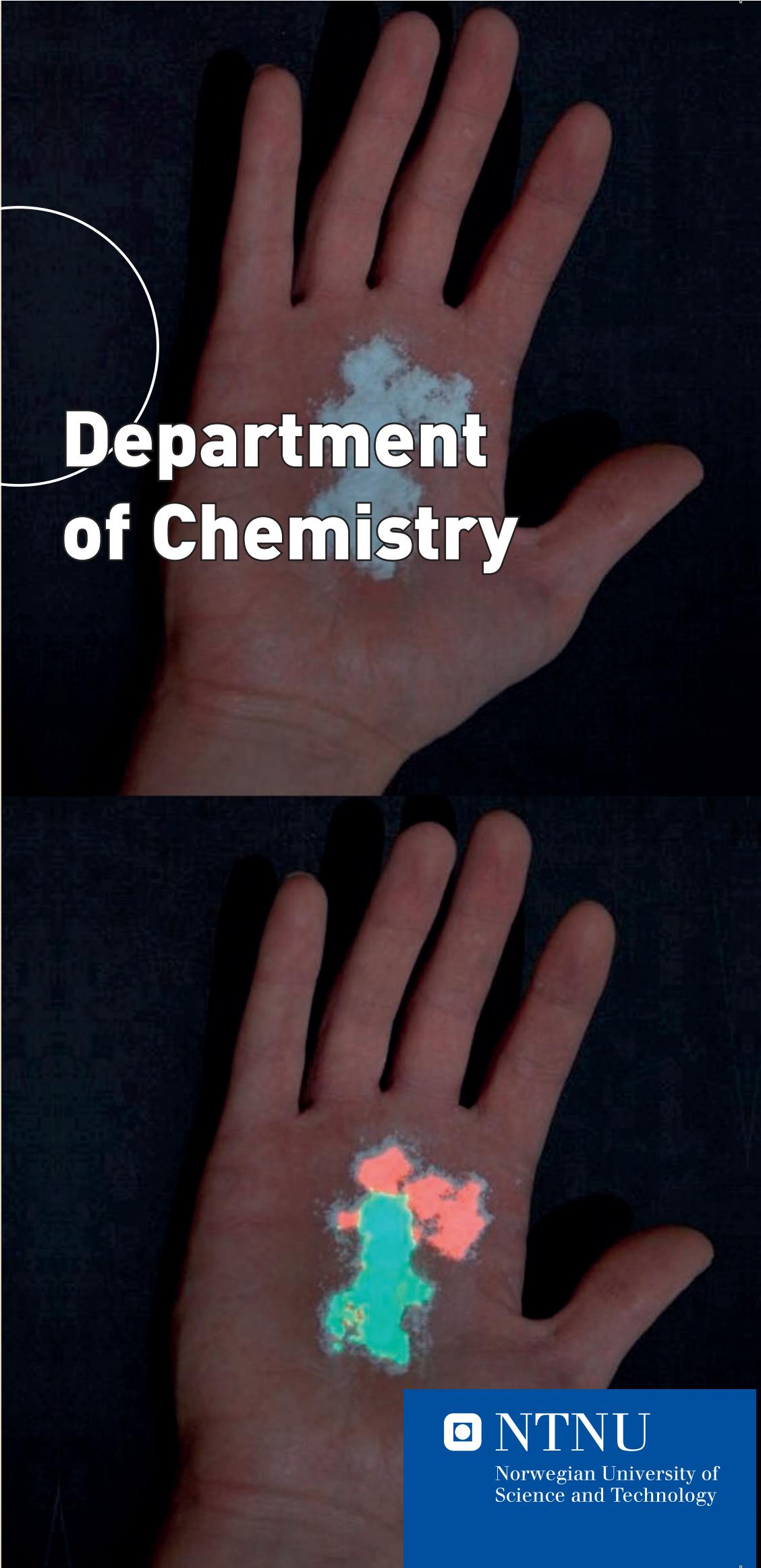


Annual Report 2010

The image features two hands, palms facing up, against a dark background. The top hand has a white, powdery substance on its palm. The bottom hand has a similar substance, but it is illuminated with a red and cyan fluorescence. A white circle is partially visible on the left side of the top hand.

# Department of Chemistry

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Professor Trond Peder Flaten

## **Head of Administration:**

Lena Frostad

### **COVER PAGE**

"Making the invisible visible"

The top figure shows a hand holding some white powder. To the human eye it seems that only one component is present when in reality there are two different compounds. The PryJector invention visualises the different components in situ by combining a hyperspectral camera, a chemometric model and an ordinary computer projector. Hyperspectral cameras record a whole spectrum in every pixel (here in the near infrared range) and a chemometric model is used to extract chemical information from each spectrum. In this example the chemometric model is used for classification. When the model is applied to each pixel, a chemical image results which contains the predicted chemical information in each pixel instead of light intensities at different wavelengths. The chemical image is then projected back onto the surface under study in order to visualise to the user where the different components are located. This can be seen in the figure at the bottom where false colour coding is used to highlight the regions for the different components. © Bjørn K. Alsberg

<b>Contents</b>	<b>Page</b>
<b>The State of the Department</b>	4
<b>Research Projects</b>	
• Renewable energy and efficient energy conversion	5
• Dissipated energy on a North Sea oil platform	6
• Reducing the dissipated energy in cryogenic air separation	7
• Dissipation in molecular motors	8
• Polymer electrolyte fuel cell laboratory	9
• Recovering Dissipated Energy from the Ferro-Silica-Alloy Industry	10
• Modelling enzyme sensors by using dimensionless parameters and variable	12
<b>Activities</b>	
• Scientific publications	14
• Extracurricular activities, conferences and Seminar Attendance	20
<b>Graduate Students</b>	
• Subjects and student attendance	29
• Students	32
<b>Post Graduate Students</b>	
• PhD-projects in progress	33
• MSc in chemistry	35
• MSc in chemistry / Siv.ing.	36
• MSc in education, chemistry	37
• MSc in environmental toxicology and chemistry	37
• PhD in chemistry	38
• Student exchange to and from NTNU	40
<b>Staff</b>	
• Scientific staff	41
• Administrative staff	44
• Technical staff	44/45
• Scientific assistants	45
• Demonstrators and Guest Professors/Researchers	45/46

## The State of the Department of Chemistry 2010

### State of the Department

In connection with previous years' Activity Reports I have previously commented on the fact that we are not operating in an economic climate that is conducive to basic or curiosity-driven research. A cash-strapped Research Council is of little use to a basic research department because even well-received applications are more often rejected than accepted. In addition to this unfortunate reality we recognise the need for us to increase our focus, capacity and capability for research. In order to increase time spent gainfully on research we must reduce our overall teaching burden. This is complicated by the requirement that we need to maintain competitiveness. There is no clear answer to the question: "how big should a chemistry department be?" In our particular case the realities of funding means that size is dictated by teaching and it is here we need to dimension in a way that actually does benefit research.

These factors moved us to define 2010 as the crucial year for formulating a new strategy plan (2011 – 2015) that will take over from the current one that expires in 2010. Accordingly, a detailed programme was worked out which revolved around examining a wide range of options relating to research, teaching, health and safety and innovation. The result was a much more intense strategy process than is normal-so much so that I sum up here – also because it is felt to be a good model for later strategic planning. The process consisted of:

Inviting three prominent researchers from the different NTNU chemistry departments to constitute a Committee of the Future. The members were Professors Tor Grande (Chair), Sigurd Skogestad and Eiliv Steinnes and they operated under a mandate given by me and reported to me. I very much appreciate the sterling work laid down by the committee which also included the time-consuming task of individually interviewing and evaluating the scientific staff.

Weekly meetings that involved all members of staff (research, technical and administrative). These meetings were devoted to predetermined topics relating to research options for the different groups, presentation of current teaching loads and the way forth, discussions on health and safety including the psychosocial environment, the role played by the administration, etc.

Environmental and analytical chemistry had included a position within marine chemistry on its wish list for the previous strategy plan. I considered it necessary that this position be reevaluated before being presented as a viable option for the next strategy plan. According, a Seminar on Marine Chemistry was organised in February 2010 at Bårdshaug Hotel. Around forty participants from various NTNU departments and also external institutions/companies (eg NINA, STATOIL, SINTEF) and from abroad. The message is clear: marine chemistry would be a good option for the department which would fit well with NTNU's marine activities.

The Strategy Seminar itself was held at Jægvolden Fjordhotell in March 2010. The aforementioned processes converged in this seminar and resulted in an outline with some details of the departments Strategy Plan which was scheduled to be

presented to the Departmental Board in December 2010 after a series of follow-up general meetings.

This process was very important because it ensured that the staff know that they are important and can identify with the strategy plan.

All in all, 2010 was a good year for the department because it marks the start of period with positive developments. These include:

Funding from NTNU central for making possible the implementation of plans (actually scheduled for 2010) for relocating the organic chemists to the Main Science Building. These plans are an integral part of our strategy for encouraging research synergies. The move is expected to be completed within the first six months of 2011.

Three new scientific positions were approved by the departmental board and by the Faculty. They are: chemical didactics; computational chemistry; and marine chemistry. The computational chemistry position is part of a collaboration with the Departments of Chemical Engineering and Materials Science and Engineering and reflects our strategy of collaborating with these applied chemical departments.

Two technical positions have also been approved; they are assigned to be ancillary instructors in teaching. This is part of our strategy to increase time spent on research.

We took the initiative to invite other departments and external organisations such as SINTEF and STATOIL to join a mass spectrometry consortium. Part of our contribution is to allocate a new higher technical position, the position was filled in 2010. The consortium is applying for the considerable funds needed for instrumentation.

The department also plays a prominent role in another consortium this time international, namely the Swiss-Norwegian Beam Lines (SNBL) at the European Synchrotron Radiation Facility (ESRF). I am currently Chairman of the SNX- Council which runs SNBL which is important for three of the faculties departments.

*David G. Nicholson  
Former Head of Department*

## RENEWABLE ENERGY AND EFFICIENT ENERGY CONVERSION

The research on renewable energy sources and on energy efficiency in the group of non-equilibrium thermodynamics increased in 2010. A new

laboratory is now being set up for the experimental part of the activity.



*The picture shows the group working on renewable and efficient energy conversion.*

*Behind, from the left: Dick Bedeaux, Mari Voldsund, Ragnhild Skorpa, Thor Anders Aarhaug, Leen van der Ham, Marit Takla  
Front row: Odne Stokke Burheim, Signe Kjelstrup, Papy Zefania*

*Absent: Anders Lervik, Kirill Glavatskiy*

Experimental and theoretical projects are now financed by NFR programs FRIENERGI, NANOMAT and KMB (FUME), by our Faculty at NTNU and by the EU 7th Framework program DeCarbit. Three projects are described in more detail below. The current projects are:

- 1.Reverse electro dialysis; reducing the power loss in a laboratory cell (in collaboration with Queens University, Fuel Cell Centre and Wetsus)
- 2.Polymer electrolyte fuel cells, reducing power loss in the catalysis and increasing the durability (in collaboration with SINTEF/IFE)
- 3.Dissipated energy on a North Sea oil platform (in collaboration with Statoil)
- 4.Reducing the dissipated energy in cryogenic air separation (DeCarbit)
- 5The driving forces in heterogeneous catalysis
- 6.Reducing the dissipated energy in the ferroalloy industry (in collaboration with the ferroalloy industry)
- 7.Dissipation in molecular motors

*Signe Kjelstrup, prof. dr.techn. et dr. ing, leader*

## Dissipated energy on a North Sea oil platform

The dissipated energy or entropy production on a particular oil producing platform located in the North Sea is evaluated using exergy analysis. The main process on the platform converts a mix of water and reservoir petroleum into stabilized oil and gas for export, treated water and gas for injection back into the reservoir. A gas-fired power plant supplies the power needed for these operations. The efficiency of all subprocesses is of interest. The main process is divided into several sub-processes; one separation section, two gas compression sections and one export oil pumping section. A flowsheet for the platform processes is simulated, and the dissipated energy is calculated as the exergy loss in each process unit is using exergy balances.

The analysis is now done for the two production years; 2009 and 2015. For 2009, the analysis is based on historical data, while the analysis for 2015 is based on predicted data. The main difference between the two years is an increase in the gas to oil ratio of the petroleum feed stream. The gas compressors are the bottleneck of the system, and less oil is produced while the same compressor work is done. The specific power consumption and an overall exergy efficiency for the process is calculated for each of the two years, and the dissipated energy is calculated for each of the platform sub-processes, locating improvement possibilities.



*A North Sea platform. The major aim of the project is to find good parameters for evaluating and monitoring the performance of the platform*

*Mari Voldsund, PhD student*



## Reducing the dissipated energy in cryogenic air separation.

### Air distillation columns with intensified heat integration

Cryogenic distillation of air is one of the main process steps of an Integrated Gasification Combined Cycle (IGCC). It is also one of the most costly steps. An IGCC with pre-combustion CO<sub>2</sub> capture is currently one of the main options for the carbon neutral production of electricity from fossil fuels. In addition to coal or gas, it requires pure oxygen and nitrogen as feeds. Those are nowadays typically obtained using a cryogenic air separation unit (ASU). As part of the European collaboration project DECARBit, we are currently investigating methods to improve the efficiency of a cryogenic ASU, with a focus on the use of novel distillation techniques.

We have first performed a detailed mapping of streams of exergy and lost exergy (dissipated energy) of a complete ASU, showing that about one

quarter of the total exergy destruction is located in the distillation column section of the process [1].

The distillation section of a conventional ASU contains two columns operate at different pressures. By positioning the low pressure column (LPC) on top of the high pressure column (HPC), a single heat exchanger can be used that functions as reboiler for the LPC and as condenser for the HPC. According to the second law of thermodynamics, it is more efficient to distribute the thermal energy supply or removal over the entire length of the column, than to add or remove such energy only at the top and bottom. Therefore we propose that the duty of the combined reboiler-condenser is spread out over a larger part of the column, moving the LPC into the HPC, as schematically illustrated in Figure 1.

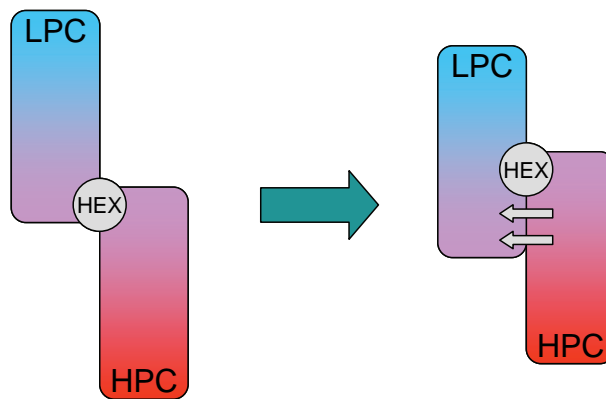


Figure 1: Schematic illustration of heat integration of the low pressure column (LPC) and the high pressure column (HPC) that are present in a cryogenic air separation unit. In the conventional configuration (left), the columns are thermally integrated by a single heat exchanger (HEX) only. In the intensified configuration (right), the added thermal integration is represented by grey arrows.

A theoretical study concludes that the effect of this heat integration, in combination with a reduction in the ratio of the two operating pressures, can lead to a reduction in the dissipation by 25%.

Because of the novelty of this type of heat integration, the study theoretical study is based on several assumptions [2]. More accurate predictions require experimental verification of those assumptions. Currently, an experimental set-up is under construction that enables detailed investigations of the most critical assumptions. The design and construction of this set-up is done in close collaboration with SINTEF Energy Research. The experimental activities are expected to take place during the summer and fall of 2011.

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Leen van der Ham, PhD student

## Dissipation in molecular motors

A biomolecular motor is a protein which converts chemical energy into mechanical work. The chemical energy can be used to bring about such processes as muscle contraction, active transport of ions and molecules across cell membranes and the synthesis of biomolecules. In the operation of a biomolecular motor, energy is also converted to heat which can be used to maintain a constant (and high) body temperature. As proteins function in a narrow temperature range, the excess heat must be

removed efficiently. The energy flow in proteins is also important for the understanding of how proteins function.

The  $\text{Ca}^{2+}$ -ATPase (“calcium pump”), see Fig.1, is a biomolecular motor which pumps calcium-ions across cell membranes, utilizing the chemical energy stored in ATP.

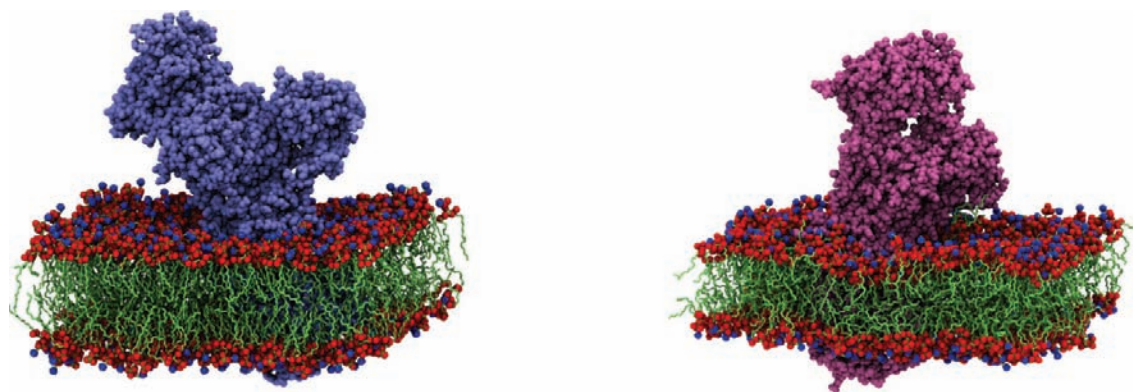


Fig. 1 Atomistic models of the  $\text{Ca}^{2+}$ -ATPase embedded in phospholipid bilayers. The  $\text{Ca}^{2+}$ -ATPase pumps  $\text{Ca}^{2+}$ -ions across the membrane against a concentration gradient, utilizing the energy of the ATP-reaction. The pump undergoes several conformational changes during the operation, and two of the conformations are shown: the calcium pump with bound  $\text{Ca}^{2+}$ -ions (to the left, coloured blue) and the calcium pump with no bound  $\text{Ca}^{2+}$ -ions (to the right, coloured pink).

Experiments have shown that there is significant energy dissipation when the molecular motor  $\text{Ca}^{2+}$ -ATPase is in operation [1]. Although the experiments provide quantitative details of energetics and structure, we need a theoretical formalism to interpret experimental results. As a matter of fact, heat regulation or thermogenesis is as yet unexplained in biology. In recent work, Kjelstrup and co-workers proposed that thermogenesis can be described by mesoscopic non-equilibrium thermodynamics (MNET) and subsequently applied this to the  $\text{Ca}^{2+}$ -ATPase molecular motor [2].

We have studied the heat transfer in the  $\text{Ca}^{2+}$ -ATPase using molecular dynamics simulations [3]. We can then simulate the molecular motor using classical mechanics and an atomistic model and give a microscopic picture of the operation of the motor. We have obtained the thermal conductivity of the calcium pump and found that the protein-water interface is important for the heat transfer from the protein to the surrounding water [3].

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Anders Lervik, PhD student



## Polymer electrolyte fuel cell laboratory

In general, the group has focused on transport phenomena and irreversible thermodynamics of Polymer Electrolyte Membrane Fuel Cells, PEMFC. Hence, up to this point a special attention has been given to thermal measurements and model development. A five year research project "Thermal Effects in Polymer Electrolyte Fuel Cells" was terminated in 2010 but a new research project on PEMFC nanodesign (NICE) was granted by the NANOMat program.

With the PhD defended in November 2009, Dr. Burheim finalised the project "Thermal Effects in Polymer Electrolyte Fuel Cells" during January and

February 2010 - leading to two accepted peer-reviewed articles<sup>[1,2]</sup>. The group also participated at the 8th ASME fuel cell conference submitting two papers, which were both well received at the conference's oral sessions. The experience with thermal conductivity measurements from this project is leading to a collaboration effort to develop a second generation apparatus at a Fuel Cell Research Center, FCRC, at Queens Univ., Ontario, Canada, where Burheim currently is a member of the PEMFC research group.



Fig.1 The research team of the "Thermal Thermal Effects in Polymer Electrolyte Fuel Cells", f.l. O. Burheim (NTNU), S. Kjelstrup (NTNU), S. Møller-Holst (SINTEF) and P.J.S. Vie (IFE).

The NANOMAT project NICE aims to test a fuel cell construct with more uniform entropy production<sup>[3]</sup>

### Salt power by RED

Reverse Electro-Dialysis is a way to produce power which utilises the Gibbs energy of mixing of sea and river water. By directing the flow of sea and river

water into compartments separated by anionic and cationic selective membranes, respectively, the Gibbs energy can be converted into a DC electrochemical potential. Extracting this energy can be done via electrochemical reactions at the ends of a stack of these compartments. This is illustrated by the means of ferric and ferrous chloride in Fig.2

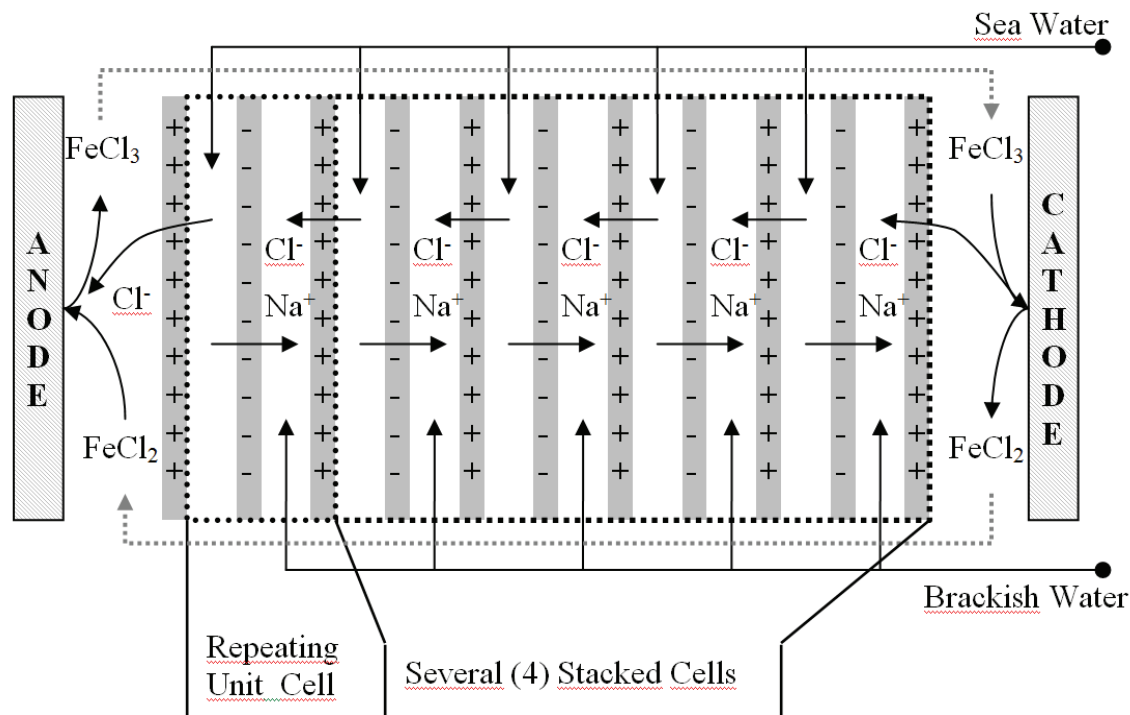


Fig.2 A sketch of the cross-section of one possible RED setup.

The project started March 1, 2010, as an international collaboration effort between NTNU and Queens Univ., Kingston, Ontario Canada, and NTNU, Norway, granted by the FRIENERGI programme of the Norwegian Research Council, NFR. To start different electrode systems and their dissipation were investigated. As a part of the Norwegian - Canadian collaboration effort, Burheim visited the group at Queens university for a total of three months and wrote a textbook chapter on salt/river water power production along with Professor J.G. Pharoah.

The group was also responsible for arranging a session on different sea/river water power production technologies during the international meeting "Renewable Energy Research Conference" hosted by NTNU in June 2010. The group presented the first results related to the electrode system efficiencies. This led to collaboration with a Dutch team at "wetsus"<sup>1</sup>, Leeuwarden, which currently hosts the world's largest research group within the field of sea/river water power production. As a part of this collaboration effort, the postdoc in the group at NTNU joined "wetsus" as a part time postdoc (25%).

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*Odne Burheim, post doc*

1. *Centre of excellence for sustainable water technology*

## Recovering Dissipated Energy from the Ferro-Silica-Alloy Industry

As a part of the KMB project FUME, granted by the Norwegian research Council, NFR, and the Norwegian Ferroalloy Producers Research Association, FFF, master student M. Takla graduated on a thesis related to conversion of thermal energy to electricity by the means of thermoelectric devices. The work was presented at the Renewable Energy Research Conference in Trondheim June 2010.

The ferroalloy industry is an energy intensive industry and a large producer of metal alloys as well as waste heat. For instance, in 2007 the Norwegian ferroalloy industry needed input of 8.3 TWh and generated 4.8 TWh of waste heat<sup>1</sup>. In comparison,

the total Norwegian power consumption was 226 TWh. Hence, utilization of waste heat is of great interest to the industry in order to improve on the energy efficiency.

M. Takla is now a PhD-student at the NT-faculty funded by the FUME sub-project Energy Emissions. As a part of this study, a first large scale thermoelectric module for electric regeneration of thermal energy, has been designed and put into production. This is to be deployed at the casting area of Elkem Salten, see Fig.3. The aim is to perform the first exergy analysis of a ferroalloy production plant.



Fig.3. Casting metals and radiating thermal energy at the silicon plant of Elkem Salten.

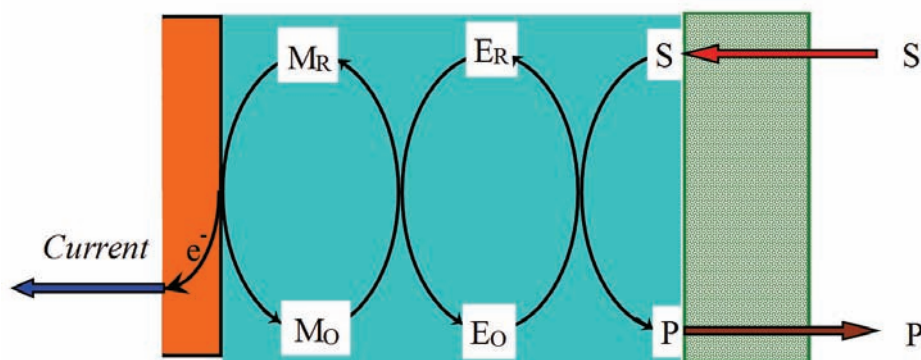
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Marit Takla, PhD student

## Modelling enzyme sensors by using dimensionless parameters and variables

Although the best known example of biosensor is the glucose sensor for determining the glucose content in blood, many other applications in clinical chemistry, food industry biosciences an environment monitoring are possible and research work in this area is very active. As a complement to experimental investigations, theoretical modeling of biosensors plays a key role since it provides a rational basis for designing the biosensor in order to achieve expected performances in term of sensitivity, selectivity and dynamic range.

This contribution refers to modeling amperometric enzyme sensors that consist of a biocatalytic layer sandwiched between a semipermeable membrane and an electrode. The biocatalytic layer includes one or several molecular layers including both the enzyme (E) and an electron transfer mediator (M). By successive electron transfer reactions, electrons are conveyed from substrate (S) to the electrode whereas both the enzyme and the mediator swing between reduced and oxidized forms. As the biocatalytic layer is extremely thin, no concentration gradients develop within and diffusion processes are confined into the semipermeable membrane.



Modeling aims at deriving mathematical equations that relate the response (here, current) to the substrate concentration. In order to impart the equation a general character, it is necessary to resort to dimensionless variables and parameters. Thus, the substrate concentration should be expressed as  $S = s/K_M$ , where  $s$  is the actual concentration and  $K_M$  is the Michaelis-Menten constant. The kinetic behavior of this system is determined by two dimensionless parameters:

$$\alpha = l_e v_{\max} / k_{S,m} K_M \quad \text{and} \quad r_T = k_2 / k_M$$

The  $\alpha$  parameter represents the rapidity of the enzyme reaction relative to the rapidity of the diffusion process. It depends on both enzyme constants ( $v_{\max}$  and  $K_M$ ) and the mass transfer coefficient of the substrate in the membrane ( $k_{S,m}$ ). It depends also on the thickness of the biocatalytic layer ( $l_e$ ). A very low  $\alpha$  value indicates that the

overall reaction rate is determined by the enzymatic reaction; in the opposite case, it is the diffusion which dictates the overall velocity of the reaction. The  $r_T$  parameter is the turnover number of the enzymatic reaction relative to that of the enzyme reaction with the mediator.

Maximum sensitivity is achieved at an electrode potential that is positive enough with respect to the standard potential of the mediator, such as to keep all mediator in the oxidized state. The current recorded under these conditions assumes a limiting, potential-independent value ( $i_l$ ) which is given by the following equation:

$$\frac{i_l}{i^*} = \frac{\alpha}{(r_T + 1)S + \alpha + 1} S$$

Here  $i^*$  is a normalizing parameter which represents the particular value of the current obtained at  $\alpha \gg 1$ ,  $r_T \ll 1$ ,  $E \gg E^0$  and  $S=1$ .

The above equation demonstrates that the limiting current is a non-linear function on the substrate concentration, which is not convenient for practical applications. However, it can be proved that the response function is quasi-linear if the substrate concentration fulfills the following condition:

$$S \leq 0.05 (\alpha + 1) (r_T + 1)^{-1}$$

Under these circumstances, the limiting current turns directly proportional to concentration, as required for analytical applications:

$$\frac{i_l}{i^*} = \frac{\alpha}{1 + \alpha} S$$

Clearly, the best sensitivity results when the sensor is designed such that  $\alpha \gg 1$  and the current becomes independent on enzyme concentration and its kinetic parameters.

A key parameter is the electrode potential,  $E$ , which determines the concentration of the oxidized mediator. A rational for selecting the value working potential is provided by the following equation:

$$\frac{i}{i^*} = \frac{\alpha}{\alpha + 1} S \left( 1 + S \frac{r_T}{\alpha + 1} e^{-\frac{F}{RT}(E-E^0)} \right)^{-1}$$

This equation proves that the current increases as the potential shifts negative of the standard potential of the mediator ( $E^0$ ) and reaches the limiting value,  $i_l$ , when the following condition is met:

$$E \leq E_0 - \frac{RT}{F} \ln \frac{\alpha}{Sr_T} + 0.076 \text{ V}$$

Therefore, such a theoretical treatment allows selecting the optimal parameters such that the sensor exhibits a linear response over a broad concentration range and achieves a maximum sensitivity.

*Florinel-Gabriel Banica*



## Scientific Publications

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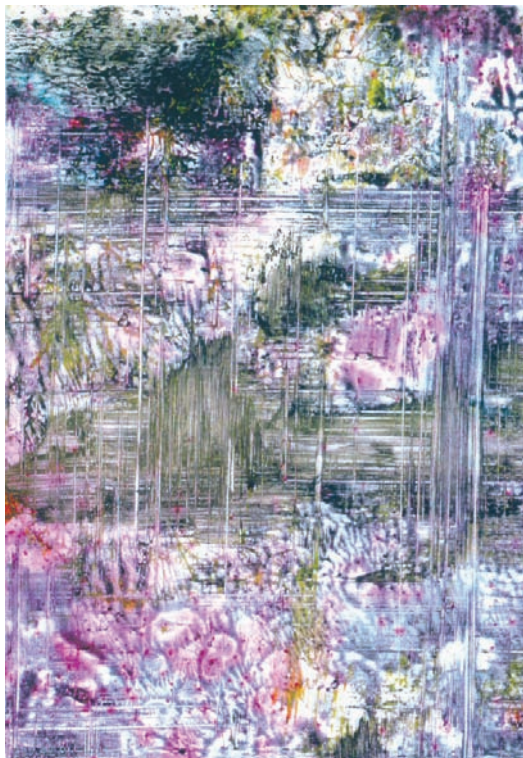
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## Physical Chemistry

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On the temperature distribution in polymer electrolyte fuel cells. *Journal of Power Sources* 2010 ;Volum 195.(16) s. 5235-5245

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Computational Science and Engineering: Challenges and Opportunities. Trondheim: NTNU og SINTEF 2010 (ISBN 978-82-995202-0-1) 155 s.

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## Activities

### Honours, Extracurricular activities, Participation in courses, conferences, lectures, and study visits

#### B. Alsberg

Section Leader, Physical Chemistry Group, Department of Chemistry, NTNU.

National Symposium on Chemometrics, Sundvolden, Norway, March 8 – 10, 2010.

Lecture on: "Localisation and Visualisation of Bone Fragments using Hyperspectral Technology".

Radio Participation, NRK 2: "CSI:Trondheim, den virkelige rettsmedisinen", April 17 and Oct. 16, 2010.

Researcher's Night, NTNU, Trondheim, Sep. 24 - 25, 2010.

Lecture on: "Hyperspektral-kamera med projektor - gjør det usynlige synlig".

#### T. Anthonsen

Conference "25. Organisk kjemisk vintermøte", Fefor, Norway, Jan. 7 - 10, 2010

Co-Author on Poster Presentation: Isoenzymes of Porcine Pancreatic Lipase with opposite Stereoselectivity.

Biocatalysis Seminar, Karlskoga, Sweden, May 3, 2010.

Lecture on: Biocatalysis for Synthesis of Enantiopure Biologically Active Compounds. Principles and Examples.

Conference "Frontiers of Chemistry: From Molecules to Systems", Maison de la Chimie, Paris, France, May 21, 2010.

Co-Author on Poster Presentation: Desymmetrisation Catalysed by Porcine Pancreatic Lipase.

RRB6 - the 6th International Conference on Renewable Resources and Biorefineries, Düsseldorf, Germany, June 7 – 9, 2010.

Co-Author on Poster Presentation: Isoenzymes from Crude Porcine Pancreatic Lipase with Opposite Stereoselectivity.

The World Forum, University of Cambridge, UK, Aug. 17 – 22, 2010.

Co-Author on Poster Presentation: Biocatalysis for Green Chemistry.

American Geophysical Union Fall Meeting, San Francisco, Cal., USA, Dec. 13 – 17, 2010.

Co-Author on Lecture on: The Analysis of Chiral Methyltetrols in Atmospheric Aerosols: A New Look at Secondary Organic Aerosols from Isoprene.



Flowers of crowberries

#### M. Ardelan

Mesocosm Experiment in The Comau Fjord, Chile, Jan. 5 – Feb. 16, 2010.

15th International Conference on Heavy Metals in the Environment, Gdansk, Poland, Sep. 19 – 23, 2010.

Co-Author on Lecture on: Changes in Mobility and Solubility of Metals at the Seawater/Sediment Interface following CO<sub>2</sub> Seepage from Sub-sea Reservoirs.

#### F.G. Banica

Norwegian Coordinator for International Co-operation Project "Training and Education of Students in Nanotechnology Focused Bioelectrochemistry and Biophysics"; NTNU and Comenius University, Bratislava, Slovak Republic.

Referee for the Czech Science Foundation

Workshop "Nanomaterials Applications in Electrochemical Biosensors", NTNU, May 21 – 23, 2010.

Lecture on: Nanomaterials Applications in Electrochemical Biosensors.

Member of Organizing Committee of Summer School "Bionanotechnology, Biophysics and Bioelectrochemistry" in co-operation with Department of Physics, NTNU and Faculty of Science, Comenius University, Bratislava, Slovak Republic, at NTNU, June 21 - 24, 2010.



Co-Author on Lecture on: Self-Assembled Biomolecular Layers on the Gold Electrode with Incorporated Calixarenes for Biosensing Applications.

The 1st International Congress Chemistry for Cultural Heritage, University of Bologna, Ravenna, Italy, June 30 – July 3, 2010.

Co-Author on Poster Presentation: Analysis of Pigments in Various Ethiopian Paintings using Portable X-ray Fluorescence Analyzer.

#### D. Bedeaux

Invited Lecture, Darmstadt, Germany, Jan. 20 – 22, 2010.

Lecture on: Non-equilibrium Thermodynamics of the three-Phase Contact Line.

Nordic Workshop on Statistical Physics; Biological, Complex and Non-Equilibrium Systems, Stockholm, Sweden, March 16 – 19, 2010.

Lecture on: Mesoscopic Non-equilibrium Thermodynamics.

5th International Zeolite Membrane Meeting, University of Patras, Loutraki, Greece, May 25 – 27, 2010.

Co-Author on Lecture on: Non-equilibrium Thermodynamics Applied to Transport of n-butane through a Membrane of Silicalite. The Effect of Coupling between Heat of Adsorption and Mass Transfer.

Summer School on Continuum Physics and Engineering Applications, Ráckeve, Hungaria, May-June, 2010.

Lecture on: Heat, Mass and Charge Transport, and Chemical Reactions at Surfaces.

Seminar Continuum Physics and Engineering Applications, Budapest University of Technology, Hungary, June 3 – 7, 2010.

Co-Author on Lecture on: Transport Coefficients of N-butane into and through the Surface of Silicalite-1 from a Non-equilibrium Molecular Dynamics Study.

9th International Meeting on Thermodiffusion, European Research Group in Thermodiffusion, Toulouse, France, June 7 – 11, 2010.

Co-Author on Lecture on: Thermodiffusion in Chemically Reacting Binary Mixtures with Nonlinear Kinetics.

24th IUPAP International Conference on Statistical Physics, Cairns, Australia, July 19 – 24, 2010.

Co-Author on Lecture on: Transport of Heat and Mass Across the Fluid-Fluid Interface of a two-phase Mixture.

15 Hour Course in Brescia, Italy, Sep. 13 – 19, 2010  
Guest Lecture: Non-Equilibrium Thermodynamics of Heterogeneous Systems: The Square Gradient Model".

Invited Seminar at the University of Central Lancashire, Preston, UK, Oct. 7, 2010.

Guest Lecture on: The Second Law of Thermodynamics and Statistical Mechanics.



*Flower of cloudberry*

#### T. Berg

Field Work, Ny-Ålesund, Spitzbergen, April 19 – 29, June 14 – 28, Aug. 16 – 30, Dec. 13 – 17, 2010.

"Nasjonalt seminar om hydrogeologi og miljøgeokjemi", NGU, Trondheim, Feb. 3, 2010.

Lecture on: Atmospheric Mercury Depletion Events at Ny-Ålesund.

Seminar "Miljø 2015", NFR, Oslo, Feb. 16 – 17, 2010.

Lecture on: Atmospheric Mercury in the Arctic

Seminar "Changing Ocean and Changes in Ocean Chemistry", Orkanger, Norway, Feb. 25, 2010.

Lecture on: Mercury Connection between Sea and Atmosphere in the Arctic.

239th Conference of ACS, San Fransisco, California, USA, March 22 – 26, 2010.

Co-Author on Lecture on: NOM Foams as Indicators of Trace Metal Transport in NOM rich Streams.

IPY Oslo Science Conference, Oslo, June 8 – 12, 2010.

Co-Author on Lecture on: GEM Measurements during 8 years at Zeppelin, Ny-Ålesund and its Relation to Climate.

15th International Conference on Heavy Metals in the Environment, Gdansk, Poland, Sep. 19 – 23, 2010.

Co-Author on Lectures on: "Long-term Measurement of GEM at Zeppelin, Ny-Ålesund and its Relation to Meteorological Variables", "Can Levels of Trace Elements in Moose (Alces Alces) Liver Explain Regional Differences in their Health Status?" and "Can Trace Elements in Moose (Alces Alces) Feed Explain Regional Health Differences?".

## Activities

“Sykere elg i sør”. Interview on Internet, Oct. 20, 2010.

“Heavy Metals May Influence Moose Health”. Interview on Internet “Science Daily”, Nov. 7, 2010.

The 3rd NorthPOP Conference, Kaliningrad, Russia, Nov. 15 – 19, 2010.

Co-Author on Lecture on: Arctic Mercury Measurements.

Nordic Forestry Mercury Workshop,, Nov. 22, 2010.  
Co-Author on Lecture on: Inputs and Outputs of Hg and MeHg in a Catchment Perspective.

### M. Bjørgen

Research Stay at University of Oslo, Department of Chemistry, Jan. 13 – 15, March 15 – 18, June 21 – 24, Aug. 2 – 18, Nov. 2 – 5 and Dec. 3 – 10, 2010.

### O. Burheim

Research Stay at FCRC/Queens University, Kingston, Ontario, Canada, April 22 – May 7, Aug. 1 – Sep. 3 and Oct. 20 – Dec. 2, 2010.

RERC Renewable Energy Research Conference, Trondheim, June 7 – 8, 2010.

Co-Author on Lecture on: Reverse Electrodialysis – a Renewable DC Power Source.

ASME - Fuel Cell Conference 2010, New York City, USA, June 14 – 16, 2010.

Co-Author on Lectures on: “On the Measured PEMFC Anode and Cathode Reversible Heat” and “Through-Plane Thermal Conductivity of PEMFC Porous Transport Layers”.

Conference TIERF 2010, Alexandria Bay, NY, USA, Nov. 12 – 14, 2010.

Co-Author on Lecture on: Blue Energy: Electric Power From Mixing Sea and River Water.



*Waterfall in springtime*

### K.L. Bøyese

Research Stay at the European Synchrotron Radiation Facility (ESRF), Swiss-Norwegian Beam Line, Grenoble, France, April 19 – 28 and Oct. 27 – 31, 2010.

Research Stay and Spectroscopy Workshop at Synchrotron Soleil, Paris, France, June 22 – 26, 2010.

### P. Carlsen

Research Stay at University of Perugia, Italy, Oct. 9 – 17 and Dec. 28 – 31, 2010.

### A. Esmurziev

Conference “25. Organisk kjemisk vintermøte”, Fefor, Norway, Jan. 7 – 10, 2010.

Co-Author on Lecture on: Chemo-enzymatic Synthesis of Benzoylated Hexapyranosides and Derivatives.

### A. Fiksdahl

Board Member of the KOSK II Research Program, The Research Council of Norway.

Board Member of “Faggruppen for Organisk kjemi” (the Group of Organic Chemistry) of the Norwegian Chemical Society.

Conference “25. Organisk kjemisk vintermøte”, Fefor, Norway, Jan. 7 - 10, 2010

Co-Author on Lectures on: “New Chiral N-Heterocyclic Carbene (NHC) Ligands” and “New Gold Catalysed Tandem Cyclisation”.

Co-Author on Poster Presentation: Indole-based Dienes; Substrates for Gold-Catalysed Cyclisations.

Member of National Committee for 18th International Conference on Organic Synthesis (ICOS-18) in Bergen, Aug. 1 – 6, 2010.

Co-Author on Lecture on: New Gold Catalysed Tandem Cyclisations. Co-Author on Poster Presentation: Synthesis and Application of new Chiral N-Heterocyclic Carbenes.

### T.P. Flaten

Deputy Head of the Department of Chemistry.

Board Member, The Committee for Geomedicine of the Norwegian Academy of Science and Letters.

Board Member, Norwegian Chemical Society, Trondheim Branch.

Editor, Norsk Epidemiologi (Norwegian Journal of Epidemiology).

239th conference of ACS, San Fransisco, California, USA, March 22 – 26, 2010.

Co-Author on Lecture on: NOM Foams as Indicators of Trace Metal Transport in NOM rich Streams.

15th International Conference on Heavy Metals in the Environment, Gdansk, Poland, Sep. 19 – 23, 2010.

Co-Author on Lectures on: “Can Levels of Trace Elements in Moose (Alces Alces) Liver Explain Regional Differences in their Health Status?” and “Can Trace Elements in Moose (Alces Alces) Feed Explain Regional Health Differences?”.

“Sykere elg i sør”. Interview on Internet, Oct. 20, 2010.

“Heavy Metals May Influence Moose Health”. Interview on Internet “Science Daily”, Nov. 7, 2010

### **E. Fuglseth**

Conference “25. Organisk kjemisk vintermøte”, Fefor, Norway, Jan. 7 - 10, 2010.

Co-Author on Lecture on: Microwave Assisted Side Chain Fluorination of 1-Arylethanones.

Co-author on Poster Presentation: Ruthenium Catalysed Asymmetric Transfer Hydrogenation of Fluorinated Ketones.

### **O.R. Gautun**

Leave of Absence, Sep. 1 – Dec. 31, 2010.

### **K.F. Gebremariam**

Field Work in different Research Sites, Ethiopia, Jan. 8 – Feb. 19, 2010.

The 1st International Congress Chemistry for Cultural Heritage, University of Bologna, Ravenna, Italy, June 30 – July 3, 2010.

Co-Author on Poster Presentation: Analysis of Pigments in Various Ethiopian Paintings using Portable X-ray Fluorescence Analyzer.

### **A. Gerontas**

Annual Post-grad Conference of the British Society for History of Science, Cambridge, UK, Jan. 4 – 7, 2010.

Lecture on: Mikhail Tsvet and Richard Willstätter; or “how and why would the Race for Chlorophyll Send the first Steps of Chromatography out of Track”.

Research Stay at Chemical Heritage Foundation, Philadelphia, PA, USA, May 14 – June 30, 2010.

The 3rd National Conference on the History of Science, Trondheim, Norway, Oct. 14 – 17, 2010.

Lecture on: The Birth and the first Steps of High Performance Liquid Chromatography in the Laboratories of Yale University; an Example of the Exchanges between Academia and Industry in the United States of the 1960s.

### **K. Glavatskiy**

Workshop “Molecular Simulations of Clathrate Hydrates”, Dublin, Ireland, May 6 – 8, 2010.

Co-Author on Poster Presentation: Stability of Gas Hydrates from Heat of Adsorption?

24th IUPAP International Conference on Statistical Physics, Cairns, Australia, July 19 – 24, 2010.

Co-Author on Lecture on: Transport of Heat and Mass Across the Fluid-Fluid Interface of a two-phase Mixture.

Workshop “Computational Carbon Capture”, Lausanne, Switzerland, July 26 – 28, 2010.

Co-Author of Lecture on: Adsorption of CO<sub>2</sub> by Gas Hydrates.

Annual Meeting of Norwegian Chemical Society in Computational Chemistry, Trondheim, Nov. 22 – 23, 2010.

Co-Author on Lecture on: Molecular Simulations of Gas Hydrates.

### **S.V. Gonzalez**

27th Montreux Symposium on LC/MS and Course CID, Montreux, Switzerland, Nov. 8 – 14, 2010.

### **L. van der Ham**

“EU-penger til CO<sub>2</sub>-forskning”. Interview in the Journal “Teknisk Ukeblad”, March 29, 2010.

23rd International Conference of Efficiency, Cost, Optimization, Simulation & Environmental Impact of Energy Systems, Lausanne, Switzerland, June 14 – 17, 2010.

Co-Author on Lecture on: The Importance of Coupling between Thermal and Molar Fluxes in a Nitrogen-Oxygen Distillation Column.



*The old giant is falling*

### **B.H. Hoff**

Conference “25. Organisk kjemisk vintermøte”, Fefor, Norway, Jan. 7 – 10, 2010.

Co-Author on Lectures on: “Chemo-enzymatic Synthesis of Benzoylated Hexapyranosides and Derivatives” and “Microwave Assisted Side Chain Fluorination of 1-Arylethanones”.



## Activities

Co-Author on Poster Presentations: "Pyrrolopyrimidines as Potential Kinase Inhibitors", "Ruthenium Catalysed Asymmetric Transfer Hydrogenation of Fluorinated Ketones" and "Synthesis of new Chiral Building Blocks: 1-Aryl-2-Fluorethylamines".

### S. Iftekhhar

239th conference of ACS, San Fransisco, California, USA, March 22 – 26, 2010.  
Co-Author on Lecture on: NOM Foams as Indicators of Trace Metal Transport in NOM rich Streams.

### S.L. Jensen

"Feminint forbilde i teknologisk miljø". Interview in the Newspaper "Adresseavisen", Sep. 11, 2010.

### S.J. Kaspersen

Conference "25. Organisk kjemisk vintermøte", Fefor, Norway, Jan. 7 – 10, 2010.  
Co-author on Poster Presentation: Pyrrolopyrimidines as Potential Kinase Inhibitors.



Lake Kvistingen in June

### S. Kjelstrup

Professor in Part Time Position at TU Delft, Netherlands, Jan. 1 – 30 , June 16 – July 6 and Oct. 11 - 24, 2010.

Workshop "Molecular Simulations of Clathrate Hydrates", Dublin, Ireland, May 6 – 8, 2010.  
Co-Author on Poster Presentation: Stability of Gas Hydrates from Heat of Adsorption?

5th International Zeolite Membrane Meeting, University of Patras, Loutraki, Greece, May 25 – 27, 2010.

Co-Author on Lecture on: Non-equilibrium Thermodynamics Applied to Transport of N-butane through a Membrane of Silicalite. The Effect of Coupling between Heat of Adsorption and Mass Transfer.

Seminar Continuum Physics and Engineering Applications, Budapest University of Technology, Hungary, June 3 – 7, 2010.

Co-Author on Lecture on: Transport Coefficients of N-butane into and through the Surface of Silicalite-1 from a Non-equilibrium Molecular Dynamics Study.

9th International Meeting on Thermodiffusion, European Research Group in Thermodiffusion, Toulouse, France, June 7 – 11, 2010.

Co-Author on Lecture on: Thermodiffusion in Chemically Reacting Binary Mixtures with Nonlinear Kinetics.

XII Sitges Conference on Statistical Mechanics, Sitges, Spain, June 7 – 11, 2010.

Lecture on: Nature-Inspired Energy- and Material Efficient Design of a Polymer Electrolyte Fuel Cell.

RERC Renewable Energy Research Conference, Trondheim, June 7 – 8, 2010.

Co-Author on Lecture on: Reverse Electrodialysis – a Renewable DC Power Source.

ASME - Fuel Cell Conference 2010, New York City, USA, June 14 – 16, 2010.

Co-Author on Lectures on: "On the Measured PEMFC Anode and Cathode Reversible Heat" and "Through-Plane Thermal Conductivity of PEMFC Porous Transport Layers".

23rd International Conference of Efficiency, Cost, Optimization, Simulation & Environmental Impact of Energy Systems, Lausanne, Switzerland, June 14 – 17, 2010.

Co-Author on Lectures on: "The Importance of Coupling between Thermal and Molar Fluxes in a Nitrogen-Oxygen Distillation Column", "Exergy Analysis of the Oil and Gas Separation Processes on a North Sea Oil Platform" and "Nature-Inspired Design of a Polymer Electrolyte Fuel cell".

Workshop "Computational Carbon Capture", Lausanne, Switzerland, July 26 – 28, 2010.

Co-Author of Lecture on: Adsorption of CO<sub>2</sub> by Gas Hydrates.

Seminar "Non-Equilibrium Thermodynamics: Foundations and Applications", Università Degli Studi Di Brescia, Italy, Sep. 7 – 10, 2010.

Research Stay at Complutense University, Applied Physics Department, Madrid, Spain, Nov. 6 – 12, 2010.

Conference TIERF 2010, Alexandria Bay, NY, USA, Nov. 12 – 14, 2010.

Co-Author on Lecture on: Blue Energy: Electric Power From Mixing Sea and River Water.

3rd Annual Meeting of Norwegian Chemical Society in Computational Chemistry, Trondheim, Nov. 22 – 23, 2010.

Lecture on: Development of Non-equilibrium Thermodynamics Theory using Molecular Dynamics Simulations.

Co-Author on Lecture on: Molecular Simulations of Gas Hydrates.

#### **H. Koch**

Research Stay at Universidad de Valencia, Spain, July 7 – 15 and Oct. 6 - 20, 2010.

#### **T. Kristiansen**

Higher European Research Course for Users of Large Experimental Systems (HERCULES) 2010, Grenoble, France, Feb. 19 – March 27, 2010.

Research Stay at the European Synchrotron Radiation Facility (ESRF), Swiss-Norwegian Beam Line, Grenoble, France, April 19 – 28 and Oct. 29 – Nov. 2, 2010.

#### **L. Kvittingen**

The 1st International Congress Chemistry for Cultural Heritage, University of Bologna, Ravenna, Italy, June 30 – July 3, 2010.

Co-Author on Poster Presentation: Analysis of Pigments in Various Ethiopian Paintings using Portable X-ray Fluorescence Analyzer.

Field Work in South Africa, Nov. 26 – Dec. 23, 2010.

#### **T. Ljones**

RRB6 - the 6th International Conference on Renewable Resources and Biorefineries, Düsseldorf, Germany, June 7 – 9, 2010.

Co-Author on Poster Presentation: Isoenzymes from Crude Porcine Pancreatic Lipase with Opposite Stereoselectivity.

#### **A. Lykknes**

Research Stay at Universiteitsarchief Katholieke Universiteit te Leuven, Belgium, Jan 10 – 15, 2010.

"Tekst og kontekst – en fagdidaktisk utfordring. 2. Nordiske Modersmålsdidaktiske Konference", Middelfart, Denmark, March 17 – 19, 2010.

Co-Author on Lecture on: "Dialogene i naturfagskrivningen".

Maternity Leave, May 12 – Dec. 31, 2010.

#### **M. Martinsen**

Research Stay at Vancouver Island University, Department of Chemistry, Canada, May 31 – Oct. 6 and Nov. 29 – Dec. 22, 2010.

58th ASMS Conference on Mass Spectrometry, Salt Lake City, Utah, USA, May 25 – 27, 2010.

Co-Author on Poster Presentation: Seasonal, Spatial and Temporal Variations of Air Toxics in the Seattle-Tacoma Airshed Measured by Membrane Introduction Tandem Mass Spectrometry (MIMS-MS/MS).

Conference "Pacifichem 2010", Honolulu, Hawaii, USA, Dec. 15 – 20, 2010.

Co-Author on Lectures on: "The Development of a Rugged, Field-Portable Membrane Introduction Tandem Mass Spectrometer (MIMS-MS/MS) and its use as an On-line Monitor for Volatile and Semi-Volatile Organic Compounds in the Alberta Oil Sands" and

"On-line Monitoring of Air Toxics in the Seattle-Tacoma Airshed from a Mobile Membrane Introduction Tandem Mass Spectrometry System".



*The little stream in the forest*

#### **K. Mathisen**

Research Stay at the European Synchrotron Radiation Facility (ESRF), Swiss-Norwegian Beam Line, Grenoble, France, April 19 – 28 and Oct. 25 – Nov. 2, 2010.

Research Stay and Spectroscopy Workshop at Synchrotron Soleil, Paris, France, June 22 – 26, 2010.

Research Stay at the Universities of London and Glasgow, UK, Sep. 26 – Oct. 2, 2010.

## Activities

### S. Melnes

18th International Conference on Organic Synthesis, Bergen, Norway, Aug. 1 – 8, 2010.

Co-Author on Lecture on: "Studies towards the Synthesis of Potential Therapeutic Agents against the Hematologic Cancer Multiple Myeloma.



*Spruces in the mystic forest*

### Ø. Mikkelsen

Section Leader, Analytical and Environmental Chemistry Group, Department of Chemistry, NTNU.

239th Conference of ACS, San Francisco, California, USA, March 22 – 26, 2010.

Co-Author on Lecture on: NOM Foams as Indicators of Trace Metal Transport in NOM rich Streams.

Conference "Watmed", Lille, France, May 26 – 28, 2010.

Co-Author on Lecture on: High Biogeochemical and Biological Monitoring in a Polluted Water System, the Deûle Canal (Northern France).

Field Work in Vancouver BC and Alberta, Canada, June 10 – 25, 2010.

Researcher's Night, NTNU, Trondheim, Sep. 24, 2010.

Lecture on: "Deo-sjokk" Stands på Researchers' Night.

Conference, Exhibition and Workshops "WWEM Water, Waste Water and Environmental Monitoring 2010", Telford, UK, Nov. 9 – 11, 2010.

Lecture on: Automatic and Unattended Monitoring of Heavy Metals in Waters, with Long-term Stability of the Measurements and with no Toxic Material needed.

Research Co-operation (Aurora) at Université du Sud Toulon Var, La Garde, France, Dec. 1 – 7, 2010.

Conference "Pacifichem 2010", Honolulu, Hawaii, USA, Dec. 15 – 20, 2010.

Co-Author on Lecture on: The Development of a Rugged, Field-portable Membrane Introduction Tandem Mass Spectrometer (MIMS-MS/MS) and its use as an on-line Monitor for Volatile and Semi-Volatile Organic Compounds in the Alberta Oil Sands.

### M.A. Mohsin

Summer School 2010 "Bionanotechnology, Biophysics and Bioelectrochemistry", NTNU, June 21 - 24, 2010.

Co-Author on Lecture on: Self-Assembled Biomolecular Layers on the Gold Electrode with Incorporated Calixarenes for Biosensing Applications.

### D.G. Nicholson

Head of the Department of Chemistry.

Chairman, SNX Council, Swiss-Norwegian Beamlines at the European Synchrotron Radiation Facility, Grenoble, France.

Scientific Advisory Council, Max IV Synchrotron Project, Max-Lab., Lund, Sweden.

Meeting Max IV Scientific Advisory Board, Max-Lab., Lund, Sweden, Feb. 22 – 23 and June 8 - 9, 2010.

Organizing Meeting "Chemistry for Cultural Heritage", Erguvan, Istanbul, Turkey, April 3 – 6, 2010.

Research Stay at University of Southampton, UK, July 13 – 20, 2010.

Research Stay at Universities of London and Glasgow, UK, Sep. 27 – Oct. 1, 2010.

Research stay at the European Synchrotron Radiation Facility (ESRF), Swiss-Norwegian Beam Line (SNBL), Grenoble, France, Oct. 23 – 29, 2010.

SNX Council Meeting (SNBL), Grenoble, Switzerland, Nov. 20 – Dec. 3, 2010.

### M. Nordløyken

15th International Conference on Heavy Metals in the Environment, Gdansk, Poland, Sep. 19 – 23, 2010.

Co-Author on Lectures on: "Can Levels of Trace Elements in Moose (Alces Alces) Liver Explain Regional Differences in their Health Status?" and "Can Trace Elements in Moose (Alces Alces) Feed Explain Regional Health Differences?".

"Sørlandselgen er sjuk og skrøpelig". Interview on Internet: gardsdrift.no, Oct. 20, 2010.

"Sykere elg i sør". Interview on Internet, Oct. 20, 2010.



“Sykere elg i sør”. Interview in the Newspaper “Fædrelandsvennen”, Oct. 21, 2010.

“Sykere elg i sør”. Interview in the Newspaper “Aftenposten morgen”, Oct. 21, 2010.

“Sykere elg i sør”. Interview in the Magazine “Jeger, hund og våpen”, Oct. 21, 2010.

“Heavy Metals May Influence Moose Health”. Interview on Internet “Science Daily”, Nov. 7, 2010

#### V. Partali

Section Leader, Organic Chemistry Group, Department of Chemistry, NTNU.

Conference “RNAi Europe”, Dublin, Ireland, Sep. 13, 2010.

Co-author on Poster Presentation: Exploring Co-lipid Formulations with a Novel Rigid, Polyene Cationic Nucleic Acid Delivery Vector.

Annual Meeting at Weill Cornell Medical College in Qatar, Doha, Qatar, Nov. 6 – 13, 2010.

#### E. – M. Sandru

Conference “25. Organisk kjemisk vintermøte”, Fefor, Norway, Jan. 7 - 10, 2010.

Lecture on: Controlling Aggregation – Aggregates of Predefined Size from Highly unsaturated Seleno Phospholipid.

ICOS 18 – 18th International Conference on Organic Synthesis, Bergen Norway, Aug. 1 – 6, 2010.

Poster Presentation: Controlling Aggregation – Aggregates of Predefined Size from Highly unsaturated Seleno Phospholipid.

#### R. Schmid

Research Stay at Leismer Statoil, Wood Buffalo, AB, Canada and Vancouver Island University, Nanaimo, BC, Canada, Sep. 3 – 16, 2010.

Conference “Pacifichem 2010”, Honolulu, Hawaii, USA, Dec. 15 – 20, 2010.

Co-Author on Lecture on: The Development of a Rugged, Field-portable Membrane Introduction Tandem Mass Spectrometer (MIMS-MS/MS) and its use as an On-line Monitor for Volatile and Semi-Volatile Organic Compounds in the Alberta Oil Sands.

#### A. Simic

10th Congress of Toxicologists of Serbia, Palic, Serbia, Sep. 22 – 25, 2010.

Co-Author on Poster Presentations: “Intensive Care Management of Organophosphate Insecticide Poisoning”, “Fatal Dimethoate Self-Poisoning; Ante-Mortem and Post-Mortem Results in two Cases Study” and “Methanol Poisoning in Prison - Case Series”.

3rd Congress of Clinical Toxicology, Varna, Bulgaria, Sep. 30 – Oct. 3, 2010.

Co-Author on Poster Presentations: “Intoxication with Cupro II Sulphat - Case Report” and “Clinical Manifestation of Bensodiasepines Poisoning”.

#### N. Simic

Bruker Scandinavia; NMR Users’ Seminar, Oslo, Norway, Jan. 11 – 12, 2010.

Field Work, Niš, Serbia, May 11 – 21, 2010.

#### R. Skorpa

Research Stay at FCRC/Queens University, Kingston, Ontario, Canada, Nov. 1 – 12, 2010.



By Orkla river

#### C. Sperger

Conference “25. Organisk kjemisk vintermøte”, Fefor, Norway, Jan. 7 - 10, 2010.

Co-Author on Lectures on: “New chiral N-Heterocyclic Carbene (NHC) Ligands” and “New Gold Catalysed Tandem Cyclisation”.

Co-Author on Poster Presentation: Indole-based Dienes; Substrates for Gold-Catalysed Cyclisations.

Conference “IUPAC ICOS-18”, Bergen, Norway, Aug. 1 – 6, 2010.

Co-Author on Lecture on: New Gold Catalysed Tandem Cyclisations.

Co-Author on Poster Presentation: Synthesis and Application of new Chiral N-Heterocyclic Carbenes.

#### A.O. Steen

15th International Conference on Heavy Metals in the Environment, Gdansk, Poland, Sep. 19 – 23, 2010.

Co-Author on Lecture on: Long-term Measurement of GEM at Zeppelin, Ny-Ålesund and its Relation to Meteorological Variables.

## Activities

The 3rd NorthPOP Conference, Kaliningrad, Russia, Nov. 15 – 19, 2010.  
Co-Author on Lecture on: Arctic Mercury Measurements.

### E. Steinnes

Nordic Environmental Chemistry Conference, Longyearbyen, Spitzbergen, March 2 – 5, 2010.  
Lecture on: Airborne PCBs in the Norwegian Environment: Concentrations and Fractionation of PCB Congeners in Surface Soil from 58 Airborne PCBs in the Norwegian Environment: Concentrations and Fractionation of PCB Congeners in Surface Soil from 58o to 80o Northern Latitude.

15th International Conference on Heavy Metals in the Environment, Gdansk, Poland, Sep. 19 – 23, 2010.

Co-Author on Lectures on: “Can Levels of Trace Elements in Moose (Alces Alces) Liver Explain Regional Differences in their Health Status?”, “Can Trace Elements in Moose (Alces Alces) Feed Explain Regional Health Differences?” and “Changes in Mobility and Solubility of Metals at the Seawater/Sediment Interface following CO<sub>2</sub> Seepage from Sub-Sea Reservoirs”.

International Symposium on in situ Nuclear Metrology as a Tool for Radioecology, Dubna, Russia, Sep. 21 – 25, 2010.

Co-Author on Lecture on: Impact of the Chernobyl Accident on Norway: Lessons Learnt.

ECOpole'10 Conference: Chemical Substances in the Environment, Opole University, Piechovoce, Poland, Oct. 13 – 16, 2010.

Lecture on: Biomonitoring of Air Pollutants on the Local and Regional Scale using Mosses: Strong and Weak Points.

“Heavy Metals May Influence Moose Health”. Interview on Internet “Science Daily”, Nov. 7, 2010



*The arches of Orkla bridge*

### R.B. Strand

Conference “IUPAC ICOS-18”, Bergen, Norway, Aug. 1 – 6, 2010.

Co-Author on Poster Presentation: Synthesis and Application of new Chiral N-Heterocyclic Carbenes.

### T. K. Thvedt

Conference “25. Organisk kjemisk vintermøte”, Fefor, Norway, Jan. 7 - 10, 2010.

Co-Author on Lecture on: Microwave Assisted Side Chain Fluorination of 1-Arylethanones.

Co-Author on Poster Presentation: Synthesis of new Chiral Building Blocks: 1-Aryl-2-Fluorethylamines.

### M. Voldsund

23rd International Conference of Efficiency, Cost, Optimization, Simulation & Environmental Impact of Energy Systems, Lausanne, Switzerland, June 14 – 17, 2010.

Co-Author on Lecture on: Exergy Analysis of the Oil and Gas Separation Processes on a North Sea Oil Platform.

Research Stay at Statoil, Bergen, Norway, June 27 – Aug. 21, 2010.

Carbon Capture and Storage Summer School, Longyearbyen, Spitzbergen, Aug. 21 – 28, 2010.

### C.L. Øpstad

Research Stay at Weill Cornell Medical College in Qatar, Doha, Qatar, March 28 – April 2, 2010.

### P. – O. Åstrand

Invited Seminar, Facultés Universitaires Notre-Dame de la Paix, Namur, France, April 14, 2010.

Guest Lecture on: Combined Charge-Transfer and Point-Dipole Interaction Model for Electronic Polarization.

Group Seminar “Theoretical Chemistry”, Northwestern University, Evanston, Illinois, USA, June 2, 2010.

Guest Lecture on: Combined Charge-Transfer and Point-Dipole Interaction Model for Electronic Polarization.

Work Shop “Many-Body Interactions: From Quantum Mechanics to Force Fields”, Telluride Science Research Center, Telluride, Colorado, USA, June 14 – 18, 2010.

Lecture on: Combined Charge-Transfer and Point-Dipole Interaction Model for Electrostatic Interactions.

Workshop on Streamer Physics and Chemistry, Västerås, Sweden, Sep. 20 – 21, 2010.

Co-Author on Lecture on: Molecular Modeling.

## Spring examination

Course no.	Course title (credits)	Lecturers and exercise coordinators	Candidates/Passed
RFEL1001	Natural Science and World Views (7,5)	Reidar Edvald Stølevik Annette Lykknes	54/44
KJ1020	Organic Chemistry (15)	Vassilia Partali	137/113
KJ2022	Spectroscopic Methods in Organic Chemistry (7,5)	Nebojsa Simic	28/23
KJ2043	Physical Methods in Structural Chemistry (15)	Morten Bjørgen	8/8
KJ2051	Analytical Chemistry, Advanced Course (7,5)	Øyvind Mikkelsen Florinel Gabriel Banica	14/14
KJ2053	Chromatography (7,5)	Rudolf Schmid	47/42
KJ2070	Environmental Chemistry (15)	Torunn Berg Trond Peder Flaten	14/11
KJ2071	Environmental Chemistry, Introductory Course (7,5)	Torunn Berg	9/9
KJ3000	Organic Medicinal and Pharmaceutical Chemistry (7,5)	Derek James Chadwick	7/6
KJ3055	Analytical Atomic Spectrometry (7,5)	Florinel Gabriel Banica	3/3
KJ3065	Enzyme chemistry (7,5)	Torbjørn Ljones	8/8
KJ8100	Organic Medicinal and Pharmaceutical Chemistry (7,5)	Derek James Chadwick	3/3
KJ8106	Advanced Organic Chemistry (7,5)	Per Henning Carlsen	2/2
KJ8901	Enzyme chemistry (7,5)	Torbjørn Ljones	2/2
TKJ4111	Organic Chemistry, Advanced Course (7,5)	Bård Helge Hoff	23/23
TKJ4130	Organic Synthesis, Laboratory (7,5)	Bård Helge Hoff Vassilia Partali	10/10
TKJ4135	Organic Synthesis, Advanced Course (7,5)	Anne Fiksdahl	9/6
TKJ4160	Basic Physical Chemistry and Laboratory (15)	Signe Kjelstrup Henrik Koch	89/82
TKJ4166	Chemical Bond Theory and Spectroscopy (7,5)	Henrik Koch	20/14
TKJ4175	Chemometrics, Basic Course (7,5)	Bjørn Kåre Alsberg	5/5
TKJ4215	Statistical Thermodynamics in Chemistry and Biology (7,5)	Per-Olof Åstrand	27/27

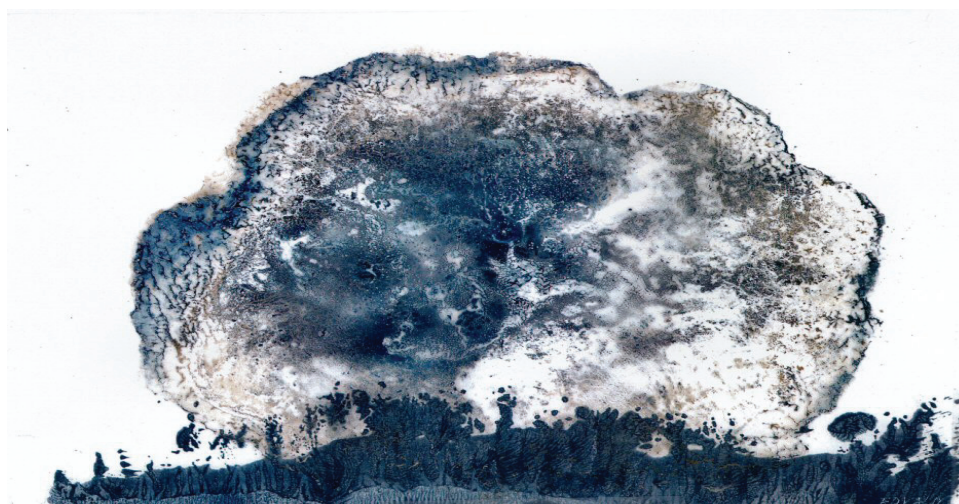


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**Autumn examination**

<b>Course no.</b>	<b>Course title (credits)</b>	<b>Lecturers and exercise coordinators</b>	<b>Candidates/Passed</b>
KJ1000	General Chemistry (15)	Kolbjørn Hagen Torbjørn Ljones	188/171
KJ1030	Inorganic Chemistry (15)	Torbjørn Ljones, Tina Kristiansen	42/36
KJ1041	Chemical Bond, Spectroscopy and Kinetics (7,5)	Henrik Koch	97/76
KJ2050	Analytical Chemistry, Basic Course (7,5)	Øyvind Mikkelsen Florinel Gabriel Banica	31/29
KJ3001	Stereochemistry and Synthesis of Chiral Compounds (7,5)	Per Henning Carlsen	6/6
KJ3021	Nuclear Magnetic Resonance Spectroscopy (7,5)	Nebojsa Simic	17/16
KJ3050	Marine Organic Environmental Chemistry (7,5)	Øyvind Mikkelsen	12/12
KJ3053	Analytical Methods for Industrial- and Environmental Monitoring (7,5)	Øyvind Mikkelsen	17/17
KJ3056	Chemical Sensors and Biosensors (7,5)	Florinel Gabriel Banica	6/6
KJ3058	Analytical Chemical Separation Techniques (7,5)	Rudolf Schmid	4/4
KJ3070	Advanced Aquatic Chemistry (15)	Trond Peder Flaten	17/15
KJ3071	Applied Geochemistry (7,5)	Rolf Tore Ottesen	19/19
KJ6002	Basic Chemistry 2 (Continuing education for teachers) (7,5)	Lise Kvittingen	
KJ8021	Stereochemistry and Synthesis of Chiral Compounds (7,5)	Per Henning Carlsen	2/2
KJ8053	Analytical Methods for Industrial- and Environmental Monitoring (7,5)	Øyvind Mikkelsen	2/2
KJ8070	Advanced Aquatic Chemistry (15)	Trond Peder Flaten	1/1
KJ8104	New Methods in Organic Synthesis (7,5)	Bård Helge Hoff	3/3
KJ8902	Molecular Modelling (7,5)	Per-Olof Åstrand	3/3
TKJ4102	Basic Organic Chemistry and Laboratory (15)	Per Henning Carlsen	105/88
TKJ4180	Physical Organic Chemistry (7,5)	Per Henning Carlsen	22/13
TKJ4195	Chemometrics, Advanced Course (7,5)	Bjørn Kåre Alsberg	1/1
TKJ4200	Irreversible Thermodynamics (7,5)	Signe Kjelstrup	8/8
TKJ4205	Molecular Modelling (7,5)	Per-Olof Åstrand	4/4
TKJ4520	Organic Chemistry, Specialization Project (15)	Per Henning Carlsen	4/4
TKJ4525	Organic Chemistry, Specialization Course (7,5)	Anne Fiksdahl	11/11



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**Re-sit examination**

<b>Course no.</b>	<b>Course title (credits)</b>	<b>Candidates/Passed</b>
RFEL1001	Natural Science and World Views (7,5)	47/43
KJ1000	General Chemistry (15)	17/10
KJ1020	Organic Chemistry (15)	10/5
KJ1030	Inorganic Chemistry (15)	4/4
KJ1040	Physical Chemistry (15)	5/2
KJ2022	Spectroscopic Methods in Organic Chemistry (7,5)	2/2
KJ2031	Inorganic Chemistry, Advanced Course (7,5)	1/1
KJ2053	Chromatography (7,5)	2/2
KJ2070	Environmental Chemistry (15)	4/4
KJ3021	Nuclear Magnetic Resonance Spectroscopy (7,5)	2/1
RFEL3093	Episodes from the history of science (7,5)	1/1
KJ8052	Analytical Electrochemistry and its Application within Industrial and Environmental Monitoring (7,5)	3/3
KJ8100	Organic Medicinal and Pharmaceutical Chemistry (7,5)	1/1
TKJ4100	Basic Organic Chemistry and Laboratory (15)	13/4
TKJ4111	Organic Chemistry, Advanced Course (7,5)	2/2
TKJ4135	Organic Synthesis, Advanced Course (7,5)	1/0
TKJ4160	Basic Physical Chemistry and Laboratory (15)	8/0
TKJ4166	Chemical Bond Theory and Spectroscopy (7,5)	2/1
TKJ4170	Quantum Chemistry, Advanced Course (7,5)	2/1
TKJ4180	Physical Organic Chemistry (7,5)	2/1
TKJ4215	Statistical Thermodynamics in Chemistry and Biology (7,5)	1/1



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## Siv.ing. students

### 3. year (MTKJ)

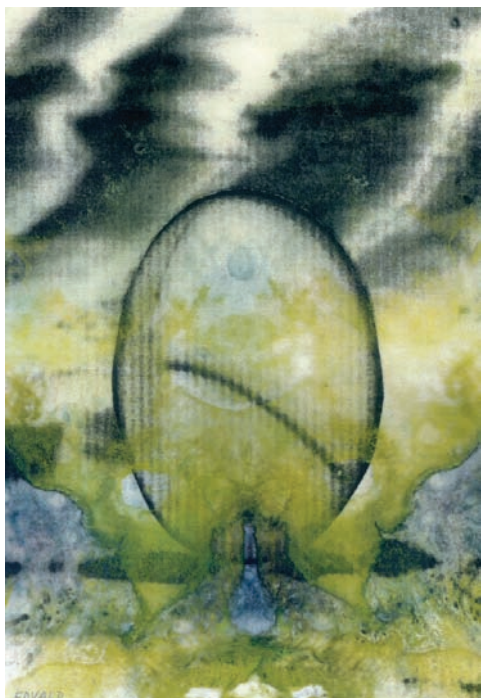
Glansberg, Karin Märta  
Hauge, Hans Henrik R.  
Holden, Mia Cathrine Hellandsjø  
Kolstad, Aleksander  
Lauvås, Marie Jacobsen  
Myhre, Rolf Heilemann  
Rydså, Line  
Skjønsvfjell, Ellen Martine

### 4. year (MTKJ)

Bøe, Maren Seljenes  
Bergersen, Amund Dolva  
Ellila, Georg  
Elnan, Jørund  
Gulbrandsen, Tore Aarhus  
Han, Jin  
Isaksen, Stian Moe  
Kaur, Maya  
Larsen, Synne  
Solemslie, Henrik Winther  
Strand, Mikael  
Surdal, Cecilie  
Tveiekrem, Marit Elise Endresen  
Vo, Mong Truc

### 5. year (MTKJ)

Blakstad, Guro  
Bugge, Steffen  
Kaasa, Kristin  
Solvang, Tina  
Tungen, Jørn Eivind



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## Master students in progress

### Chemistry (MKJ)

Berge, May Britt  
Borkenhagen, Marius  
Borkowska, Zuzanna  
Egeness, Mari Jystad  
Emdal, Martin Folke  
Forselv, Stian  
Haugland, Marius Myreng  
Heggøy, Anette  
Henriksen, Stine  
Hjertenæs, Eirik  
Hoholm, Rebecca Stavrum  
Høiås, Morten Juul  
Høyvik, Ida-Marie  
Kvithyll, Heidi  
Larsen, Rune  
Lindgjerdet, Per Magnus  
Martinsen, Morten  
Moen, Ingvill Marie  
Nauste, Kristian Bunkholt  
Noreng, Mona Skagseth  
Ohm, Ragnhild Gaard  
Opsahl, Anette  
Rise, Astrid Toftaker  
Simensen, Jan Tore  
Sivertsen, Sveinung Sundfør  
Strandberg, Trond  
Sørensen, Lisbet  
Aaen, Ingrid

### Environmental toxicology and chemistry (MSENVITOX)

Alston, John Fraser  
Bechmann, Pernille  
Eskeland, Maren  
Hunnestad, Annie Vera  
Høydal, Liv Mari Brunstad  
Haakseth, Anne-Britt  
Kamalia, Uswatun Hasanah Isna  
Larsen, Katrine Hervik  
Liu, Zhucheng  
Melting, Kine  
Nordum, Mats  
Sanchez, Nicolas  
Slinde, Gøril Aasen  
Sundeng, Kathrine Helen  
Trefjord, Terese

### Master of Science Education (MLREAL)

Andersen, Marthe Kristin  
Buraas, Ida Kristine  
Paulsrud, Lars Evensen  
Pedersen, Lars Størseth

### Natural Resource Management (MSNARM)

Som, Bozume



**The following Ph.D. projects are in progress:**

<b>Student</b>	<b>Title</b>	<b>Thesis advisor</b>
Bøyesen, Katrine	Combined Raman, X-ray Absorption, Scattering and diffraction studies on nanoparticulate VOx species in micro and mesoporous systems for the selective oxidation of propene and propane.	Karina Mathisen
Chu, Chunmei	Automated de novo optimization of functional organometallic compounds by integrating a QSAR/genetic algorithm method.	Bjørn K. Alsberg
Esmurziev, Aslan	Synthesis of new fluorinated uronic acids and total synthesis of new uridine diphosphate fluoro-uronic acids. (Syntese av fluorerte uronsyrer og talsyntes av nye uridine difosfat fluoro-uronsyrer.)	Bård Helge Hoff
Flatberg, Arnar	Simulation of microarray experiments and protsomic 2D gel electrophoresis.	Bjørn K. Alsberg
Gebremariam, Kidane Fanta	Analytical methods for art objects investigation	Lise Kvittingen
Gerontas, Apostolos	A history of the development of column chromatography: From Tswet to HPLC	Annette Lykknes
Ham, Leen van der	Optimising the Second law efficiency of a cryogenic air separation unit	Signe Kjelstrup
Iftekhar, Shafia	Trace metals and natural organic matters in rivers.	Torunn Berg
Kaspersen, Svein Jacob	New pyrrolo, thieno and furopyrimidine targeting tyrosine kinases (cancer) and protozoas: synthesis and bioactivity	Bård Helge Hoff
Kristiansen, Tina	Aerogels: A new class of materials for catalytic purposes.	David G. Nicholson
Kumelj, Tjasa	Free energy calculations of ligand-protein interactions.	Per-Olof Åstrand
Lervik, Anders	Energy transfer in biomolecular motors	Signe Kjelstrup
Løkken, Torbjørn Vegard	Analysen av vannduggpunkt og hydrokarbonduggpunkt i naturgass. (Determination of water dewpoint and hydrocarbon dewpoint in natural gas.)	Rudolf Schmid
Martinsen, Morten	Development of an on-line monitoring platform and procedure for rapid environmental and process monitoring of heavy oil extraction operations and industrial activity	Øyvind Mikkelsen
Mekki, Miriam	Development and application of response methods for large molecular systems.	Henrik Koch
Melnes, Silje	Rational drug design synthesis of potential selective inhibitors of tyrosin kinase 2.	Odd Reidar Gautun

## Post Graduate Students

<b>Student</b>	<b>Title</b>	<b>Thesis advisor</b>
Mohsin, Muhammad Ali	Surface functionalization by bio-organic materials.	Florinel G. Banica
Nordløyken, Marit	Spormetaller i hjortedyr i Norge. (Trace of elements in Norwegian deer).	Torunn Berg
Raju, Rajesh	Optically active amphiphiles and artificial cells	Per Carlsen
Sandru, Eugenia-Mariana	Synthese av høy umettete bioorganiske forbindelser. (Synthesis of highly unsaturated bioorganic compounds.)	Vassilia Partali
Saepurahman	Spectroscopic studies of zeolites and zeolite facilitated oxygenate/hydrocarbon conversion reactions.	Morten Bjørgen
Simic, Anica	Trace elements and persistent organic pollutants (POPs) in blood serum samples from the Nord-Trøndelag health study (HUNT) and the possible role of trace elements in type 2 diabetes.	Trond Peder Flaten
Skorpa, Ragnhild	A thermodynamic base for reaction kinetics. Studied by non-equilibrium molecular dynamics simulations.	Signe Kjelstrup
Steen, Anne Orderdalen	Atmosfærisk spesiering av kvikksølv i polare områder.	Torunn Berg
Strand, Ragnhild B.	Heterocyclic synthetic chemistry based on nitropyridine derivatives.	Anne Fiksdahl
Syed, Majid Bukhari	Isolation and structure elucidation of natural Bioactive molecules of plant origin.	Nebojsa Simic
Takla, Marit	Methods to utilize waste heat in the ferro alloy industry.	Signe Kjelstrup
Thvedt, Thor Håkon Krane	Enzymatic resolution coupled with in-situ racemisation for production of enantiopure amines. Application of the building blocks in preparation of potential antifungal compounds.	Bård Helge Hoff
Zaidi, Asma	Synthesis of highly unsaturated amino acids.	Vassilia Partali
Zeeshan, Muhammad	Optical resolution by fractional aggregation.	Vassilia Partali
Voldsund, Mari	Entropy production in process equipment	Signe Kjelstrup
Weggeberg, Hanne	Metal characterization of different size fractions of airborne particulate matter and adverse health effects in humans	Trond Peder Flaten
Aarhaug, Thor Anders	Ny membran for polymer brenselceller.	Signe Kjelstrup

**MSc in Chemistry**

<b>Braaten, Hans Fredrik Veiteberg</b>	<b>Er kvikksølv i snø i Arktis av atmosfærisk eller marin opprinnelse. En studie av metylkvikksølv, totalkvikksølv og marine hovedioner i arktisk snø</b>
Supervisor:	Professor Torunn Berg
Examiners:	Senior Research Scientist, dr.scient. Hilde Thelle Uggerud, NILU Associate Professor Trond Peder Flaten
<b>Engøy, Ingemund Magnus Falkberget</b>	<b>Synthesis and reduction of 1-aryl-2,2-difluoroethanones</b>
Supervisor:	Associate Professor Bård Helge Hoff
Examiners:	Researcher, dr.scient. Harald Svendsen, EPAX AS Dr.ing. Eva Mørkved
<b>Edvardsen, Tove-Nanny</b>	<b>Large and extra-large pore acidic ITQ-zeotypes: An in-situ spectroscopic study of fundamental properties</b>
Supervisors:	Associate Professor Morten Bjørgen Post.doc. Karina Mathisen
Examiners:	Associate Professor Stian Svelle, UiO Professor David Nicholson
<b>Egede-Nissen, Cecilie</b>	<b>Utvikling av en ny type elektrokjemisk DGT-enhet for overvåking av spormetaller i kystvann ved bruk av, og kvalitetssikring med, komplementerende målinger</b>
Supervisor:	Professor Øyvind Mikkelsen
Examiners:	Professor Emeritus Knut Schrøder Stipendiat Kristina Strasunske
<b>Haug, Siri</b>	<b>Bruk av DGT og voltammetri for varsling av forhøyede konsentrasjoner av sulfid som indikator for korrosjonsfremmende miljø</b>
Supervisor:	Professor Øyvind Mikkelsen
Examiners:	Professor Emeritus Knut Schrøder Stipendiat Kristina Strasunske
<b>Helgerud, Trygve</b>	<b>Synthesis and application of new chiral N-heterocyclic carbenes</b>
Supervisor:	Professor Anne Fiksdahl
Examiners:	Associate Professor Tore Lejon, UiT Professor Emeritus Jan Magnus Bakke
<b>Hoftaniska, Idar</b>	<b>Synthesis and characterization of microporous zeotypes with the AFN topology: Phase impurities and thermal stability</b>
Supervisors:	Associate Professor Morten Bjørgen Post.doc. Karina Mathisen
Examiners:	Associate Professor Stian Svelle, UiO Professor Emeritus Reidar Stølevik
<b>Hovde, Gunnhild</b>	<b>Studie av fysikalsk-kjemiske parametere i ellevann. Kvalitetssikring av miljødata</b>
Supervisor:	Professor Øyvind Mikkelsen
Examiners:	Professor Emeritus Knut Schrøder Stipendiat Kristina Strasunske
<b>Høyvik, Ida-Marie</b>	<b>Part A: Structures and conformational energies of selected fluoropropenes. Part B: Alternative forms of exchange correlation functionals derived from pair-creation transformations</b>
Supervisor:	Professor Henrik Koch
Examiners:	Professor Kenneth Ruud, UiT Professor Per-Olof Åstrand

## Post Graduate Students

<b>Skorpa, Ragnhild</b>	<b>Assessing the surface sites of the microporous materials H-ITQ-7 and H-Beta using FT-IR spectroscopy and various molecular probes</b>
Supervisor:	Associate Professor Morten Bjørgen
Examiners:	Post.doc. Karina Mathisen Research Scientist, dr.scient. Merete Hellner Nilsen, UiO Professor David Nicholson
<b>Sveinhaus, Krister</b>	<b>Studie av voltammetrisk respons for analyse av spormetaller under påvirkning av mekanisk fremdrevet vibrasjon</b>
Supervisor:	Professor Øyvind Mikkelsen
Examiners:	Research Scientist Kalman Nagy, SINTEF Stipendiat Kristina Strasunske
<b>Volynkin, Andrey Sergeevich</b>	<b>Synthesis, characterization, and catalytic studies of ITQ-33. Conversion of methanol to hydrocarbons over a microporous germano-aluminosilicate</b>
Supervisors:	Associate Professor Morten Bjørgen Post.doc. Karina Mathisen
Examiners:	Research Scientist, dr.scient. Merete Hellner Nilsen, UiO Associate Professor Frode Seland
<b>MSc in Chemistry/Siv.ing.</b>	
<b>Lyngvi, Eirik</b>	<b>Synthesis of new indole derivatives substrates for gold(I) catalyzed cyclization reactions</b>
Supervisor:	Professor Anne Fiksdahl
Examiners:	Associate professor Tore Lejon, UiT Professor Anne Fiksdahl
<b>Mekki, Miriam</b>	<b>Quantum chemical calculations on pristine and boron substituted carbon nanotubes</b>
Supervisors:	Professor Henrik Koch
Examiner:	Professor Trygve Helgaker, UiO Professor Henrik Koch
<b>Rognså, Guro</b>	<b>Synthesis of alpha-iodo ketones, and their application in glycosylation reactions</b>
Supervisor:	Professor Per Carlsen
Examiners:	Ph.d. Kenneth J. Hoffmann Professor Per Carlsen
<b>Seglem, Karen Nessler</b>	<b>Reducible Disulfide Linked Carotenoid Amphiphiles</b>
Supervisors:	Professor Vassilia Partali
Examiners:	Associate Professor Birte J. Sjørnes, HiØ Professor Vassilia Partali
<b>Slungård, Sigrid Volden</b>	<b>Asymmetrisk transfer hydrogenering av 1-aryletanoner og 1-aryl-2,2,2-trifluoretanoner</b>
Supervisor:	Associate Professor Bård Helge Hoff
Examiners:	Reinert Fure, Borregaard Associate Professor Bård Helge Hoff
<b>Takla, Marit</b>	<b>Recovering industrial waste heat by the means of thermoelectricity</b>
Supervisor:	Professor Signe Kjelstrup
Examiners:	Research Scientist, dr.ing. Andreas Grimstvedt Professor Signe Kjelstrup
<b>Vågenes, Birgitte Bårli</b>	<b>Synthesis of highly unsaturated cationic amphiphiles</b>
Supervisor:	Professor Vassilia Partali
Examiners:	Associate Professor Birte J. Sjørnes, HiØ Professor Vassilia Partali



**Willassen, Veronica**

Supervisor:  
Examiners:

**Synthesis of new tyrosine kinase inhibitors**

Associate Professor Bård Helge Hoff  
Dr.ing. Harald Svensen, Epax  
Associate Professor Bård Helge Hoff

**MSc in Education, chemistry**

**Belsaas, Kristin**

Supervisors:  
Examiners:

**Bruk av DGT og HR-ICP-MS for studier av metallers døgn- og sesongvariasjoner i vassdrag**

Professor Øyvind Mikkelsen  
Professor Emeritus Knut Schrøder  
Stipendiat Kristina Strasunske

**Dahl, Anette**

Supervisor:  
Examiners:

**Förändring över tid i koncentration av metaller i naturlig jord på Sørlandet i Norge**

Associate Professor Trond Peder Flaten  
Professor Torunn Berg  
Professor Emeritus Eiliv Steinnes  
Bjørn Ove Berthelsen, Trondheim Kommune

**Hoston, Audhild**

Supervisor:  
Examiners:

**PAH og PCB i byjord fra Dublin. Kilder og forurensningsstatus**

Associate Professor Trond Peder Flaten, Professor II Rolf Tore Ottesen  
Chief Engineer Toril Haugland  
Professor Torbjørn Ljones

**Milli, Guro Kristine**

Supervisors:  
Examiners:

**Mulige aktive forurensningskilder i havneområdet i Trondheim**

Associate Professor Trond Peder Flaten, Professor II Rolf Tore Ottesen  
Chief Engineer Toril Haugland  
Professor Torbjørn Ljones

**MSc in Environmental toxicology and chemistry (MFORU)**

**Granly, Toril**

Supervisors:

Examiners:

**Biologiske virkninger av metylglykosal (MGA) in vitro**

Associate Professor, Dr.ing. Trond Peder Flaten  
Dr.med. Jan Olav Aaseth, Sykehuset Innlandet  
Professor Torbjørn Lones  
Professor Lars Skjeldal  
Professor, Dr.scient Torunn Berg



*Detail from Realfagbygget*

## Ph.d. in Chemistry

<b>Eggen, Per-Odd</b>	<b>Current chemistry experiments and practice in electrochemistry education.</b>
Trial lecture	Semiconductors as a new topic in upper secondary school chemistry in Norway: What should be the aims and which principles, models, devices and applications should be studied?
Supervisor	Professor Lise Kvittingen
Evaluation committee	Professor Jorge Ibanez, Universidad Iberoamericana, Depto. de Ing. y Ciencias Químicas, Mexico Dr. Scient Vivi Ringnes, Hosle, Norway Professor Vassilia Partali, Department of Chemistry, NTNU
<b>Fuglseth, Erik</b>	<b>Synthesis of 1-aryl-2-fluoroethanones and their use in the preparation of enantioenriched 1-aryl-2-fluoroethanols and 1-aryl-2-fluoroethylamines.</b>
Trial lecture	Organic based solar cells: principles, challenges and prospects.
Supervisor	Associate professor Bård Helge Hoff
Evaluation committee	Associate Professor Trond Ulven, Department of Chemistry, University of Southern Denmark, Odense, Denmark Professor Tore Lejon, Department of Chemistry, University of Tromsø, Tromsø, Norway Associate Professor Nebojsa Simic, Department of Chemistry, NTNU, Trondheim, Norway
<b>Hestad, Øystein Leif</b>	<b>Prebreakdown phenomena in solids and liquids stressed by fast transients: The effect of additives and phase.</b>
Trial Lecture	Possible influences of interfaces and nanofiller nature and shape on prebreakdown phenomena.
Supervisor	Professor Per-Olof Åstrand
Evaluation committee	Professor Markus Zhan, Massachusetts Institute of Technology, USA Ph.D. Arnaud Allais, HV-MV Materials and Technologies, France Associate Professor Wilhelm Glomm, Department of Chemical Engineering, NTNU
<b>Ryeng, Einar</b>	<b>Analysis of Microarray Data Using Inductive Logic Programming and Ontological Background Information.</b>
Trial lecture	Chemical graph theory
Supervisor	Professor Bjørn K. Alsberg
Co-supervisor	Associate Professor Tore Amble, Department of Computer and Information Science, NTNU
Evaluation committee	Researcher PhD Amanda Clare, Department of Computer Science, University of Wales, UK Associate Professor Bjørn Grung, Department of Chemistry, University of Bergen, Norway Professor Signe Kjelstrup, Department of Chemistry, NTNU
<b>Smalø, Hans Sverre</b>	<b>Modeling molecular properties of interest for streamer studies.</b>
Trial lecture	The electronic structure of graphene: why is this hot stuff.
Supervisor	Professor Per-Olof Åstrand
Evaluation committee	Associate Professor Rampi Ramprasad, Chemical, Materials & Biomolecular Engineering School of Engineering, University of Connecticut, USA Professor Kenneth Ruud, Dept. of Chemistry, Universitetet i Tromsø. Professor Henrik Koch, Department of Chemistry, NTNU
<b>Stockmann, Vegar</b>	<b>Sythetic applications of Nitropyridine derivatives.</b>
Trial lecture	Structure, synthesis and mode of action of antimicrobial and lice agents used in fish farming.
Supervisor	Professor Anne Fiksdahl
Evaluation committee	Professor Tekn. Dr. Jan Bergman, Institut för Biovitenskaper, Karolinska Institutet, Sweden Director R&D PhD Ingrid Hegbom Ekman, Cambrex Karlskoga AB, Sweden Assistant Professor PhD Bård Hoff, Department of Chemistry, NTNU

<b>Strasunske, Kristina</b>	<b>Automatic monitoring systems for trace metals in natural and waste water - Nafion coated solid metal electrodes for sensitivity enhancement and stability improvement.</b>
Trial lecture	Methods for speciation of trace elements in the marine system, with special emphasis on ligand competition/CSV for copper speciation and CSV for iodine speciation.
Supervisor	Professor Øyvind Mikkelsen
Co-supervisor	Professor emeritus Knut Henning Schrøder
Evaluation committee	Professor CMG van den Berg, Earth and Ocean Sciences, University of Liverpool, UK Senior Scientist Ivanka Pizeta, Division for Marine and Environmental Research, Ruder Boskovic Institute, Croatia Professor Trond Peder Flaten, Department of Chemistry, NTNU
<b>Øpstad, Christer Lorentz</b>	<b>Carotenoid Surfactants and Transfection Agents The Colourful Chemistry of Polyenes.</b>
Trial lecture	Oxidative degradation products of carotenoids – natural occurrence, biological importance, chemical synthesis.
Supervisor	Professor Vassilia Partali
Co-supervisor	Guest Researcher Richard Sliwka, Department of Chemistry, NTNU
Evaluation committee	Dr Hansgeorg Ernst, BASF, Ludwigshafen, Germany Chief Operation Officer Dr Erik Lüddecke, BASF, Germany Professor Per Henning Carlsen, Department of Chemistry, NTNU
<b>Aaseng, Jon Erik</b>	<b>Asymmetric synthesis of substituted 2-aminotetralins.</b>
Trial lecture	Enantioselective synthesis based on organocatalysis by proline or proline derivatives.
Supervisor	Associate professor Odd Reidar Gautun
Evaluation committee	Professor Kristina Luthman, Department of Chemistry, University of Gothenburg Associate Professor Bengt Erik Haug, Centre for Pharmacy, University of Bergen Professor Per Carlsen, Department of Chemistry, NTNU



*Entrance to the woodpeckers home*

## Post Graduate Students

### Student Exchange from NTNU, Department of Chemistry

Name	Specialization	Level	Institution
Bøe, Maren Seljenes	MTKJ-Org.chem.	MSc, 3rd yr	University of California, Berkeley, USA
Gulbrandsen, Tore A.	MTKJ-Org.chem.	MSc, 4th yr	University of Helsinki, Finland
Heggøy, Anette	MKJ- Envir.chem.	MSc, 4th yr	The University of British Columbia, Canada
Kaasa, Kristin	MTKJ-Org.chem.	MSc, 4th yr	Danmarks Tekniske Universitet, Denmark
Kaur, Maya	MTKJ-Org.chem.	MSc, 4th yr	Universidad Politécnica de Valencia
Ohm, Ragnhild Gaard	MKJ-Org.chem.	MSc, 4th yr	Seoul National University
Surdal, Cecilie	MTKJ-Org.chem.	MSc, 4th yr	The University of Western Australia

### Student exchange to NTNU, Department of Chemistry

Name	Institution
Granados, Cindy	University of Rouen, France
Jozic, Robert-Jan	Hogeschool Leiden, Netherlands
Superville, Pierre-Jean	USTL, Lille, France



From Baklandet



## Staff

### Academic Staff

#### Organic Chemistry



Group Leader  
Professor, Dr.rer.nat.  
(Fribourg). Vassilia Partali



Adjunct Professor, Ph.D.  
(Oxford) . Derek Chadwick



Professor, Dr.ing.  
Anne Fiksdahl



Professor, Ph.D. (Buffalo).  
Per Carlsen



Associate Professor, Dr.ing.  
Odd Reidar Gautun



Associate Professor, Ph.D.  
(Niš), Nebojsa Simic



Associate Professor, Dr.scient  
Bård Helge Hoff

**Physical Chemistry**



Group Leader  
Professor, Dr.scient.  
Bjørn Alsberg



Professor, Dr.techn.  
Signe Kjelstrup



Professor, Ph.D. (Lund)  
Per-Olof Åstrand



Adjunct Professor, Dr.philos.  
(Utrecht). Dick Bedeaux



Professor, Ph.D. (Århus).  
Henrik Koch



Associate Professor. Ph.D.  
Morten Bjørgen



Assistant Professor  
Terje Bruvoll



Professor, Ph.D.  
Torbjørn Ljones

**Environmental and Analytical Chemistry**



Group Leader  
Professor, Dr.Scient  
Øyvind Mikkelsen



Professor, Dr.scient.  
Lise Kvittingen



Associate Professor, Dr.rer.nat.  
(Zürich). Rudolf Schmid



Associate Professor, Dr.ing.  
Florinel G. Banica



Associate Professor, Ph.D.  
Karina Mathisen



Associate Professor, Ph.D.,  
Annette Lykknes



Professor, Dr.scient.  
Torunn Berg



Professor, Ph.D. (London)  
David Nicholson



Professor, Dr.ing.  
Trond Peder Flaten



Adjunct Professor  
Rolf Tore Ottesen

**Administrative staff**



Head of administration  
Lena Frostad



Senior executive officer  
Lillian Hanssen



Higher executive officer  
Bjørn Syvertsen



Executive officer  
Inger Marie Frøseth



Higher executive officer  
Ingrid Kristine Tømmerdal

**Technical staff**



Staff engineer  
Stein Almo



Staff engineer  
Julie Asmussen



Head engineer  
Susana Villa Gonzalez



## Staff



Head engineer  
Julie Jackson



Head engineer  
Syverin Lierhagen



Staff engineer  
Gunnar Svare



Staff engineer  
Nina Klausen



Senior engineer  
Tron Rolfsen



Staff engineer  
Roger Aarvik

## Scientific Assistants

Burheim, Odne S.  
Bøyesen, Katrine Lie  
Gebremariam, Kidane Fanta  
Gerontas, Apostolos  
Gonzalez, Susana  
Hjertenæs, Eirik  
Kaspersen, Svein Jacob  
Klausen, Nina  
Kumelj, Tjasa  
Lervik, Anders  
Lystvet, Sina Maria  
Martinsen, Morten  
Mekki, Miriam  
Nordløyken, Marit  
Sandru, Eugenia-Mariana  
Simic, Anica  
Smalø, Hans Sverre  
Takla, Marit  
Thvedt, Thor Håkon Krane  
Voldsund, Mari  
Volynkin, Andrey  
Vågenes, Birgitte  
Weggeberg, Hanne

## Demonstrators

Andersen, Marthe K.  
Baumberger, Sigrid  
Bersås, Anita  
Birkestøl, Karianne  
Blakstad, Guro  
Braadland, Peder R.  
Bugge, Steffen  
Buraas, Ida Kristine  
Bøe, Maren S.  
Courtade, Gaston  
Elgaaen, Christian  
Ellila, Georg  
Emdal, Martin Folke  
Evensen, Agnete Sion  
Han, Jin  
Haugland, Marius M.  
Hellstrøm, Kaja C.  
Hjettland, Ola S.  
Hjort, Ida  
Hoholm, Rebekka S.  
Jacobsen, Julie Berild

## Staff

### Demonstrators contd.

Kirste, Karsten  
Kvithyll, Heidi  
Kjøglum, Kristin T.  
Lakså, Solveig M.B.  
Larsen, Synne  
Linde, Henrik  
Løvås, Jim  
Madland, Eva  
Mattson, Ingrid  
Mekki, Miriam  
Mikalsen, Ragni  
Myhre, Rolf H.

Nauste, Kristian B.  
Ohm, Ragnhild  
Ouassou, Jabir Ali  
Slinde, Gøril Aasen  
Solemslie, Henrik W.  
Solvang, Tina  
Strand, Mikael  
Tungen, Jørn E.  
Tveekrem, Marit Elise  
Trefjord, Terese  
Van der Wijst, Cornelis  
Yttervik, Johan Hatling  
Aasgaard, Lasse S.

### Guest professors/researchers/lecturers

Josep Bonet  
Thijs J.H. Vlugt  
Cédric Garnier  
Erwan Tessier  
Andrzej Bobrowski  
Aleksandra Liberska  
Gabriel Billon  
Michael Pungente  
Thijs J.H. Vlugt

Feb. 1 – 5, 2010  
Feb. 20 – 28, 2010  
April 26 – May 7, 2010  
April 26 – May 7, 2010  
May 31 – June 4, 2010  
June 1 – Sep. 30, 2010  
June 14 – 18, 2010  
July 5 – 9, 2010  
Sep. 18 – 21, 2010

Professor A. Bobrowski, AGH-University of Science and  
Technology, Krakow, Poland:  
"Application of Catalytic Adsorptive Stripping Voltammetry  
In Trace Analysis and Chromium Speciation Studies"

June 2, 2010



WinterSolstice 2010



# Annual Report for Department of Chemistry 2010



## **NTNU**

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

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