

2018 Annual Report

Petroleum Research School of Norway

Nasjonal forskerskole i petroleumsfag (NFiP)

Introduction

Petroleum Research School of Norway (NFiP) includes PhD students from all of the five universities in Norway that provide PhD education within petroleum related disciplines. Education of petroleum researchers at Norwegian universities benefits from coordinated, interdisciplinary collaboration between the Norwegian universities graduating PhD's in petroleum related scientific disciplines.

The Petroleum Research School of Norway was established to provide a national tool to improve the PhD education within petroleum related sciences in Norway. This is achieved by coordinating lectures given by the different universities and providing intensive courses, seminars and conferences for all PhD students in Norway with research projects related to petroleum. The objective is also to establish discussion groups, collaborating opportunities and interdisciplinary meeting places for PhD students and their supervisors in Norway and internationally; for more information please see <https://nfip.no/>.

In 2016 NFiP obtained financial support from The Norwegian Research Council (RNC) amounting to NOK 23mill for the next 8 years. This support enabled NFiP to continue and expand the educational efforts.

Members of the Petroleum Research School of Norway; include University of Bergen, University of Stavanger, University of Oslo, Norwegian University of Science and Technology (NTNU), University of Tromsø and the University Center at Svalbard (UNIS).

More than 1200 students (PhD and MSc students) have participated in NFiP activities in total. In 2018 a total of 176 students participated at NFiP arrangements. In addition, around 70 students (PhD and MSc students) participated on activities financially supported by NFiP.

2018 NFiP Activities

2018 Courses, Conferences and Seminars provided by NFiP and NorTex

During 2018 the following courses, conferences and seminars were provided by NFiP. The IOR Norway conference was financially supported by NFiP.

DATE	EVENT/Location	# STUDENTS	Universities attending
Apr. 23 rd – 25 th	IOR Norway	70	
Apr. 23 rd – 27 th	Geochemical assessment of subsea engineering, Texas A&M U at Corpus Christi	19	SINTEF: 1 PhD U. Texas: 1 bachelor, 1 master, 1 postdoc. University of Kansas: 1 PhD UoS: 10 master, 1 PhD UoB: 3 master
May 3 rd – 4 th	Rhetoric course, Oslo	9	UoB: 1 PhD UoS: 1 master NTNU: 4 master, 1 PhD UoO: 1 PhD, 1 master
Sept. 10 th -16 th	Arctic Field School, Svalbard	19	AGH: 1 PhD Leoben: 1 master U. Texas: 2 PhD, 1 master UNIS: 1 master UoB: 2 PhD, 2 master UoS: 1 master UoO: 2 PhD, 1 master NTNU: 1 master UoT: 1 PhD, 3 master
Oct. 15 th -19 th	CCUS Student Week, Golden, Colorado, USA	50	CSM: 8 Imperial: 4 NTNU: 5 Rice Uni.: 1 SINTEF: 1 Southwest Petr. Uni.: 3 DTU: 1 New Mexico Tech: 1 Texas A&M: 1 University of Tokyo: 1 UNIS: 2 UoB: 4 University of Campinas: 3 University of Denver: 1 University of Houston: 1 UoO: 1 UoS: 2 USC: 1 University of Texas: 9
Oct. 28 th - Nov. 3 rd	Field trip PYREX, Pyrenees, Spain	18	NTNU: 3 PhD, 5 master UoB: 5 master UoT: 3 PhD Uni. Of Naples Federico II: 2 master
Nov. 19 th – 23 rd	Field trip Dorset, Devon, UK	9	NTNU: 1 PhD, 2 master UoB: 2 master UoT: 2 PhD Uni. Of Naples Federico II:

			2 master
Nov. 16 th	Annual PhD Seminar, Petroleum Museum, Stavanger	52	NTNU: 6 PhD, 1 master UoB: 4 PhD, 2 master UoS: 17 PhD, 19 master UoO: 1 PhD UNIS: 2 master
SUM		246 students	

2018 Seminars and courses

1) Geological field trip to the Ainsa area in the Spanish Pyrenees (PYREX)

The course was primarily about clastic reservoir geology. The rocks studied are analogous to a number of important reservoir sections offshore Norway and other parts of the world and the use of analogues was discussed throughout the course. Within the topic of reservoir geology a number of parallel themes were addressed. The course included a mixture of fieldwork and class work. A total of 18 participants (33% females, 33% PhD) attended the course. Participants were from the University of Bergen (5), NTNU (8), University of Tromsø (3) and University of Naples Federico II (2).

Link to the course: <https://nfip.no/2018/08/30/pyrex-2018-geological-field-trip-to-the-spanish-pyrenees/>

2) World Heritage Jurassic coast of Dorset; field techniques for sedimentary research

This course provided introduction to the stratigraphy and facies of the siliciclastic and carbonate sediments, and instruction in field logging and sampling techniques appropriate to the various sediment types present. The Jurassic coast provides spectacular exposures of Triassic-Cretaceous sediments, which include outcropping examples of source rocks and reservoirs of the Wytch Farm oilfield, including a number of fossil oil seeps. A total of 9 participants (44% females, 33% PhD) attended the course. Participants were from the University of Bergen (2), NTNU (3), University of Tromsø (2) and University of Naples Federico II (2).

Link to the course: <https://nfip.no/2018/08/30/world-heritage-jurassic-coast-of-dorset-2018/>

3) Petroleum Research School of Norway Annual Seminar

Petroleum Research School of Norway (NFIP) provided in collaboration with NorTex Petroleum Cluster the conference: *“Innovative Petroleum Research at Universities in Norway”*, and it was arranged at the Norwegian Petroleum Museum in Stavanger. A total of 53 participants (26% females) from industry and academia attended the conference program, toured the Petroleum Museum and enjoyed networking during the conference dinner at the museum restaurant. A total of 52 graduate students from the following universities in Norway participated: NTNU (7), UoB (6), UoO (1), UoS (36), and UNIS (2).

Link to the seminar: <https://nfip.no/2018/10/03/nfip-annual-phd-seminar-2018/>

4) Practical Course in Rhetoric

The course is intended to help participants to be more precise and feel more confident in oral and written communication. The course lecturer was Siri Blindheim, who has been conducting rhetoric courses for 15 years.

A total of 9 participants attended the course; UoB: 1 PhD, UoS: 1 master, NTNU: 4 master, 1 PhD and UoO: 1 PhD, 1 master.

Link to the course: <https://nfip.no/2018/02/09/practical-course-in-rhetoric-2/>

5) Geochemical Assessment of Subsea Engineering (Texas A&M U.)

At Texas A&M Corpus Christi campus a course emphasizing environmental concerns during subsea operations was lectured by Richard B. Coffin, Ph.D and Chair of the Department of Physical and Environmental Sciences. This course was a geochemical assessment of subsea engineering related to energy mining and carbon sequestration with a focus on environmental impact and platform and pipeline stability.

A total of 19 participants (11% females), 3 PhD students and 16 Master students from academia attended the course. International attendance: 1 PhD student from SINTEF, 1 bachelor-, 1 master- and 1 postdoc.- students from University of Texas, 1 PhD student from University of Kansas, 10 master- and 1 PhD students from University of Stavanger and 3 master students from University of Bergen.

Link to the conference: <https://nfip.no/2018/02/08/geochemical-assessment-of-subsea-engineering-2018-2/>

6) Arctic Field School

The Arctic Petroleum Field School was arranged at Svalbard for the first time fall 2018. The candidate were introduced to the Billefjorden Trough, an excellently exposed rift basin in Svalbard.

In addition to the excursions, the students acquired and processed photogrammetric data on selected outcrops to generate virtual outcrops. These virtual outcrop models were integrated within industry-standard software for improved multi-scale characterization of the petroleum system elements.

A total of 19 participants (42% females, 8 PhD) attended the course. 1 PhD from AGH, 1 master student from Leoben, 2 PhD and 1 master students from University of Texas, 1 master student from UNIS, 2 PhD and 2 master students from University of Bergen, 1 master student from University of Stavanger, 2 PhD and 1 master students from University of Oslo, 1 master student from NTNU and 1 PhD and 3 master students from University of Tromsø.

Link to the course: <https://nfip.no/2018/06/05/coming-soon-arctic-petroleum-field-school-2018/>

2018 Conferences

1) IOR/EAGE 2018 Conference

NFiP co-hosted, together with EAGE and The National IOR Centre of Norway, the Improved Oil Recovery (IOR) conference in Stavanger April 23-25th, 2018.

A total of 350 attendees discussed sustainability within the oil and gas production. International experts and Norwegian researchers discussed the future of IOR. A total of ca. 70 students attended.

Link to the conference: <https://www.uis.no/research-and-phd-studies/research-centres/the-national-ior-centre-of-norway/conferences/ior-norway-2018/>

2) CCUS Student Week (CSM, Golden, Colorado)

"Whole Value Chain Carbon Capture, Utilization and Storage (CCUS) Conference" was an international Conference in Golden, CO, USA, Oct. 15-19th, 2018, emphasizing Whole Value Chain CCUS. The event was a collaborative effort between Petroleum Research School of Norway (NFiP), NorTex Petroleum Cluster, International Energy Cluster (IEC), ColNor Clean Energy Transition Research and Education Collaboration (ColNor) and Colorado School of Mines (CSM).

Out of 170 applicants, 50 graduate students were accepted from 9 selected countries: China, Japan, Brazil, USA and from 6 countries in Europe. Travel and one week accommodation for all were paid by NFiP, financially supported also by NFR/Climit. A total of 28 lecturers participated.

All presentations are found at the NFiP web-page:

<https://nfip.no/2018/06/14/coming-soon-whole-value-chain-carbon-capture-utilization-and-storage/>

The symposium objectives were to cover the Whole Value Chain approach of CCUS, including capture, transport, utilization and storage of CO₂. Successful global CO₂ storage in the amounts needed to mitigate global warming requires industry participation. To realize industrial CO₂ storage, sustainable economy, with opportunity to generate revenues, is crucial. CO₂ EOR provides such an economic opportunity and will simultaneously store the huge amounts of CO₂ required. This will provide synergy between the need for increased energy production and the need for reduction in emission of anthropogenic CO₂, by storage in sedimentary rocks.

A total of 68 industry, governmental and academic representatives participated, where 50 students from the following universities participated: NTNU (5), UoB (5), UoS (2), UoO (1), University of Southern California (1), Rice University (1), Texas A&M (1), University of Houston (1), University of Texas (9), Colorado School of Mines (8), SINTEF (1), Imperial College London (4), Southwest Petroleum University (3), State University of Campinas -UNICAMP (3), Technical University of Denmark – DTU (1), New Mexico Tech (1), UNIS (2), University of Denver (1).

Link to the conference: <https://nfip.no/2018/06/14/coming-soon-whole-value-chain-carbon-capture-utilization-and-storage/>

2018 Student/ Researcher Exchange

NFiP promotes and supports collaborative international petroleum research initiatives; preferentially between universities that have signed MoU's with NFiP, by providing financial travel support for students. NFiP has negotiated 3 additional MoUs during the project period: U. of Texas A&M at Corpus Christi, U. of Barcelona and Danish Technical University, the latter two still pending. Previously NFiP has signed MoU with 8 universities in the US and 3 universities in Europe.

NFiP Short Term Exchange Program (STEP) financially supports students to spend collaborative research time in counterpart countries of international research collaborations. During 2018 the following student exchange programs were granted financial support:

First Name	Surname	Affiliation	Destination	From	To
Helene Meling	Stemland	University of Bergen	Stanford, US	03.01.2018	03.01.2019
Fernando	Borras	University of Barcelona	University of Bergen	30.01.2018	30.04.2018
Tore	Føyen	University of Bergen	Texas, US	15.04.2018	29.04.2018
Muhammad Awais	Ashfaq Alvi	University of Stavanger	NTNU	25.06.2018	01.09.2018
Metin	Karakas	University of Southern California	University of Bergen	03.09.2018	21.09.2018
Metin	Karakas	University of Southern California	University of Bergen	01.04.2019	21.04.2019
Ilias	Gavrielatos	University of Tulsa	University of Bergen	22.07.2018	31.07.2018
Ricardo Vasconcellos	Soares	University of Stavanger	Sibiu, Romania	22.07.2019	02.08.2019
Fredrik	Wesenlund	University of Tromsø	University of Oslo	03.03.2019	31.03.2019
Ilias	Gavrielatos	University of Tulsa	University of Bergen	02.06.2019	02.09.2019

During 2018 the following student were supported with maximum 5000 NOK to attend conferences:

First Name	Surname	Affiliation	Destination	From	To
Mario	Silva	University of Stavanger	Abu Dhabi	12.03.2018	16.03.2018
Mahmoud	Khalifeh	University of Stavanger	Denver, US	10.06.2018	14.06.2018
Valentin	Zuchuat	University of Oslo	Edinburgh, UK	17.12.2018	20.12.2018
Solveig	Riisøen	University of Stavanger	AERC, Slovenia	07.04.2019	11.04.2019

2018 student exchange programs

PhD student Helene Meling Stemland, Univ. of Bergen, Norway – visit at Stanford University, USA

Project Name: Seismic analysis in Arctic environments
Institution: University of Bergen
PhD student: Helene Meling Stemland
Project Supervisor: Tor Arne Johansen, Bent Ole Ruud, Leiv-J. Gelius
Institution Visited: Stanford University
Hosted By: Jon F. Clearbout and Gary Mavko
Period: Jan. 3rd, 2018 - Jan. 3rd, 2019

Project Summary:

The objective of this project is to perform seismic measurements in arctic environment. More specifically, to study challenges related to arctic conditions and methods to ensure improved data quality and handling. Jon F. Clearbout and Gary Mavko from the Geophysics Department at Stanford University will contribute to the research project by providing guidance and opportunities for the PhD candidate related to automatic wave separation and elastic properties and temperature sensitivity. Research within this topic can provide valuable knowledge for monitoring of permafrost and potential hydrocarbon survey in the Arctic.

BSc student Fernando Borrás, Univ. of Barcelona, Spain – visit at University of Bergen, Norway

Project Name: Upscaling and implementation of CO₂ foam
Institution: Univ. of Barcelona, Spain
PhD student: Fernando Borrás
Project Supervisor:
Institution Visited: University of Bergen, Department of Physics and Technology
Hosted By: Arne Graue, Martin Fernø, University of Bergen
Period: Jan. 30th - Apr. 30th, 2018

Project Summary:

The objective of this project is to demonstrate the efficiency and viability of implementing CO₂ foam EOR method at the Stockton oil field in the Permian Basin of West Texas. In this project, the characteristics of Queen Formation as main reservoir of the Stockton field are explained, as well as the source rocks that have produced the hydrocarbons and the underlying trapping mechanisms of the reservoir. The geological features and some physical parameters of the reservoir rocks from thin-sections, core samples and also well logs are analysed and interpreted. Obtaining this geological data of the reservoir rock can further accelerate full-scale implementation of CO₂ foam EOR.

PhD student Tore Føyen, Univ. of Bergen, Norway – visit to Texas A&M Corpus Christi campus, USA

Project Name: SPE IOR and Texas A&M Corpus Christi campus
Institution: University of Bergen, Department of Physics and Technology, and SINTEF Industry
PhD student: Tore Føyen

Project Supervisor: Arne Graue, University of Bergen
Institution Visited: Texas A&M Corpus Christi
Hosted By: Richard B. Coffin
Period: Apr. 15th - Apr. 29th, 2018

Project Summary:

This project combined participation at the SPE Improved Oil Recovery 2018 conference in Tulsa, Oklahoma with the course Geochemical Assessment of Subsea Engineering, Corpus Christi. The course At Texas A&M Corpus Christi campus emphasized environmental concerns during subsea operations and was lectured by Richard B. Coffin, Ph.D and Chair of the Department of Physical and Environmental Sciences. This course was a geochemical assessment of subsea engineering related to energy mining and carbon sequestration with a focus on environmental impact and platform and pipeline stability.

PhD student Muhammad Awais Ashfaq Alvi, Univ. of Stavanger, Norway – visit at NTNU, Trondheim

Project Name: Functionalization of nanoparticles
Institution: University of Stavanger, Norway
PhD student: Muhammad Awais Ashfaq Alvi
Project Supervisor: Mesfin belayneh Agonafir and Kjell Kåre Fjelde, University of Stavanger
Institution Visited: NTNU, Trondheim, Norway
Hosted By: NTNU NanoLab
Period: Jun. 25th - Sep. 01st, 2018

Project Summary:

Nanomaterials can address a multitude of issues in the fields of oil and gas industry, like improving drilling fluids, enhance oil recovery and improved oil well cementing. In the current project, challenges associated with conventional drilling fluid, cementing and enhanced oil recovery will be focussed. The PhD research work will therefore develop systems that improve problems related in oil and gas wells. Studies with commercial nanoparticles showed that Fe₂O₃ nanoparticles having concentration of 0.0095 wt. % reduced the friction coefficients of the laboratory drilling fluids by 43 % as well as the API static filtrate loss is reduced by 14.3 % . Since at the moment commercial nanoparticles are used, however major goal of this PhD is to develop novel system based on nanoparticles and also to investigate the mechanism by which nanoparticles are improving the performance of systems in oil and gas sector. Therefore it is decided to perform this experimental work at Norwegian University of Science and Technology (NTNU) to utilize the state of art facilities at NTNU NanoLab.

During the stay various research task will be performed, some of them are functionalization of commercial nanoparticles with different polymers as well as synthesis and functionalization of a novel system based on nanoparticles. These particles will be used in improving the issue related to drilling fluids, EOR and oil well cementing which can benefit oil and gas industry. Variety of characterization techniques like Dynamic light scattering (DLS), Ultraviolet–visible spectroscopy (UV-Vis), X-ray Powder Diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR) and Electron microscopy will be used throughout this study.

PhD student Metin Karakas, Univ. of Southern California, USA – visit at University of Bergen, Norway

Project Name: CO₂ EOR mobility control
Institution: University of Southern California/University of Bergen
PhD student: Metin Karakas
Project Supervisor: Arne Graue, University of Bergen
Institution Visited: University of Bergen, Department of Physics and Technology
Hosted By: Arne Graue, University of Bergen
Period: Sep. 3rd - 21st, 2018 and Apr. 1st - 21st, 2019

Project Summary:

Recently, resistivity and pressure measurements have been proposed to determine the effectiveness of foam as a Mobility Control Method and hence, provide a way to remedy any under-performing foam (and CO₂-foam) floods as well as to improve the oil recovery. Reservoir monitoring (and control) is crucial for the application of foam (and CO₂ foam) in reservoirs where heterogeneity is involved. Currently, this methodology has been demonstrated using simplified reservoir models. Additional research and development is required to extend this work to more realistic heterogeneous reservoir conditions. This project will extend on earlier works done at UiB to pilots with multiple observation wells which provide key reservoir data (saturation changes) as the injected fluids advance in the reservoir. By incorporating data from observation wells, we will show how to reduce uncertainties.

Research objectives are to develop an CO₂-EOR-Foam Implementation Methodology (Reservoir Workflow) for realistic reservoir conditions, to model and identify effective and low-cost monitoring techniques for CO₂ Foam Injection, and finally to evaluate various Reservoir Optimization ideas for CO₂-FoamEOR.

PhD student Ilias Gavrielatos, Univ. of Tulsa, USA – visit at University of Bergen, Norway

Project Name: Core-scale emulsion formation in EOR processes
Institution: University of Tulsa, USA
PhD student: Ilias Gavrielatos
Project Supervisor: Ovadia Shoham and Ram Mohan
Institution Visited: University of Bergen, Department of Physics and Technology
Hosted By: Arne Graue, University of Bergen
Period: Jul. 22nd - 31st, 2018

Project Summary:

This project is related to multi-phase flow and/or Enhanced Oil Recovery operations and oil-water emulsions. The research will build on the separation kinetics of oil/water emulsions stabilized by nanoparticles of different wettabilities. The main purpose of this exchange program is to see how the research facilities of the EOR laboratory can be coupled to a Portable-Dispersion Characterization Rig to better understand emulsion formation in the cores and ultimately increase the efficiency of Enhanced Oil Recovery operations.

PhD student Ricardo Vasconcellos Soares, Univ. of Bergen, Norway – visit to Summer School on Data Assimilation in Sibiu, Romania

Project Name: The Data Assimilation Summer Course
Institution: University of Bergen, Norway
PhD student: Ricardo Vasconcellos Soares
Project Supervisor: Guttorm Alendal and Xiaodong Luo, University of Bergen
Institution Visited: Lucian Blaga University, Sibiu, Romania
Hosted By: Faculty of Mathematics and Computer Science, Lucian Blaga University
Period: Jul. 22nd - Aug 2nd, 2019

Project Summary:

The focus of the PhD research is the use of seismic and production data in the data assimilation process utilizing an automated reservoir-modeling workflow. The research is divided into two main parts: (1) identification of better methodologies capable of processing and extracting useful information from seismic data (big data); and (2) use of this information in the data assimilation process to improve knowledge of the reservoir behavior. The primary objective of the Data Assimilation Summer Course is to educate and to familiarize graduate students with basic concepts and in-depth topics of the data assimilation paradigms and its applications. The secondary objective is to set up the environment for discussions and debates concerning big data challenges.

Some of the covered topics in the course include: Ensemble Kalman Filter; Variational Methods for Data Assimilation; Particle Filter and Hybrid Filter; Scientific Programming using C and Python, Parallel Programming using MPI; Ensemble based Assisted History Matching in Modern Reservoir Engineering; Risk and Safety Issues among others. The concepts and discussions about these topics involved in the course will be of a great value to improve the overall understanding of basic concepts and main applications. Consequently, the results of the PhD research can also be improved. The Data Assimilation Summer Course is a reference for people working with ensemble-based methods in data assimilation problems, as it puts together reference scientists in the area from different places (Norce, Equinor, TU Delft, UT Austin etc) to share knowledge and experiences.

PhD student Fredrik Wesenlund, University of Tromsø – visit at University of Oslo, Norway

Project Name: Organic geochemical characteristics
Institution: University of Tromsø, Norway
PhD student: Fredrik Wesenlund
Project Supervisor: Sten-Andreas Grundvåg, Olaf Thiessen and Jon Halvard Pedersen
Institution Visited: University of Oslo, Norway
Hosted By: Org. Geochemical Lab
Period: Mar. 3rd - 31st, 2019

Project Summary:

The overall aim of the project is to provide a link between the organic geochemical characteristics and the sedimentological features observed in these Middle Triassic source rocks, as Svalbard represents an exhumed part of the northern–northeastern Barents Sea. The Botneheia Formation can be readily traced offshore to the east. The analyses that need to be performed are therefore important in order to understand the depositional environment, petroleum potential, thermal maturity and source rock–oil correlation of the source rocks in the offshore areas. So far, four field expeditions to Svalbard have resulted in a large sample database which have yet to be analyzed geochemically. The analysis includes: 1) SOXTEC extraction. To analyze the organic molecular matter in shales, it is essential to extract the relevant compounds by using a SOXTEC HT 1043 Extraction Unit. 2) Gas chromatography - flame ionization detection. The extracts will be analyzed for their n-alkanes and selected terpenoids (especially pristane and phytane). The objective is to fingerprint the oil, and quantify relative amounts of compounds which is used to determine degree of biodegradation, thermal maturity, source rock depositional environment and organofacies. 3) Gas chromatography - mass spectrometry. Mass spectrometry analysis allow to determine relative amounts of biomarkers, which allows to look deeper into the source rock geochemistry. The objective is to quantify and use these parameters to interpret depositional environment, maturity, age specific biomarkers, source–oil correlation and organofacies in the rock formation.

PhD student Ilias Gavrielatos, Univ. of Tulsa, USA – visit at University of Bergen, Norway

Project Name: CO₂ nanoparticle and surfactant stability
Institution: University of Tulsa, USA
PhD student: Ilias Gavrielatos
Project Supervisor: Ovadia Shoham and Ram Mohan
Institution Visited: University of Bergen, Department of Physics and Technology
Hosted By: Arne Graue, University of Bergen
Period: Jun. 2nd - Sep. 2nd, 2019

Project Summary:

This project expands on previous research on the stability of nanoparticle and surfactant oil-water emulsions. The current series of experiments is comparing nanoparticle emulsions to surfactant emulsions under high temperatures and high salinities. Once this series is completed, the stability of nanoparticle foams will be compared to that of surfactant foams under the same operating conditions. The main objective of the first stage of the project is to identify systems (emulsions and/or foams) of

high stability using the state-of-the-art P-DCR facility available here at TU. The second stage of the collaborative project aims to test further the identified systems (from stage 1) inside reservoir analogues under high pressures and comprises the following activities: The identified systems will be tested inside the 2-D pore network of the silica-wafer micro-models under high pressure. A refractive optical microscope will be used to acquire images, monitor multiphase flow, study flow patterns, and gain insights regarding system stability within the porous medium. Results from these activities will be of importance to optimizing CO₂-foam EOR operations and developing nanotechnologies that will increase oil recoveries in the field through efficient EOR processes.

2018 Board Meetings

Two Board Meetings were held in 2018; Jan. 30th, and Sep. 27th. Additionally, two circulation cases were included in the Board Activities.

2018 Chairman Activities

NFiP and NorTex were promoted by visits and presentations at: Univ. of Texas A&M, Corpus Christi, TX, USA, Rice Univ. and Univ. of Houston, TX, USA, USC, CA, USA, AGH U. in Krakow, Poland, ConocoPhillips, Bartlesville, OK, USA, Imperial College, BP Sunbury and CSLF in London, UK, Repsol, Madrid, Spain, USDOE, Washington DC, USA, CSLF, Abu Dhabi, UAE, DGH in New Delhi, India and OED, NPD and NRC in Norway.

Chairman of the Executive Board of NFiP and NorTex Petroleum Cluster has participated/presented at various occasions and events.

2018 selected invited scientific talks by the Chairman; where NFiP and NorTex were presented:

1. Arne Graue: "CO₂ Foam EOR for Mobility Control – Preparations for Two Field Pilots in Texas", Statoil Research Center, Trondheim, Febr. 6th, 2018.
2. Arne Graue: "CO₂ Field Pilots and Research Collaboration with USA», Ministry of Petroleum and Energy, Oslo, Febr. 9th, 2018.
3. Arne Graue: "CO₂ Field Pilots and Research Collaboration with USA», IEA, Oslo, Febr. 9th, 2018.
4. Arne Graue: "Petroleum Research School of Norway", U. of Oslo, Oslo, Febr. 15th, 2018.
5. Arne Graue: "Petroleum Research School of Norway", U. of Stavanger, Stavanger, Febr. 21st, 2018.
6. Geir Ersland and Arne Graue: "Applications of CO₂ as CCUS Efficient, Cost Saving and More Sustainable Petroleum Production", Joint Force Seminar, Norwegian Petroleum Directorate, April 9th, 2018.
7. Arne Graue: "CO₂ Foam EOR Field Pilots and other CCUS activities", NRC US-Bilateral, Oslo, May 2nd, 2018.
8. Arne Graue: "CO₂ Foam EOR", EOR Workshop, BASF/Wintershall, Ludwigshafen, May 14-15th, 2018
9. Arne Graue: "Research Collaboration Potentials between Equinor and Petroleum and Process Technology at UiB", Equinor, July 4th, 2018.
10. Arne Graue: "CO₂ Enables Petroleum as Energy Security in More Sustainable Energy for the Future", Oil and Gas Institute, Krakow, Poland, July 10th, 2018
11. Arne Graue; "ColNor Clean Energy Research and Educational Collaboration" and "CCUS Week in Golden, Oct. 15-19th, 2018", Colorado School of Mines, Golden, CO, USA, August 24th, 2018.

NFiP Web-site

The NFiP web-site has been further improved and updated through 2018: <https://nfip.no/>

The NFiP secretariat, at Dept. of Physics and Technology, UiB, with Assoc. Prof. Martin Fernø as coordinator, and Else Johannesen as secretary, has been of great value for the 2018 activities.

February 1st, 2019

Arne Graue

Chairman of the Executive Board