last five decades, their spectroscopic characterization remained rudimentary and altogether inconclusive. Lumiflavin and riboflavin were therefore re-examined, using nanosecond laser photolysis and multichannel detection over a wide spectral range; radical cations and semiquinone radicals were generated by quenching flavin triplets with $C(NO_2)_4$ (electron acceptor) and NO_2^- (electron donor), respectively. The problem of estimating the extent of ground state depletion after a single flash was solved by developing a new strategy that provides reliable lower and upper bounds for the depletion (and for the molar absorption coefficients of the transient species of interest).

3) *Photoprotection of the reaction centre in photosystem II.* Can Trolox, a water soluble analogue of α-tocopherol and a scavenger of singlet oxygen ($^1O_2$), provide photoprotection, under high irradiance, to isolated photosystem II (PSII) reaction centre (RC)? To answer the question, endogenous production of $^1O_2$ was studied in preparations of five-chlorophyll PSII RC (RC5) containing only one β-carotene molecule, which was found, with the help of linear dichroism spectroscopy, to be located in the D1 protein. The photoinduced oxygen consumption in the oxygen electrode, when RC5 and Trolox were mixed, revealed that Trolox was a better $^1O_2$ scavenger than histidine and furfuryl alcohol at low concentrations (*i.e.* < 1 mM). After its incorporation into detergent micelles in unbuffered solutions, Trolox was able to photoprotect the D1 protein, but not the RC5 pigments. These results are discussed and compared with studies dealing with the physiological role of tocopherol molecules as $^1O_2$ scavenger in thylakoid membranes of photosynthetic organisms.

4) *Photoprotection of the light-harvesting complex LHCII associated with photosystem II.* Photophysical studies on LHCII (wild type and several mutants produced through site-directed mutagenesis) were undertaken to shed light on the role played by xanthophylls in photoprotection.

DIVISION OF COMPLEX MATERIALS

Staff
Professor Jon Otto Fossum
Professor Alex Hansen
Professor Arne Mikkelsen
Professor Steinar Raaen
Professor Bo-Sture Skagerstam
Adjunct professor Kenneth D. Knudsen
Professor emeritus Arnljot Elgsæter
Professor emeritus Frode Mo

Non-tenured staff
Elisabeth Bouchaud (Onsagerprof. 1.4–1.10)
Davi de Miranda Fonseca (Post.doc)
Santanu Sinha (Post-doc)
Bjørn Skjetne (Scientist)

Overview

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

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

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

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

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

Survey of research activities

Experimental investigations of soft and complex matter: From nano to macro.
(*J.O. Fossum*)
The research group has during several years focused on basic understanding of problems within soft and complex materials, in particular physical phenomena in soft matter using synthetic nanolayered silicates (clays), as physical complex model systems. Main physical phenomena studied in these systems include flow and diffusion processes, intercalation processes, spontaneous self-organization into liquid crystalline phases in systems of nanoplatelets, and guided self-organization into electro-rheological and magneto-rheological systems with smart material properties. The most important experimental methods used at NTNU include standard microscopy, as well as AFM and STM; rheology in external applied fields (magnetic or electric); visible light scattering; and wide- and small-angle X-ray scattering. Synchrotron X-ray scattering is performed at ESRF in Grenoble, France, LNLS in Sao Paulo, Brazil, PAL in Pohang, South Korea, Max-lab Lund university 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. This state can be described through non-equilibrium thermodynamics. We are exploring this description in collaboration with Professor Signe Kjelstrup at the NTNU Chemistry Department. We are also collaborating with Professor Knut Jørgen Måløy at the University of Oslo who does experiments on steady-state flow in two-dimensional model systems.

We have developed a model for film flow in porous media. This allows us to calculate the effective resistive properties of oil-water-rock systems under different flow conditions. This is necessary input for exploration methods using electromagnetic wave reflection from reservoirs.

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

We are studying hydraulic fracture – i.e. the creation of fractures through high pressure – through collaboration with the SINTEF Rock Physics Group.

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

We study the flow in single fractures in collaboration with Dr. Harold Auradou and Laurent Talon at the Université de ParisSud at Orsay (see Research Highlight Section).

Self-assembly of 2D-nanostructures
(S. Raaen, A. Julukian)
Surface properties depend on structure and composition. Of particular interest in the present context is how the reactivity of surfaces varies with effective dimension of nanostructures for metal nanostructures which are supported on non-metallic substrates. One example is Pt nanostructures on graphite, as shown in Fig.1.

It has been known for a long time that the properties of catalytic active metals may be dramatically changed by varying the particle size in the range 2 to 10 nm. Still the detailed mechanisms on how this happens are still not understood. Our studies have focused on model systems in which the details of the adsorption and desorption process may be studied. One example is adsorption and desorption of carbon-monoxide from supported Pt-desorption of carbon-monoxide from supported Pt nanostructures. The experiments include photo-electron spectroscopy, temperature programmed desorption spectroscopy and scanning electron microscopy. Fig.2 shows data from CO desorption from Pt/graphite. It is observed that the leading edge in the thermal desorption spectra changes with amount of Pt on the graphite surfaces in such a way that lower desorption temperature corresponds to Pt structures of smaller effective dimension.

The effective size of the Pt structures have been correlated to the electrostatic core level shift due to the unit charge that is left on the metal particle in the final state of the photoemission process.
The results have been discussed in terms of surface coordination and the electrostatic properties of the supported metal particles.

Fig.1. Scanning electron microscopy image of Platinum nanostructures on graphite formed by evaporation at room temperature

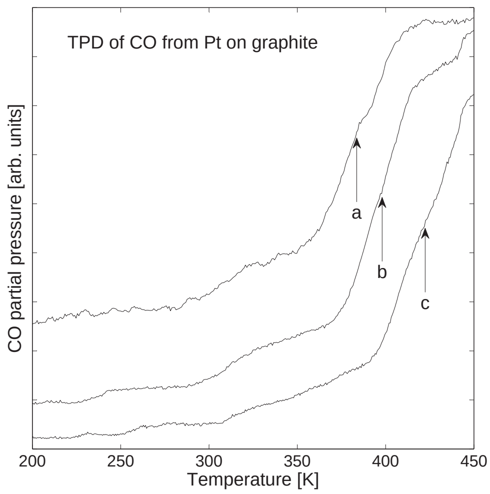


Fig.2. Temperature programmed desorption of CO from Pt/graphite.

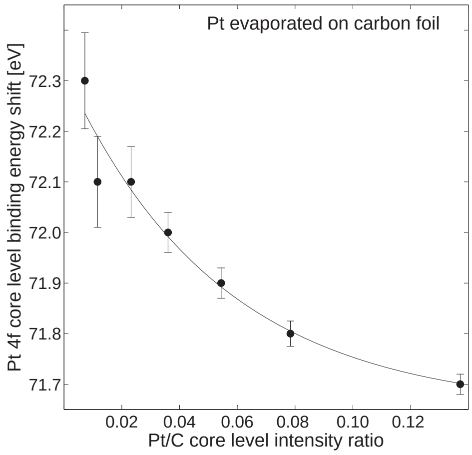


Fig.3. Pt 4f core level binding energy as a function of amount of Pt on graphite. Smaller particles give larger binding energies.

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

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

Polymer-nanoparticle systems
(*Kenneth D. Knudsen*)
The research has been centered on nanostructured soft matter, with an emphasis on polymer-based systems. Recent progress in polymer science has demonstrated that remarkable changes in material properties are achievable by combining polymers with miniature particles, where at least one of the particle dimensions is in the nano-range. In order to elucidate and subsequently modify the nanostructure of these new materials, we rely heavily on various scattering methods, using mainly neutrons and high-intensity x-rays as probes. Via the collaboration with the Institute for Energy Technology (IFE) we have unique access to specialized instrumentation, particularly small-angle neutron scattering. This method is especially useful for the study of soft and light materials, such as polymers, due to the negligible radiation damage and selective interaction for neutrons compared to x-rays. The work in this area is performed mainly together with prof. J.O. Fossum, as well as master and PhD students.

Example of research carried out in 2010

Flow of fluids in single fractures
(Alex Hansen in collaboration with Harold Auradou and Laurent Talon)

The flow of fluids and gases through fracture systems forms an essential ingredient in connection with the extraction of oil from carbonate reservoirs which have so low permeability that this must be done through the fracture systems they contain. The same situation occurs in connection with natural gas extraction from shales. An essential ingredient in understanding such flow in fractures is to find the relation between the permeability of the fractures as a function of their opening.

Fig. 4 shows the color coded topography of a fracture. Darker red means that the fracture is narrow whereas lighter red means that the opening at that point is larger. The grey areas signal that the opening is zero. The topography of fracture surfaces has certain scaling properties that are summarized in the notion of self affinity. The most important consequence of these scaling properties is that the fracture width scales as the length of the fracture to the exponent 0.8. This is irrespective of the material that has fractured as long as it is brittle.

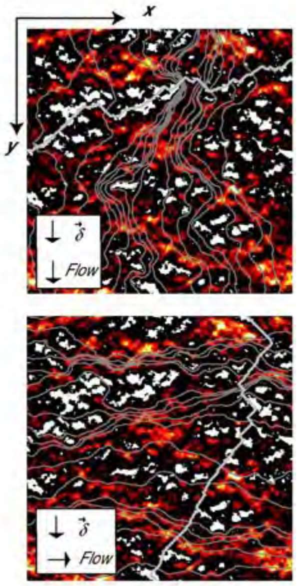


Fig.4.

Several studies in the past have reported non-trivial relations between fracture aperture and the measured permeability. For large mean distance between the fracture planes, the permeability is found to scale with the cube of this distance. In this limit, the fracture can be viewed as consisting of two parallel flat walls. But, as soon as the halves are brought closer together, deviations from this cubic law due to the surface roughness become important. In recent years, various theoretical models based on statistical averages, weak disorder perturbation expansions or mean field approximations have been tested to evaluate these deviations. Most of the foregoing developments, however, break down if contact zones exist in the fracture. When the fracture halves are brought even closer, all the fluid is finally forced to pass a single strait --- or bottle neck --- connecting the inlet and the outlet. The permeability of the entire fracture is then controlled by the permeability of the bottle neck. Also here we find a cubic law.

These various regimes are illustrated in Fig. 5 which shows the flow field for different fracture openings. In d – for large opening, the cubic regime is seen. In a, we are in the bottle neck regime. In b and c, we are in a regime where the self affinity of the fracture plays a significant role. Dark areas in Fig. 5 signify areas of contact between the two opposite fracture surfaces.

In previous studies of the permeability of fracture surfaces, no scaling regime where the permeability is proportional to the fracture opening to some power has been found. The reason for this is that the right length scale measuring the fracture opening has not been identified until now. It turns out that it is the generalization of a bottle neck in one-dimensional fractures. In two dimensions, it can be defined as the path across the sample that has the least average opening.

By using this length scale, we see in Fig. 5 the three scaling regimes clearly, the middle one being the new one. Here the permeability scales as the new length scale to the power 2.25. The two other regimes are the cubic law regimes that act both for very small and very large fracture openings.

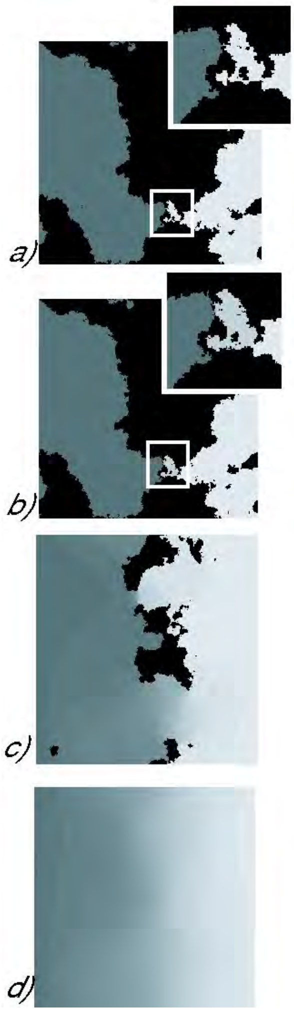
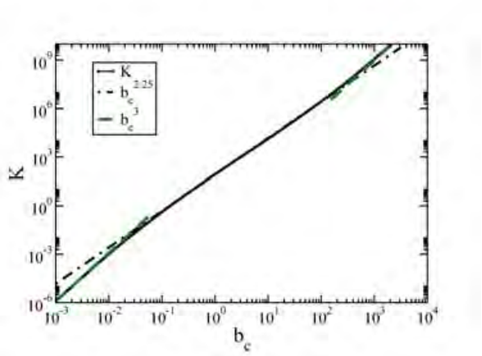


Fig.5..



Reference: L. Talon, H. Auradou and A. Hansen, Phys. Rev. E 82, 046108 (2010).

DIVISION OF CONDENSED MATTER PHYSICS

Staff
Professor Anne Borg
Professor Randi Holmestad

Assoc. professor Dag Werner Breiby
Assoc. professor Ton van Helvoort
Assoc. professor Ragnvald Mathiesen
Assoc. professor Erik Wahlstrøm

Adjunct professor John Walmsley

Engineer Bjørn Gunnar Solheim
Engineer Ole Tore Busedt
Professor emeritus Kristian Fossheim
Professor emeritus Ola Hunderi
Professor emeritus Emil J. Samuelsen
Professor emeritus Ivar Svare

Non-tenured staff
Flemming Ehlers (Post-doc)

Per Erik Vullum (Research scientist)
Justin Wells (Post-doc)
Lars-Erik walle (Post-doc)
Song Fei (Research scientist)
Wakshum M. Tucho (Post-doc)

Chaolin Zha (Post-doc)
Kristin Høydalsvik (Post-doc)
Wajira Mirihanage (Post-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 optical spectroscopy, scanning tunneling microscopy, transmission electron microscopy, X-ray scattering, diffraction and imaging employing home laboratory- and 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.

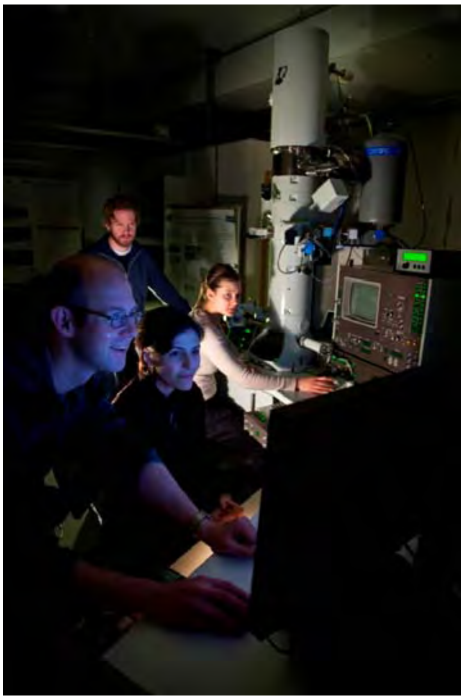
Survey of research activities

X-ray scattering
(D.W. Breiby, R.H. Mathiesen, K.Høydalsvik. W. Mirihanage)
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 2010 the group has continued its activities within national and European research projects, such as FME Solar Cells, ColdWear, SUP Improvement, Nasjonal Forskerskole "Nanoteknologi for Mikrosystem", NFR 3D X-ray Coherent Diffraction Imaging of Working Catalyst Nanoparticles, ESA MAP XRMON and FP7 MIntWeld. The group currently has three PhD students and two post docs. The X-ray laboratory has been undergoing substantial upgrades, and presently consists of three set ups, two of which are used for X-ray scattering and diffraction experiments. Late 2010 the group started assembly and construction of the third instrument, dedicated to microradiographic imaging. The laboratory is generic, covering a large variety of experiments ranging from imaging and tomography, via reflectivity and grazing incidence measurements to traditional wide- and small angle X-ray scattering (WAXS/SAXS). A significant part of the experimental activities of the X-ray group is carried out at synchrotron radiation facilities.

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.

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 9 PhD students and 2 post-docs, and work in close collaboration with SINTEF through the TEM Gemini centre (see http://www.ntnu.edu/geminicentre/tem).

In 2010 the TEM Gemini centre was involved in 26 journal publications, and educated 1 PhD students; Ragnhild Sæterli, within studies of electronic structures. . The main objective of the TEM group now is to secure funding for new state-of-the-art TEMs to Norway. We continued in 2010, together with the TEM environment at UiO, to work for a nationally coordinated investment plan in the Research Council's large scale infrastructure program. Within this initiative 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 2010 we started a bilateral project with Japan within these topics. In addition, there is a broad range of research activity on other materials, with a common emphasis on nano/micro understanding of properties and advanced microscopy techniques. Examples are:

- Multicrystalline silicon solar cell materials-defects and impurity influence on efficiency
- Electronic structure of thermoelectric materials
- Functional perovskite materials - ferroelectric thin films and nanorods
- Nanoparticles and support in catalyst materials – electron tomography and other advanced techniques
- 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, , Justin Wells, Fei Song, Chaolin Zha, Lars-Erik Walle, 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 with sources and electron energy analyser for UPS/XPS analysis. In addition to this two home built scanning probe microscopes have been developed and are currently operational.

Surface science
During 2010 the surface science activities have included investigations of oxidation and reduction behaviour of Pd-based single crystal alloy surfaces, an activity run in close collaboration with Department of Chemical Engineering (Prof. H. J. Venvik) at NTNU. Another main topic has been to understand the adsorption behaviour and interaction of selected adsorbates with ordered TiO_2 surfaces. Our studies have included scanning tunnelling microscopy (STM) and high-resolution photoelectron spectroscopy (HRPES) experiments as well as ordinary and spin polarised Angle resolved ultraphott-electronspectroscopy (ARUPS). 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 performed both at NTNU and abroad. Specific projects have been:

- Oxidation and reduction of (100)-oriented single crystal surfaces of PdAg and PdCu

- Adsorption of water and gold at anatase and rutile surfaces
- Formation of thin TiO_2 films by chemical vapour deposition
- Angle resolved/ spin polarised angle resolved photoemission studies of Bi(441) and graphene/SiC surface.

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. 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 (Fe and Bi on graphite) for fundamental studies through laterally resolved point contact studies of interface resistance.
- Set up of FMR characterisation (utilsing EPR and waveguide set-up)

Research example: Electronic structure of functional oxides studied by electron energy loss spectroscopy

Transmission Electron Microscope (TEM) is a poweful imaging tool. In addition, the local electronic structure of materials can be studied using Electron Energy Loss Spectroscopy (EELS). Being able to study the electronic structure with high spatial and spectral resolution is crucial for the understanding of functional properties at the nm-scale. In 2010 we used EELS combined with structure simulation for the detailed study of the electronic structure of perovskites in order to get more information about their functional properties.

Modified multiferroic $BiFe0_3$ systems[1]:

The multiferroic perovskite bismuth ferrite $BiFeO_3$ and the related isostructural compounds $Bi_{0.9}La_{0.1}FeO_3$ and $BiFe_{0.7}Mn_{0.3}O_3$ were investigated through experiments and modelling. Using EELS the oxygen *K* edge, i.e., the unoccupied O *p* density of states, is probed. As these states participate in covalent bonding with both Bi and Fe states, insight into the bonding in the materials is obtained. By substituting on both cation sites, it is possible to connect features in the spectrum to chemical bonds to the cations. We compare the experimental results of substituted and unsubstituted $BiFeO_3$ and apply a multiple-scattering approach as well as density functional theory to interpret the differences in terms of changes in electronic structure and density of states. Specifically, we show that although mainly ionic, both Bi-O and Fe-O bonds have some covalent character, and that Mn substitution on Fe sites is found to alter the Bi-O bonds and reduce the anisotropy of the system. Upon introduction of La on Bi sites, the covalent character of the material is reduced and the ionic interaction increases as the La-O bond is higher in energy and mediated through other cation orbitals La *d* orbitals than the Bi-O bond Bi *p* orbitals. Also, La substitution is found to influence the Fe electronic structure, showing that the *A* and *B* site cations are more coupled than commonly recognized. Thus, we use the electronic structure to confirm that *B* site cation substitution can influence the ferroelectricity, which is usually almost exclusively attributed to *A* site cation anisotropy.

Thin film ferroelctrics[2]:

For ferroelectric materials, the evolution of the order parameter close to an interface is important to understand regarding the stability of the ferroelectric phase, and how to optimize devices taking advantage of the polarization at the interface. We employ EELS in scanning transmission electron microscopy to compare the electronic and structural properties in both bulk and interface regions of epitaxial $PbTiO_3$ thin films grown on $SrTiO_3$ substrates. At the interface, changes in EELS spectra of the Ti-$L_{3,2}$ and O-*K* edges, as compared to the bulk of the thin film, reveal a reduction in the hybridization of Ti 3*d* and Pb 6*sp* states with O 2*p*, and thus tetragonal distortion of the TiO6 octahedron. Real-space multiple-scattering calculations of the O-*K* edge support the experimental results. Moreover, the analysis of the Ti-valence reveals that the change is gradual over ~2–3 nm. The data implies a decreasing ferroelectric order parameter over ~2–3 nm close to the $PbTiO_3$ $SrTiO_3$ interface with a nonzero value at the interface with an additional screening of the polarization over ~1–2 nm into the $SrTiO_3$ substrate from the Ti atoms.

The work has been done in the TEM Gemini Centre by PhD students Ragnhild Sæterli and Espen Eberg. Supervisors in Dept of Physics were Ton van Helvoort and Randi Holmestad. Collaborators at NTNU were Tor Grande, Mari-Ann Einarsrud, Sverre M. Selbach and Thomas Tybell. Other collaborators were Ponniah Ravindran at UiO and Takahashi R., Gass M., Mendis B., Bleloch A at SuperSTEM Facility in Daresbury UK.

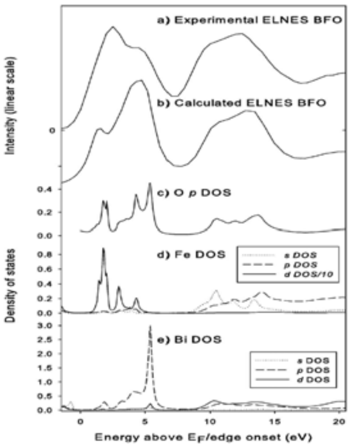


Figure 1. Experimental and calculated electron loss near edge structure (ELNES) of the oxygen K edge in pure $BiFeO_3$, together with calculated density of states (DOS) for the different orbitals involved. Details in the fine structure relates to changes in bonding. More details are given in [1].

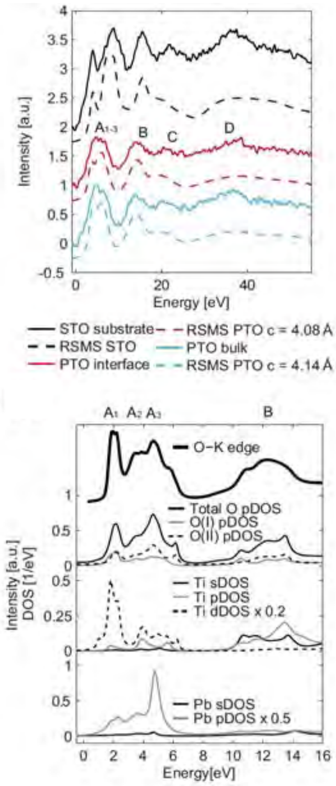


Figure 2. ELNES of the oxygen K edge in $PbTiO_3$ thin film, experimentally for different positions within the thin film and simulated for different *c*-parameters, together with calculated density of states (DOS) [2]. ELNES details can be related to the band structure and change in the order parameter. More details are given in [2].

References:

[1] Sæterli, R., Selbach, S. M., Ravindran, P., Grande, T. and Holmestad, R., "Electronic structure of multiferroic $BiFeO_3$ and related compounds: Electron energy loss spectroscopy and density functional study." *Physical Review B*, 82, 064102, 2010.

[2] Eberg E, van Helvoort A.T.J., Takahashi R., Gass M., Mendis B., Bleloch A., Holmestad R., and Tybell T., “EELS investigation of Pb and Ti hybridization with O at the $PbTiO_3/SrTiO_3$ interface”, *Journal of Applied Physics*, 109, 034104, 2011.

DIVISION OF THEORETICAL PHYSICS

Staff
Professor Jens Oluf Andersen
Professor Arne Brataas
Professor Johan S. Høye
Professor Michael Kachelriess
Professor Jan Myrheim
Professor Kåre Olaussen
Professor Asle Sudbø
Assoc. professor Jon Andreas Støvneng
Assoc. professor Ingjald Øverbø
Assoc. professor Jacob Linder (since July 1)
Adjunct professor Roger Sollie

Professor emeritus Eivind Hiis Hauge
Professor emeritus Per Chr. Hemmer
Professor emeritus Kjell Mork

Non-tenured staff
Swarnali Bandopadhyay (Post-doc, until June 30)
Sergey Ostapchenko (Res. scientist)
Askhat Gazizov (Res. scientist, until May 31)
Anatoly Malshukov (Res. scientist, 2 months)

Overview

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

Survey of research activities and examples of research carried out in 2010

Transport of spin and charge in nanostructures
(A. Brataas, A. Qaiumzadeh, H. Haugen, K. Hals, S. Sadjina, A. Kapelrud)
Understanding nanostructures requires a combination of expertise in different fields by integrating semiconductors and normal metals with magnetic and superconducting materials. Our group explores spin and charge flow in such nano-structures. We aim to develop improved theoretical methods for describing transport phenomena and other physical effects, and use these methods to increase our understanding of experiments. We study the properties of novel systems, pure or hybrid, containing ferromagnets, normal metals, semiconductors, and superconductors. Among our current projects are 1) current induced dynamics in ferromagnets and antiferromagnets, 2) spin flow into superconductors, 3) transport in normal and magnetic semiconductors, 4) fluctuations and dissipation in ferromagnets. We published 10 papers in 2010, among which two in Physical Review Letters, one in EPL, six in Physical Review B, and one in Solid State Communications. Our paper "Effective Magnetic Monopoles and Universal Conductance Fluctuations" in Phys. Rev. Lett. was highlighted in Physics as well as chosen as Editor's suggestion.

Quantum transport in systems with multiple broken symmetries
(*J. Linder, A. Sudbø*)
During 2010 we published 9 papers in Physical Review B, 1 paper in Physical Review A, and 1 paper in Physical Review Letters. Two of the papers published in Physical Review B were Rapid Communications. In addition, two of the papers were chosen as Editors' Suggestions. The primary research focus has been to explore novel effects pertaining to quantum transport in hybrid systems featuring multiple broken symmetries. A main goal in this context is to find ways to exert experimental control over the generation, manipulation, and detection of spin- and charge-currents. This is interesting both from a fundamental physics point of view and in terms of possible applications in nanotechnological structures. In particular, the topics of research in the above publications include 1) topological insulators and Majorana fermions, 2) triplet supercurrents and proximity effects in ferromagnet/superconductor hybrids, 3) odd-frequency pairing in graphene, 4) phase-separation in Bose-Fermi mixtures, and 5) unconventional superconductivity induced by spin-active interfaces.

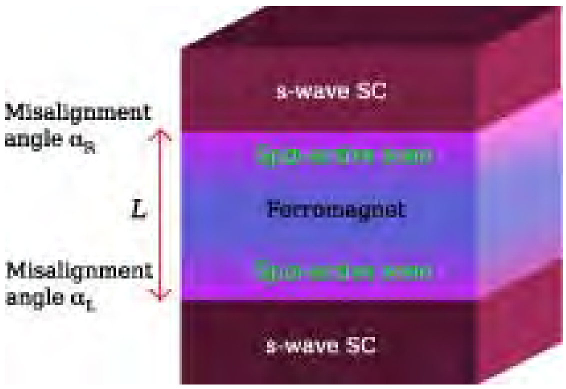


Fig. 1. The model employed for a Josephson junction with a ferromagnetic Heusler Cu_2MnAl barrier. The junction width is L, and we take into account a canted magnetization texture near the interfaces with misalignment angles relative to the bulk

magnetization. These spin-active zones generate a long-range supercurrent.

The research highlights from the above publications include the prediction of Majorana fermions generated at the interface between a topological insulator and a hybrid structure consisting of a ferromagnet/superconductor bilayer. We also demonstrated how spin-active interfaces may induce a crossover from conventional BCS superconducting correlations to exotic odd-frequency correlations at a critical interface resistance. In addition, we have developed a model for a recent experiment reporting a long-range triplet supercurrent in a ferromagnetic Josephson junction (see Fig. 1), and explain this result in terms of conversion from singlet to triplet Cooper pairs by canted magnetization textures at the interface regions.

High-Energy Astrophysics

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

High energy particles interacting with the extragalactic photon background initiate electromagnetic pair cascades. We used data published in 2010 by the Fermi-LAT satellite to derive several constraints on ultrahigh energy cosmic ray models, the flux of cosmogenic neutrinos, and the extragalactic magnetic field. In the former case, we used the diffuse isotropic gamma radiation measured by Fermi-LAT to show that cosmogenic neutrino fluxes are only marginally detectable by existing and currently planned neutrino experiments. In the latter case, we showed that the non-observation of the TeV blazar 1ES 0229+200 by Fermi-LAT requires that the extragalactic magnetic field is stronger than about 5×10^{-15} G in at least 60% of space. Thus the (non-) observation of GeV extensions around TeV blazars probes the magnetic fields in voids and puts strong constraints on the origin of extragalactic magnetic fields, favoring its primordial origin in the early universe. An example of the influence of extragalactic magnetic fields on the appearance of TeV blazars, i.e., active galactic nuclei emitting beamed high-energy photons, is shown in Fig. 2. As the strength of the extragalactic magnetic field increases, the image of the blazar acquires an asymmetric halo. While the observation of such halos would lead to an estimate of the field-strength, missing halos were used by us to derive lower limits on the field.

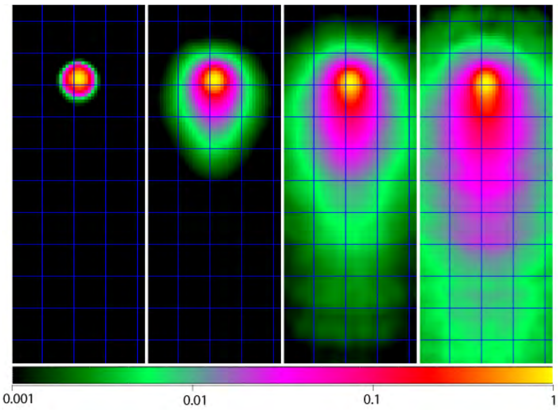


Fig. 2. E > 1 GeV band images of the sky region around TeV blazars with beaming angle 3° for different values of the extragalactic magnetic field strength. From left to right: 10^{-17} G, 10^{-16} G, 10^{-15} G, 10^{-14} G. The color code shows the surface brightness of the source.

Cosmic ray physics

(M. Kachelriess, G. Giacinti, S. Ostapchenko, D. Semikoz, G. Sigl)

Several works studying the propagation of high energy cosmic rays in the Milky Way and their interactions in the atmosphere were performed. In the latter case, a treatment of nonlinear effects in high energy hadronic interactions based on Reggeon field theory was developed, using a complete all-order resummation of enhanced (Pomeron-Pomeron interaction) diagrams. The developed methods and results were used to develop a new Monte Carlo generator (QGSJET-II model) for hadronic interactions, with numerous potential applications in cosmic ray and collider physics.

Dark Matter

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

We concluded our studies of the small-scale clustering of dark matter. In particular, we developed a formalism describing the formation of superdense clumps which can be produced by spiky features in the spectrum of inflationary perturbations and by cosmological phase transitions. The theoretically most interesting property of such clumps is that their evolution can lead to a “gravithermal catastrophe”, similar to the one known from the evolution of stellar clusters.

Multi-Higgs models with additional symmetries

(K. Olaussen, P. Osland, M. Aa. Solberg)

The Higgs particle is the missing piece of the Standard Model of Particle Physics. It is somewhat of a *bête noir* within the model, but no convincing alternatives have been found. Higgs particles are more likely to exist in many variants (as particles of a multi-Higgs model) than not at all. Since multi-Higgs models are plagued with a large number of free parameters one tries to impose some organization or symmetry principle to reduce their number. We have proposed and analyzed one possible symmetry, implying that Higgs particles will occur in (weakly broken) SO(3) multiplets, similar to the states of a(n almost) rotation symmetric system.

Very-High-Precision numerical solutions of some Schrödinger type eigenvalue equations
(A. Mushtaq, A. Noreen, K. Olaussen, I. Øverbø)
We have developed, analyzed, and implemented numerical algorithms for solving some Schrödinger equation eigenvalue problems to almost ridiculous high precision (from thousands up to more than one million decimals). As one example (see Fig. 3) we computed the lowest even and odd eigenvalues of the double well potential,

$$-s^2 \psi'' + (x^2 - 1)^2 \psi = \varepsilon \psi,$$

Fig. 3. The double well potential and its two lowest almost degenerate energy levels.

for s=1/50000. In this case one may use the WKB-approximation to show that the states are degenerate to 28954 decimals. We computed each eigenvalue to a little more than 30000 decimals before taking the difference, and found complete agreement with a 10^{th} order WKB calculation (which however only gives 48 decimals relative accuracy). The method currently works for a large class of problems which can be reduced to ordinary differential equations with only a few singular points, but we have good hopes of extending it to genuine two-dimensional equations. Although we know a couple of possible applications, this is currently a solution in search of a problem.

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 friction
(J. S. Høye, I. Brevik)
The friction force due to the relative motion of a pair of interacting harmonic oscillators has been considered. Due to the recent interest in this problem with different opinions and results we have reconsidered and extended previous work in this area. Various methods are used. In one way we use the Kubo formalism where a response function is evaluated, and a general result for the total energy dissipated is obtained. In another way time-dependent quantum mechanical perturbation theory is applied to obtain the dissipated energy. We were able to show that the results from these two apparently very different methods were equivalent.

Dielectric properties of ionic fluids
(J. S. Høye)
A quantized ionic fluid or electron gas with radiating electromagnetic interaction has been considered by utilizing the path integral formalism. With this approach the quantized problem can be regarded as a polymer problem in four dimensions. Thus the quantum mechanical problem can be regarded as a problem where methods developed in classical statistical mechanics can be applied. This includes the situation with time-dependent interactions. In the latter case one finds that current-current correlations are needed besides density-density correlations. With this one finds that the ionic fluid is equivalent to a dielectric one with a non-local dielectric constant. If one lets the ionic fluid represent the free electrons of a metal, one can obtain the Casimir force between metallic plates. It is shown that there is no zero frequency transverse electric mode that would contribute for non-zero temperatures. This issue has been heavily debated for many years in the Casimir research community. Further the influence of radiation corrections has been included in the Hartree-Fock and density functional theory evaluations of molecular energies.

Critical properties of fluids
(J. S. Høye, E. Lomba)
By previous investigation by one of us the critical properties of the unified HRT (hierarchical reference theory) and SCOZA (self-consistent Ornstein-Zernike theory) were obtained on the basis of certain assumptions. This led to simple numbers for the critical indices. In standard notation they were α=0, β=1/3, δ=5, γ=4/3, η=0, and υ=2/3. It was further argued that, based upon graph expansion arguments, it was not ruled out that these indices except for logarithmic type corrections might be the exact ones for fluids, lattice gases, and the Ising model. By the present investigation the critical properties for the unified

problem is investigated by further analytic work and numerical evaluations. It is noted that in the critical region the HRT part of the problem dominates, so the SCOZA part can be neglected in this respect. From earlier extensive numerical work by others it is well known that for the HRT, values close to 1/3 have been obtained for the index β depending slightly upon the precise equations used. With given index δ=5 the other indices then follow by the usual scaling relations.

Surface structure and reactivity

(*Ø. Borck, K. Nigussa, K. L. Nielsen, J. A. Støvneng*)

Density functional theory (DFT) is used to investigate the geometry 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, nickel titanium "shape memory" alloys, with applications within biomedicine, and cerium platinum surface alloys. For the NiTi system, the DFT calculations illustrate how doping with potassium has a tendency to deplete nickel atoms from the surface and enhance the formation of a protective layer of titanium dioxide, thereby promoting the biofunctionality of the material (see Fig. 4). The nickel titanium work has been published in Physical Review B. Parts of the chromium oxide work has been accepted for publication in Corrosion Science.

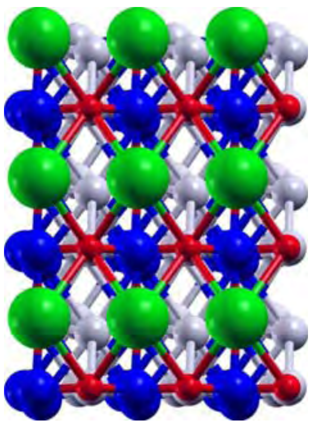


Fig. 4. Adsorption of O_2 on a K-doped B19' NiTi (010) surface. (Top view; O – red, K – green, Ti – blue, Ni – white.)

QCD Phase Diagram

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

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

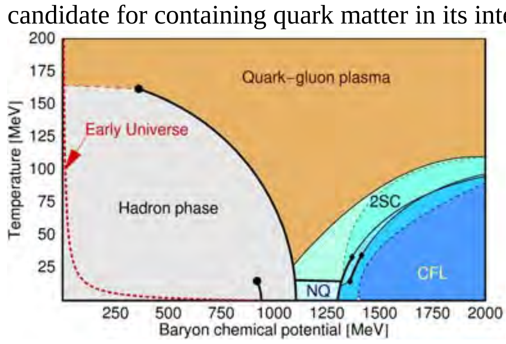


Fig. 5. QCD phase diagram as function of baryon chemical potential and temperature.

We are currently carrying out research to determine the thermodynamic properties of the quark-gluon plasma and various phases of dense matter. In particular, we have been using hard-thermal-loop perturbation theory to thermal QCD and studied the possibility for Bose-Einstein condensation of diquarks in two-color QCD. This is a part of the large efforts being made to obtain a quantitative understanding of the properties of strongly interacting matter at finite temperature and density. The group published four papers and four conference proceedings in 2010, among others one in Physical Review Letters.

PUBLICATIONS

JOURNALS IN LEVEL 1 AND 2

(Total 168)

Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Kildemo, Morten; Lindgren, Mikael. Dynamic response of a fast near infra-red Mueller matrix ellipsometer. *Journal of Modern Optics* 2010;Volum 57.(17) s. 1603-1610

Afadzi, Mercy; Davies, Catharina De Lange; Hansen, Yngve Hofstad; Johansen, Tonni Franke; Måsøy, Svein-Erik; Angelsen, Bjørn Atle J.. Ultrasound Stimulated Release of Liposomal Calcein. *IEEE International Ultrasonics Symposium Proceedings* 2010 s. 2107-2110

Alidoust, Mohammad; Linder, Jacob. Spin-triplet supercurrent through inhomogeneous ferromagnetic trilayers. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(22)

Alidoust, Mohammad; Linder, Jacob; Rashedi, Gholamreza; Yokoyama, Takehito; Sudbø, Asle. Spin-polarized Josephson current in superconductor/ferromagnet/superconductor junctions with inhomogeneous magnetization. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(1)

Alidoust, Mohammad; Rashedi, Gholamreza; Linder, Jacob; Sudbø, Asle. Phase-controlled proximity effect in ferromagnetic Josephson junctions: Calculation of the density of states and the electronic specific heat. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(014532)

Anawati, X; Graver, Brit Kathrine F; Nordmark, Heidi; Zhao, Zhijun; Frankel, GS; Walmsley, John C; Nisancioglu, Kemal. Multilayer Corrosion of Aluminum Activated by Lead. *Journal of the Electrochemical Society* 2010;Volum 157.(10) s. C313-C320

Andersen, Jens Oluf; Brauner, Tomas. Phase diagram of two-color quark matter at nonzero baryon and isospin density. *Physical Review D. Particles and fields* 2010;Volum 81.(9)

Andersen, Jens Oluf; Kyllingstad, Lars Tandle. Pion condensation in a two-flavour NJL model: the role of charge neutrality. *Journal of Physics G: Nuclear and Particle Physics* 2010;Volum 37.(1)

Andersen, Jens Oluf; Kyllingstad, Lars Tandle; Splittorff, Kim. The sign problem across the QCD phase transition. *Journal of High Energy Physics (JHEP)* 2010;Volum 2010.(01)

Andersen, Jens Oluf; Strickland, Michael; Su, Nan. Gluon Thermodynamics at Intermediate Coupling. *Physical Review Letters* 2010;Volum 104.(122003)

Andersen, Jens Oluf; Strickland, Michael; Su, Nan. Three-loop HTL gluon thermodynamics at intermediate coupling. *Journal of High Energy Physics (JHEP)* 2010;Volum 2010.(8)

Andersen, Odd Jan; Løvseth, Jørgen. Stability Modification of the Frøya Wind Spectrum. *Journal of Wind Engineering and Industrial Aerodynamics* 2010;Volum 98.(4-5) s. 236-242

Andersen, Sigmund J; Marioara, CD; Vissers, Rene; Torsæter, Malin; Bjørge, Ruben; Ehlers, Flemming; Holmestad, Randi. The dual nature of precipitates in Al-Mg-Si alloys. *Materials Science Forum* 2010;Volum 638-642. s. 390-395

Bakke, Jan Øystein Haavig; Ray, Purusattam; Hansen, Alex. Morphology of Laplacian random walks. *Europhysics letters* 2010;Volum 92.(3)

Balogh, Emeric; Simonsen, Ingve; Nagy, Balint Zs; Neda, Zoltan. Persistent collective trend in stock markets. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2010;Volum 82.(6) s. 066113-066113-9

Bandopadhyay, Swarnali; Chaudhuri, Debasish; Jayannavar, Arun M.. A comparative study of two phenomenological models of dephasing in series and parallel resistors. *Physics Letters A* 2010;Volum 374.(6) s. 813-818

Bauer, Gerrit E. W.; Bretzel, S; Brataas, Arne; Tserkovnyak, Yaroslav. Nanoscale magnetic heat pumps and engines. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(2)

Bender, Scott A.; Tserkovnyak, Yaroslav; Brataas, Arne. Microwave response of a magnetic single-electron transistor. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(18)

Berezinsky, V; Dokuchaev, V; Eroshenko, Yu; Kachelriess, Michael; Solberg, Marius Aase. Annihilations of superheavy dark matter in superdense clumps. *Physical Review D. Particles and fields* 2010;Volum 81.(10)

Berezinsky, V; Dokuchaev, V; Eroshenko, Yu; Kachelriess, Michael; Solberg, Marius Aase. Superdense cosmological dark matter clumps. *Physical Review D. Particles and fields* 2010;Volum 81.(10)

Bernhardt, B; Sorokin, E; Jacquet, P; Thon, R; Becker, T; Sorokina, Irina T; Picque, N; Hansch, TW. Mid-infrared dual-comb spectroscopy with 2.4 mu m Cr2+:ZnSe femtosecond lasers. *Applied physics. B, Lasers and optics (Print)* 2010;Volum 100.(1) s. 3-8

Bjørge, Ruben; Marioara, Calin D; Andersen, Sigmund J; Holmestad, Randi.
Germanium network connecting precipitates in an Mg-rich Al-Mg-Ge alloy. *Journal of Electron Microscopy* 2010;Volum 59.(S1) s. S129-S133

Bjørge, Ruben; Marioara, Calin D; Andersen, Sigmund J; Holmestad, Randi.
Precipitation in Two Al-Mg-Ge Alloys. *Metallurgical and Materials Transactions*. A 2010;Volum 41A.(8) s. 1907-1916

Black-Schaffer, Annica; Linder, Jacob.
Strongly anharmonic current-phase relation in ballistic graphene Josephson junctions. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(18)

Borck, Øyvind; Svenum, Ingeborg-Helene; Walle, Lars Erik; Andersen, Therese Hegsvold; Schulte, Karina; Borg, Anne. Adsorption of methylamine on Ni3Al(111) and NiAl (110) - a high resolution photoelectron spectroscopy and density functional theory study. *Journal of Physics: Condensed Matter* 2010;Volum 22.(39)

Bowden, Samuel; Gibson, Ursula.
Logic operations and data storage using vortex magnetization states in mesoscopic permalloy rings, and optical readout. *Journal of Physics, Conference Series* 2010;Volum 200.(7)

Bulatov, Lenar I.; Mashinskii, Valerii M.; Dvoyrin, Vladislav V.; Kustov, E. F.; Dianov, E. M.. Luminescent properties of bismuth centres in aluminosilicate optical fibres. *Quantum electronics* (Woodbury, N.Y.) 2010;Volum 40.(2) s. 153-159

Chabera, Pavel; Fuciman, Marcel; Naqvi, Kalbe Razi; Polivka, Tomas.
Ultrafast dynamics of hydrophilic carbonyl carotenoids - Relation between structure and excited-state properties in polar solvents. *Chemical Physics* 2010;Volum 373.(1-2) s. 56-64

Cui, Jingbiao; Gibson, Ursula. A Simple Two-Step Electrodeposition of Cu2O/ZnO Nanopillar Solar Cells. *The Journal of Physical Chemistry C* 2010;Volum 114.(14) s. 6408-6412

Dasa, Lakshmi Narayana; Zhou, Hailong; Anthonysamy, Fervin Moses; Hoang, Thang Ba; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Growth of heterostructured III-V nanowires by molecular beam epitaxy for photonic applications. *Proceedings of SPIE, the International Society for Optical Engineering* 2010;Volum 7608. s. 76081C-1-76081C-6

Delaleau, Pierre Patrick; Beckermann, Christoph; Mathiesen, Ragnvald; Arnberg, Lars. Mesoscopic Simulation of Dendritic Growth Observed in X-ray Video Microscopy During Directional Solidification of Al-Cu Alloys. *ISIJ International* 2010;Volum 50.(12) s. 1886-1894

Duffaut, Kenneth; Landrø, Martin; Sollie, Roger. Using Mindlin theory to model friction-dependent shear modulus in granular media. *Geophysics* 2010;Volum 75.(3) s. E143-E152

Dvoyrin, Vladislav; Mashinskii, Valerii M.; Iskhakova, L. D.; Khopin, V. F.; Gur'yanov, Aleksei N; Dianov, Evgenii M. Optical fibre with a germanate glass core for lasing near 2 μm. *Quantum electronics* (Woodbury, N.Y.) 2010;Volum 40.(12) s. 1103-1105

Ehlers, Flemming; Holmestad, Randi.
Direct Approach to Atomistic Ab Initio Studies of Precipitate Growth in Alloys. *Materials Research Society Symposium Proceedings* 2010;Volum 1229E.(LL-02-09)

Eikenes, Live; Tufto, Ingunn; Schnell, Edrun Andrea; Bjørkøy, Astrid; Davies, Catharina de Lange. Effect of Collagenase and Hyaluronidase on Free and Anomalous Diffusion in Multicellular Spheroids and Xenografts. *Anticancer Research* 2010;Volum 30.(2) s. 359-368

Ellingsen, Simen Andreas Ådnøy; Gjerden, Knut Skogstrand; Grøva, Morten; Hansen, Alex. Model for density waves in gravity-driven granular flow in narrow pipes. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2010;Volum 81.(6)

Eriksen, Jon Alm; Biswas, Soumyajyoti; Chakrabarti, Bikas K.. Effect of fractal disorder on static friction in the Tomlinson model. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2010;Volum 82.(4)

Espy, Patrick Joseph; Ochoa, Sara; Forkman, Peter; Murtagh, Donal; Stegman, Jacek. The role of the QBO in the inter-hemispheric coupling of summer mesospheric temperatures. *Atmospheric Chemistry and Physics Discussions* 2010;Volum 10.(10) s. 23403-23422

Fagerholt, Egil; Grytten, Frode; Gihleengen, Britt Elin; Langseth, Magnus; Børvik, Tore. Continuous out-of-plane deformation measurements of AA5083-H116 plates subjected to low-velocity impact loading. *International Journal of Mechanical Sciences* 2010;Volum 52.(5) s. 689-705

Garskaite, Edita; Lindgren, Mikael; Einarsrud, Mari-Ann; Grande, Tor. Luminescent properties of rare earth (Er, Yb) doped yttrium aluminium garnet thin films and bulk samples synthesised by an aqueous sol-gel technique. *Journal of the European Ceramic Society* 2010;Volum 30.(7) s. 1707-1715

Gawel, Kamila; Barriet, David; Sletmoen, Marit; Stokke, Bjørn Torger. Responsive Hydrogels for Label-Free Signal Transduction within Biosensors. *Sensors* 2010;Volum 10.(5) s. 4381-4409

Giacinti, G.; Kachelriess, Michael; Semikoz, Dimitry; Sigl, G.. Ultrahigh Energy Nuclei in the Galactic Magnetic Field. *Journal of Cosmology and Astroparticle Physics* 2010;Volum 2010.(8)

Gibson, Ursula; Casey, Catherine. "Phenylalanine Detection Using Matrix-Assisted Pulsed Laser Evaporation of Molecularly Imprinted Amphiphilic Block Copolymer Films". *Biosensors & bioelectronics* 2010;Volum 26.(2) s. 703-709

Glimsdal, Eirik; Carlsson, Marcus; Kindahl, Thomas; Lindgren, Mikael; Lopes, Cesar; Eliasson, Bertil. Luminescence, Singlet Oxygen Production, and Optical Power Limiting of Some Diacetylide Platinum(II) Diphosphine Complexes. *Journal of Physical Chemistry A* 2010;Volum 114.(10) s. 3431-3442

Graver, Brit Kathrine F; Van Helvoort, Antonius; Nisancioglu, Kemal.
Effect of heat treatment on anodic activation of aluminium by trace element indium. *Corrosion Science* 2010;Volum 52.(11) s. 3774-3781

Gulbrandsen-Dahl, Sverre; Moen, Knut Erling; Ehlers, Flemming; Marioara, Calin D; Pedersen, Ketill Olav; Marthinsen, Knut. Matrix Coherency Strain and Hardening of Al-Mg-Si. *Materials Science Forum* 2010;Volum 638-642. s. 229-234

Gundersen, Paul; Kongshaug, Kjell Ove; Selvig, Espen; Haakenaasen, Randi. Electrical characterization of HgTe nanowires using conductive atomic force microscopy. *Journal of Applied Physics* 2010;Volum 108.(11)

Haakenaasen, Randi; Selvig, Espen; Tonheim, Celin Russøy; Kongshaug, Kjell Ove; Lorentzen, Torgeir; Trosdahl-Iversen, Laila; Andersen, Jonathan Borenstein; Gundersen, Paul. HgCdTe Research at FFI: Molecular Beam Epitaxy Growth and Characterization. *Journal of Electronic Materials* 2010;Volum 39.(7) s. 893-902

Hak, Sjoerd; Reitan, Nina Kristine; Haraldseth, Olav; Davies, Catharina De Lange. Intravital microscopy in window chambers: a unique tool to study tumor angiogenesis and delivery of nanoparticles. *Angiogenesis* 2010;Volum 13.(2) s. 113-130

Hals, Kjetil Magne Dørheim; Brataas, Arne; Bauer, Gerrit E. W.. Thermopower and thermally induced domain wall motion in (Ga, Mn)As. *Solid State Communications* 2010;Volum 150.(11-12) s. 461-465

Hals, Kjetil Magne Dørheim; Brataas, Arne; Tserkovnyak, Y. Scattering theory of charge-current-induced magnetization dynamics. *Europhysics letters* 2010;Volum 90.(4)

Hals, Kjetil Magne Dørheim; Nguyen, Kiet Anh; Waintal, Xavier; Brataas, Arne. Effective Magnetic Monopoles and Universal Conductance Fluctuations. *Physical Review Letters* 2010;Volum 105.(20)

Hansen, Henning F.; Walle, Lars Erik; Hansen, Alex. Wealth and Income Distributions in Norway: A Case Study. *Dynamics of Socio-Economic Systems* 2010;Volum 2.(1) s. 110-120

Haugen, Håvard; Huertas-Hernando, Daniel; Brataas, Arne; Waintal, Xavier. Crossed Andreev reflection versus electron transfer in three-terminal graphene devices. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(17)

Hemmen, Henrik; Alme, Lars Ramstad; Fossum, Jon Otto; Meheust, Yves. X-ray studies of interlayer water absorption and mesoporous water transport in a weakly hydrated clay. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2010;Volum 82.(3)

Herland, Egil; Babaev, Egor; Sudbø, Asle. Phase transitions in a three dimensional U(1)×U(1) lattice London superconductor: Metallic superfluid and charge-4e superconducting states. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(13)

Hessen, Dag Olav; Carroll, JoLynn; Kjeldstad, Berit Johanne; Korosov, Anton; Pettersson, Lasse H.; Pozdnyakov, Dmitry; Sørensen, Kai. Input of organic carbon as determinant of nutrient fluxes, light climate and productivity in the Ob and Yenisey estuaries. *Estuarine, Coastal and Shelf Science* 2010;Volum 88.(1) s. 53-62

Hoang, Thang Ba; Anthonysamy, Fervin Moses; Ahtapodov, Lyubomir; Zhou, Hailong; Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge. Engineering Parallel and Perpendicular Polarized Photoluminescence from a Single Semiconductor Nanowire by Crystal Phase Control. *Nano letters (Print)* 2010;Volum 10.(8) s. 2927-2933

Høye, Johan Skule. Dielectric properties of classical and quantized ionic fluids. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2010;Volum 81.(6)

Høye, Johan Skule. Dynamical pair correlations of classical and quantum fluids perturbed with weak long-range forces. *Physica A: Statistical Mechanics and its Applications* 2010;Volum 389.(7) s. 1380-1390

Høye, Johan Skule; Brevik, Iver Håkon. Casimir friction force and energy dissipation for moving harmonic oscillators. *Europhysics letters* 2010;Volum 91.(6)

Høye, Johan Skule; Lomba, Enrique. A simple one-dimensional lattice model with water-like phase behaviour. *Molecular Physics* 2010;Volum 108.(1) s. 51-55

Jahn, TR; Makin, O. Sumner; Morris, KL; Marshall, Karen; Tian, P; Sikorski, Pawel; Serpell, Louise C.. The Common Architecture of Cross-beta Amyloid. *Journal of Molecular Biology* 2010;Volum 395.(4) s. 717-727

Jauffred, Liselotte; Sletmoen, Marit; Czerwinski, Fabian; Oddershede, Lene. Quantum dots as handles for optical manipulation. *Proceedings of SPIE, the International Society for Optical Engineering* 2010;Volum 7762.

Jettestuen, Espen; Nermoen, Anders; Hestmark, Geir; Timdal, Einar; Mathiesen, Joachim. Competition on the Rocks: Community Growth and Tessellation. *PLoS ONE* 2010 ;Volum 5.(9)

Johansson, Erik; Plogmaker, Stefan; Walle, Lars Erik; Schölin, Rebecka; Borg, Anne; Sandell, Anders; Rensmo, Håkan. Comparing Surface Binding of the Maleic Anhydride Anchor Group on Single Crystalline Anatase TiO2 (101), (100), and (001) Surfaces. *The Journal of Physical Chemistry C* 2010;Volum 114.(35) s. 15015-15020

Kachelriess, Michael. Ultrahigh energy neutrinos: Theoretical aspects. *Journal of Physics, Conference Series* 2010;Volum 203.(1)

Kachelriess, Michael; Ostapchenko, Sergey; Tomas, R. TeV Gamma Rays from Ultrahigh Energy Cosmic Ray Interactions in the Cores of Active Galactic Nuclei: Lessons from Centaurus A. *Publications Astronomical Society of Australia* 2010;Volum 27.(4) s. 482-489

Kachelriess, Michael; Ostapchenko, Sergey; Tomas, Ricard. Antimatter spectra from a time-dependent modeling of supernova remnants. *Journal of Physics, Conference Series* 2010;Volum 259.(1)

Klein, Dionne C.G.; Latz, Eicke; Espevik, Terje; Stokke, Bjørn Torger. Higher order structure of short immunostimulatory oligonucleotides studied by atomic force microscopy. *Ultramicroscopy* 2010;Volum 110.(6) s. 689-693

Kurkov, A. S.; Dvoyrin, Vladislav; Marakulin, A.V.. All-fiber 10 W holmium lasers pumped at λ=1.15 μm. *Optics Letters* 2010 ;Volum 35.(4) s. 490-492

Kustov, E. F.; Bulatov, L. I.; Dvoyrin, Vladislav; Mashinsky, V.M.; Dianov, E. M.. Crystal field and molecular orbital theory of MBm centres in glasses. *Journal of Physics B: Atomic, Molecular and Optical Physics* 2010;Volum 43.(2)

Kvande, Ingvar; Zhu, Jun; Zhao, Tiejun; Hammer, Nina; Rønning, Magnus; Raaen, Steinar; Walmsley, John C; Chen, De. Importance of Oxygen-Free Edge and Defect Sites for the Immobilization of Colloidal Pt Oxide Particles with Implications for the Preparation of CNF-Supported Catalysts. *The Journal of Physical Chemistry C* 2010;Volum 114.(4) s. 1752-1762

Larsen, Magnus Hurlen; Walmsley, John C; Lunder, Otto; Nisancioglu, Kemal. Effect of Excess Silicon and Small Copper Content on Intergranular Corrosion of 6000-Series Aluminum Alloys. *Journal of the Electrochemical Society* 2010;Volum 157.(2) s. C61-C68

Le Roy, S; Søndergård, Elin; Nerbø, Ingar Stian; Kildemo, Morten; Plapp, Mathis. Diffuse-interface model for nanopatterning induced by self-sustained ion-etch masking. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(16)

Lee, Wai Keat; Hin Yong, Wong; Chan, Kah Yong; Yong, Thian Khok; Yap, Seong Shan; Tou, Teck Yong. Effects of laser fluence on the structural properties of pulsed laser deposited ruthenium thin films. *Applied Physics A: Materials Science & Processing* 2010;Volum 100.(2) s. 561-568

Leganger, Lars Erlend; Eeg, Jan Olav. Nonfactorizable contribution to B-d(0) -> pi D-0(0). *Physical Review D. Particles and fields* 2010;Volum 82.(7)

Leinaas, JM; Myrheim, Jan; Sollid, PO. Numerical studies of entangled positive-partial-transpose states in composite quantum systems. *Physical Review A. Atomic, Molecular, and Optical Physics* 2010;Volum 81.(6)

Leinaas, Jon Magne; Myrheim, Jan; Sollid, Per Øyvind. Low-rank extremal positive-partial-transpose states and unextendible product bases. *Physical Review A. Atomic, Molecular, and Optical Physics* 2010;Volum 81.(6)

Letnes, Paul Anton; Nerbø, Ingar Stian; Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Kildemo, Morten. Fast and optimal broad-band Stokes/Mueller polarimeter design by the use of a genetic algorithm. *Optics Express* 2010;Volum 18.(22) s. 23095-23103

Letnes, Paul Anton; Simonsen, Ingve. Spectrally dependent locations of hot-spots in nanoparticle clusters. *Physica status solidi. B, Basic research* 2010;Volum 247.(8) s. 2084-2088

Li, Yanjun; Chen, Yongjun; Walmsley, John C.; Mathiesen, Ragnvald; Dumoulin, S; Roven, Hans Jørgen. Faceted interfacial structure of {1011} twins in Ti formed during equal channel angular pressing. *Scripta Materialia* 2010;Volum 62.(7) s. 443-446

Linder, Jacob; Black-Schaffer, Annica; Sudbø, Asle. Triplet proximity effect and odd-frequency pairing in graphene. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(4)

Linder, Jacob; Cuoco, Mario; Sudbø, Asle. Spin-active interfaces and unconventional pairing in half-metal/superconductor junctions. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(17)

Linder, Jacob; Sudbø, Asle. Majorana fermions manifested as interface states in semiconductor hybrid structures. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(8)

Linder, Jacob; Sudbø, Asle. Probing phase separation in Bose-Fermi mixtures by the critical superfluid velocity. *Physical Review A. Atomic, Molecular, and Optical Physics* 2010;Volum 81.(1)

Linder, Jacob; Sudbø, Asle. Triplet supercurrent due to spin-active zones in a Josephson junction. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(2)

Linder, Jacob; Sudbø, Asle; Yokoyama, Takehito; Grein, Roland; Eschrig, Matthias. Signature of odd-frequency pairing correlations induced by a magnetic interface. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(21)

Linder, Jacob; Tanaka, Yukio; Yokoyama, Takehito; Sudbø, Asle; Nagaosa, Naoto. Interplay between superconductivity and ferromagnetism on a topological insulator. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(18)

Linder, Jacob; Tanaka, Yukio; Yokoyama, Takehito; Sudbø, Asle; Nagaosa, Naoto. Unconventional Superconductivity on a Topological Insulator. *Physical Review Letters* 2010;Volum 104.(6)

Linder, Jacob; Yokoyama, Takehito; Sudbø, Asle. Pure spin current generated by reflection at a normal metal/two-dimensional electron gas interface. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(7)

Lindgren, Mikael; Hammarström, Per. Amyloid oligomers: spectroscopic characterization of amyloidogenic protein states. *The FEBS Journal* 2010;Volum 277.(6) s. 1380-1388

Liu, Yun; Monsen, Åsmund Fløystad; Boschker, Jos Emiel; Wahlström, Erik; Borg, Anne; Tybell, Thomas. Nanoscale surface modification of La0.7Sr0.3MnO3 thin films. *Journal of Vacuum Science & Technology B* 2010;Volum 28.(2) s. 407-410

Liu, Yun; Zhang, J. The effect of coalescence on threading dislocations in GaN films. *Scripta Materialia* 2010;Volum 63.(1) s. 109-112

Liu, Yun; Zhang, J.. Nanolithography on SrRuO3 thin film surfaces by scanning tunneling microscopy. *Physica. B, Condensed matter* 2010;Volum 405.(7) s. 1890-1893

Liu, Yun; Zhang, Jia. Controllable nanostructures on La0.7Sr0.3MnO3 thin film surfaces formed by scanning tunneling microscopy. *Microelectronic Engineering* 2010;Volum 87.(11) s. 2264-2267

Liu, Yun; Zhang, Jia. Effects of sapphire annealing on the structural properties of AlN thin films grown by molecular beam epitaxy. *Physica. B, Condensed matter* 2010;Volum 405.(6) s. 1643-1646

Mal'shukov, AG; Brataas, Arne. ac Josephson effect induced by spin injection. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(14)

Mal'shukov, AG; Sadjina, Severin Simon; Brataas, Arne. Inverse spin Hall effect in superconductor/normal-metal/superconductor Josephson junctions. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(6)

Mathiesen, Ragnvald; Arnberg, Lars; Li, Yanjun; Snigirev, Anatoly; Snigireva, Irina; Dahle, Arne Kristian. X-Ray Video Microscopy Studies of Irregular Eutectic Solidification Microstructures in Al-Si-Cu Alloys. *ISIJ International* 2010;Volum 50.(12) s. 1936-1940

McFadden, Shaun; Schaffer, Paul; Mathiesen, Ragnvald; Browne, David. Analysis of an Equiaxed Dendrite Growth Model with Comparisons to In-Situ Results of Equiaxed Dendritic Growth in an Al-Ge Alloy. *Materials Science Forum* 2010;Volum 654-656. s. 1359-1362

Mumm, Florian; Kemell, M; Leskelä, M; Sikorski, Pawel. A bio-originated porous template for the fabrication of very long, inorganic nanotubes and nanowires. *Bioinspiration & Biomimetics* 2010;Volum 5.(2)

Mørkved, Eva Henmo; Andreassen, Trygve; Fröhlich, Roland; Mo, Frode; Bruheim, Per. Unsymmetrical zinc azaphthalocyanines, peripherally substituted with thiophen-2-yl and 2-functionalized phenoxy groups. *Polyhedron* 2010;Volum 29.(17) s. 3229-3237

Naqvi, Kalbe Razi; Li, Heng; Melø, Thor Bernt; Webster, Richard D.. Spectroscopic Characterization of Neutral and Cation Radicals of alpha-Tocopherol and Related Molecules: A Satisfactory Denouement. *Journal of Physical Chemistry A* 2010;Volum 114.(40) s. 10795-10802

Nerbø, Ingar Stian; Le Roy, S; Foldyna, Martin; Kildemo, Morten; Søndergård, Elin. Characterization of inclined GaSb nanopillars by Mueller matrix ellipsometry. *Journal of Applied Physics* 2010;Volum 108.(1)

Neronov, Andrii; Semikoz, Dmitri; Kachelriess, Michael; Ostapchenko, Sergey; Elyiv, Andrii. DEGREE-SCALE GeV "JETS" FROM ACTIVE AND DEAD TeV BLAZARS. *The Astrophysical Journal* 2010;Volum 719.(2) s. L130-L133

Nigussa, Kenate Nemera; Støvneng, Jon Andreas. Oxidation of pure and potassium-doped NiTi shape memory surface: A density functional theory investigation. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(24) s. 245401-1-245401-13

Ostapchenko, Sergey. Total and diffractive cross sections in enhanced Pomeron scheme. *Physical Review D. Particles and fields* 2010;Volum 81.(11)

Overskaug, Kristian; Holt, Gunnar; Steffensen, Morten; Hagen, Karin Gjøl; Næss, Arild Brandrud. An Analysis of Visitation Patterns at the Museum of Natural History and Archaeology, Trondheim, Norway, from 1954 to 2006.. *Visitor Studies* 2010;Volum 13.(1) s. 107-117

Pauw, Brian R; Vigild, Martin E; Mortensen, Kell; Andreasen, Jens W.; Klop, Enno A; Breiby, Dag Werner; Bunk, Oliver. Strain-induced internal fibrillation in looped aramid filaments. *Polymer* 2010;Volum 51.(20) s. 4589-4598

Pierce, David M.; Lilledahl, Magnus Borstad; Ricken, Tim; Davies, Catharina de Lange; Holzapfel, Gerhard. Morphological Analysis of Articular Cartilage Using Multiphoton Microscopy as Input for Constitutive Modeling: Experiment and Mathematical Implementation. *International Federation for Medical and Biological Engineering Proceedings* 2010;Volum 31.(3) s. 895-898

Pradhan, Srutarshi; Hansen, Alex; Chakrabarti, Bikas K.. Failure processes in elastic fiber bundles. *Reviews of Modern Physics* 2010 ;Volum 82.(1) s. 499-555

Raaen, Steinar. Possible influence of electrostatics in molecular bonding at supported metal nanoparticles. *Philosophical Magazine Letters* 2010;Volum 90.(3) s. 193-199

Ramachandran, Amutha; Borck, Øyvind; Andersen, Trine; Svenum, Ingeborg-Helene; Walle, Lars Erik; Borg, Anne. Methanol adsorption on Pd(110) and Ag/Pd(110) studied by high-resolution photoelectron spectroscopy. *Surface Science* 2010;Volum 604.(2) s. 89-97

Ramachandran, Amutha; Tucho, Wakshum Mekonnen; Mejdell, Astrid Lervik; Stange, Marit; Venvik, Hilde Johnsen; Walmsley, John C; Holmestad, Randi; Bredesen, Rune; Borg, Anne. Surface characterization of Pd/Ag23 wt% membranes after different thermal treatments. *Applied Surface Science* 2010;Volum 256.(20) s. 6121-6132

Reitan, Nina Kristine; Thuen, Marte; Goa, Pål Erik; Davies, Catharina De Lange. Characterization of tumor microvascular structure and permeability: comparison between magnetic resonance imaging and intravital confocal imaging. *Journal of Biomedical Optics* 2010 ;Volum 15.(3)

Revheim, Mona Elisabeth; Røe, Kathrine; Bruland, Øyvind; Bach-Gansmo, Tore; Skretting, Arne; Seierstad, Therese. Monitoring the Effect of Targeted Therapies in a Gastrointestinal Stromal Tumor Xenograft Using a Clinical PET/CT.. *Molecular Imaging and Biology* 2010

Ringdal, Nils Ivar; Fonseca, Davi De Miranda; Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fossum, Jon Otto. Nematic textures in colloidal dispersions of Na-fluorohectorite synthetic clay. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2010 ;Volum 81.(4)

Rozynek, Zbigniew; Knudsen, KD; Fossum, Jon Otto; Meheust, Y; Wang, Bao-Xiang; Zhou, Min. Electric field induced structuring in clay-oil suspensions: new insights from WAXS, SEM, leak current, dielectric permittivity, and rheometry. *Journal of Physics: Condensed Matter* 2010;Volum 22.(32)

Rødal, Jan; Søvik, Åste; Malinen, Eirik. Influence of MLC leaf width on biologically adapted IMRT plans. *Acta Oncologica* 2010;Volum 49.(7) s. 1116-1123

Rødal, Jan; Søvik, Åste; Skogmo, Hege K.; Knudtsen, Ingerid Skjei; Malinen, Eirik. Feasibility of contrast-enhanced cone-beam CT for target localization and treatment monitoring. *Radiotherapy and Oncology* 2010;Volum 97.(3) s. 521-524

Rødseth, Silje; Bungum, Berit. Hva inspirerer til fysikkstudier? En undersøkelse av begynnerstudenter på fysikk. *NorDiNa: Nordic Studies in Science Education* 2010;Volum 6.(1) s. 3-15

Samuelsson, P; Brataas, Arne. Proposal for quantum spin tomography in ferromagnet-normal conductors. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(18)

Santucci, Stephane; Grob, M; Toussaint, Renaud; Schmittbuhl, Jean; Hansen, Alex; Måløy, Knut Jørgen. Fracture roughness scaling: A case study on planar cracks. *Europhysics letters* 2010;Volum 92.(4)

Saxegaard, Magne; Zheng, Yang de; Wahlström, Erik; Brucas, Rimantas; Hanson, Maj. Field and current-induced magnetization reversal studied through spatially resolved point-contacts. *Journal of Applied Physics* 2010;Volum 107.(10)

Schaefer, Andreas; Sandell, Anders; Walle, Lars Erik; Zielasek, V.; Schowalte, M.; Rosenauer, A.; Bäumer, Marcus. Chemistry of thin film formation and stability during praseodymium oxide deposition on Si(111) under oxygen-deficient conditions. *Surface Science* 2010;Volum 604.(15-16) s. 1287-1293

Schaffer, Paul; Mathiesen, Ragnvald; Arnberg, Lars. In situ investigations of liquid-liquid phase separation in hypermonotectic alloys. *Materials Science Forum* 2010;Volum 649. s. 149-158

Schaffer, Paul; Mathiesen, Ragnvald; Arnberg, Lars. In-situ Investigation of Liquid-Liquid Phase Separation in Hypermonotectic Alloys. *Materials Science Forum* 2010;Volum 649. s. 149-158

Sen, Pinar; Hirel, Catherine; Andraud, Chantal; Aronica, Christophe; Bretonniere, Yann; Mohammed, Abdelsalam; Ågren, Hans; Minaev, Boris; Minaeva, Valentina; Baryshnikov, Gleb; Lee, Hung-Hsun; Duboisset, Julien; Lindgren, Mikael. Fluorescence and FTIR Spectra Analysis of Trans-A2B2-Substituted Di- and Tetra-Phenyl Porphyrins. *Materials* 2010 ;Volum 3.(8) s. 4446-4475

Siew, Wee Ong; Lee, Wai Keat; Wong, Hin Yong; Yong, Thian Khok; Yap, Seong Shan; Tou, Teck Yong. Investigation of droplet formation in pulsed Nd:YAG laser deposition of metals and silicon. *Applied Physics A: Materials Science & Processing* 2010;Volum 101.(4) s. 627-632

Simonsen, Ingve. Enhanced back and forward scattering in the reflection of light from weakly rough random metal surfaces. *Physica status solidi. B, Basic research* 2010;Volum 247.(8) s. 2075-2083

Simonsen, Ingve. Optics of surface disordered systems:A Random Walk Through Rough Surface Scattering Phenomena. *The European Physical Journal Special Topics* 2010;Volum 181.(1) s. 1-103

Simonsen, Ingve; Maradudin, Alexei A.; Leskova, Tamara A.. Scattering of Electromagnetic Waves from Two-Dimensional Randomly Rough Penetrable Surfaces. *Physical Review Letters* 2010;Volum 104.(22) s. 223904-223904-4

Simonsen, Ingve; Maradudin, Alexei; Leskova, Tamara. Scattering of electromagnetic waves from two-dimensional randomly rough perfectly conducting surfaces: The full angular intensity distribution. *Physical Review A. Atomic, Molecular, and Optical Physics* 2010;Volum 81.(1)

Sletmoen, Marit; Draget, Kurt Ingar; Stokke, Bjørn Torger. Alginate oligoguluronates as a tool for tailoring properties of Ca-alginate gels. *Macromolecular Symposia* 2010;Volum 291-292.(1) s. 345-353

Sperstad, Iver Bakken; Stiansen, Einar; Sudbø, Asle. Monte Carlo simulations of dissipative quantum Ising models. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.(10)

Starikov, Anton A.; Kelly, Paul J.; Brataas, Arne; Tserkovnyak, Y; Bauer, GEW. Unified First-Principles Study of Gilbert Damping, Spin-Flip Diffusion, and Resistivity in Transition Metal Alloys. *Physical Review Letters* 2010;Volum 105.(23)

Strand, Sabina P.; Lelu, Sylvie; Reitan, Nina Kristine; Davies, Catharina De Lange; Artursson, Per; Vårum, Kjell Morten. Molecular design of chitosan gene delivery systems with an optimized balance between polyplex stability and polyplex unpacking. *Biomaterials* 2010 ;Volum 31.(5) s. 975-987

Strandberg, Rune; Reenaas, Turid Worren. Limiting efficiency of intermediate band solar cells with spectrally selective reflectors. *Applied Physics Letters* 2010;Volum 97.(3)

Strickland, Michael; Su, Nan; Andersen, Jens Oluf. QED Thermodynamics at Intermediate Coupling. *Acta Physica Polonica B* 2010;Volum 3.(3) s. 727-734

Su, Nan; Andersen, Jens Oluf; Strickland, Michael. Hard-thermal-loop QED thermodynamics. *High Energy Physics & Nuclear Physics* 2010;Volum 34.(9) s. 1527-1529

Sun, Dezheng; Kim, Dae-Ho; Le, Duy; Borck, Øyvind; Berland, Kristian; Kim, Kwangmoo; Lu, WenHao; Zhu, YeMing; Luo, MiaouMiaou; Wyrick, Jonathan; Cheng, ZiHai; Einstein, TL; Rahman, Talat; Hyldgaard, Per; Bartels, Ludwig. Effective elastic properties of a van der Waals molecular monolayer at a metal surface. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(20)

Sun, J; Wang, J; Wells, Justin W; Koroteev, YM; Bihlmayer, G; Chulkov, EV; Hofmann, Ph; Pohl, K. Structure and oscillatory multilayer relaxation of the bismuth (100) surface. *New Journal of Physics* 2010;Volum 12.

Svenum, Ingeborg-Helene; Borck, Øyvind; Walle, Lars Erik; Schulte, Karina; Borg, Anne. Adsorption of CO on Ni3Al(111) investigated using high-resolution photoemission spectroscopy and density functional theory. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 81.

Sæterli, Ragnhild; Rørvik, Per Martin Ljønes; You, Chang Chuan; Holmestad, Randi; Tybell, Thomas; Grande, Tor; Van Helvoort, Antonius; Einarsrud, Mari-Ann. Polarization control in ferroelectric PbTiO3 nanorods. *Journal of Applied Physics* 2010;Volum 108.(12)

Sæterli, Ragnhild; Selbach, Sverre Magnus; Ravindran, Ponniah; Grande, Tor; Holmestad, Randi. Electronic structure of multiferroic BiFeO3 and related compounds: Electron energy loss spectroscopy and density functional study. *Physical Review B. Condensed Matter and Materials Physics* 2010;Volum 82.(6)

Søvik, Åste; Rødal, Jan; Skogmo, Hege K.; Lervåg, Christoffer; Eilertsen, Karsten; Malinen, Eirik. Adaptive radiotherapy based on contrast enhanced cone beam CT imaging. *Acta Oncologica* 2010 ;Volum 49. s. 972-977

Talon, L; Auradou, H; Hansen, Alex. Permeability estimates of self-affine fracture faults based on generalization of the bottleneck concept. *Water resources research* 2010;Volum 46.

Talon, L; Auradou, Harold; Hansen, Alex. Permeability of self-affine aperture fields. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2010;Volum 82.(4)

Tenorio, RP; Engelsberg, M; Fossum, Jon Otto; da Silva, GJ. Intercalated Water in Synthetic Fluorhectorite Clay. *Langmuir* 2010;Volum 26.(12) s. 9703-9709

Tierney, Sven; Sletmoen, Marit; Skjåk-Bræk, Gudmund; Stokke, Bjørn Torger. Interferometric characterization of swelling of covalently crosslinked alginate gel and changes associated with polymer impregnation. *Carbohydrate Polymers* 2010;Volum 80.(3) s. 828-832

Torsæter, Malin; Hasting, Håkon Stokka; Lefebvre, Williams; Marioara, Calin Daniel; Walmsley, John; Andersen, S. J.; Holmestad, Randi. The influence of composition and natural aging on clustering during preaging in Al-Mg-Si alloys. *Journal of Applied Physics* 2010;Volum 108.(7)

Tucho, Wakshum Mekonnen; Mauroy, Henrik; Walmsley, John; Deledda, Stefano; Holmestad, Randi; Hauback, Bjørn. The effects of ball milling intensity on morphology of multiwall carbon nanotubes. *Scripta Materialia* 2010;Volum 63.(6) s. 637-640

Tørå, Glenn; Hansen, Alex. Heat diffusion in a two-dimensional thermal fuse model. *Physical Review E. Statistical, Nonlinear, and Soft Matter Physics* 2010;Volum 81.(6)

Valberg, Arne. Colour vision: Different roads from perception to neuroscience. *Color Research and Application* 2010 s. 81-82

Van Helvoort, Antonius; Dasa, Lakshmi Narayana; Zhou, Hailong; Grønsberg, Sondre; Patriarche, G; Fimland, Bjørn-Ove; Weman, Helge. Dark field transmission electron microscopy techniques for structural characterization of nanowire heterostructures. *Journal of Physics, Conference Series* 2010;Volum 241.

Walmsley, John; Albertsen, Jorun Zahl; Friis, Jesper; Mathiesen, Ragnvald. The evolution and oxidation of carbides in an Alloy 601 exposed to long term high temperature corrosion conditions. *Corrosion Science* 2010;Volum 52.(12) s. 4001-4010

Xie, Minli; Olderøy, Magnus Østgård; Andreassen, Jens-Petter; Selbach, Sverre Magnus; Strand, Berit Løkensgard; Sikorski, Pawel. Alginate-controlled formation of nanoscale calcium carbonate and hydroxyapatite mineral phase within hydrogel networks. *Acta Biomaterialia* 2010;Volum 6.(9) s. 3665-3675

Yap, Seong Shan; salomatova, Alesya Viktorovna; Ladam, Cecile; Dahl, Øystein; Reenaas, Turid Worren. Pulsed laser ablation and deposition of silicon. *Applied Physics A: Materials Science & Processing* 2010;Volum 101.(4) s. 765-770

Yap, Seong Shan; Siew, Wee Ong; Ladam, Cecile; Dahl, Øystein; Reenaas, Turid Worren; Tou, Teck Yong. Nanosecond pulsed laser deposition of germanium films. *Proceedings of SPIE, the International Society for Optical Engineering* 2010;Volum 7766. s. 776614-

Yong, Thian Khok; Kee, Yeh Yee; Tan, Sek Sean; Yap, Seong Shan; Siew, Wee Ong; Tou, Teck Yong. The effects of sodium in ITO by pulsed laser deposition on organic light-emitting diodes. *Applied Physics A: Materials Science & Processing* 2010;Volum 101.(4) s. 621-626

Yong, Thian Khok; Nee, Chen Hon; Yap, Seong Shan; Siew, Wee Ong; Safran, Gyorgy; Yap, Yoke Kin; Tou, Teck Yong. Pulsed Laser Deposition of Nanostructured Indium-Tin-Oxide Film. *Proceedings of SPIE, the International Society for Optical Engineering* 2010;Volum 776615.

Zahl, Maria Gundersen; Myrseth, Velaug; Andersen, Trine; Harnes, Jarle; Borg, Anne; Sæthre, Leif J.; Børve, Knut J.. Molecular Spectra As a Tool in Assigning Carbon 1s Photoelectron Spectra of Physisorbed Overlayers. *The Journal of Physical Chemistry C* 2010;Volum 114.(36) s. 15383-15393

Zha, Chaolin; Dumas, RK; Fang, Y; Bonanni, V; Nogues, Juan P.; Åkerman, Jonas. Continuously graded anisotropy in single (Fe53Pt47)(100-x)Cu-x films. *Applied Physics Letters* 2010 ;Volum 97.(18)

Zhou, Dayong; Sharma, Gaurav; Thomassen, Sedsel Fretheim; Reenaas, Turid Worren; Fimland, Bjørn-Ove. Optimization towards high density quantum dots for intermediate band solar cells grown by molecular beam epitaxy. *Applied Physics Letters* 2010 ;Volum 96.(6)

Zhou, Dayong; Vullum, Per Erik; Sharma, Gaurav; Thomassen, Sedsel Fretheim; Holmestad, Randi; Reenaas, Turid Worren; Fimland, Bjørn-Ove. Positioning effects on quantum dot solar cells grown by molecular beam epitaxy. *Applied Physics Letters* 2010;Volum 96.(8)

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* 2010 (5) s. 729-734

Zimmermann, Gerhard; Hecht, Ulrike; Mathes, Michael; Mathiesen, Ragnvald. Time resolved X-ray imaging of eutectic cellular patterns evolving during solidification of ternary Al-Cu-Ag alloys. *International Journal of Materials Research - Zeitschrift für Metallkunde* 2010 ;Volum 101.(12) s. 1484-1488

OTHER JOURNALS

(Total 22)

Arnesen, Heidi; Aschehoug, Øyvind; Fosse, Per; Haase, Matthias; Hansen, Eilif Hugo; Jelle, Bjørn Petter; Kolås, Tore; Matusiak, Barbara; Valberg, Arne; Wyckmans, Annemie. Lysforsk - Norsk senter for lysforskning og utdanning. *Lys* 2010 (1) s. 8-10

Brataas, Arne; Normannsen, Sølvi Waterloo. Ny koordinator i 7. Rammeprogram: Flytter nano-grenser. *Universitetsavisen* 2010-04-22

Bungum, Berit. NorSEd: Nordic research network in Science Education. *NorDiNa : Nordic Studies in Science Education* 2010;Volum 6.(2) s. 2010-2012

Bungum, Berit; Wallin, Anita. NorDiNa: Changing editors. *NorDiNa : Nordic Studies in Science Education* 2010 ;Volum 6.(2) s. 107-108

Bungum, Berit; Wallin, Anita; Andersson, Björn. Welcome to NorDiNa 6(1)!. *NorDiNa : Nordic Studies in Science Education* 2010 ;Volum 6.(1) s.1-2

Holmestad, Randi. Ser innover i nanoverdenen. *Adresseavisen* 2010-10-12

Johnsson, Anders; Oftedal, Gunnhild; Førre, Bernt. Hva kan skade mest - mobilstråling eller avisoppslag?. *Adresseavisen* 2010

Leganger, Lars Erlend. Uillustrert Vitenskap: Tilbyr kreftbehandling på alternativmesse.. *Radio Revolt, Studentradioen i Trondheim*. 2010-05-13

Meland, Svein Inge; Gibson, Ursula. Vill fange sol billig. *Adresseavisen* 2010-11-02

Naqvi, Kalbe Razi. Comment on "Heavy (or large) ions in a fluid in an electric field: The diffusion equation exactly following from the Fokker-Planck equation" [J. Chem. Phys. 129, 044903 (2008)]. *Journal of Chemical Physics* 2010;Volum 132.(1)

Samuelsen, Emil J. Eksamenstekst på nynorsk. *Universitetsavisen* 2010

Samuelsen, Emil J. "Magnetiske monopolar - finst dei?". *Fra Fysikkens Verden* 2010;Volum 72.(2) s. 49-51

Samuelsen, Emil J. "Når elektrisk isolerande materiale blir supraleiande". *Fra Fysikkens Verden* 2010;Volum 72.(1) s. 24-26

Samuelsen, Emil J. Underkjøling av væsker: Grenseflata spelar ei rolle. *Fra Fysikkens Verden* 2010;Volum 72.(3) s. 75-78

Samuelsen, Emil J; Hunderi, Ola. Minneord om Ragnvald Høier, 30.11.1938-23.10.2009. *Årbok / Norges Tekniske Vitenskapsakademi - NTVA* 2010;Volum 2009. s. 140-141

Samuelsen, Emil J; Samuelsen, Ragnar T. Hans N Bjerke - ein ressursperson. *Menneske og miljø i Nord-Troms* 2010;Volum 25. s. 28-34

Samuelsen, Emil J; Samuelsen, Ragnar T. "Ressurspersonen Hans N Bjerke". *Frå Hjørundfjord* 2010;Volum 32. s. 7-15

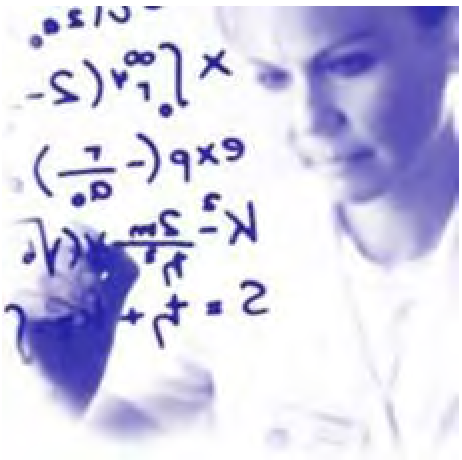
Sikorski, Pawel. Gullmus hjelper forskarar å lage lengre nanotrådar. *NRK* 2010-12-17

Sikorski, Pawel; Mumm, Florian. Sea mouse boost for nanowire-makers. *New Scientist magazine* 2010-08-07

Sudbø, Asle; Linder, Jacob. Nobelprisen i fysikk 2010. *Fra Fysikkens Verden* 2010 (4)

Tørå, Glenn; Ramstad, Thomas; Hansen, Alex. Anomalous Diffusion Clusters in Steady-State Two-Phase Flow in Porous Media. *Europhysics letters* 2010;Volum 89.

Volkmann, Dieter; Johnsson, Anders; Baluska, Frantisek. Im All Wurzeln schlagen. *Spektrum der Wissenschaft* 2010 Suppl. Extra - Schwerelos s. 123-129



BOOKS, BOOK CHAPTERS AND REPORTS

BOOKS AND PART OF BOOKS AT LEVEL 1 AND 2

(Total 5)

Ahlgren, Peter Toke Heden; Dahl, Henrik; Jensen, Mogens Høgh; Simonsen, Ingve.
What can be learned from Inverse Statistics?. I: *Econophysics approaches to large-scale business data and financial crisis.* Springer 2010 ISBN 978-4-431-53852-3. s. 247-270

Dasa, Lakshmi Narayana; Zhou, Hailong; Anthonysamy, Fervin Moses; Hoang, Thang Ba; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Heterostructured III-V Nanowires with Mixed Crystal Phases Grown by Au-assisted Molecular Beam Epitaxy. I: Nanowires. INTECH 2010 ISBN 978-953-7619-79-4.

Linder, Jacob; Sudbø, Asle.
Interplay Between Ferromagnetism and Superconductivity. I: *Nanoscience and Engineering in Superconductivity.* Springer Science+Business Media B.V. 2010 ISBN 978-3-642-15136-1. s. 349-383

Supphellen, Steinar; Overskaug, Kristian; Fossheim, Kristian.
The City of Knowledge: The Royal Norwegian Society of Sciences and Letters (DKNVS) brought science and learning to Trondheim and Norway. I: *Forskning Trøndelag 2010.* Tapir Akademisk Forlag 2010 ISBN 978-82-519-2589-1. s. 181-196

Wei, Yingkang; Holter, Bengt; Simonsen, Ingve; Husby, Karsten; Kuhnle, Jacob; Norum, Lars Einar.
Wave Propagation Along a Thin Wire Antenna Placed in a Horizontally Layered Medium. I: *Digest of the 2010 14th Biennial IEEE Conference on Electromagnetic Field Computation.* IEEE Press 2010 ISBN 978-142447059-4.

OTHER BOOKS/REPORTS

(Total 17)

Andersen, Sigmund J; Marioara, CD; Holmestad, Randi.
Precipitates in Al-Mg-Si alloys. Relations to Zintl-phases and polar intermetallics. I: *Proceedings for 5th Japan-China-Norway Cooperative Symphosium on Nanostructure of Advanced Materials and Nanotechnology- JCNCS2010.* Toyama, Japan: University of Toyama 2010 ISBN 978-4-9903248-2-7. s. 39-42

Bungum, Berit; Rødseth, Silje; Lykknes, Annette; Murvoll, Kari Mette.
What brought them into science? University students' interest profiles and motivation for choosing science at university level. I: *Contemporary Science Education Research: Learning and Assessment.* Istanbul, Turkey: Pegem Akademi 2010 ISBN 978-605-364-033-2. s. 85-91

Fossheim, Kristian.
Formidling og engasjement: Kronikkar, artiklar, foredrag og debattinnlegg. Trondheim: NTNU-trykk 2010 (ISBN 978-82-303-1702-0) 323 s.

Holmestad, Jon; Marioara, C.D.; Andersen, Sigmund J.; Holmestad, Randi.
Microstructure of Two Overaged Al-Mg-Si-Cu Alloys. I: *Proceedings of the 12th International Conference on Aluminium Alloys (ICAA12).* : The Japan Institute of Light Metals 2010 ISBN 978-4-905829-11-9. s. 1021-1026

Holmestad, Jon; Marioara, CD; Andersen, Sigmund J.; Holmestad, Randi.
The effect of Ag on Hardness and Microstructure during Overageing of Al-Mg-Si-Cu Alloys. I: *Proceedings for 5th Japan-China-Norway Cooperative Symphosium on Nanostructure of Advanced Materials and Nanotechnology-JCNCS2010.* Toyama, Japan: University of Toyama 2010 ISBN 978-4-9903248-2-7. s. 53-56

Holmestad, Randi; Marioara, C.D.; Ehlers, Flemming J H; Torsæter, Malin; Bjørge, Ruben; Røyset, Jostein; Andersen, S.J..
Precipitation in 6xxx Aluminium Alloys. I: *Proceedings of the 12th International Conference on Aluminium Alloys (ICAA12).* : The Japan Institute of Light Metals 2010 ISBN 978-4-905829-11-9. s. 30-39

Lefebvre, Williams; Vurpillot, F.; Torsæter, Malin; De Geuser, F..
Methods for the study of clustering and precipitation in Al-based alloys by APT. I: *Proceedings of the 12th International Conference on Aluminium Alloys (ICAA12).* : The Japan Institute of Light Metals 2010 ISBN 978-4-905829-11-9. s. 1379-1384

Marioara, CD; Andersen, Sigmund J.; Bjørge, Ruben; Holmestad, Randi.
Si/Ge network connecting precipitates in Al-Mg-Si/Ge-Cu(-Ag) alloys. I: *Proceedings for 5th Japan-China-Norway Cooperative Symphosium on Nanostructure of Advanced Materials and Nanotechnology- JCNCS2010.* Toyama, Japan: University of Toyama 2010 ISBN 978-4-9903248-2-7. s. 49-52

Nakamura, Junya; Matsuda, Kenji; Sato, Tatsuo; Marioara, CD; Andersen, Sigmund J.; Holmestad, Randi; Ikeno, Susum.
Effect of Silver addition on crystal structure for beta' phase in Al-Mg-Si alloy. I: *Proceedings for 5th Japan-China-Norway Cooperative Symphosium on Nanostructure of Advanced Materials and Nanotechnology- JCNCS2010*. Toyama, Japan: University of Toyama 2010 ISBN 978-4-9903248-2-7. s. 135-136

Plogmaker, Stefan; Johansson, Erik; Schölin, Rebecka; Walle, Lars Erik; Borg, Anne; Sandell, Anders; Rensmo, Håkan.
UHV study of the binding geometry of an organic perylene dye on single crystalline anatase TiO2(101). I: *MAX-lab Activity Report 2009*. Lund: MAX-lab 2010 s. 404-405

Sorokina, Irina T.
Frequency combs in the mid-IR: generation and applications. I: *Photonics 2010. Guwahati: Sunil Khijwania and Ashwini K.* Sharma 2010 ISBN 978-81-309-1719-1. s. 181-181

Torsæter, Malin; Lefebvre, Williams; Andersen, S.J.; Marioara, C.D.; Walmsley, JC; Holmestad, Randi.
Clustering Behaviour in Al-Mg-Si Alloys Investigated by APT. I: *Proceedings of the 12th International Conference on Aluminium Alloys.* yokohama: Japan Institute of Light Metals 2010 ISBN 978-4-905829-11-9. s. 1385-1390

Torsæter, Malin; Lefebvre, Williams; Marioara, CD; Andersen, Sigmund J.; Walmsley, John; Holmestad, Randi.
The study of clustering in Al-based alloys by APT. I: *Proceedings for 5th Japan-China-Norway Cooperative Symphosium on Nanostructure of Advanced Materials and Nanotechnology- JCNCS2010.* Toyama, Japan: University of Toyama 2010 ISBN 978-4-9903248-2-7. s. 23-26

Walle, Lars Erik; Borg, Anne; Uvdal, Per; Sandell, Anders.
Experimental evidence for mixed dissociative and molecular adsorption of water on a rutile TiO2(110) surface without oxygen vacancies. I: *MAX-lab Activity Report 2009*. Lund: MAX-lab 2010 s. 414-415

Walle, Lars Erik; Svenum, Ingeborg-Helene; Andersen, Trine; Gustafson, Johan; Lundgren, Edvin; Andersen, Jesper N.; Borg, Anne.
Oxidation of Pd0.57Cu0.43(100). I: *MAX-lab Activity Report 2009.* Lund: MAX-lab 2010 s. 154-155

Walle, Lars Erik; Svenum, Ingeborg-Helene; Borg, Anne; Sandell, Anders.
Growth of ultrathin TiOx films on Pt(110) studied by high resolution photoemission and X-ray absorption spectroscopy. I: *MAX-lab Activity Report 2009.* Lund: MAX-lab 2010 s. 156-157

Wei, Yingkang; Holter, Bengt; Simonsen, Ingve; Norum, Lars Einar.
Wave Propagation alon a Thin Vertical Wire Antenna Placed in a Horizontally Layered Media. I: *ACES2010: Applied Computational Electromagnetics Society annual conference.* Finland: ACES 2010 ISBN 978-952-15-2397-7.

DOCTORAL THESIS

(Total 7)

Haugen, Håvard. *Spin and Charge Transport in Two-dimensional Electron Gases.* ISBN: 978-82-471-2379-9

Mumm, Florian. *Interactions of High Aspect Ratio Nanostructures and Biological Systems.* ISBN: 978-82-471-2483-3

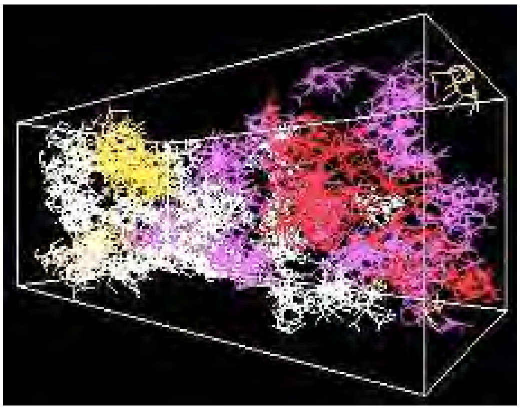
Saxegaard, Magne. *Scanning tunneling microscopy based point-contact measurements of nanoscale magnetic systems.* ISBN: 978-82-471-2330-0

Solberg, Marius Aa. *Dark matter candidates and their indirect detection.* ISBN: 978-82-471-2272-3

Strandberg, Rune. *Theoretical studies of the intermidiate band solar cell.* ISBN: 978-82-471-2150-4

Sæterli, Ragnhild. *Electronic structure of thermoelectric and ferro-electric materials: - Advanced transmission electronmicroscopy studies.* ISBN: 978-82-471-2285-3

Tørå, Glenn. *Pore-scale modelling of two-phase flow: dynamic effects and electrical response.* ISBN: 978-82-471-2431-4



CONFERENCES AND TALKS

SCIENTIFIC TALKS

(Total 142)

Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Kildemo, Morten.
Dynamic response of a Ferroelectric Liquid Crystal based Mueller matrix Ellipsometer. Norwegian electrooptics meeting 2010; 2010-04-07 - 2010-04-09

Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Kildemo, Morten.
Polarimetric imaging of strain in multi crystalline silicon. The 5th International Conference on Spectroscopic Ellipsometry; 2010-05-23 - 2010-05-28

Andersen, Jens Oluf.
A flavor of two-color QCD. Vitenskapleg foredrag; 2010-06-16 - 2010-06-16

Andersen, Jens Oluf.
Gluon Thermodynamics at Intermediate Coupling. SEWM2010; 2010-06-29 - 2010-07-02

Andersen, Jens Oluf.
Hard-thermal-loop perturbation theory and quasiparticle picture of a quark-gluon plasma. Invitert foredrag; 2010-08-24 - 2010-08-28

Andersen, Jens Oluf.
HTL perturbation theory and quasiparticle picture of a quark-gluon plasma. Theory seminar; 2010-11-08 - 2010-11-08

Andersen, Jens Oluf.
HTL QCD thermodynamics. Theory seminar; 2010-11-09 - 2010-11-09

Andersen, Jens Oluf.
Two-color QCD. teoriseminar; 2010-06-09 - 2010-06-09

Andersen, Sigmund J.; Marioara, CD; Torsæter, Malin; Bjørge, Ruben; Ehlers, Flemming J H; Holmestad, Randi; Reiso, O; Røyset, Jostein.
Behind Structure and Relation of Precipitates in Al-Mg-Si and Related Alloys. International conference on Aluminium alloys ICAA; 2010-09-05 - 2010-09-11

Anthonysamy, Fervin Moses; Ahtapodov, Lyubomir; Hoang, Thang Ba; Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Micro-photoluminescence spectroscopy and imaging of single axial and radial heterostructured III-V nanowires. Norwegian electro-Optics meeting; 2010-04-07 - 2010-04-09

Anthonysamy, Fervin Moses; Hoang, Thang Ba; Ahtapodov, Lyubomir; Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Engineering photoluminescence polarization in a single semiconductor nanowire. 5th NanoLab user meeting; 2010-09-10 - 2010-09-10

Bernhardt, B.; Sorokin, E.; Jacquet, P.; Thon, R.; Becker, T.; Sorokina, Irina T; Picque, N; Haensch, Th..
2.4 μm Dual-Comb Spectroscopy. Conference on Lasers and Electrooptics; 2010-05-16 - 2010-05-21

Bittner, Michael; Espy, Patrick Joseph; French, John; Höppner, Kathrin; Sheer, Jürgen; Taylor, Michael.
The Network for the Detection of Mesopause Change (NDMC). 38th COSPAR Scientific Assembly; 2010-07-18 - 2010-07-25

Bjørge, Ruben; Nakashima, Philip N.H.; Marioara, Calin D.; Andersen, Sigmund J.; Muddle, Barry C.; Etheridge, Joanne; Holmestad, Randi.
Precipitate/Matrix Interface in an Al-Mg-Ge Alloy Studied by Annular Dark-Field Scanning Transmission Electron Microscopy. The 12th International Conference on Aluminium Alloys; 2010-09-05 - 2010-09-09

Borck, Øyvind; Svenum, Ingeborg-Helene; Walle, Lars Erik; Schulte, Karina; Borg, Anne.
Adsorption of CO on Ni3Al(111): A combined theoretical and experimental study. CCP 2010, Conference on Computational Physics; 2010-06-23 - 2010-06-26

Boschker, Jos Emiel; Monsen, Åsmund Fløystad; Folkman, CM; Bark, C.W.; Folven, Erik; McEnroe, S.A.; Grepstad, Jostein; Eom, CB; Wahlström, Erik; Tybell, Thomas.
Periodic lattice distortions in perovskite thin films and interface coupling. 5th NTNU Nanolab Users Mtg.; 2010-09-10

Boschker, Jos Emiel; Monsen, Åsmund Fløystad; Folkman, CM; Folven, Erik; McEnroe, S.A.; Grepstad, Jostein; Eom, CB; Wahlström, Erik; Tybell, Thomas.
Epitaxial control of periodic lattice distortions in perovskite thin films. 17th International Workshop on Oxide Electronics; 2010-09-19 - 2010-09-22

Brataas, Arne.
Introduction to Current-Induced Magnetization Dynamics and Spin-Pumping. Harvard University condensed matter theory seminar; 2010-09-24 - 2010-09-24

Brataas, Arne.
Scattering Theory of Mesoscopic Gilbert Damping. Kavli Institute of Theoretical Physica, Beijing, Kina Workshop; 2010-05-27 - 2010-06-03

Brataas, Arne.
Scattering Theory of Mesoscopic Gilbert Damping. APS March Meeting 2010; 2010-03-14 - 2010-03-19

Brataas, Arne.
Theory of Current-Induced Magnetization Excitations and Spin-Pumping. APS March Meeting 2010 Tutorial; 2010-03-14 - 2010-03-19

Brataas, Arne.
Unpolarized Current-Induced Magnetization Excitations. Spincurrent 2010, Tohoku University, Japan; 2010-02-07 - 2010-02-10

Breiby, Dag Werner.
Activities at the new NTNU X-ray center. NTNU Nanolab Annual User Meeting; 2010-09-10 - 2010-09-10

Breiby, Dag Werner.
Use of new IFE neutron reflectometer by Norwegian scientists. Workshop 'Possible realizations of a neutron reflectometer at IFE'; 2010-06-17 - 2010-06-17

Daae, Marianne; Kleinknecht, Nora; Espy, Patrick Joseph; Clilverd, Mark.
Effect of precipitating electrons on middle atmospheric ozone during enhanced geomagnetic activity. 38th COSPAR Scientific Assembly; 2010-07-18 - 2010-07-25

Dahl, Eskil Kulseth; Babaev, Egor; Sudbø, Asle.
Hidden vortex lattices in a thermally paired superfluid. Marc Meeting of the American Physical Society; 2010-03-15 - 2010-03-19

Dahl, Eskil Kulseth; Babaev, Egor; Sudbø, Asle.
Unusual states of vortex matter in mixtures of Bose--Einstein Condensates on rotating optical lattices. March Meeting of the American Physical Society; 2010-03-15 - 2010-03-19

Dasa, Lakshmi Narayana; Munshi, Abdul Mazid; Fimland, Bjørn-Ove; Weman, Helge; Van Helvoort, Antonius.
Controlling crystal phases in GaAs nanowires grown by Au-assisted molecular beam epitaxy. 5th nanowire growth workshop; 2010-11-03 - 2010-11-05

Dasa, Lakshmi Narayana; Munshi, Abdul Mazid; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Controlling crystal phases in GaAs nanowires grown by Au-assisted molecular beam epitaxy. 16th International Conference on Molecular Beam Epitaxy; 2010-08-22 - 2010-08-27

Dasa, Lakshmi Narayana; Munshi, Abdul Mazid; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Tuning of the crystal phases in GaAs nanowires grown by Au-assisted molecular beam epitaxy. 5th NanoLab user meeting; 2010-09-10

Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Growth of heterostructured III-V semiconductor nanowires by molecular beam epitaxy. Nano-network workshop 2010; 2010-05-31 - 2010-06-02

Dasa, Lakshmi Narayana; Zhou, Hailong; Anthonysamy, Fervin Moses; Hoang, Thang Ba; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Growth of heterostructured III-V nanowires by molecular beam epitaxy for photonic applications. Photonics West; 2010-01-23 - 2010-01-28

Dasa, Lakshmi Narayana; Zhou, Hailong; Anthonysamy, Fervin Moses; Hoang, Thang Ba; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Tuning of the crystal phase in III-V nanowires grown by Au-assisted molecular beam epitaxy. MRS Spring meeting; 2010-04-05 - 2010-04-05

Davies, Catharina De Lange; Afadzi, Mercy; Hansen, Yngve Hofstad; Johansen, Tonni Franke; Måsøy, Svein-Erik; Angelsen, Bjørn Atle J..
The impact of ultrasound on liposomal drug release. European Science Foundation - Nanomedicine; 2010-10-23 - 2010-10-28

Davies, Catharina De Lange; Afadzi, Mercy; Hansen, Yngve Hofstad; Johansen, Tonni Franke; Måsøy, Svein-Erik; Angelsen, Bjørn Atle J..
The impact of ultrasound on liposomal drug releasr. Conf erence of the Society for medical innovation and technology; 2010-09-02 - 2010-09-04

Dehghan-Niri, Roya; Hansen, Thomas Willum; Wagner, Jakob Birkedal; Holmen, Anders; Rytter, Erling; Borg, Øyvind; Walmsley, John C.
In-situ reduction of cobalt oxide supported on alumina in an environmental transmission electron microscope. Sixth Tokyo Conference on Advanced Catalytic Science and Technology & Fifth Asia Paciific Congress on Catalysis (TOCAT6/APCAT5) "Innovation driven by catalysis"; 2010-07-18 - 2010-07-23

Delaleau, Pierre; Beckermann, Christoph; Mathiesen, Ragnvald; Arnberg, Lars.
Mesoscopic Simulation of Directional Solidification of Al-Cu Alloys with Convection. The 2nd International Symposium on Cutting Edge of Computer Simulation of Solidification and Casting (CSSC2010); 2010-02-03 - 2010-02-05

Dvoyrin, V. V.; Sorokina, Irina T; Mashinsky, V. M.; Ischakova, L. D.; Kalashnikov, V. L.; Khopin, V. F.; Guryanov, A. N.; Dianov, E. M..
Tm3+-doped fiber laser based on a highly GeO2-doped fiber. EOS Annual Meeting 2010; 2010-10-26 - 2010-10-29

Eberg, Espen; Van Helvoort, Antonius; Takahashi, Ryota; Gass, Mhairi; Mendis, Budhika; Holmestad, Randi; Tybell, Thomas.
Evidence of Change in Ti/Pb-O Hybridization at the PbTiO3 / SrTiO3 Interfaces. MRS Spring meeting; 2010-04-05 - 2010-04-07

Ehlers, Flemming; Andersen, Sigmund J.; Marioara, Calin D.; Holmestad, Randi.
Atomistic Ab Initio Studies Of Precipitate/Host Lattice Interfaces. 12th International Conference on Aluminium Alloys (ICAA); 2010-09-05 - 2010-09-09

Falnes, Johannes; Hals, Jørgen.
Heaving buoys, point absorbers and arrays. Theo Murphy international scientific meeting on ”Peaks and troughs of wave energy, the dreams and the reality”; 2010-10-13 - 2010-10-15

Fossum, Jon Otto.
Self-Organized Soft Nanostructures in Clays. 150th orbit of Alexander von Humboldt,in Workshop on Complex Systems; 2010-06-06 - 2010-06-12

Fossum, Jon Otto.
Sorption and Migration of CO2 in Porous Media. CLIMIT Days 2010; 2010-10-12 - 2010-10-13

Gawel, Kamila; Tierney, Sven; Barriet, David; Gao, Ming; Sletmoen, Marit; Stokke, Bjørn Torger.
Hybrid hydrogels for biospecific signal transduction – a tool for realizing biosensors on a fiber-optic based interferometer.. 1st Annual Workshop of the Norwegian PhD Network on Nanotechnology for microsystems, Nanonet; 2010-05-31 - 2010-06-02

Gibson, Ursula; Cui, Jingbiao.
All-Oxide Embedded-Nanowire Solar Cells. Advanced Photonics Congress and Renewable Energy Congress; 2010-06-20 - 2010-06-24

Goldman, Max; Goldman, Alice; Sigmond, Reidar Svein.
Ageing processes of the voids in insulating materials. 63rd Gaseous Electronics Conference and 7th International Conference on Reactive Plasmas; 2010-10-04 - 2010-10-08

Granlund, Håvard; Breiby, Dag Werner.
Mapping of atomic-scale structures with micron-scale resolution. 1st annual workshop in the Norwegian PhD Network on Nanotechnology for Microsystems; 2010-05-31 - 2011-06-02

Hammarström, Per; Lindgren, Mikael; Nilsson, Peter.
Luminescent conjugated oligothiophenes: optical dyes for revealing pathological hallmarks of protein misfolding diseases.. SPIE Optics and Photonics - Organic Semiconductors in Sensors and Bioelectronics V; 2010-08-01 - 2010-08-05

Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fonseca, Davi De Miranda; Coutant, C.; Knudsen, Kenneth D; Plivelic, T; Fossum, Jon Otto.
Temperature induced changes in the structure of saline clay suspensions. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fossum, Jon Otto.
Colloidal platelet self-organization from solvent evaporation. International Workshop on CO2 and Fluids in Nanoscience; 2010-12-07 - 2010-12-10

Hasting, Håkon Stokka; Frøseth, Anders Gudmund; Andersen, Sigmund J.; Vissers, Rene; Walmsley, John; Marioara, CD; Lefebvre, Williams; Danoix, Frederic; Holmestad, Randi.
Composition of β” precipitates in Al-Mg-Si alloys by atom probe tomography and first principles calculations. ’Solid-Solid Phase Transformations in Inorganic Materials’ (PTM); 2010-06-06 - 2010-06-11

Haugen, Håvard; Brataas, Arne; Huertas-Hernando, Daniel; Waintal, Xavier.
Crossed Andreev reflection and electron transfer in three-terminal devices. APS March Meeting 2010; 2010-03-17

Hemmen, Henrik; Alme, Lars Ramstad; Fossum, Jon Otto; Meheust, Y.
X-ray studies of interlayer water absorption and mesoporous water transport in a weakly hydrated clay. International Workshop on CO2 and Fluids in Nanoscience; 2010-12-07 - 2010-12-10

Hemmen, Henrik; Alme, Lars Ramstad; Fossum, Jon Otto; Meheust, Y.
X-ray studies of interlayer water absorption and mesoporous water transport in a weakly hydrated clay. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Hemmen, Henrik; Hansen, Elisabeth Lindbo; Fonseca, Davi De Miranda; Coutant, C.; Sigstad, Mats; Fossum, Jon Otto.
Temperature-induced Positional Ordering in Colloidal Liquid. Materials Research Society 2010 MRS Fall Meeting; 2010-11-29 - 2010-12-03

Hemmen, Henrik; Ringdal, Nils I; Azevedo, Eduardo N.; Engelsberg, Mario; Hansen, Elisabeth Lindbo; Meheust, Y; Fossum, Jon Otto; Knudsen, Kenneth D.
The Isotropic-Nematic Interface in Suspensions of Na-fluorohectorite Synthetic Clay. Seventh Nordic Workshop on Scattering from Soft Matter; 2010-01-27 - 2010-01-28

Holmestad, Jon; Marioara, C.D.; Andersen, Sigmund J.; Holmestad, Randi.
Microstructure of Two Overaged Al-Mg-Si-Cu Alloys. 12th International Conference on Aluminium Alloys (ICAA); 2010-09-05 - 2010-09-09

Holmestad, Jon; Marioara, C.D.; Andersen, Sigmund J.; Holmestad, Randi.
The Effect of Ag on Hardness and Microstructure during Overageing of Al-Mg-Si-Cu Alloys. JCNCS; 2010-09-12 - 2010-09-15

Holmestad, Randi.
Physics in Aluminium?!. Friday colloquium, NTNU, Department of Physics; 2010-11-05 - 2010-11-05

Holmestad, Randi; Marioara, CD; Ehlers, Flemming; Torsæter, Malin; Bjørge, Ruben; Røyset, Jostein; Andersen, Sigmund J.
Precipitate Structure Determination in 6xxx Aluminium Alloys. 17th International Microscopy Congress - IMC 2010; 2010-09-19 - 2010-09-24

Holmestad, Randi; Marioara, CD; Ehlers, Flemming; Torsæter, Malin; Bjørge, Ruben; Røyset, Jostein; Andersen, Sigmund J.
Precipitation in 6xxx Aluminum Alloys. 12th International Conference on Aluminium Alloys (ICAA); 2010-09-05 - 2010-09-09

Høye, Johan Skule.
Casimir forces, theories and experimental challenges.. Workshop MODELICO-CM: Modelización y simulación de sistemas complejos; 2010-06-29 - 2010-06-29

Johnsson, Anders.
Vektløshet som verktøy. NRS Workshop; 2010-06-22 - 2010-06-22

Johnsson, Anders; Antonsen, Frank.
Gravity effects on endogenous movements. 38th scientific assembly of COSPAR; 2010-07-18 - 2010-07-25

Kalashnikov, V. L.; Sorokin, E; Sorokina, Irina T.
Soliton Absorption Spectroscopy in Normal-Dispersion Lasers. 36th European Conference and Exhibition on Optical Communication; 2010-09-19 - 2010-09-23

Kildemo, Morten.
Fast near infra-red Ferroelctric Liquid Crystal based Mueller matrix system for imaging and spectroscopy. International Conference on Spectroscopic Ellipsometry V; 2010-05-23 - 2010-05-28

Kildemo, Morten.
Fast near-infra-red Mueller matrix (imaging) Ellipsometry. 3rd INTERNATIONAL SYMPOSIUM ON FLEXIBLE ORGANIC ELECTRONICS (IS-FOE10); 2010-07-05 - 2010-07-08

Kildemo, Morten.
Near Infra Red Mueller matrix (polarimetric) imaging of cartilage. Norsk elektro optikk møte; 2010-04-07 - 2010-04-09

Kildemo, Morten.
Near infra-red imaging Mueller matrix system used for imaging of cartelage. Kongsvoldmøtet 2010; 2010-03-03 - 2010-03-05

Kildemo, Morten; Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar.
Fast spectroscopic Mueller matrix (imaging) Ellipsometry using FLC polarimeter designs. 3rd NanoCharm Workshop on Non-Destructive Real Time Process Control; 2010-10-13 - 2010-10-15

Kildemo, Morten; Nerbø, Ingar Stian.
Real time Spectroscopic Ellipsometry characterization of the formation of self-organized GaSb nanopillars. 7th International Conference on Nanosciences & Nanotechnologies (NN10); 2010-07-11 - 2010-07-14

Knudsen, Kenneth Dahl; Helgesen, Geir; Fossum, Jon Otto; Skjeltorp, Arne T..
CO2 interaction with porous structures: Use of Scattering methods. International Workshop on CO2 and Fluids in Nanoscience; 2010-12-07 - 2010-12-10

Kyllingstad, Lars Tandle.
Probing the phase diagram of the universe with QCD-like models. Internt teoriseminar; 2010-05-03

Kyllingstad, Lars Tandle.
The chiral phase transition and the role of vacuum fluctuations. Quark Confinement and the Hadron Spectrum IX; 2010-08-30 - 2010-09-03

Kyllingstad, Lars Tandle.
The sign problem across the chiral phase transition. Norwegian Winter Workshop on QCD in Extreme Conditions; 2010-02-24 - 2010-02-26

Lefebvre, Williams; Vurpillot, Francois; Torsæter, Malin; De Geuser, F.
Methods for the study of clustering and precipitation in Al-based alloys by APT. 12th International Conference on Aluminium Alloys (ICAA);; 2010-09-05 - 2010-09-09

Leganger, Lars Erlend.
Kaon condensation in the color–flavor-locked phase of quark matter, the Goldstone theorem, and the 2PI Hartree approxioation. Quark Confinement and the Hadron Spectrum IX; 2010-08-30 - 2010-09-03

Leganger, Lars Erlend.
Quark matter in compact stars. Teoriseminar, Inst. for fysikk, NTNU.; 2010-08-23

Lilledahl, Magnus Borstad.
Nonlinear microscopy in medicine and biology. Årsmøte Norsk forening for fotobiologi og fotomedisin; 2010-11-05 - 2010-11-05

Lindgren, Mikael; Psonka-Antonczyk, Katarzyna Maria; Stokke, Bjørn Torger; Hammarström, Per; Nilsson, Peter.
Detection and Diagnostics of Amyloid Fibrils Using Fluorescence and Atomic Force Microscopy.. Nordic-China symposium on Bio- and Nanoscience; 2010-09-19 - 2010-09-25

Marioara, CD; Andersen, Sigmund J.; boothroyd, Chris; Holmestad, Randi.
Disordered Precipitates in an Al-Mg-Si-Cu-Ag Alloy. International Conference on Aluminium Alloys; 2010-09-06 - 2010-09-11

Mathiesen, Ragnvald.
Synchrotron radiation - opportunities in material science. Hero-m Summer School; 2010-06-28 - 2010-07-01

Mathiesen, Ragnvald; Arnberg, Lars.
X-radiographic video microscopy studies of alloy solidification processes. Deutsche Physikalische Gesellschaft Spring Meeting; 2010-03-22 - 2010-03-26

Mathiesen, Ragnvald; Arnberg, Lars.
X-radiographic video microscopy studies of solidification processes. Work Shop - Spring-8 synchrotron, Japan; 2010-02-08 - 2010-02-08

Mathiesen, Ragnvald; Arnberg, Lars.
X-radiographic video microscopy studies of solidification processes - eutectic solidification. The 2nd International Symposium on Cutting Edge of Computer Simulation of Solidification and Casting (CSSC2010); 2010-02-03 - 2010-02-05

Mathiesen, Ragnvald; Arnberg, Lars; Li, Yanjun; Dahle, Arne Kristian.
In-situ X-ray video microscopy studies of Al-Si eutectic solidification.. ICAA12; 2010-09-06 - 2010-09-09

Mauroy, Henrik; Knudsen, Kenneth D; Fossum, Jon Otto.
Phase separations in PNIPA-Laponite Nanocomposites. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Maurstad, Gjertrud; Vårum, Kjell Morten; Strand, Sabina P.; Stokke, Bjørn Torger.
Polyelectrolyte complexes with potential applications in biomedicine. 10th International Hydrocolloids Conference,; 2010-06-20 - 2010-06-24

Meheust, Y; Khaldoun, A.; Møller, P.; Fall, A.; Wegdam, G.; de Leeuw, B.; Fossum, Jon Otto; Bonn, D..
The rheology of quick clays – Implications for landslides of clayey soils. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Myrheim, Jan.
Numerical studies of low rank entangled states. Quantum Foundations at Nordita (Week one, Foundations of Quantum Mechanics); 2010-09-27 - 2010-10-01

Nakamura, J; Matsuda, Kenji; Sato, Tatsuo; Marioara, CD; Andersen, Sigmund J.; Holmestad, Randi; Ikeno, S..
The Effect of Ag Addition on Transition of Crystal Structure for β'-phase in Al-Mg-Si Alloy. Internaational Conference on Aluminium ICAA; 2010-09-06 - 2010-09-11

Nerbø, Ingar Stian; Kildemo, Morten; Le Roy, S; Søndergård, Elin.
Real time in-situ observation of the formation of GaSb nanopillars by spectroscopic ellipsometry. ICSE 5; 2010-05-23 - 2010-05-28

Nerbø, Ingar Stian; Kildemo, Morten; Le Roy, S; Søndergård, Elin.
Real-time in situ observation of the formation of GaSb nanopillars by spectroscopic Mueller matrix ellipsometry. 3rd NanoCharm Workshop on Non-Destructive Real Time Process Control; 2010-10-13 - 2010-10-15

Newnham, David; Espy, Patrick Joseph; Clilverd, Mark; Roger, Craig; Seppala, Annika; Maxfield, David; Hartogh, Paul.
Mesospheric nitric oxide (NO) enhancements above Troll Station, Antarctica during March-May 2008. 38th COSPAR Scientific Assembly; 2010-07-18 - 2010-07-25

Nordmark, Heidi; Ulyashin, Alexander; Walmsley, John; Holmestad, Randi.
H-initiated extended defects from plasma treatment: Comparison between c-Si and mc-Si. International Conference on Extended Defects in Semiconductors (EDS2010); 2010-09-19 - 2010-09-24

Olderøy, Magnus Østgård; Xie, Minli; Strand, Berit Løkensgard; Draget, Kurt Ingar; Sikorski, Pawel; Andreassen, Jens-Petter.
Control of calcium carbonate polymorphism and morphology by high molecular weight alginate and well defined alginate oligomers. International Workshop on Industrial Crystallization (BIWIC); 2010-09-08 - 2010-09-10

Olderøy, Magnus Østgård; Xie, Minli; Østnæs, Simen; Strand, Berit Løkensgard; Draget, Kurt Ingar; Andreassen, Jens-Petter; Sikorski, Pawel.
Control of calcium carbonate crystal polymorphism and morphology by high molecular weight alginate and well defined alginate oligomers. Biophysics meeting, Kongsvold 2010; 2010-03-03 - 2010-03-05

Rauwel, Erwan Yann; Nilsen, Ola; Walmsley, John; Fjellvåg, Helmer.
Atomic layer deposition applied to catalyst improvement. inGAP seminar 2010; 2010-06-14 - 2010-06-15

Reitan, Nina Kristine.
Delivery of nanomedicine to tumor tissue studied by MRI and intravital confocal imaging. Norwegian Electro‐Optics Meeting 2010.; 2010-04-07 - 2010-04-09

Reitan, Nina Kristine.
Delivery of nanomedicine to tumor tissue studied by MRI and intravital confocal imaging. Biofysikk-møtet 2010; 2010-03-03 - 2010-03-05

Reitan, Nina Kristine; Sporsheim, Bjørnar; Bjørkøy, Astrid; Lelu, Sylvie; Steine, Jan; Strand, Sabina P.; Davies, Catharina De Lange.
Gene delivery by DNA-chitosan nanoparticles; novel chitosans with improved structural and functional properties. BIT's 8th Annual Congress of International Drug Discovery Sciences and Technology; 2010-10-23 - 2010-10-26

Rozynek, Zbigniew; Fossum, Jon Otto; Castberg, Rene; Måløy, Knut Jørgen; Flekkøy, Eirik Grude.
Electric Field Induced Rotation of Clay Particles. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Rozynek, Zbigniew; Fossum, Jon Otto; Wang, Bao-Xiang; Knudsen, Kenneth D.
Electric Field Induced Structuring of Modified Na-fluorohectorite Clay Particles. International Workshop on CO2 and Fluids in Nanoscience; 2010-12-07 - 2010-12-10

Rozynek, Zbigniew; Wang, Bao-Xiang; Fossum, Jon Otto.
Electric-field induced alignment of modified Na-fluorohectorite clay particles. 5th Mid-European Clay Conference (MECC2010); 2010-08-25 - 2010-08-29

Rørvik, Per Martin; Sæterli, Ragnhild; You, Chang Chuan; Holmestad, Randi; Van Helvoort, Antonius; Tybell, Thomas; Grande, Tor; Einarsrud, Mari-Ann.
Annealing effect on the domain orientation in PbTiO3 nanorods. Electroceramics XII; 2010-06-13 - 2010-06-16

Sigmond, Reidar Svein; Goldman, Alice; Goldman, Max.
Simulation of partial discharges in voids in insulating materials. 63rd Gaseous Electronics Conference and 7th International Conference on Reactive Plasmas; 2010-10-04 - 2010-10-08

Sletmoen, Marit; Brewer, Curtis Fred; Takemasa, Makoto; Skjåk-Bræk, Gudmund; Stokke, Bjørn Torger.
Structure-function relationships of biomacromolecules studied at the single molecule level. 25th International Carbohydrate Symposium (ICS2010); 2010-07-30

Soleim, Bjørn Gunnar; Sæterli, Ragnhild; Vullum, Per Erik; Van Helvoort, Antonius.
FIB TEM sample preparation. NanoLab's Seminar series; 2010-04-13 - 2010-04-13

Sorokin, E; Kalashnikov, V. L.; Sorokina, Irina T.
Intracavity Absorption Spectroscopy in Passively Modelocked Lasers. 4th EPS-Qeod EUROPHOTON Conference on Solid-Sate Fibre, and Waveguide Coherent Light Sources, Hamburg, Deutschland; 2010-08-29 - 2010-09-03

Sorokin, E; Komar, V. K.; Puzikov, V. M.; Zagoruiko, Yu. A.; Gerasimenko, A. S.; Kovalenko, N. O.; Sorokina, Irina T.
Extension of the ultrabroadband laser operation of Cr:ZnMgEs towards infrared. 14th International Conference on Laser Optics 2010; 2010-06-28 - 2010-07-02

Sorokin, E.; Sorokina, Irina T.
Femtosecond operation and random quasi-phase-matched self-doubling of ceramic Cr: ZnSe laser. Conference on Lasers and Electrooptics; 2010-05-16 - 2010-05-21

Sorokin, E; Sorokina, Irina T; Mirov, S.; Fedorov, V.; Moskalev, I.; Mirov, M..
Ultrabroad Continuous-Wave Tuning of Ceramic Cr:ZnSe and Cr:ZnS Lasers. Advanced Solid-State Photonics; 2010-01-31 - 2010-02-01

Sorokina, Irina T.
Advances in ultra-short pulse generation and applications. Norwegian Electro-optics meeting; 2010-04-07 - 2010-04-09

Sorokina, Irina T.
Cr:ZnSe Laser: a Ti:Sapphire of the Infrared. Seminar at Lawrence Livermore Laboratory; 2010-05-24 - 2010-05-24

Sorokina, Irina T.
Frequency combs in the mid-IR: generation and applications. Photonics 2010 - International Conference on Fiber Optics and Photonics; 2010-12-12 - 2010-12-15

Sorokina, Irina T.
From artificial sun to new planets. Frontiers in Optics 2010: session "What is hot in optics"; 2010-10-24 - 2010-10-28

Sorokina, Irina T.
Mid-IR Ultrafast Lasers. Seminar at Spectraphysics; 2010-05-25 - 2010-05-25

Sorokina, Irina T.
Mid-IR Vibronic Solid-State Lasers: the 50 years quest. International Workshop on Solid-State Lasers: 50 years after; 2010-03-19 - 2010-03-20

Sorokina, Irina T.
Recent Advances in Ultrashort pulse Generation and Applications in the Mid-infrared. 14th International Conference on Laser Optics 2010; 2010-06-28 - 2010-07-02

Sorokina, Irina T; Sorokin, E; Komar, V. K.; Puzikov, V. M.; Zagoruiko, Yu. A.; Gerasimenko, A. S.; Kovalenko, N. O..
Tunable continuous-wave Zn0.75Mg0.25Se:Cr2+ : a way towards longer wavelengths. 4th EPS-Qeod EUROPHOTON Conference on Solid-Sate Fibre, and Waveguide Coherent Light Sources, Hamburg, Deutschland; 2010-08-28 - 2010-09-03

Stokke, Bjørn Torger.
Biopolymer interactions: Electrostatically driven biomacromolecular assembly and biosensing. Invited lecture, Riken; 2010-01-15 - 2010-01-15

Stokke, Bjørn Torger.
Biopolymer single-molecule interactions maps functional and structural properties.. Invited lecture, Institute for biomaterials and bioengineering, Tokyo Medical and Dental University; 2010-01-13 - 2010-01-13

Sudbø, Asle; Herland, Egil; Babaev, Egor.
Competing Current-Current Interactions in Multicomponent Superconductors and Superfluids. Nanoscale Superconductivity, Fluxonics, and Plasmonics; 2010-09-21 - 2010-09-26

Sudbø, Asle; Linder, Jacob.
Hybrid structures of ferromagnets and superconductors. Odd-frequency superconducting pairing. International Workshop on Superconductivity in Reduced Dimensions; 2010-05-04 - 2010-05-08

Sudbø, Asle; Linder, Jacob; Sperstad, Iver Bakken.
0-π phase shifts in Josephson junctions as a signature for the $s_{+-}-wave pairing. 9th Intl Conf on Spectroscopy of Novel Superconductors; 2010-05-23 - 2010-05-28

Sudbø, Asle; Linder, Jacob; Yokoyama, Takehito.
Hybrid structures of ferromagnets and superconductors: Odd-frequency superconducting pairing. Workshop Nanoscale Engineering with Superconductors; 2010-05-04 - 2010-05-08

Svenum, Ingeborg-Helene; Borck, Øyvind; Walle, Lars Erik; Schulte, Karina; Borg, Anne.
Adsorption of CO on Ni3Al(111): A combined theoretical and experimental study. ECOSS 27; 2010-08-29 - 2010-09-03

Thomassen, Sedsel Fretheim; Gholami, Mayani Maryam; Reenaas, Turid Worren; Zhou, Dayong; Fimland, Bjørn-Ove.
Quantum dot density studies for quantum dot intermediate band solar cells. Renewable Energy Research Conference - 2020 and Beyond; 2010-06-07 - 2010-06-08

Torsæter, Malin; Lefebvre, Williams; Andersen, S. J.; Marioara, C.D.; Walmsley, John C.; Holmestad, Randi.
Clustering behaviour in Al-Mg-Si alloys investigated by APT. 12th International Conference on Aluminium Alloys (ICAA); 2010-09-05 - 2010-09-09

Torsæter, Malin; lefebvre, Williams; Andersen, Sigmund J; Walmsley, John; Holmestad, Randi.
Investigation of clustering in Al-Mg-Si alloys by Atom Probe Tomography. 17th International Microscopy Congress - IMC 2010; 2010-09-19 - 2010-09-24

Torsæter, Malin; Lefebvre, Williams; Marioara, C.D.; Andersen, S. J.; Walmsley, John C.; Holmestad, Randi.
The study of clustering in Al-based alloys by APT. JCNCS; 2010-09-12 - 2010-09-15

Tørå, Glenn; Hansen, Alex; Øren, Pål-Eric.
Dynamic network modeling of resistivity index in a steady-state procedure. SPE Annual Technical Conference and Exhibition; 2010-09-19 - 2010-09-22

Van Helvoort, Antonius; Holmestad, Randi; Walmsley, John C.
TEM as tool in nanotechnology at NTNU. 5th NTNU Nanolab usermeeting; 2010-09-10 - 2010-09-10

Walle, Lars Erik; Ragazzon, Davide; Uvdal, Per; Borg, Anne; Sandell, Anders.
Experimental Evidence for Mixed Dissociative and Molecular Adsorption of Water on a Rutile TiO2(110) Surface without Oxygen Vacancies. AVS 57th International Symposium and Exhibition; 2010-10-17 - 2010-10-22

Walle, Lars Erik; Schulte, Karina; Gustafson, Johan; Weststrate, C. J.; Lundgren, Edvin; Andersen, Jesper N.; Borg, Anne.
Oxide formation and CO induced oxide reduction on the Pd75Ag25(100) surface. ECOSS 27; 2010-08-29 - 2010-09-03

Walmsley, John C; Dehghan-Niri, Roya; Vullum, Per Erik; Holmestad, Randi; Rønning, Magnus; Holmen, Anders; Hauback, Bjørn.
TEM analysis of catalyst and energy storage materials. International Symposium on Advanced Electron Microscopy for Catalysis and Energy Storage Materials; 2010-01-17 - 2010-01-20

Weigand, Christian Carl; Ladam, C.; Bergren, Matt; Tveit, Johannes; Vullum, Per Erik; Dahl, Øystein; Fagerberg, Ragnar; Collins, R.T.; Furtak, T.E.; Grepstad, Jostein; Weman, Helge.
ZnO nanostructures grown by pulsed laser deposition. 5th NTNU Nanolab Users Mtg.; 2010-09-10

Wells, Justin W.
A novel approach to spin filtering; Separating Spins in a One-Dimensional Topological Metal Surface.. ISA meeting; 2010-01-28 - 2010-01-29

Wells, Justin W.
Separating Spins in a One-Dimensional Topological Metal Surface. SRMS; 2010-07-11 - 2010-07-14

Wells, Justin W.
Spin transport and topological insulators.. Invited talk; 2010-11-10 - 2010-11-10

Wells, Justin W.
Topological surfaces; an introduction to topological surfaces and their potential applications.. Invited talk; 2010-03-23 - 2010-03-23

Xie, Minli; Olderøy, Magnus Østgård; Strand, Berit Løkensgard; Andreassen, Jens-Petter; Sikorski, Pawel.
Nanoscale control of mineral deposition within alginate gel networks. Biophysics meeting, Kongsvold 2010; 2010-03-03 - 2010-03-05

SCIENTIFIC POSTERS

(Total 52)

Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Kildemo, Morten.
Polarimetric Imaging of Strain in Multi Crystalline Silicon. 3rd NanoCharm Workshop on Non-Destructive Real Time Process Control; 2010-10-13 - 2010-10-15

Afadzi, Mercy; Davies, Catharina De Lange; Hansen, Yngve Hofstad; Johansen, Tonni Franke; Måsøy, Svein-Erik; Angelsen, Bjørn Atle J..
Ultrasound stimulated release of liposomal calcien. 2010 IEEE International Ultrasonics Symposium (IUS); 2010-10-11 - 2010-10-14

Anthonysamy, Fervin Moses; Hoang, Thang Ba; Ahtapodov, Lyubomir; Dasa, Lakshmi Narayana; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Photoluminescence polarization anisotropy in a single heterostructured III-V nanowire with mixed crystal phases. 30th International Conference on the Physics of Semiconductors (ICPS 2010); 2010-07-25 - 2010-07-30

Azevedo, Eduardo N.; Alme, Lars Ramstad; Engelsberg, Mario; Fossum, Jon Otto; Dommersnes, Paul Gunnar; Hemmen, Henrik.
X-ray studies of interlayer water absorption and mesoporous water transport in a weakly hydrated clay. Gordon Research Conference on Flow and Transport in Permeable Media; 2010-07-10 - 2010-07-16

Azevedo, Eduardo N.; Engeslberg, Mario; Alme, Lars Ramstad; Fossum, Jon Otto; Dommersnes, Paul G..
Fluid imbibition in paper fibers: Precursor front. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Bjørge, Ruben; Nakashima, Philip N.H.; Marioara, Calin D.; Andersen, Sigmund J.; Muddle, Barry C.; Etheridge, Joanne; Holmestad, Randi.
β' precipitate in an Al-Mg-Ge alloy studied by Cs-corrected STEM. ESTEEM Workshop on Aberration-Corrected STEM; 2010-07-03 - 2010-07-05

Boschker, Jos Emiel; Monsen, Åsmund Fløystad; Folven, Erik; McEnroe, S.A.; Grepstad, Jostein; Wahlström, Erik; Tybell, Thomas.
Step-edge controlled strain in epitaxial perovskite thin films. 1st Annual Workshop, Nano Network; 2010-05-31 - 2010-06-02

Da Silva, Geraldo; Amato, Marco; Fossum, Jon Otto.
Photothermal studies of hydration pro-cess in nanolayered synthetic silicate. XXXIII Encontro Nacional de Física da Matéria Condensada (ENFMC) da Sociedade Brasileira de Física; 2010-05-10 - 2010-05-14

Daae, Marianne; Espy, Patrick Joseph; Newnham, David; Kleinknecht, Nora; Clilverd, Mark.
The effect of precipitating particles on middle atmospheric night time ozone during enhanced geomagnetic activity. Fall AGU Conference; 2010-12-13 - 2010-12-17

Dasa, Lakshmi Narayana Dheeraj; Munshi, Abdul Mazid; Van Helvoort, Antonius; Fimland, Bjørn-Ove; Weman, Helge.
Control of wurtzite and zinc blende crystal phases in single GaAs nanowires grown by Au-assisted molecular beam epitaxy. 5th Nanowire growth workshop; 2010-11-04 - 2010-11-04

Dehghan-Niri, Roya; Hansen, Thomas W.; Wagner, Jakob Birkedal; Holmen, Anders; Rytter, Erling; Borg, Øyvind; Holmestad, Randi; Walmsley, John.
Using environmental transmission electron microscope to study the in-situ reduction of Co3O4 supported on α-Al2O3. 17th International Microscopy Congress - IMC 2010; 2010-09-19 - 2010-09-24

Esmaeili, Morteza; Granlund, Håvard; Andreasen, Jens wenzel; Breiby, Dag Werner.
Characterization of Nanostructures in High-Modulus Fibres. 1st annual workshop in the Norwegian PhD Network on Nanotechnology for Microsystems; 2010-05-31 - 2010-06-02

Espy, Patrick Joseph; Daae, Marianne; Shprits, Yuri.
Reanalysis of Radiation Belt Electron Phase Space Density using the UCLA 1-D VERB code and Kalman filtering: Correlation between the inner edge of the outer radiation belt phase space density and the plasmapause location. Fall AGU Conference; 2010-12-13 - 2010-12-17

Fløystad, Jostein Bø; Grepstad, Sigrid; Mo, Frode; Mathiesen, Ragnvald; Tybell, Thomas; Breiby, Dag Werner.
Domain size distributions in ferroelectric PbTiO3 thin films. 1st annual workshop in the Norwegian PhD Network on Nanotechnology for Microsystems; 2010-05-29 - 2010-06-02

Fonseca, Davi De Miranda; Meheust, Y; Knudsen, Kenneth D.; Fossum, Jon Otto.
Phase diagram of polydisperse Na-fluorohectorite-water suspensions: A synchrotron small-angle X-ray scattering study. International Workshop on CO2 and Fluids in Nanoscience; 2010-12-07 - 2010-12-10

Fonseca, Davi De Miranda; Meheust, Y; Knudsen, Kenneth D; Fossum, Jon Otto.
Phase diagram of polydisperse Na-fluorohectorite-water suspensions: A synchrotron small-angle X-ray scattering study. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Garaiova, Zuzana; Strand, Sabina P.; Davies, Catharina De Lange.
Gene transfer in Hela cells mediated by chitosan/DNA nanoparticles. Regional Biophysics Conference; 2010-09-15 - 2010-09-18

Hak, Sjoerd; Jarzyna, Peter A.; Mulder, Willem J.M.; Thuen, Marte; Reitan, Nina Kristine; Haraldseth, Olav; Davies, Catharina De Lange.
Combined in vivo MRI and in vivo CLSM to study the behavior of multifunctional nanoemulsions. World Molecular Imaging Conference; 2010-09-07 - 2010-09-10

Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fossum, Jon Otto.
Colloidal platelet self-organization from solvent evaporation. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fossum, Jon Otto.
Orientational Ordering in Aqueous Clay Gels and/or Glasses. Materials Research Society 2010 MRS Fall Meeting; 2010-11-29 - 2010-12-03

Hansen, Elisabeth Lindbo; Hemmen, Henrik; Fossum, Jon Otto.
Volume Fraction Versus Order In Nematic Fluorohectorite Dispersions. 2010-Trilateral Meeting on Clays (2010TMC-CSSJ-CMS); 2010-06-06 - 2010-06-11

Hemmen, Henrik; Alme, Lars Ramstad; Fossum, Jon Otto; Meheust, Y.
X-ray studies of interlayer water absorption and mesoporous water transport in a weakly hydrated clay. Gordon Research Conference on Flow and Transport in Permeable Media; 2010-07-10 - 2010-07-16

Hemmen, Henrik; Hansen, Elisabeth Lindbo; Blindheim, E.; Fossum, Jon Otto.
Flow Induced Ordering In Na-Fluorohectorite Dispersion. 2010-Trilateral Meeting on Clays (2010TMC-CSSJ-CMS); 2010-06-06 - 2010-06-11

Hemmen, Henrik; Ringdal, Nils Ivar; Azevedo, Eduardo N.; Engelsberg, Mario; Hansen, Elisabeth Lindbo; Meheust, Y; Fossum, Jon Otto; Knudsen, Kenneth D.
The Isotropic-Nematic interfacde in suspensions of Na-fluorohectorite synthetic clay. International Workshop on CO2 and Fluids in Nanoscience; 2010-12-07 - 2010-12-10

Hemmen, Henrik; Ringdal, Nils Ivar; Azevedo, Eduardo N.; Engelsberg, Mario; Hansen, Elisabeth Lindbo; Meheust, Y; Fossum, Jon Otto; Knudsen, Kenneth D.
The Isotropic-Nematic interfacde in suspensions of Na-fluorohectorite synthetic clay. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Mauroy, Henrik; Knudsen, Kenneth D.; Fossum, Jon Otto.
Diffusion through layered clay monitored by small angle neutron scattering. International Workshop on CO2 and Fluids in Nanoscience; 2010-12-07 - 2010-12-10

Maurstad, Gjertrud; Strand, Sabina P.; Vårum, Kjell Morten; Stokke, Bjørn Torger.
Characterization of complexes of DNA and PEGylated chitosans. 25th International Carbohydrate Sympoisum,; 2010-08-01 - 2010-08-06

Mehli, Hanne.
Se lyset! Spektroskopi, laser og optiske illusjoner. Forskningstorget 2010; 2010-09-24 - 2010-09-25

Olderøy, Magnus Østgård; Xie, Minli; Strand, Berit Løkensgard; Draget, Kurt Ingar; Andreassen, Jens-Petter; Sikorski, Pawel.
Powerful Polymorph Selection in the Calcium Carbonate System by Well Defined Alginate Oligomers. Gordon Research Conference: Biomineralization; 2010-08-15 - 2010-08-20

Reenaas, Turid Worren; Vullum, Per Erik; Song, Y.; Sadeghi, M.; Thomassen, Sedsel Fretheim; Holmestad, Randi; Wang, S.; Fimland, Bjørn-Ove.
Comparative study of spacer layers for InAs quantum dot stacks. 22nd International Conference on Indium Phosphide and Related Materials; 2010-05-31 - 2010-06-04

Reitan, Nina Kristine; Thuen, Marte; Goa, Pål Erik; Davies, Catharina De Lange.
Characterization of tumor vasculature structure and permeability by MRI and intravital confocal imaging. ISRM 2010; 2010-05-01 - 2010-05-07

Rozynek, Zbigniew; Fossum, Jon Otto; Castberg, Rene; Måløy, Knut Jørgen; Flekkøy, Eirik Grude.
Electric Field Induced Rotation of Clay Particles. International Workshop on CO2 and Fluids in Nanoscience; 2010-12-07 - 2010-12-10

Rozynek, Zbigniew; Fossum, Jon Otto; Wang, Bao-Xiang; Knudsen, Kenneth D..
Electric Field Induced Structuring of Modified Na-fluorohectorite Clay Particles. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Rozynek, Zbigniew; Wang, Bao-Xiang; Fossum, Jon Otto.
Electric-field Induced Alignment of Modified Na-fluorohectorite Clay Particles. Materials Research Society 2010 MRS Fall Meeting; 2010-11-29 - 2010-12-03

Rozynek, Zbigniew; Wang, Bao-Xiang; Plivelic, T; Fossum, Jon Otto.
X-ray Scattering Study of a Clay/Gelatine Hybrid Electrorheological Elastomer. Seventh Nordic Workshop on Scattering from Soft Matter; 2010-01-27 - 2010-01-28

Siew, Wee Ong; Yap, Seong Shan; Ladam, Cecile; Dahl, Øystein; Reenaas, Turid Worren; Tou, Teck Yong.
Nanosecond laser ablation and deposition of Si. ICPEPA 7; 2010-08-16 - 2010-08-21

Soleim, Bjørn Gunnar; Sæterli, Ragnhild; Van Helvoort, Antonius.
Comparing Several TEM Sample Preparation Techniques to Study Ferroelectric Lead Titanate Nanostructures. 17th International Microscopy Congress - IMC17; 2010-09-19 - 2010-09-24

Soleim, Bjørn Gunnar; Sæterli, Ragnhild; Van Helvoort, Antonius.
TEM sample preparation of surface nanostructures using Focused Ion Beam. International Conference on Electroceramics XII; 2010-06-13 - 2010-06-16

Svensen, Øyvind; Frette, Øyvind; Kildemo, Morten; Aas, Lars Martin Sandvik; Erga, Svein Rune; Stamnes, Jakob J..
Mueller matrix measurements of algae with different shape and size distributions.. Ocean Optics XX; 2010-09-27 - 2010-10-01

Tan, B; Chu, X; Liu, H; Yamashita, C; Harvey, V; Gardner, C.; Espy, Patrick Joseph.
Comparative study of stratopause at the South Pole and Rothera. Fall AGU Conference; 2010-12-13 - 2010-12-17

Tenorio, R.; Engeslberg, Mario; Fossum, Jon Otto; Da Silva, Geraldo.
Intercalated Water in Synthetic Lithium-fluorhectorite Clay. Materials Research Society 2010 MRS Fall Meeting; 2010-11-29 - 2010-12-03

Tenorio, Romulo P.; Engeslberg, Mario; Fossum, Jon Otto; Da Silva, Geraldo.
Confined water molecules in layered structures. International Workshop on Complex Physical Phenomena in Materials; 2010-12-14 - 2010-12-17

Thomassen, Sedsel Fretheim; Reenaas, Turid Worren; Fimland, Bjørn-Ove.
InAs/GaAs quantum dot density variation across a quarter wafer when grown with substrate rotation. 16th International Conference on Molecular Beam Epitaxy; 2010-08-22 - 2010-08-27

Thomassen, Sedsel Fretheim; Zhou, Dayong; Gholami, Mayani Maryam; Reenaas, Turid Worren; Fimland, Bjørn-Ove; Vitelli, Stefano.
Quantum dot density studies for quantum dot intermediate band solar cells. 25th European Photovoltaic Solar Energy Conference and Exhibition/5th World Conference on Photovoltaic Energy Conversion; 2010-09-06 - 2010-09-10

Torsæter, Malin; Hasting, Håkon Stokka; Lefebvre, Williams; Marioara, Calin D; Walmsley, John C.; Andersen, Sigmund J.; Holmestad, Randi.
The influence of composition and natural ageing on clustering during pre-ageing in Al-Mg-Si alloys. SCANDEM; 2010-06-08 - 2010-06-11

Weigand, Christian Carl; Grepstad, Jostein; Bergren, Matt; Weman, Helge; Furtak, Tom; Collins, Reuben; Fagerberg, Ragnar; Ladam, Cecile; Vullum, Per Erik; Dahl, Øystein; Tveit, Johannes.
ZnO nanostructures grown by pulsed laser deposition. 1st Annual Workshop of the Norwegian PhD Network on Nanotechnology for Microsystems; 2010-05-31 - 2010-06-02

Weigand, Christian Carl; Grepstad, Jostein; Weman, Helge; Ladam, C.; Vullum, Per Erik; Dahl, Øystein; Bergren, M.R.; Collins, R.T.; Furtak, T.E.; Tveit, Johannes; Holmestad, Randi.
ZnO nanosheets grown by pulsed laser deposition. 5th Nanowire Growth Workshop; 2010-11-03 - 2010-11-05

Xie, Minli; Olderøy, Magnus Østgård; Strand, Berit Løkensgard; Standal, Therese; Zhang, Zhibing; Andreassen, Jens-Petter; Sikorski, Pawel.
Bio-inspired mineralization of alginate hydrogels with hydroxyapatite for new composite materials in tissue engineering. Gordon Research Conference: Biomineralization; 2010-08-15 - 2010-08-20

Yap, Seong Shan; salomatova, Alesya Viktorovna; Ladam, Cecile; Dahl, Øystein; Reenaas, Turid Worren.
Pulsed Laser Ablation and Deposition of Silicon. RERC 2010; 2010-06-07 - 2010-06-08

Yap, Seong Shan; Siew, Wee Ong; Ladam, Cecile; Dahl, Øystein; Reenaas, Turid Worren; Tou, Teck Yong.
Nanosecond pulsed laser deposition of germanium films. SPIE 's Optics and Photonics; 2010-08-01 - 2010-08-05

Yap, Seong Shan; Siew, Wee Ong; Ladam, Cecile; Reenaas, Turid Worren; Tou, Teck Yong.
Effects of laser wavelength and fluence in nanosecond pulsed laser deposition of silicon. 2010 International Conference on Nano Science and Nano Technology (ICNST 2010); 2010-11-08 - 2010-11-09

Yap, Seong Shan; Siew, Wee Ong; Ladam, Cecile; Reenaas, Turid Worren; Tou, Teck Yong.
Effects of laser wavelength and fluence in pulsed laser deposition of ge films. 2010 National conference on physics; 2010-10-27 - 2010-10-30

POPULAR SCIENTIFIC TALKS
(Total 14)

Brataas, Arne
Nano - ingen liten sak. Det Norske Videnskapsakademi, fellesmøte; 2010-04-15 - 2010-04-15

Bungum, Berit
En case fra vitenskapshistorien: Nikola Tesla. Videreutdanningskurs, Teknologi og forskningslære; 2010-03-23 - 2010-03-24

Bungum, Berit
Hva kan plastforming bidra med i teknologiprosjekter?. Nettverkssamling for Teknologi og Forskningslære; 2010-09-16

Bungum, Berit
Lærebøker i naturfag fra lærebokforfatterens perspektiv. Masteremne i naturfagdidaktikk; 2010-10-27

Bungum, Berit; Bjørkum, Per Arne
Hva kan vi lære av vitenskapshistorien?. Videreutdanningskurs, Teknologi og forskningslære; 2010-03-23 - 2010-03-24

Bungum, Berit; Jørgensen, Eva Celine
Learning by inquiry in a technological context. S-TEAM mid-project conference; 2010-10-13 - 2010-10-16

Espy, Patrick Joseph
Vulkansk aske i atmosfæren. Kunnskapsbyen; 2010-09-16

Falnes, Johannes
Havbølgjeenergi: potensial og status. Opning av Kompetansesenter for havenergi, Runde Miljøsenter; 2010-10-28 - 2010-10-28

Førre, Bernt; Olaussen, Kåre; Løvaas, Tore Høe; Nordam, Tor
Hvordan se inn i materialer - hva ligger under?. Researchers' Night 2010; 2010-09-24 - 2010-09-24

Gibson, Ursula
Nanoscience: Threat and Promise. University of Kuwait seminar series; 2010-12-10 - 2010-12-15

Leganger, Lars Erlend
Teoretisk fysikk. Skolebesøk; 2010-12-14 - 2010-12-14

Linder, Jacob; Leganger, Lars Erlend
Teoretisk fysikk - Det er tanken som teller. Foredrag under Jentedagene 2010 ved NTNU; 2010-10-25 - 2010-10-25

Sorokina, Irina T
Women in physics: a life choice or a life chance?. IONS 2010; 2010-06-20 - 2010-06-24

Thomassen, Sedsel Fretheim
Spennende solceller. Jentedagen 2010; 2010-10-25 - 2010-10-26

PHYSICS PRESENTATION THROUGH MEDIA

Brataas, Arne; Normannsen, Sølvi Waterloo
Ny koordinator i 7. Rammeprogram: Flytter nano-grenser. Universitetsavisa 2010-04-22

Holmestad, Randi
Ser innover i nanoverdenen. Adresseavisen 2010-10-12

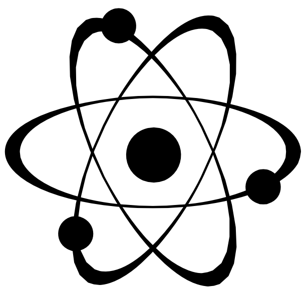
Leganger, Lars Erlend
Uillustrert Vitenskap: Tilbyr kreftbehandling på alternativmesse.. Radio Revolt, Studentradioen i Trondheim 2010-05-13

Letnes, Paul Anton; Nerbø, Ingar Stian; Aas, Lars Martin Sandvik; Ellingsen, Pål Gunnar; Kildemo, Morten
Fast and optimal broad-band Stokes/Mueller polarimeter design by the use of a genetic algorithm. [Patent] Patentnr./Lisensnr.: US61/380 532 Registrert 2010-09-07

Meland, Svein Inge; Gibson, Ursula
Vill fange sol billig. Adresseavisen 2010-11-02

Sikorski, Pawel
Gullmus hjelper forskarar å lage lengre nanotrådar. NRK Nett 2010-12-17
NTNU

Sikorski, Pawel; Mumm, Florian
Sea mouse boost for nanowire-makers. New Scientist magazine 2010-08-07



COOPERATING INSTITUTIONS

EUROPE

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

Borg, A.:
* Department of Physics and Materials Science, Uppsala University, Uppsala, Sweden (docent A. Sandell)
* Department of Synchrotron Radiation Physics, Lund University, Sweden (prof. J. N. Andersen and docent E. Lundgren).
* Department of Chemistry (Lund University, Sweden (prof. P. Uvdal)

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

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

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

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

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

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

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

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

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

Holmestad, R.:
* Rouen University /CNRS, France (W. Lefebvre)
* University of Milano Bicocca, Italy (S. Binetti)
* Denmark Technical University, Denmark (R. Dunin-Borkowski/ C. Boothroyd)
* University of Poltier, France (J. Pacaud)
* Helmholz Centre Berlin, Germany (J. Banhart)
* SuperSTEM, Daresbury, England (A. Bleloch)

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

Johnsson, A.:
* Institut für Biologie, Tübingen (W. Engelmann, Biophysics)

Kachelriess, M.:
* APC (Laboratoire AstroParticule et Cosmologie), Paris, France (G. Giacinti, D. Semikoz)
* Institute for Nuclear Research, Moscow, Russia (V. Berezinsky, V. Dokuchaev, Yu. Eroshenko, D. Semikoz)
* Laboratori Nazionali del Gran Sasso, Assergi, Italy (V. Berezinsky)
* MPI für Astrophysik, Garching, Germany (K. Dolag)
* University Hamburg, Germany (R. Tomas)
* ISDC Data Center for Astrophysics, University of Geneva (A. Neronov)

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

Kjeldstad, B:
* University of Hannover, Germany (UV radiation)

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

Lindgren, M.:
* Linköpings Universitet, IFM (Per Hammarström, Peter Nilsson, Patrick Norman)
* Kungliga Tekniska Høgskolan, Teoretisk Kjemi, Stockholm (Hans Ågren)
* Umeå Universitet, Organisk kemi, Umeå (B. Eliasson)
* Riken, Biophotonics Lab, Wako-shi, Japan (Tamotsu Zako).
* Université Claude Bernard (Lyon1), Laboratoire des Multimatériaux et Interfaces (Stephane Parola)
* ENS-Lyon (Ecole Normale Superieure), (Chantal Andraud)

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

Melø, T.B., Naqvi, K. R.:
* ITQB, Universidade Nova de Lisboa, Oeiras, Portugal (E. Melo)
* Instituto de Recursos Naturales y Agrobiología, CSIC, Salamanca, Spain (J.B. Arellano)
* Department of Chemistry, Yarmouk University, Irbid, Jordan (Y.A. Yousef)
*Department of Chemistry, Faculty of Science, Mansoura University, New Damietta, Damietta, Egypt (A. El-Agamey)
*Division of Chemistry and Biological Chemistry, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore (R. D. Webster)

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

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

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

Skagerstam, B.S.:
*Institut für Theoretische Physik der Universität Göttingen, (G.C. Hegerfeldt)
* Chalmers Tekniska Högskola, Gøteborg, Sverige (G. Johansson, G. Wendin, V. Shumeiko)
* NORDITA and Stockholm University, Stockholm (I. Bengtsson)
* AXSESS, Molde (P. K. Rekdal)

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

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

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

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

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

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

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

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

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

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).

ASIA

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

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

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

Holmestad, R.
* Toyama University, Graduate school of Science and Engineering, Japan (K Matsuda)
*Tokyo Institute of Technology, Tokyo, Japan (T. Sato)
*Tokyo National College of Technology, Tokyo, Japan (Nagayoshi)

Johnsson, A.:
* Jawaharklal Nehru Centre for Advanced Scientific Research, Bangalore, India (V K Sharma)

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

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

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

Naqvi, K.R.:
* 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)

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

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

Skagerstam, B.S.:
* Centre for High Energy Physics, Indian Institute of Science, Bangalore, India (S. Vaidya).
* 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.
* Department of Polymer Chemistry, Graduate School of Engineering, Kyoto University, Katsura Nishikyo-ku, Kyoto 615-8510 Japan (Kazunari Akiyoshi) Biophysics

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

AUSTRALIA

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

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

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

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, Erik Marstein)
* Division of Biophysics and Medical Technology, Radium Hospital, Oslo (Ø. Bruland, A. Skretting, D.R. Olsen)
* Statoil Research Centre, Trondheim
(F. Antonsen, H. Widerøe, Erling Rytter)
* University of Oslo (J.M. Leinaas, A. Dahlback, E.G. Flekkøy, K.J. Måløy, Johan Taftø, Øystein Prytz, Ame Olsen, Anette Gunnæs, H. Fjellvåg, O. Nilsen)
* University of Bergen (J.Stamnes, P. Osland)
* Optomed (R. Ellingsen, D.R. Hjelme, B. Falch)
* FMC Biopolymers (E. Onsøyen)
* Norwegian Radiation Protection Authority (Bjørn Johnsen, Terje Christensen)
* Tambartun National Resource Center for the Visually Handicapped, Melhus (P. Fosse)
* Centre for Viking and Medieval Studies, University of Oslo
* Finnmark University College (Bjørn Tore Esjeholm)
* Numerical Rocks AS, Trondheim (Ramstad, Øren)
* Høgskolen I Sør-Trøndelag, HiST (E. Munkeby)
* Vestfold University College (K.E. Aasmundtveit)
* The Norwegian Polar Institute, (Kim Holmén), Tromsø Norway.
* Dept of Circulation and Medical Imaging, NTNU (Prof. Bjørn Angelsen, Prof Olav Haraldseth)
* Epitarget as (Sigrid Fossheim)
* Department of Oncology, St.Olav's Hospital (T. Strickert, J. Frengen)
* Høgskolen i Sør-Trøndelag, HIST (G. Oftedal, S. Ramstad)
* SINTEF (C. Marioara, S. Andersen, B.S. Tanem, R. Fagerberg, Ø. Dahl, C. Ladam, P-E. Vullum,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 ATTENDENCE

Some subjects were self-study courses in 2010

Subjects		*Student Attendance*
MSc Technology 1st and 2nd year		
TFY4102	Physics for Product Design Engineering, Earth Sciences and Petroleum Engineering (incl. lab)	134
TFY4104	Physics for Product Design and Manufacturing, Marine Technology (incl. lab)	229
TFY4106	Physics for Civil and Transport Engineering, Industrial Economics and Technology Management (incl. lab)	218
TFY4115	Physics for Electronics Engineering, Engineering Cybernetics, Nanotechnology	195
TFY4120	Physics for Chemical Engineering and Biotechnology, Materials Science and Engineering (incl. lab)	115
TFY4125	Physics for Computer Science, Communication Technology	191
TFY4145	Mechanical Physics (incl. lab)	111
TFY4155	Electromagnetism (incl. lab)	99
TFY4160	Wave Physics (incl. lab)	89
TFY4165	Thermal Physics (incl. lab)	88
TFY4215	Introduction to Quantum Physics	98
TFY4335	Nano Life Science	26
MSc Technology 3rd year		
TFY4170	Physics 2 for Electronics Engineering	40
TFY4185	Measurement Techniques (incl. lab)	84
TFY4190	Instrumentation (incl. lab)	76
TFY4195	Optics (incl. lab)	79
TFY4205	Quantum Mechanics II	42
TFY4230	Statistical Physics	76
TFY4240	Electromagnetic Theory	63
TFY4250	Quantum Mechanics I	54
TFY4260	Cell Biology and Cellular Biophysics (incl. lab)	47
MSc Technology 4th year		
TFY4200	Optics, Advanced Course (incl. lab)	5
TFY4210	Quantum Theory of Many-Particle Systems	11
TFY4220	Solid State Physics (incl. lab)	115
TFY4225	Nuclear and Radiation Physics (incl. lab)	41
TFY4235	Computational Physics	22
TFY4245	Solid State Physics, Advanced Course	13
TFY4255	Materials Physics (incl. lab)	10
TFY4275	Classical Transport Theory	6
TFY4280	Signal Processing (incl. lab)	14
TFY4292	Quantum Optics	13
TFY4300	Energy and Environmental Physics	57
TFY4305	Non-linear Dynamics	7
TFY4310	Molecular Biophysics (incl. lab)	7
TFY4315	Biophysics of Ionizing Radiation	5

TFY4320	Medical Physics (incl. lab)	6
TFY4340	Mesoscopic Physics	5
TFY4345	Classical Mechanics	34
TFY485x	Experts in Team, Interdisciplinary Project	29

MSc Technology 5th year

TFY4265	Biophysical Micromethods (incl. lab)	7
TFY4500	Biophysics, Specialization Project	4
TFY4505	Biophysics, Specialization Course	4
TFY4510	Physics, Specialization Project	20
TFY4515	Physics, Specialization Course	11
TFY4520	Nanotechnology, Specialization Project	10
TFY4525	Bionanotechnology, Specialization Course	6
TFY4900	Physics, Master's Thesis	32

BSc

FY0001	Service Course in Physics (incl. lab)	62
FY1001	Mechanical Physics (incl. lab)	90
FY1002	Wave Physics (incl. lab)	56
FY1003	Electricity and Magnetism (incl. lab)	63
FY1005	Thermal Physics (incl. lab)	33
FY1006	Introduction to Quantum Physics	33
FY2045	Quantum Mechanics I	29
FY2302	Biophysics (incl. lab)	10
FY2450	Astrophysics	34
FY2451	Astrophysics II	8
FY2900	Physics Education	5

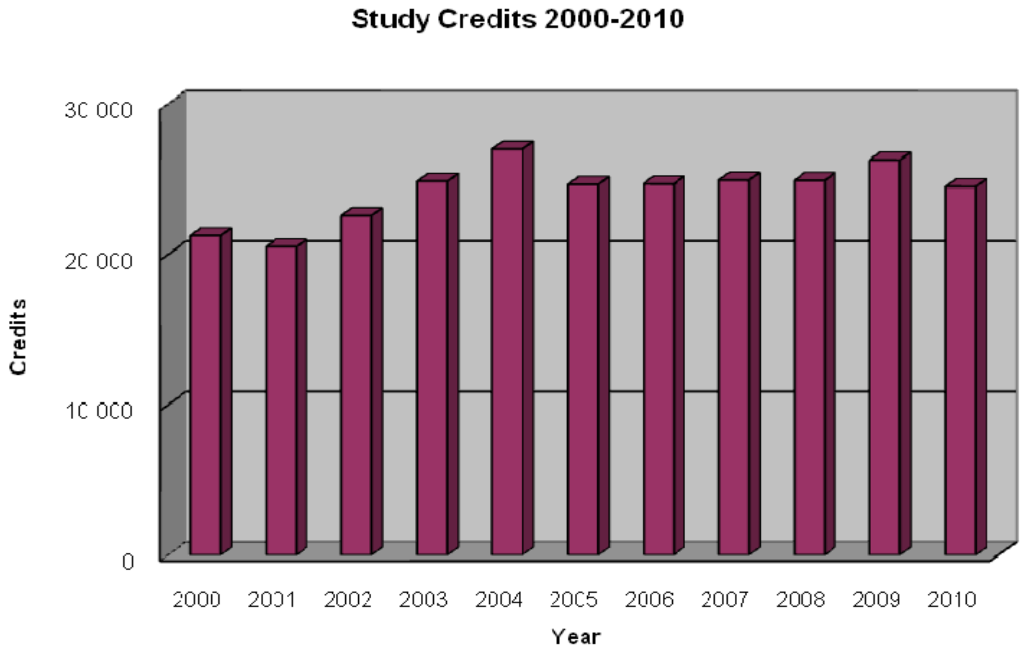
MSc

RFEL3092	Research Methods in Science	7
FY2290	Energy Resources	15
FY3006	Sensors and Transducers	7
FY3114	Functional Materials	17
FY3201	Atmospheric Physics and Climate Change	15
FY3402	Subatomic Physics	24
FY3403	Particle Physics	5
FY3452	Gravitation and Cosmology	15
FY3464	Quantum Field Theory I	3
FY3466	Quantum Field Theory II	6
FY3900	Master Thesis in Physics	15
FY3950	Master Thesis in Physics (Teacher Education)	3

PhD

FY8100	Characterization of Solid Surfaces	8
FY8102	Electron Microscopy and Diffraction	9
FY8104	Symmetry Groups in Physics	1
FY8203	Soft Condensed Matter	3
FY8303	Phase Transitions and Critical Phenomena	6
FY8201	Nanoparticle and Polymer Physics	2
FY8304	Mathematical Approximation Methods in Physics	11
FY8305	Functional Integral Methods	3
FY8401	Interactions of Ionizing Radiation with Matter	3
FY8407	Magnetic Resonance Imaging	1
FY8503	Advanced Theoretical Physics	7
FY8504	Advanced Experimental Physics	6

FY8901	Sensors and Transducers	2
FY8902	Atmospheric Physics and Climate Change	4
FY8904	Computational Physics	6
FY8905	Materials Physics	2
FY8906	Biophysical Micromethods	3
FY8907	Classical Transport Theory	2
FY8908	Quantum Optics	0



THESIS – GRADUATE STUDIES

Master of Science in Technology – Applied Physics and Mathematics

Alnes, Solveig Søvik
Mechanisms of Particle Deposition in a Turbulent Channel Flow
Supervisor: Jon Andreas Støvneng / Nils E. Haugen

Alvestad, Øystein
Exclusvie Two-Photon Production of Lepton Pairs in PYTHIA8
Supervisor: Michael Kachelriess / Martin Pohl

Bjørnstad, Anders Granskogen
Particle Deposition on a Cylinder in Turbulent Cross Flow
Supervisor: Jon Andreas Støvneng / Nils E. Haugen

Blindheim, Eirik Voje
Experimental Studies of Particle Organization and Rheology of Clay Suspensions
Supervisor: Jon Otto Fossum

Bojesen, Troels Arnfred
Theoretical Investigations of the Tunneling Current in Josephson Junctions made of Single- or Multiband Superconductors
Supervisor: Asle Sudbø

Christoffersen, Ingeborg M.
A Numerical Study of Turbulent Mixing in Coaxial Jets
Supervisor: Jon Andreas Støvneng / Nils E. Haugen

Eidsaa, Marius
Debye Mass to Order g^6 for Massless Scalar Phi^4 Theory by an Effective Field Theory Approach
Supervisor: Jens Oluf Andersen

Ellingsen, Pål Gunnar
Development of Mueller Matrix Imaging Technique for Characterising Collagen Spatial Orientation in Cartilage: Comparison to Multiphoton Microscopy
Supervisor: Morten Kildemo

Fadnes, Tore
CO Adsorption on Supported Metal Nanoparticles
Supervisor: Steinar Raaen

Fløystad, Jostein Bø
Domain Structures in PbTiO3 Thin Films
Supervisor: Dag Breiby

Fredriksen, Tonje Dobrowen
Color Coded Velocity Spectrum. A New Method for Quantification of Mitral Regurgitation Using Parallel Beamforming
Supervisor: Marit Sletmoen / Torbjørn Hergum

Grimsmo, Arne Løhre
Open Systems and Measurement in Quantum Optics. The Photodetection Process and Master Equations
Supervisor: Bo-Sture Skagerstam

Haugstad, Kristin Elisabeth
Implementation of Optical Tweezers for Single Molecule Characterisation
Supervisor: Marit Sletmoen

Helgaker, Jan Fredrik
*Microstructure and Hardness Evolution During Aging of Two 6xxx Al-Alloy*s
Supervisor: Randi Holmestad

Hersvik, Kjetil
Oil-Oil Droplet Deformation under DC Electric Field. A Method to Investigate Clay Electrorheology
Supervisor: Jon Otto Fossum

Hilde, Ingeborg Lunby
Image Stabilization for Intraoperative Echocardiography
Supervisor: Catharina Davies / Hans Torp

Hofstad, Kjetil
Design and Construction of a Photoreflectance Setup for the Study of Quantum Dot Intermediate Bands
Supervisor: Morten Kildemo

Jaarvik, Merete
Analysis of CSEM Data Near Salt
Supervisor: Ingve Simonsen / Ketil Hokstad

Mohn, Silje
Implementering av datamodell for simulering av pustebevegelsers påvirkning på forventet dosefordeling under behandling med IMRT
Supervisor: Tore Lindmo / Ellen Wasbø

Muggerud, Astrid-Marie Flattum
Electron Microscopy Studies and Microanalysis of Front Contact Interfaces in Silicon Solar Cell Materials
Supervisor: Randi Holmestad / Per Erik Vullum

Oksavik, Odne Andreas
A New Method for Measurement of Fluid Saturation in Reservoir Core Samples Using Gamma Radiation
Supervisor: Tore Lindmo / Matts Devik

Revheim, Kari
Kartlegging av strålefeltet rundt gammakniven
Supervisor: Tore Lindmo / Jan Heggedal

Rimstad, Eivind
Sea Ice Fracture Networks
Supervisor: Alex Hansen

Sigstad, Mats
Experimental Studies of Temperature Effects on Colloidal Dispersions of Clay Nanoplatelets
Supervisor: Jon Otto Fossum

Skåring, Øyvind
Ultrashort Relaxation Dynamics in Laser Excited Semiconductors
Supervisor: Jon Andreas Støvneng / Trond Brudevoll

Spreemann, Gard
Topological Quantum Field Theories on a Category of Open and Closed Cobordisms
Supervisor: Jens Oluf Andersen / Nils Baas

Svanes, Eirik Eik
The Non-Perturbative Renormalization Group with Applications
Supervisor: Jens Oluf Andersen

Tveit, Johannes
TEM Characterization of ZnO Nanostructures to be Utilized in Organic/Inorganic Solar Cells
Supervisor: Randi Holmestad

Vevatne, Jonas Nesland
Sea Ice Fracture Networks
Supervisor: Alex Hansen

Wille, Egil
Measurement and Logging of Ice Temperatures
Supervisor: Erik Wahlström / Bernt Førre

Wisting, Håvard Norøm
MICE EMR Prototype. Efficiency and PMT Calibration
Supervisor: Michael Kachelriess / Alain Blondel

Yang, Sylvia Xuewei Ma
Functional Testing of Patients with Achilles Tendon Rupture
Supervisor: Catharina Davies / Tine Alkjær Eriksen

Ødegård, Martin
Optimizing Traffic Flow in a New Cellular Automaton Model for City Traffic
Supervisor: Alex Hansen

Ødegården, Torgeir Bryge
Oil Release and Transport Mechanisms Due to Wettability Change in a Mixed-Wet 2D Porous Medium
Supervisor: Alex Hansen / Erik Skjetne

Master of Science in Physics

Bukholm, Ole Magnus
Interaction-Free Measurement with a Mode-Sensitive Absorber
Supervisor: Bo-Sture Skagerstam

Eggum, Stein
Unconventional Goldstone Bosons and Nielsen-Chadha Counting Rule
Supervisor: Jens Oluf Andersen

Eriksen, Jon Alm
Overlap Distributions of Random Cantor Sets and their Applications
Supervisor: Alex Hansen / Bikas Chakrabarti, SAHA

Espe, Bjørnar Rønning
Material Removal in Wire Sawing of Silicon
Supervisor: Turid Reenaas / Otto Lohne

Gudmundsen, Magne
Improved Secret Key Rate in Quantum Key Distribution using highly irregular Low-Density Parity-Check Codes
Supervisor: Kåre Olaussen

Johnsen, Magnus Berg
Hypertermisk fremkalt celledød i kreftcellelinjen Jurkat: Computerassistert analyse basert på fluorescensmerking og morfologi
Supervisor: Thor Bernt Melø

Kleinknecht, Nora
Planetary Wave Oscillations Observed in Ozone from Troll Station Antartica
Supervisor: Patrick Espy

Klemetsen, Lars Erik
An Experimental and Numerical Study of the Free Surface Pelton Bucket Flow
Supervisor: Jan Myrheim / Torbjørn Nielsen

Kvalsund, Karsten Arne
The Modified Newtonian Dynamics. An Introduction to and Comparison of MOND and CDM
Supervisor: Jan Myrheim

Langseth, Anders
Lydhastighet i væsker
Supervisor: Ingve Simonsen / Jørn Stenebråten

Lie, Leif Amund
Optical Properties of a Thin Film of Coated, Truncated Spheres
Supervisor: Ingve Simonsen

Lund, Harald
Variation of the Hydroxyl Near Infrared Airglow at Rothera, Antarctica (68°S, 68°W)
Supervisor: Patrick Espy

Salomatova, Olessia V.
Growth of Germanium Quantum Dots on Silicon by Pulsed Laser Deposition
Supervisor: Turid Reenaas

Sivertsen, Henrik
Flow Pattern Visualization
Supervisor: Jan Myrheim

Master of Science in Condensed Matter Physics

Abriha, Tadelle Haddush
SEM Microstructure Study and Hardness Evaluation of Al-Mg-Si (Ge) (6XXX) Alloys
Supervisor: Randi Holmestad

Aggrey, Eric
Synthesis of Anodic Alumina Oxide Template for Growth of Magnetic Nanowires
Supervisor: Erik Wahlström

Master of Science in Medical Technology – Biophysics and Medical Physics

Vallee, Emilie
Diffusion Functional MRI: A Method for Depicting True Neuronal Activity in the Intact Human Brain?
Supervisor: Tore Lindmo / Asta Håberg

Master of Science in Science Education

Sjøvik, Vegard Aas
Group Discussions around a Force Platform - A qualitative study of the use of language to reveal and correct pupils' alternative conceptions in mechanics
Supervisor: Berit Bungum / Hanne Mehli

Øren, Øystein
A Study on the Interaction Between YouTube Videos and Cooperative Learning
Supervisor: Berit Bungum

Aalmen, Frode
Drama in teaching Nature of Science - Development and testing of a curriculum about history of physics
Supervisor: Berit Bungum

DOCTORAL THESIS

Haugen, Håvard
Spin and Charge Transport in Two-dimensional Electron Gases
Supervisor: Arne Brataas

Mumm, Florian
Interactions of High Aspect Ratio Nanostructures and Biological Systems
Supervisor: Pawel Sikorski

Saxegaard, Magne
Scanning tunneling microscopy based point-contact measurements of nanoscale magnetic systems
Supervisor: Erik Wahlström

Solberg, Marius Aa.
Dark matter candidates and their indirect detection
Supervisor: Michael Kachelriess

Strandberg, Rune
Theoretical studies of the intermidiate band solar cell
Supervisor: Turid W. Reenaas

Sæterli, Ragnhild
Electronic structure of thermoelectric and ferro-electric materials: - Advanced transmission electronmicroscopy studies
Supervisor: Randi Holmestad

Tørå, Glenn
Pore-scale modelling of two-phase flow: dynamic effects and electrical response
Supervisor: Alex Hansen

Photo: Irene Aspli

PARTICIPATION IN COMMITTEES

EVALUATION COMMITTEES

Andersen J.O:
* Opponent for PhD thesis of Jorn Boomsma, Vrije Universiteit, Amsterdam, The Netherlands June 2010.

Borg, A.:
* Opponent at the PhD defence of Krithika Venkataramani, Interdisciplinary Nanoscience Center and Department of Physics and Astronomy (iNANO), Aarhus University, June 2010.
* Opponent at the PhD defence of May Lin Ng, Department of Physics, Astronomy, Molecular and Condensed Matter Physics, Uppsala University, November 2010.
*Evaluation committee for appointing professor in Nanoscience and Outreach Activities, Department of Physics, Denmark Technical University.

Breiby, D.W.:
* Administrator for the PhD defense of Florian Mumm, NTNU

Bungum, B.:
* Member of PhD evaluation committee for Claes Klasander (Norrköping, Sweden)
* Member of PhD evaluation committee for Barbro Gustafsson (Växjö, Sweden)

Davies C. de L.;
* Evaluation committee for application on infrastructure to the regional health authorities Helse Sør-Øst
* Evaluation committee for Dr.Philos thesis submitted by Gunnar Myhr
* Opponent for PhD thesis of Øyvind Sverre Svenden, University of Bergen, February 2010

Espy, P.:
* Opponent for PhD defence of Margit Dyrland, Department of Physics, University of Tromsø, February 2010.
* Member of PhD evaluation committee for Bengt Rydberg, Department of Radio and Space Science, Chalmers University of Technology, February 2010
* Member UNIS advisory committee for Arctic Geophysics, 2010.

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

Holmestad, R.:
*Administrator for PhD defense of Chang You, (Electronics and Telecommunication, NTNU, Febr. 2010), Rune Strandberg (Physics, May 2010) and Magne Saxegaard (Physics, October 2010).
* Evaluation committee for assistant professor at Chalmers, May 2010.

Linder, J.:
* Secretary for "Oppfølgingsutvalget for fysikkfagene" spring 2010.

Reenaas, T.W.:
* Evaluation committee PhD thesis of Elisa Antolin, Universidad Politécnica de Madrid, Januray 2010

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 Administrative Council of SEFI (European Society for Engineering Education)

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).
* Coordinator of Nordic research network, NorSEd

Espy, P.:
* Member SCOSTEP Climate and Weather of the Sun-Earth System (CAWSES-II) Task Group 2, 2010.
* Member International ALOMAR Science Advisory Committee, 2010.

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

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

Hansen, A.:
* Secretary to the Board of European Physical Society's Computational Physics group.
*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
*Member of the Editorial Board of the International Journal of Modern Physics C

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

Kachelriess, M.:
* Member of the steering committee of "ISAPP: International School on AstroParticle Physics European Doctorate School"
* Member of the Organizing Committee of the workshop ``Theory and observations of extragalactic magnetic fields", Paris 2010
* External evaluator for Vidi-research proposals of NWO (Netherlands Organisation for Scientific Research)

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).
* Core expert, study program accreditation in Nanoscience and Applied Physics, ACE Denmark
* Evalution of Strategic University College Funding, The Norwegian Research Council, Committee member
* Research proposal reviewer, Wellcome Trust-India Alliance
* Scientific advisory board, Polymer Networks conferences, 2010 (Germany)
* International Advisory Board, 10th International Hydrocolloids Conference, 20-24 June 2010, Shanghai Jiatong University, Shanghai, China.

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.
* Member of the Board for the Niels Henrik Abel Memorial Fund

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

Espy, P.:
* Member UNIS advisory committee for Arctic Geophysics, 2010.

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

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

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".
* Member of the board at Department of Industrial Economics and Technology Management

Brataas, A.:
* Chairman of the board of "Realfagsbiblioteket".
(on sabbatical leave 2010-2011)

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.

Gibson, U.:
* Member leader group "Gemini Centre Solar Cell Materials"
* Member of the Nanolab leadership committee

Hansen, A.
*Member of "Fakultetets sakkyndige kommite"

Holmestad, R.:
* Leader of the TEM Gemini Centre
* Member of Faculty of Natural Science and Technology (NT) board
* Member of NTs 'Forskningsutvalg'.
* Member of NTs 'Ansettelsesutvalg'
* Deputy Department head (Research), Department of Physics
*Chairman 'Formidlingsutvalget', Department of Physics.

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

Linder, J.:
*Member of ‘Formidlingsutvalget’, Department of Physics

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

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”.
* Substitute for the Elected member of the Departmental Board.

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.

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

Sudbø, A.:
* Head of the Department of Physics

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

Øverbø, I.:
* Chairman, “Studieprogramrådet for Realfag”.

ARRANGEMENT COMMITTEES

Fossum J.O.:
* Main organizer of International Workshop on Complex Physical Phenomena in Materials, GoldenTulip Recife Palace Hotel, Boa Viagem, Recife PE, Brazil, December 14-17 2010 *
* Main organizer of International Workshop on CO2 and Fluids in Nanoscience, International Center for Condensed matter Physics (ICCMP), Universidade de Brasilia (UnB), Brasilia, Brazil, December 7-10 2010
* Main organizer of Mini-Workshop on Complex Matter Physics, NTNU in Trondheim, Norway, September 20&21 2010 (Co-organized with Onsager Prof. E. Bouchaud CEA-SACLAY Paris)

Hansen, A.;
*Chairman of CCP2010, IUPAP Conference on Computational Physics, Trondheim, June 23-26.

van Helvoort, A.T.J.:
* Member scientific committee 10th International Congress for Applied Mineralogy (ICAM) in Trondheim, Norway on 1-5 August 2011.

Holmestad, R:
* Conference co-chair for Japan-China-Norway Cooperative Symposium on Nanostructure of Advanced Materials and Nanotechnology (JCNCS2010), Toyama, Japan, 12-13. Sept 2010

Kildemo, M.:
* Member of program committee for the 5th International Conference on Spectroscopic Ellipsometry, ICSE Albany, 22-28 May 2010

Reenaas, T.W.:
* Co-organizer international conference “Renewable Energy Research Conference” Trondheim, June 7-8 2010.

FRIDAY COLLOQUIUM

PROGRAM – SPRING TERM
Convenors: Razi Naqvi and Jens Oluf Andersen

29. January: Harald Hauglin, Justervesenet: "A Million Laser Lines, Atomic Clocks and the Possible Drift of Natural Constants"

12. February: Einar Halvorsen, Høgskulen i Vestfold: "MEMS vibration energy harvesting"

19. February: Ellen K. Henriksen, UiO: "TILFELDIG? NEPPE! Om studenters valg av fysikk og realfag i høyere utdanning"

12. March: Chuck Bennett, Johns Hopkins University: "WMAP and the Standard Model of Cosmology"

19. March: Eivind Almaas, Inst. for Biologi, NTNU: "Systems Biology -- what? how? who? You!"

9. April: Piet Brouwer, Freie Universitaet Berlin: "Quantum transport and its classical limit"

30. April: Børge Arntsen, Inst. for petroleumsteknologi og anvendt geofysikk, NTNU: "ECHOES OF THE EARTH: How to make images of the crust of the earth"

7. May: Yasser Roudi, Nordita (Stockholm): "The Inverse Ising problem: finding connections from correlations"

Note - Two Colloquiums were cancelled due to volcaic activity in Iceland:
16. April: Jan de Boer, University of Amsterdam: "Holography, quantum gravity and black holes"

23. April: Charlie Marcus, Harvard "Schrödinger's Chip: Semiconductor Approaches to Quantum Information"

PROGRAM – AUTUMN TERM
Convenors: Kåre Olaussen and Jan Myrheim

3. September: Phil Scott, NTNU and University of Leeds: "Why physics is difficult to teach and hard to learn"

9-10. September: No regular colloquium this week due to Kavli Prize Seminars on September 9th. "Kavli Prize Lectures & affiliated symposia in Nanoscience and Neuroscience at NTNU"

17. September: Håkon Dahle, Inst. for teoretisk astrofysikk, UiO: "The biggest lenses in the universe - and what we can learn from them"

20. September: Yves Couder, Matière et Systèmes Complexes, Université Paris Diderot: "A macroscopic type of wave-particle duality: The role of a "path memory" in the motion of bouncing droplets"

1. Ocotber: Geir Helgesen, Physics Department, Institute of Energy Technology: "Structure and Properties of Carbon Cones"

15. October: Margrethe Wold, Dark Cosmology Centre, Niels Bohr Institute: "The co-evolution of supermassive black holes and galaxies"

22. October: Arne Espelund, NTNU: "Karbonkontroll ved framstilling av jern"

29. Ocotber: Magnus H. Sørby, Physics Department, Institute for Energy Technology: "Neutron scattering at IFE"

5. November: Randi Holmestad, Inst. for fysikk: "Physics in Aluminium"

12. November: Jacob Linder, Inst. for fysikk: "Nobelprisen i fysikk 2010"

19. November: Jan de Boer, University of Amsterdam: "Holography, quantum gravity and black holes"

26. November: Martin Ystenes, NTNU: "Hvordan sprøytvarsleren tenker Sprøytvarsleren"

10. December: Alain Gibaud, CNRS, Université du Maine: "Small angle x-ray analysis of mesoporous hybrid nanomaterials: SAX, GISAXS, X-ray reflectivity