ANNUAL REPORT 2018

The National IOR Centre of Norway

THE 2018 PARTNERS

University of Stavanger

NORCE

IFE

NEPTUNE ENERGY

wintershall

eni

vår energi

TOTAL

HALLIBURTON

Schlumberger

ConocoPhillips

Lundin Norway

equinor

DEA

AkerBP

OBSERVERS

With funding from
The Research Council of Norway

NORWEGIAN PETROLEUM DIRECTORATE

petoro

CONTENT

MANAGEMENT

Merete Vadla Madland, Centre director
Aksel Hiorth, Research director/leader theme 1
Randi Valestrand, Research director/leader theme 2
Sissel Opsahl Viig, director of field implementation
Svein M. Skjæveland, director of academia

BOARD

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Martin Foss, IFE

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Anders Soltvedt, Norwegian Petroleum Directorate
Erik Søndenå, Petoro

TECHNICAL COMMITTEE

Consists of representatives from each user partner.

Niels Lindeloff, Total E&P Norge AS (head)
Andrea Reinholdtsen, ENGIE AS
Bjørn Gulbrandsen, Lundin Norway AS
Roar Kjelstadli, AkerBP
Robert Moe, ConocoPhillips Scandinavia AS
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Johanna Ravnås, DEA Norge AS

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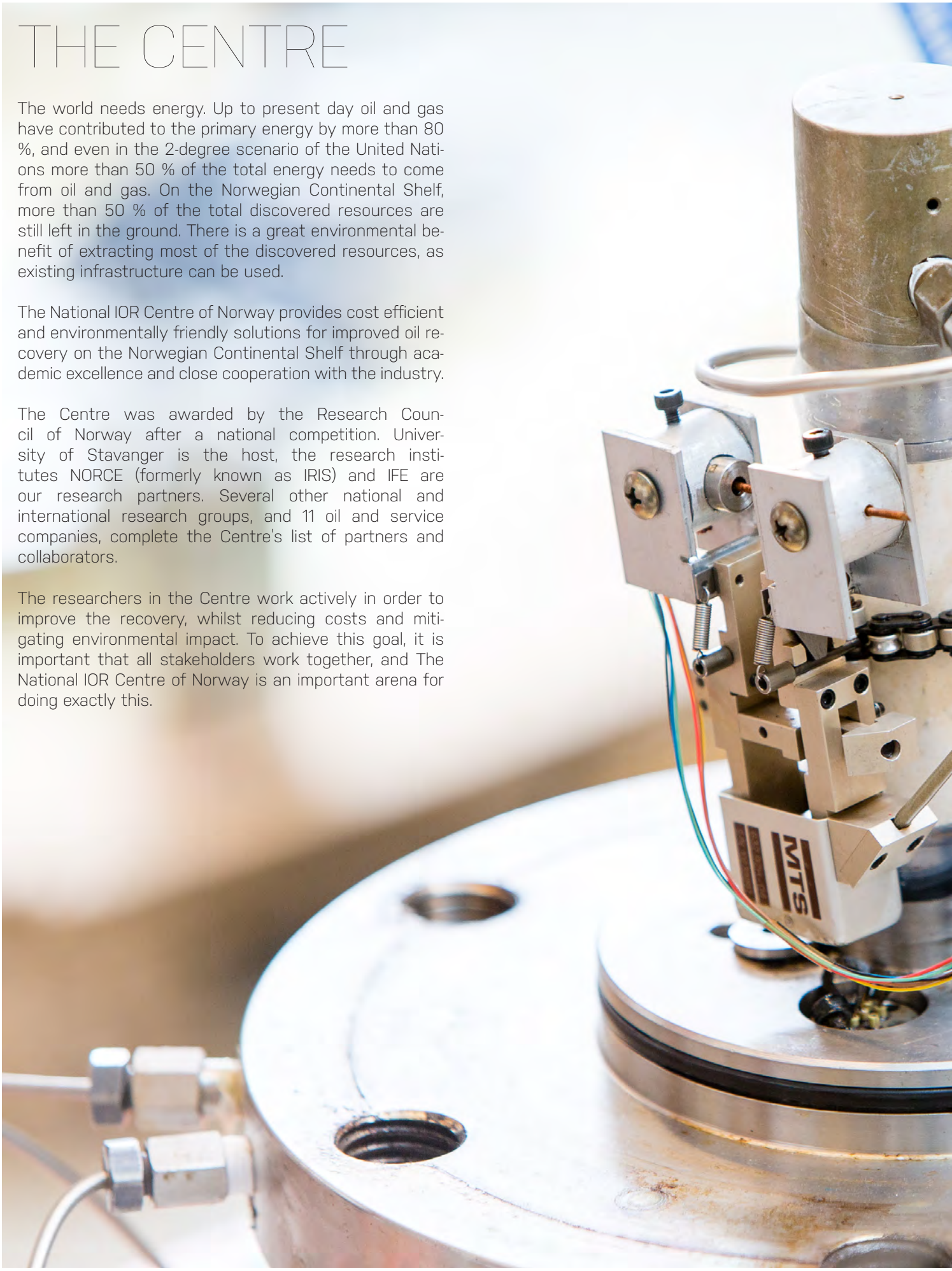
THE CENTRE

The world needs energy. Up to present day oil and gas have contributed to the primary energy by more than 80 %, and even in the 2-degree scenario of the United Nations more than 50 % of the total energy needs to come from oil and gas. On the Norwegian Continental Shelf, more than 50 % of the total discovered resources are still left in the ground. There is a great environmental benefit of extracting most of the discovered resources, as existing infrastructure can be used.

The National IOR Centre of Norway provides cost efficient and environmentally friendly solutions for improved oil recovery on the Norwegian Continental Shelf through academic excellence and close cooperation with the industry.

The Centre was awarded by the Research Council of Norway after a national competition. University of Stavanger is the host, the research institutes NORCE (formerly known as IRIS) and IFE are our research partners. Several other national and international research groups, and 11 oil and service companies, complete the Centre's list of partners and collaborators.

The researchers in the Centre work actively in order to improve the recovery, whilst reducing costs and mitigating environmental impact. To achieve this goal, it is important that all stakeholders work together, and The National IOR Centre of Norway is an important arena for doing exactly this.



OVERALL AIM

The Centre will contribute to the implementation of cost efficient and environmentally friendly technologies for improving oil recovery on the Norwegian Continental Shelf.

SECONDARY OBJECTIVES

- Robust upscaling of recovery mechanism observed on pore and core scale to field scale.
- Optimal injection strategies based on total oil recovered, economic and environmental impact.
- Education of 20 PhD students and 8 postdocs during the lifetime of the Centre.

GREETINGS FROM THE DIRECTOR

Many large and legacy fields at the NCS are already mature with rapid production decline, and the time is now critical to implement IOR, including EOR technologies. Through the Centre's work and interactions with industry partners, it has become evident that one of the major showstoppers for field implementation of IOR on the NCS is the lack of large-scale testing and infrastructure for these kind of tests. This specific need is also highlighted in NPDs Resource Report 2017: "Norway has built up a petroleum industry with world-class specialists involved in research and technology development. However, many good ideas get no further than laboratory testing. Some have a considerable chance of success, but need full-scale testing or field trials under real conditions."

Since start up, the Centre has completed a successful yard test on polymer degradation in 2015 and in 2018 another large-scale test evaluating the thermally triggered polymers such as associative polymers to study polymer retention, polymer propagation and thermal-activation mechanism, has been planned, designed and rigged up with a temporary test rig at Halliburton`s facilities. Some initial calibration tests have already been run while the real large scale experiment will be performed early next year and the results from that will then be compared with recently concluded laboratory experiments.

The "Norwegian Roadmap for Research Infrastructure 2018" published by the Research Council of Norway (RCN) states that there will be significant future demand for infrastructure that provides facilities for value-adding research to corroborate and test new technologies in the petroleum sector.

I am excited upon the results from the Centre`s new upcoming large scale test and believe that research on IOR and EOR is one of the areas where huge technological advances and added value can be created if facilitated by improved large scale infrastructure.

Merete Vadla Madland, Centre director

Photo: Jan Inge Haga

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GREETINGS FROM THE CHAIRMAN

The National IOR Centre of Norway has progressed in the last year very much towards implementation and concretization of the first five years of efforts.
For this work, the Centre has received important recognition from world leading peers and The Research Council of Norway. The Centre is following a roadmap built in dialogue with the industry partners and is delivering needed knowledge, workflows, softwares and operational IOR/EOR methods.

Main deliveries include:

- Improved decision making with advances in simulation to better assess the microscopic mechanisms of EOR strategies as well as to provide the full field value of their potential implementation.
- Increased robustness in identifying remaining targets by designing and implementing automated history matching workflows including 4D data and by facilitating uncertainty centric workflows by supporting the development of open source softwares.
- New data acquisition measures for better decision making by maturing the use of a new type of tracers.
- Help in derisking the implementation of new EOR methods by developing large scale testing capabilities and thereby increasing the understanding of physical processes and operational risks.

The Centre has strengthened over time the collaboration with the industry, specifically by setting up topic specific workshops involving company experts. This is ensuring continued value of the initiatives and steady progress towards pilots of new technologies and workflows designed to maximize oil recovery on the NCS and beyond.

Thierry Laupretre, Chairman of the Board

Photo: Kjersti Riiber

Annual Report 2018

The National IOR Centre of Norway

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MANAGEMENT

MERETE VADLA MADLAND is professor in reservoir technology at University of Stavanger. In autumn 2013 she was appointed director of The National IOR Centre of Norway. She holds a Dr. ing.-degree in geomechanics from University of Stavanger and has been supervising more than 150 undergraduate and graduate students. The last 18 years she has worked on developing new methods for effective extraction of oil from reservoir rocks. She has been heading several research projects funded by the Research Council of Norway as well as a number of industry funded projects. Her research focuses on understanding the physical and chemical interactions between rocks and fluids on the pore and core (nano/micro) scale and how these can be transferred to the field (macro) scale. Her research is presented in more than 100 scientific publications and she has given several keynote presentations at national and international conferences/symposiums. Madland has served on numerous boards. She has been member of the Granting Committee for FRINATEK since 2014, the OG21 Board representing the University sector since 2017, and the NPF Stavanger Board since 2018.

AKSEL HIORTH is chief research scientist within enhanced oil recovery (EOR) at NORCE (formerly known as IRIS) and professor within reservoir technology at the University of Stavanger. Currently he is research director for theme 1 at The National IOR Centre of Norway. He has a PhD within theoretical physics from University of Oslo, and has been principal investigator within several large research projects supported by the industry and the Research Council of Norway. In the last decade he has mainly worked with developing simulation models that can describe the physical and chemical processes taking place during multiphase flow in porous rocks. He has published more than 75 scientific papers.

RANDI VALESTRAND is the research director at NORCE heading the Data Assimilation and Optimization group located in Bergen. Valestrand is research director for theme 2 in The National IOR Centre of Norway. She holds a PhD degree in physics from University of Bergen. Since 1999 she has worked with research within the petroleum sector with main focus on parameter estimation, history matching, reservoir characterization and data assimilation. She has worked in NORCE since 2002 and has frequently worked as project leader for large projects sponsored by the industry and the Research Council of Norway.

SISSEL OPSAHL VIIG is holding a position as a senior scientist with the Petroleum Technology Division at Institute for Energy Technology (IFE). Viig is director of field Implementation in the Centre. She has a master degree in nuclear chemistry from University of Oslo. Since 2003 she has worked with research within tracer technology with main focus on development of tracer methods for reservoir evaluation, tracer methods for determination of residual oil saturation and analytical chemistry. She is frequently working as project leader for several research projects with national and international industry partners.

SVEIN M. SKJÆVELAND is a reservoir engineering professor at University of Stavanger with a PhD from Norwegian University of Science and Technology in engineering physics and a PhD in petroleum engineering from Texas A&M University. He is director of Academia at The National IOR Centre of Norway. At UiS (Rogaland Regional College) he worked to establish the master and PhD programs in petroleum engineering and geoscience and to develop the research organization IRIS (Rogaland Research). He is an appointed «Oil Man of the Year», and has won many prizes. During 1992-94 he was an elected rector and has held many adminstrative positions in academia. He has published papers in the fields of physics, reservoir engineering, and multiphase flow in porous media.

Niels Lindeloff
Head of Technical Committee

Thierry Laupretre
Chairman of the Board

Merete Vadla Madland
Centre Director

Aksel Hiorth
Research Director
Leader Theme 1

Randi Valestrand
Research Director
Leader Theme 2

Sissel Opsahl Viig
Director of Field Implementation

Svein M. Skjæveland
Director of Academia & Research

Arne Stavland
Leader Task 1
Core scale

Udo Zimmermann
Leader Task 2
Nano/submicron scale

Espen Jettestuen
Leader Task 3
Pore Scale

Aksel Hiorth
Leader Task 4
Upscaling

Tor Bjørnstad
Leader Task 5
Tracer Technology

Robert Klöfkorn
Leader Task 6
Reservoir simulation

Geir Nævdal
Leader Task 7
Field scale evaluation

TASK LEADERS

Task 1: Core scale
Leader: Arne Stavland, NORCE

Arne Stavland is a chief scientist at NORCE where he has worked for 30 years. His main interests are in enhanced oil recovery and chemical water control. He holds an M.Sc. degree in physics from Norwegian University of Science and Technology in Trondheim.

Task 2: Mineral fluid reactions at nano/submicron scale
Leader: Udo Zimmermann, UiS

Udo Zimmermann is professor at UiS. His research has focused on provenance techniques and reservoir characterization using petrography, heavy minerals and geochemical and isotope geochemical methods in clastic and chemical sedimentary rocks of Archean to Phanerozoic ages.

Task 3: Pore scale
Leader: Espen Jettestuen, NORCE

Espen Jettestuen is a senior researcher at NORCE. His main interests are with rock-fluid interactions and how these influence the properties of reservoir rock on the microscopic scales. He holds a PhD in physics from the University of Oslo.

Task 4: Upscaling and environmental impact
Leader: Aksel Hiorth, UiS/NORCE

Aksel Hiorth is chief research scientist at NORCE and professor within reservoir technology at the University of Stavanger. His main interest is developing simulation models that describe the physical and chemical processes during multiphase flow in porous rocks.

Task 5: Tracer technology
Leader: Tor Bjørnstad, IFE

Tor Bjørnstad is at present special advisor at IFE within reservoir technology, and Prof. Em. in nuclear chemistry at University of Oslo. Main interests: Tracer technology, IOR and flow assurance. He holds a PhD (Dr. Philos.) in Nuclear Chemistry from UiO.

Task 6: Reservoir simulation tools
Leader: Robert Klöfkorn, NORCE

Robert Klöfkorn is a senior researcher at NORCE. He holds a Dr. rer. nat. in applied mathematics from the University of Freiburg. His research interests are scientific computing and software development with focus on computational methods for partial differential equations and its applications.

Task 7: Field scale evaluation and history matching
Leader: Geir Nævdal, NORCE

Nævdal is working as chief scientist at NORCE. His research interests include reservoir characterization, data assimilation and production optimization, and his main research focus is the use of ensemble based methods for updating reservoir models. He holds a PhD in mathematics from NTNU.

THE SCIENTIFIC ADVISORY COMMITTE MEETS THE PHDS


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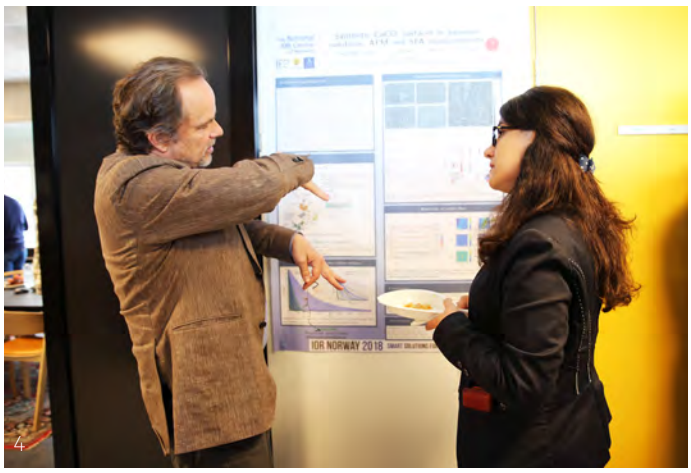

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Top left: 1. Postdoc Pål Østebø Andersen and PhD student Irene Ringen. 2. Professor Ann Muggeridge and PhD student Remya Nair. 3. Professor Ann Muggeridge. 4. Director at Max Planck Institute, Stephan Herminghaus and PhD student Shaghayegh Javadi. Photos: Kjersti Riiber

MANDATE:

- The main task of SAC is to advise and evaluate the scientific performance of The National IOR Centre of Norway in relation to the Centre's vision, objective and research plans including PhD projects.
- SAC will meet with The Centre's Management Team, Task Leaders and Project Leaders once a year. Between meetings the Centre director and theme leaders are encouraged to seek advice from SAC on important decisions relating to the scientific performance.
- SAC must be composed of international experts collectively covering the scope of work carried out in The National IOR Centre of Norway.
- The committee will report to the Centre director and the management team.

MEMBERS:

- YU-SHU WU

Professor, Foundation CMG Reservoir Modeling Chair, and the Director of Energy Modeling Group (EMG) Research Center in the Petroleum Engineering Department at The Colorado School Of Mines (CSM)

- STEPHAN HERMINGHAUS

Director at the Max Planck Institute for Dynamics and Self-Organization

- WILLIAM R. ROSSEN

Professor in Reservoir Engineering, Department of Geoscience and Engineering,
Delft University of Technology

- ANN MUGGERIDGE

Professor of Reservoir Physics and EOR, Dept. of Earth Science and Engineering,
Imperial College London

2018 WAS HIS LAST YEAR AS HEAD OF TECHNICAL COMMITTEE

2018 was another year of high activity in The National IOR Centre of Norway and in the industry in general. It was also yet another year with many changes. We live in a dynamic world and change is a fundamental boundary condition for most of us. For some, including myself, the changes included the name of the company we work for, be it due to merger and acquisition activities or as part of rebranding efforts. As a result you will also see some changes in the list of industry partners in the IOR Centre for 2019.

The climate change agenda is receiving an ever increasing attention from society around us. In response we need to articulate clearly how we can contribute constructively to keeping the wheels of society turning by helping provide the energy needed – in a way that is responsible and with proper attention to health, safety and environment. The National IOR Centre of Norway increased the focus on environment in relation to our projects during 2018 and the effort was kicked off with a risk assessment workshop hosted by Halliburton.

Additional workshops organized by the Centre in collaboration with the member companies focused on describing a roadmap for bringing EOR to the field and on our core technologies, polymer and smart water EOR. Finally, a workshop dedicated to modeling these using IORsim. These workshops were well attended by the partner companies and researchers from the Centre, and a big «Thank you» goes out to the organizers, contributors and participants for making these workshops a success and in particular to Schlumberger, ENI and the IOR Centre for organizing and hosting the events.

A number of projects have been concluded during 2018 and the researchers and PhD students involved are congratulated for their achievements and for successfully concluding their studies. The excellent results and reporting of these are much appreciated by the member companies. This is also evidenced by the high number of contributions from the IOR Centre accepted for publication or presentation at conferences within our scientific community.

On a personal level, the end of 2018 also marks the end of my turn as leader of the technical committee. It has been a pleasure to work with inspiring and enthusiastic colleagues both from the other industrial partners, the contributing researchers and students and not least from the Centre management. Thanks to all of your efforts we have a solid workplan and roadmap for the year ahead. With the commitment from the Research Council of Norway to approve the next three years of the IOR Centre's activities, we can look forward to many good and interesting results to come.

All the best,
Niels Lindeloff

When the TC meets the discussion is active and the engagement high. Needless to say the industry partner representatives and the researchers of the Centre want progress in the projects.

Amare Mebratu from Halliburton and Andrea Reinholdtsen from Neptune Energy (former Engie) are two of the members in Technical Committee. Photos: Kjersti Riiber

The Technical Committee at The National IOR Centre of Norway have 4-5 meetings each year. The most important task of TC is to plan for future research projects at the Centre.

THE RESEARCH THEMES

The research in the Centre is organised in two R&D themes with seven main Tasks, which are specified by a research plan covering deliverables, milestones and methodologies.
Researchers from UiS, NORCE, and IFE serve as task leaders. As an overall strategy in these tasks, we involve researchers from different research environments (Improved Oil Recovery / Enhanced Oil Recovery, reservoir, chemistry, geology, geochemistry, geophysics, mathematics, physics, nano- science/ technology, biochemistry, environmental, industrial economy) from the partners as well as national and international collaborators.

1: MOBILE AND IMMOBILE OIL AND EOR METHODS

In theme 1 the main goal is to understand, model, and upscale the microscopic and macroscopic displacement efficiency when various EOR fluids are injected into a porous rock. The environmental impact is addressed through a fundamental understanding of the amount of chemicals needed to efficiently displace the oil and the fate of the chemicals from the injector to the producer.
EOR fluids interacts with the rock, alters primary mineral phases, and their surface properties. Many EOR fluids are non-Newtonian (e.g. polymeric fluids), which behaves highly non-linear in complex and time dependent flow which is relevant for porous media. To solve these challenges we work at the submicron to characterize the rock before and after flooding, and quantify the changes induced by the pore water. The dynamic of polymeric liquids are investigated experimentally by performing experiments in porous rocks, capillary tubes, and Anton Paar Rheometer. The experiments are interpreted using molecular dynamic simulations, methods based on statistical physics, and by extending Darcy law. A multi scale understanding of the EOR processes secures that the reservoir scale models we develop are consistent with the underlying physical and chemical processes taking place in the pore space. This in turns allow us in a robust way to evaluate the potential of EOR operations for realistic cases, and the environmental impact.

2: MOBILE OIL – RESERVOIR CHARACTERISATION TO IMPROVE VOLUMETRIC SWEEP

In theme 2 we focus on improved reservoir modelling by simulation, optimization, and prediction, of IOR methods. This is done by; integration of all types of data (such as pressure data, production data, seismic data, tracer data, geophysical data, and geological data into the field scale simulation models); by developing improved simulation tools capable of handle/simulate the complexity of different IOR methods; and by developing new and improved tracers. We put emphasis on real fields and aim to develop methodologies that ease the decision making of a petroleum producing reservoir. The aim is to develop new and improved methodologies that will support the evaluation and decision making with regards to IOR/EOR pilots at the Norwegian Continental Shelf (NCS). This addresses the potential of producing the resources in unswept areas as well as mobilizing the trapped resources in swept areas. The research is focusing on challenges for the entire NCS while demonstrating the improved methodologies on real field cases.

THE RESEARCH TASKS

TASK 1: CORE SCALE
The aim is to design novel experiments on core scale and develop models that capture the transport mechanisms observed. The deliverables of this task will be chemical systems that can improve the microscopic and macroscopic sweep on clastic and chalk fields.

TASK 2: MINERAL FLUID REACTIONS AT NANO/SUBMICRON SCALE
The research is focused on rock-fluid interactions when injecting fluids into rock formations either clastic or chemical sedimentary rocks. We deliver methods in the field of electron microscopy, Raman spectroscopy, specific surface area measurements and X-Ray Diffraction for further investigations of EOR related experiments in the future. The geology of the hydrocarbon bearing formations plays a significant role in task 2.

TASK 3: PORE SCALE
The focus in this task is to study the interplay between fluid transport, mineral reactions and oil recovery in reservoir rocks at pore scale. The main aspects are to identify the mechanisms that influence transport and reactions on the pore scale using experiments and numerical modeling, and then to evaluate if these mechanisms are important on the core scale.

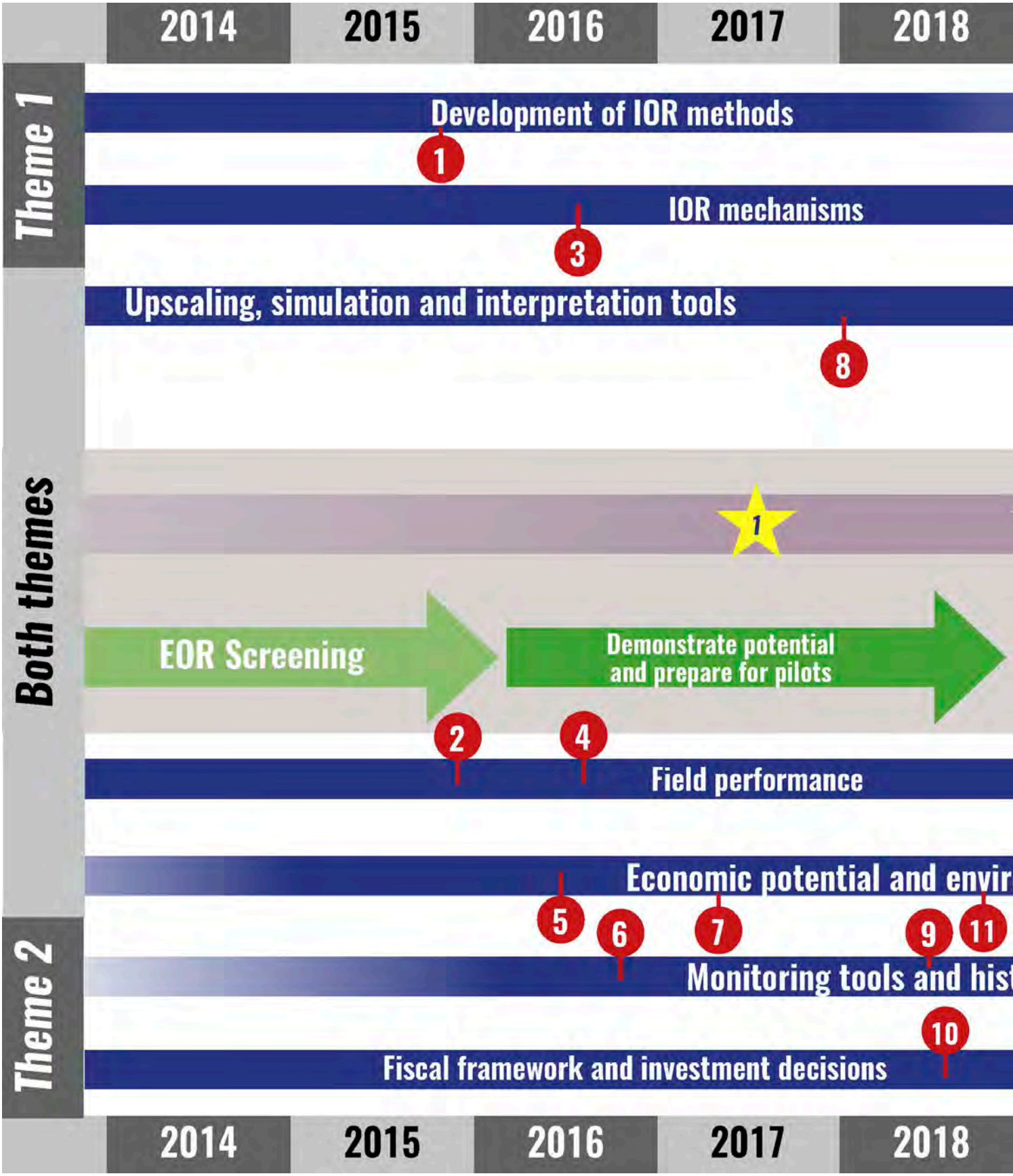
TASK 4: UPSCALING AND ENVIRONMENTAL IMPACT
The main objective is to translate the knowledge we have about EOR processes on core scale to field scale. The deliverables from this task will be simulation models and work flows that can be used to design IOR operations and interpret IOR implementations.

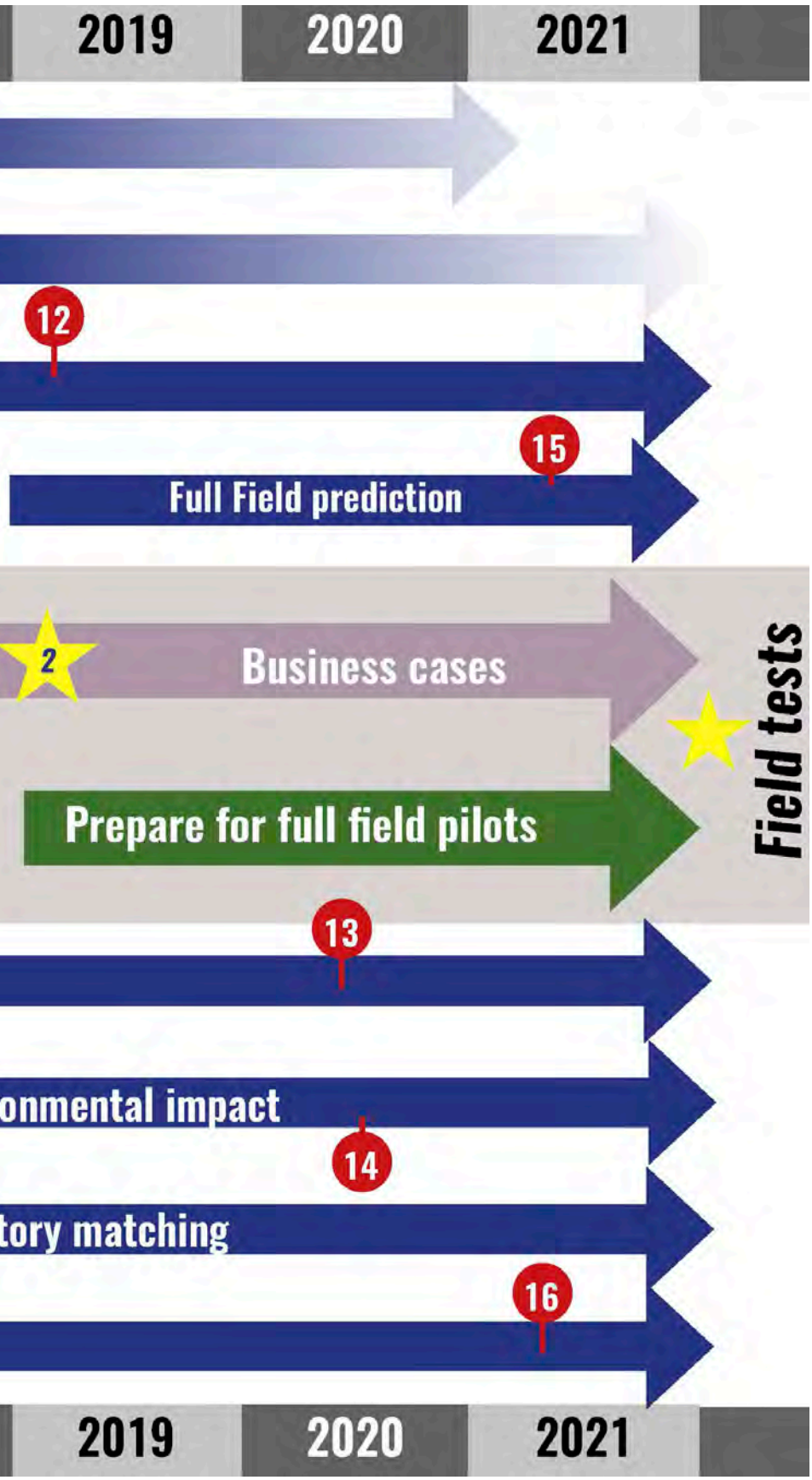
TASK 5: TRACER TECHNOLOGY
The objective is the development of tracer technology to measure reservoir properties and (changing) conditions during production. The most important condition is the (remaining) oil saturation, either in the flooded volume between wells (interwell examinations) or in the near-well region out to some 10 m from the well (single-well huff-and-puff examinations).

TASK 6: RESERVOIR SIMULATION TOOLS
The primary objective of this task is to advance the state-of-the-art of modeling and simulation in context of reservoirs. Such advance is needed to cope with the challenges arising from scientific questions and targets of The National IOR Centre of Norway.

TASK 7: FIELD SCALE EVALUATION AND HISTORY MATCHING
We are focusing on history matching, optimization and economical evaluation for improved decision making. A large focus has been on history matching using 4D seismic data, which means that we are tuning reservoir parameters to obtain reservoir models that are matching the actual observations. We are using ensemble based methods to this. That means that we are running with a set (an ensemble) of different realizations of the parameter set and use statistical methods to tune the parameters. The outcome is then a set of reservoir simulation models that are better aligned with the actual observations from the field.

THE ROADMAP & MILESTONES





1. Selection of suited field for single-well tests (access to field data)

2. Single-well pilot tests:
Smart water injection
Polymer injection

1. Selected IOR methods

2. Field data in place (injection, production and tracer data, 4D seismic and reservoir model/geo-model/ geomechanical model)

3. Input model parameters (from pore, core, sub-micron experimental and modeling R&D activities)

4. Large scale polymer shear degradation test

5. Economic potential of IOR methods

6. Monitoring tools: 4D seismic (front detection), tracer data (residual oil S_{or})

7. Conditioning of injection fluids

8. Reservoir simulation, geomechanics (e.g. Eclipse, Visage), tracer and IOR fluid simulation (IORSim)

9. Full field history matching with 4D seismic and tracer data

10. Viability of methods (fiscal framework and taxation)

11. Environmental impact of selected IOR methods

12. Tool-box for interpretation of pilot-tests

13. Pilot-tests conclusions (volumetric sweep/injection and production strategy, S_{or}, compaction impact, economic potential)

14. Economic potential of pilot-tests

15. Recommendation for comprehensi-ve and full-field tests

16. Economic potential of full-field tests at NCS

HIGHLIGHTS 2018

READY FOR THREE NEW YEARS

On the second day of the IOR NORWAY 2018 conference, the Research Council of Norway announced that The National IOR Centre of Norway will be given support for three new years.

The decision was taken in a board meeting in the Division for Energy, Resources and the Environment at the Research Council of Norway.

The last months of 2017, The National IOR Centre of Norway was evaluated. An expert panel visited the Centre in mid September, reviewed documents and interviewed both the management team and the PhD students. The conclusions were gathered in an evaluation report. This report formed the basis for determining whether the funding from the Research Council should be continued for further three years. The evaluation report concluded that the Centre is strong and well-run.

It was the Vice dean of research at University of Stavanger, Helge Bøvik Larsen, who announced the message of continued support.
«The report claims that the Centre can be said to be in the lead for IOR research internationally,» said Bøvik Larsen from the chair.

The evaluation report also provided advice on areas that could be improved – the environmental aspect was one of them. The Centre has now answered this by including environmental experts from the University of Stavanger and NORCE in the projects. In the first half of 2018, we have also organized several seminars with industry partners, including getting environmental risk assessment into the plans for the past three years.

Centre director Merete Vadla Madland could not get a better rounding off of the conference.
«We are ready for the last three years. With the support of the Research Council, we can continue to deliver outstanding IOR research here at the University of Stavanger towards 2021,» Madland said.

The Centre and its partners have already started planning for the future. Both University of Stavanger and our industry partners welcome continuation of our work, but the organization model is not decided yet.

Centre director Merete Vadla Madland gets the message of continued support. Photo: Marius Vervik

Former Minister of Petroleum and Energy, Terje Søviknes and Centre director Merete Vadla Madland. In the background Dean Øystein Lund Bø and leader of the NITO students Tobias Lynghaug. Photo: Kjersti Riiber

ASKED THE MINISTER FOR MONEY FOR LARGE SCALE TEST INFRASTRUCTURE

One of the last official visits for former Minister of Petroleum and Energy, Terje Søviknes was to University of Stavanger and The National IOR Centre of Norway. The message from the Centre management was clear; the government need to follow up on large scale testing. Now the same message goes out to Søviknes' successor Kjell-Børge Freiberg.

Minister of Petroleum and Energy, Terje Søviknes visited the University in Stavanger to participate in a panel debate on students' prospects in tomorrow's oil and energy sector. In addition to this event, the former Minister asked to get a tour of The National IOR Centre of Norway and an update on the current activities at the Centre.

It had only been one and a half year since the Minister's last visit to the Centre, but a lot had happened. Most important, the Centre is now ready for three new years of research, after the Research Council of Norway's decision to prolong their funding of the Centre.

After a short presentation of Centre affairs, the Minister got a lab tour. When visiting the SEM lab (scanning electron microscope laboratory), Centre director Merete Vadla Madland and research director Aksel Hiorth took the opportunity to tell the Minister about the need for more large scale tests. These tests can be used to qualify relevant IOR technologies for field implementation, including validation of modelling tools to plan field operations.

The Centre and the University of Stavanger handed in an application for research infrastructure 10 October. The plan is to build facilities for on-shore pilot tests in Risavika, just a few kolimetres from Ullandhaug. The price tag is NOK 80 million.

Terje Søviknes acknowledged the need for these tests and was interested in hearing more about the Risavika plans. For accelerating field implementation of advanced technologies to improve oil recovery on the Norwegian Continental Shelf toward the ambitious 70% recovery goal set by the Centre, we propose the establishment of «IOR Field Lab» with large scale experimental capabilities, from the current core scale in centimetres, to meters scale. We believe that this facility can be used to qualify relevant IOR technologies for field implementation, including validation of modelling tools to plan field operations.

Note: Just a few weeks after his visit in Stavanger, Søviknes announced that he was leaving the minister post. He was succeeded by Kjell Børge Freiberg (Frp).

SECURING INDUSTRY RELEVANCE

Left: Kjetil Brakstad (Equinor), Jarle Haukås (Schlumberger), Ana Todosijevic (Wintershall) and Siv Marie Åsen (The National IOR Centre of Norway).

WORKSHOPS → WORK PLAN

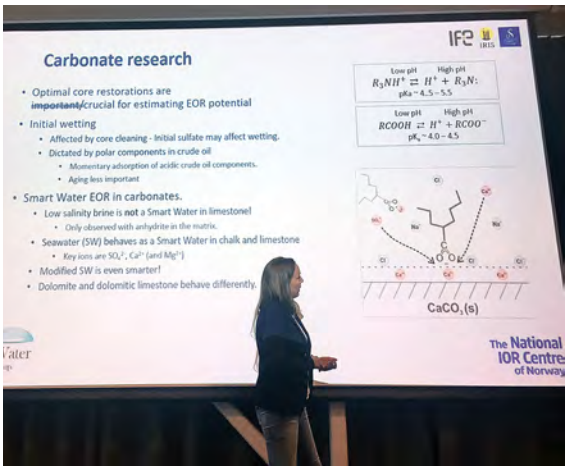
Patrizia Pisicchio (Eni Milan).

Photos: Kjersti Riiber

Aksel Hiorth (The National IOR Centre of Norway/UiS/NORCE).

- Environmental Risk Assessment (22 February)
- Integration of Research Activities (8 March)
- IOR NORWAY workshop (23 April)
- Polymer workshop (25 June)
- Smartwater workshop (14 September)
- IORSim workshop (4 December)

Odd Sele Larsen (Halliburton)



Tina Puntervold (The National IOR Centre of Norway/UiS)

Through thematic workshops and TC meetings all our partners have been active in the process of making the work plan for 2019 which holds 35 projects focusing on user needs. The user partners have slightly different objectives, but several of the R&D activities include elements that all companies have interest in. We have also tried to understand the needs of each individual industry partner and all companies have been invited to give specific feedback by e-mail after technical committee meetings.

The process towards Work Plan 2019 started in 2017 when the Centre had to deliver updated plans for the three last years in connection with the midterm evaluation. Early in 2018 we started a more intensive work together with the industry partners to detail the plans together, and before May we had already arranged two topic-specific workshops; one on Environmental Risk Assessment hosted by Halliburton and one on Integration of Research Activities hosted by Schlumberger. At the TC meeting May 2018, our industry partners were asked to give even more feedback on the process towards work plan 2019 and also suggestions on new topic-specific workshops were needed. As a result, three workshops have been arranged during the second half of 2018; polymer, smart water and simulation challenges related to IOR processes at field scale using the Centre's tools IORSim, IORCoreSim and Open Porous Media (OPM).

The result of this work has been even better than foreseen. The polymer workshop was arranged on short notice, but still 35 representatives from our partners took the time to attend – including a delegation from Wintershall's head office in Germany and several from the Eni Milan research headquarter.

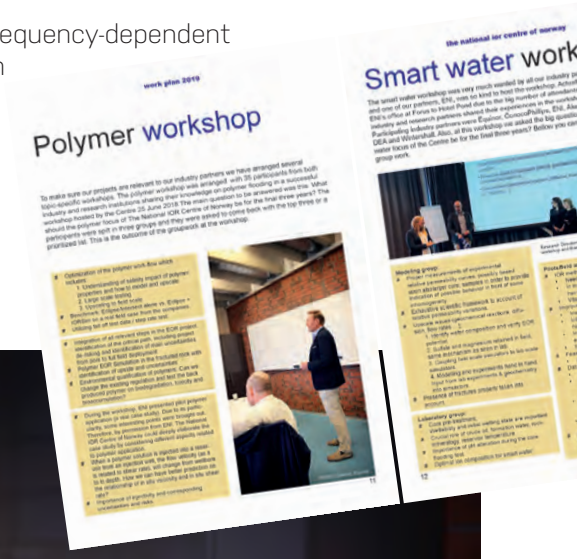
The smart water workshop hosted by Eni drew a total of 50 participants, including both nationally and internationally attendees from the industry partners. Also the IOR Simulation workshop was of great interest for our partners (for the first time we offered to stream the workshop who reached a total of 55 participants).

The industry partners have given plenty of feedback in the workshops, at Technical Committee meetings as well as by e-mail, on the topics of the workshops and also on other relevant issues. The input has been taken into consideration in the work plan for 2019. For more detailed summaries of the workshops, find the workplan at www.uis.no/ior. A broad summary is as follows: For the polymer and smartwater research in the Centre we are on track and cover many, if not all, of the challenges related to the subsurface. The upscaling is still a major challenge, and in the Centre we will focus on both improving our simulation tools and to study the polymeric fluids at a larger scale.

THESE ARE THE NEW PROJECTS

Here are the new Centre projects that directly address many of the issues discussed in the polymer and smart water workshops and in the meetings of the technical committee.

- Understanding the initial wettability of reservoirs
- Reservoir wettability and its effect on water based recovery processes
- Mineralogical influence on reservoir wetting and Smart Water EOR processes
- Upscaling of Polymer and Smart Water Processes
- Applying the analytical tool box to specific EOR related experiments to enhance oil recovery and to assist upscaling
- Development of a simulation tool for complex non-Newtonian fluid flow
- Risk Management / ERA
- Improve IOR models in IOR Sim
- Nanoparticle tracers for petroleum reservoir studies
- Lanthanide ester complexes for single well chemical tracer test (SWCTT)
- Dynamic flooding properties of new PITT tracers
- Upscaling of chemo-mechanical compaction to field scale models
- IOR Pilot Projects – Learning by Doing
- The Value of Data and Data Analytics for IOR Operati ons
- Data assimilation using 4D seismic and tracer data
- Developing optimal strategies for polymer or smart water injection using synthetic models and the Open Porous Media (OPM) framework
- 4D seismic frequency-dependent AVO inversion to predict saturation-pressure changes



Christian Burmester (DEA) and Pankaj Kumar (Wintershall).

It was crowded in the meeting room at UiS at the polymer workshop arranged by the Centre 25 June. Photos: Kjersti Riiber

Research director Randi Valestrand, director of field implementation Sissel Opsahl Viig, postdoc Dmitry Shogin, research director Aksel Hiorth, Ole Eeg (ConocoPhillips) and Torstein Grøstad (Equinor). This is from the combined lunch/break-out sessions, where people were split in groups.

R&D ACTIVITIES

THE GREEN IN IOR

Environmental risk assessments (ERAs) are routinely carried out by the Norwegian petroleum industry, as a basis for decision-making on risk acceptance and risk-reducing measures such as oil spill response systems. Quantitative ERAs related to «large» oil spills are typically performed according to the industry guideline «Method for environmental risk assessment», which is well-established in the industry and currently being revised. Quantitative ERA methods for operational discharges have been developed in Norway and tools for discharges to sea have been in mandatory use by all operators on the Norwegian continental shelf for their produced water discharges since 2006. Other North Sea countries are presently phasing in these tools. Similar relevant tools for drilling discharges are also developed jointly by NCS operators, and are in use by some. To evaluate environmental risk of emissions to air the operators are using different methods. No common quantitative tools have yet been developed for this purpose. NORCE Environment has taken part in the development of the above tools, and is presently using them to provide ERA services to the operators on the Norwegian and Danish continental shelves.

The National IOR Centre of Norway provides innovative solutions for improved oil recovery on the Norwegian continental shelf. In support of the IOR Centre efforts to assess and evaluate overall environmental impacts and risk associated with different IOR solutions (products and processes/methods) resulting from the IOR Centre research activities, the purpose of this project is to develop and implement new risk analysis methods and models, building on existing methods and models and suitable for the novel IOR solutions developed at the Centre. The aim is to be able to use the specific risk analysis results obtained in the decision-making process regarding R&D priorities at the Centre, and more broadly to contribute to the general development of methods, models and the foundations of environmental risk assessment.

Steinar Sanni (behind) and Roger Flage became part of The National IOR Centre of Norway in 2018. Photo: Kjersti Riiber

A PhD student has been hired linked to this project. He will be starting in early 2019. Among the first tasks of the student will be to perform an identification and screening of the IOR solutions developed at the Centre, and to review existing methods for environmental risk assessment and assess their relevance to the developed IOR solutions. The result of these initial efforts is expected to be an understanding of the research needs in terms of risk analysis methods and models, as well as the identification of one or more relevant case studies.

Text: Roger Flage & Steinar Sanni

PROJECT SELECTED FOR DEMO2000

The project entitled «Detecting Events and Anomalies from Permanently Installed Distributed Temperature Sensors and Distributed Vibration Sensors in Injector Wells», was recently selected by the Research Council of Norway for funding under the DEMO2000 program. This collaboration between ConocoPhillips and Schlumberger (industry partners of the Centre) is expected to provide important synergy effects to The National IOR Centre of Norway's program by extending the 4D seismic reservoir monitoring measurements with downhole control. These measurements are provided by instrumenting wells with fibre optical cables. This enables recording of the seismic signal along the well-bore and is often referred to as Distributed Vibration Sensing (hDVS) or Distributed Acoustic Sensing (DAS).

These hDVS recordings will be simultaneous with the 4D seismic recordings from Permanent Reservoir Management system (LoFS (Life of Field Seismic)) and hence provide real time calibration of the 4D seismic both in the overburden and in the reservoir layer. Our initial research suggests that these hDVS measurements will significantly improve the detections of saturation and pressure changes in the reservoir.

The optical fibers may also be used for other production logs like Distributed Temperature Sensing (DTS) which is widely used in the industry. They can generate frequent temperature logs over the life of the well. Examples of applications of DTS data

COLLABORATION WITH CORNELL

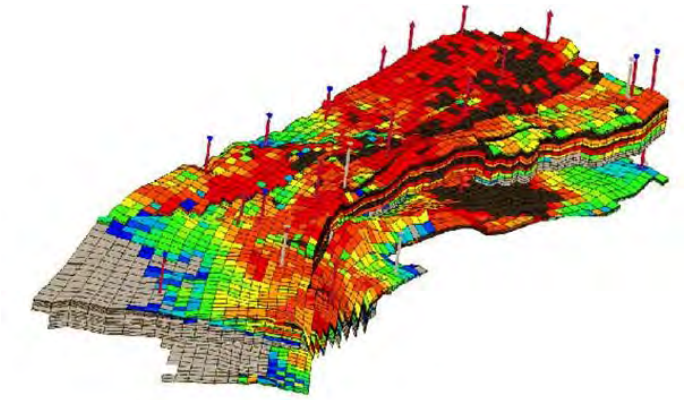
There is an ongoing collaboration between Cornell University (CU, USA) and the Tracer department of the Institute for Energy Technology (IFE, Norway) since the early stage of The National IOR Centre of Norway (NIORC) in 2014. The collaboration project falls under the scope of task 5 (Tracer Technology), led by Pr.em Tor Bjørnstad. The joint effort of CU and IFE aims at a better understanding and improvement of C-dots nanoparticles first discovered and reported as oil-field tracer by Cornell in 2011. Under the goal of using nanotechnology to provide better answers to increase the understanding of the reservoir, C-dots nanoparticles appear as one of the best nanotracer candidates. Such is due to their intrinsic properties: mass conservation, stable in reservoir conditions, easy to detect, etc. To the collaborator's knowledge, only few studies refer to the testing of nanoparticles as tracers in real reservoir conditions (e.g. EOR pilots).

From left Professor Lawrence Cathles III and Dr. Mahmoud Ould Metidji.
Photo: Kjersti Riiber

Prof. Lawrence Cathles III from CU have initiated an application to the Department of Energy (DoE) in USA, involving the Colorado State University (CSU, USA) and IFE, for testing the C-dots in a sandstone reservoir located at CSU. More generally, the high expectations for this larger-scale tracer test are driven by the substantial gain of information which would improve the qualification process of several tracers under development.

Since 2014, 3 postdocs have already worked on task 2.5.2. resulting in 4 communications in international Oil&Gas conferences. A new PhD candidate located at IFE will take over the experimental part of the project including improvement of the C-dots detectability and study the potential structural modifications to take advantage of the C-dots as active tracers in inter-well studies.
As an important part of The National IOR Centre of Norway, the promising collaboration between Cornell and IFE will continue to play a major role to meet future IOR challenges.

Dr. Mahmoud Ould Metidji, IFE



Water injection driving oil to producers in a Norwegian field.

FUNDING

are to detect leaks outside the casing, calculate flow contribution, evaluate water injection/shut-in profiles, effectiveness of fracture jobs, identify cement tops and identify crossflow between zones and other flow. Another focus of this project will be to demonstrate how detections of anomalies in the DTS production logs can be automated using Artificial Intelligence and how combinations of DTS data and hDVS data may improve the diagnostics of these anomalies.

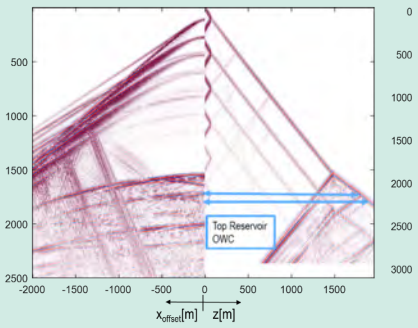


Figure A: Simultaneous seismic recording along PRM array on the seabed or the towed 4D seismic arrays (left panel) and DVS recording along the well-trajectory (right panel). The seismic responses of the top reservoir and the Oil-Water-Contact (OWC) in depth on the DVS VSP array is highlighted and the calibration of these events to the 4D seismic recording are marked.

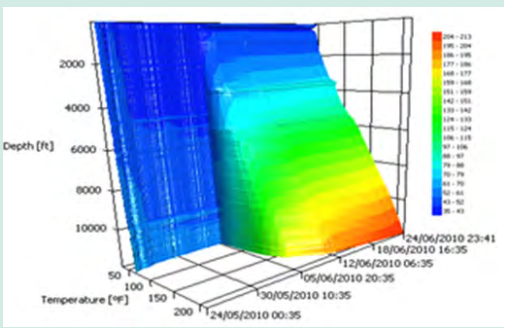
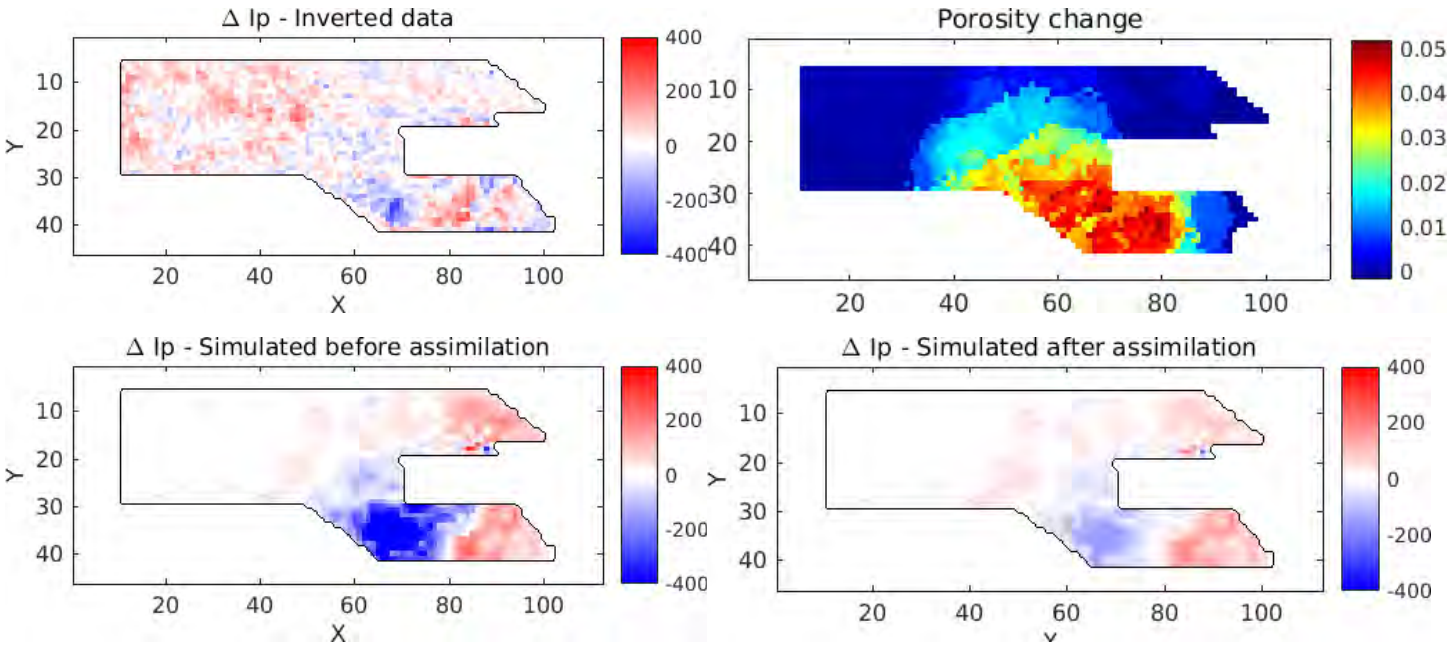


Figure B: DTS log showing Depth versus Temperature versus Time display of a warm-back effect after well shut-in based on DTS measurements.

4D SEISMIC DATA ASSIMILATION FOR IOR

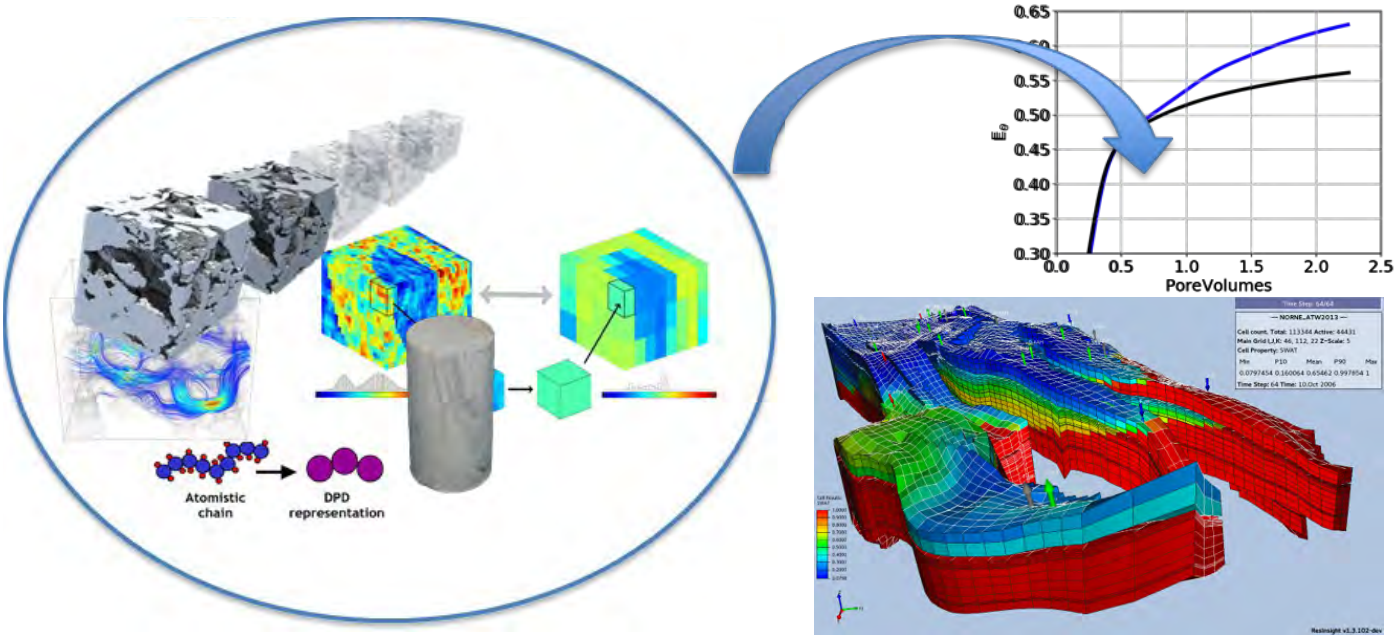


Computer models for subsurface flow are valuable tools for assessment, planning and monitoring of IOR operations. Higher accuracy for the models implies better strategies and higher value for the operations. For a long time, data assimilation has been an important way to automatically calibrate uncertain reservoir parameters based on information from measurements. Through tuning of permeability, porosity, clay volumes, fault properties, etc., the goals are reduced uncertainty for the subsurface representation and models that have improved accuracy when simulating multiphase flow. In particular, updated models can be used to simulate flow in unswept parts of the reservoir, and hence provide useful information when planning infill wells or EOR strategies. Ensemble-based data assimilation methods was first applied for petroleum problems at IRIS (now NORCE) in 2001. Since then, rapid developments and extensive research have been conducted, and the approach is now considered state-of-the-art. These types of methods are characterized by extensive use of sample covariance estimates, combined with Bayesian inference. This is enabled using an ensemble of reservoir models, each equipped with a unique set of reservoir properties. Traditionally, production data are most commonly used, but aligned with the emerging focus on big-data and digitalization, assimilation of seismic 4D datasets is now at the forefront of research.

Seismic offshore data are collected from emitted soundwaves that reflects at subsurface formations and are then recorded at hydrophones. The size of the recorded dataset is usually large – terabytes or even petabytes in magnitude. Proper handling of datasets with this size is a major challenge for traditional history matching methods. It is also a challenge to quantify the uncertainty of the data, and to select the best level of processing before using the data. Through processing of raw seismic waves, several attributes can be derived, such as amplitudes, impedance, rock density, saturations, pressure, et cetera.

Through recent projects at The National IOR Centre of Norway (NIOR) and NORCE, several advances in 4D seismic data assimilation have been done. Some of the important achievements are data compression based on image denoising, uncertainty quantification of seismic attributes and adaptive selection of influential measurements. Testing of the methodology on the Norne field located in the Norwegian Sea show promising results. Production data between 1997 and 2006, and seismic data from four surveys, are released by Equinor and used in this study. The results show that we improve the match for both production and seismic data, and the updated petrophysical fields are geologically credible. The figure (top, left) shows acoustic impedance (difference between two surveys), inverted from the seismic data. The corresponding simulated data before and after assimilation, is shown on the bottom row. A clear improvement is seen, especially at the lower part of the reservoir. The figure also shows (top, right) how porosity changes due to data assimilation. This update, and other similar model improvements, can be of crucial importance when planning and correctly evaluating the value and uncertainty of new IOR operations.

Rolf J. Lorentzen (NORCE/The National IOR Centre of Norway)
Tuhin Bhakta (NORCE/The National IOR Centre of Norway)
Dario Grana (University of Wyoming)
Xiaodong Luo (NORCE/The National IOR Centre of Norway)
Randi Valestrand (NORCE/The National IOR Centre of Norway)
Geir Nævdal (NORCE/The National IOR Centre of Norway)
Ivar Sandø (NORCE/The National IOR Centre of Norway)



Models are developed for a purpose, they should give insight into the processes and lead to better decisions. Better decision leads to improved production.

THIS NEW MASTER PROGRAMME WILL TEACH ENGINEERS HOW TO MODEL

As digitization increases, new opportunities have emerged for performing tasks. If you want to make good decisions it is important to have knowledge of different processes, relevant data, as well as good models and skills on how to model. A Master's degree in Computational Engineering makes you eligible for the most demanding and interesting tasks as an engineer, researcher or leader. Professor Aksel Hiorth (Research director at The National IOR Centre of Norway), together with Professor Steinar Evje and Professor Reidar Bratvold, are the initiators of the new study programme.

«We have developed many good methods in our research and see that these fit well into a new study programme. This will be a form of technology transfer, in order to equip candidates for a continuously changing job market,» says Hiorth.

By learning more about modeling and decision making, the students will be even better equipped for a more digitized work life. He or she will acquire skills that will enable them to analyse complex real world problems, and to use this insight as a foundation for making better decisions. The study programme forms the basis for more career opportunities.

«In a world where digitization is becoming more important, there is a need for candidates with knowledge of the field, combined with calculation modeling skills. All major oil companies, service companies, research institutes and many of their sub-companies seek this expertise,» says Hiorth.

He thinks the industry seeks different qualities now when they are hiring new people.

«We have seen a shift in the industry. Previously, the industry could pick specialists who could go straight into a specific field. Now we will work more with the methods for making future workers who can work a lot more generally and who have knowledge of tools that can be used in several fields,» Hiorth explains.

«When you use computers actively, it is easier to analyze complex issues. We want to teach students to break a complex problem into smaller and more manageable parts. This is a form of algorithmic thinking, also known as computational thinking, a skill that everyone benefits from, not just programmers. It is a strategy that will allow you to study a specific issue, evaluate different approaches to solve it and understand the strengths and weaknesses of choosing different methods,» he explains.

Professor Aksel Hiorth is one of the initiators of the new study programme. Here with Master student Tonje Rafshol Hovden.

Text and photo: Mari Løvås

YOUNG & INNOVATIVE

POSTDOCS PÅL & DMITRY

From left Vice Dean Helge Bøvik Larsen, postdoc Pål Østebø Andersen and postdoc Dmitry Shogin. Photo: Marius Vervik

Pål Østebø Andersen, postdoc at The National IOR Centre of Norway, was on the toplist of the most productive publishing researchers at University of Stavanger in 2018. Andersen is a postdoctoral fellow at The National IOR Centre of Norway and Department of Energy Resources, University of Stavanger (UiS). He does research in Multiphase Flow Processes, Special Core Analysis and Reactive Flow. Østebø Andersen took his PhD degree at Department of Petroleum Engineering, UiS 2011–2014.

Besides publishing a lot of papers and representing the Centre at conferences all over the world, Østebø Andersen spends a lot of his time supervising both bachelor students and master students at UiS. He is also teacing two courses; Mathematical and Numerical Modelling of Transport Processes and Formation Evaluation and Well Testing.

To appear at this top list, you have to go the extra mile. Østebø Andersen does that, and he is also known to be a collaborator involving both students and fellow reserachers in all his papers – he shares every research point. This makes Andersen's total of 5,6 points even more impressive.

Other Centre contributors, Zhixin Yu and Reidar Bratvold, were even higher on the 2018 list – ranked 6th and 21st most productive.

Postdoc **Dmitry Shogin** was rewarded with funding from Equinor's Vista programme in 2018. He is the first postdoc at University of Stavanger to receive Vista funding. He is now looking at three new years working on his project at The National IOR Centre of Norway. The programme supports at any time 20 projects (PhD and postdoc level) within exploration, environment, improved recovery and future development.

Dr. Shogin applied to Vista for his project in early 2018. The Vista contract started July 2018. Shogin is one of the physicists at the Centre. His research is presently focused on advanced tensor models of non-Newtonian fluids, including polymers for oil recovery applications. Shogin holds a PhD degree in Applied Mathematics and Physics from UiS and has worked as a postdoc at the Centre from 2015. He combines his work on the Vista project with a teaching position at UiS.

In his project he addresses the problem of modelling polymer flow in IOR procedures. Today's polymer fluid models are too simple and do not take the complex nature of polymeric liquids into account. Shogin is aimed at improving advanced polymer fluid models consistent with microscopic physics, calibrating them to controlled laboratory experiments, and developing numerical algorithms to solve the arising equations. The project is based on close collaboration between researchers with different background.

DMITRY GIVES COURSES IN LATEX & WOLFRAM RESEARCH MATHEMATICA

In September 2018 master and PhD students at University of Stavanger joined the course organized by Dmitry Shogin, associate professor at The National IOR Centre of Norway.

"Both LaTeX and Mathematica are very powerful programs. Knowing how to use them is a great advantage for any researcher or engineer", explains Shogin. "Originally, I created this course for my master students as a part of supervision programme – but eventually much more people asked me about a possibility to join. So I made the course available for everyone."

LaTeX is a computer program for typesetting high-quality documents, which is used by all leading scientific journals and publishing companies. Wolfram Mathematica is a commercial computational tool which can be used for a whole spectrum of scientific and engineering tasks – for example, solving algebraic and differential equations, creating plots, diagrams and animation, and writing laboratory reports.

The course is now runned at The National IOR Centre of Norway two times a year.

In October-December 2018 Dmitry Shogin, organized a series of seminars in non-Newtonian fluid dynamics. The seminars are oriented first of all at young researchers at UiS and NORCE who work with polymers. The Centre PhD students Bjarte Hetland, Oddbjørn Nødland (Centre postdoc since 2019), Irene Ringen and Siv Marie Åsen are among the most active seminar participants.

"Polymer solutions do not obey the laws of classical fluid dynamics: they are non-Newtonian fluids", says Shogin. "We study these complex fluids with a cross-disciplinary approach, and each of us carries a piece of the puzzle. The aim of these seminars is to share our knowledge with each other and create a common understanding platform, so that all of us – petroleum engineers, physicists, chemists and programmers – can speak the same language when it comes to research on polymers."

The seminars shall continue in 2019, and Dmitry Shogin aims at creating a foundation for more intense collaboration between the polymer researchers both from The National IOR Centre of Norway and from outside it.

Dmitry Shogin (in the middle) has been giving several courses in 2018. Here he is teaching students Wolfram Research Mathematica. The students are Sameer Ahmed, ABM Hedayatul Islam, Ramesh Subedi and Nonso Ihebuzor. Photo: Kjersti Riiber

YOUNG TALENTS

Centre PhD student Dhruvit Berawala was one of 36 young talents who presented their research at IOR NORWAY 2018. One of the Centre's goals is to attract and retain the best talents. So far (by the end of 2018) four PhD students have graduated. The next three years 25 more are due.

MASTER'S CORNER

We are not only educating PhDs. The Centre researchers supervise almost 50 MSc students each year. Tayyaba Kausar and Signe Kristoffersen were two of the students participating in Master's Corner at IOR NORWAY. They handed out CVs to industry partners. Photos: Marius Vervik

County mayor Solveig Ege Tengesdal gave her greetings to the students. Here she is talking til Merete Vadla Madland and Aksel Hiorth afterwards.

KNUST IN GHANA LOOK TO NORWAY

Centre PhD student Samuel Erzuah (from left), Professor Kwabena Nyarko, Professor Mark Adom-Asamoah and Professor Merete Vadla Madland discuss the future career of Samuel Erzuah. Nyarko and Adom-Asamoah came to Stavanger to headhun Erzuah for a new IOR Centre in Ghana.
Photo: Kjersti Riiber

PhD student at The National IOR Centre of Norway, Samuel Erzuah, has been asked to run a national IOR centre in Ghana. The centre will be a part of the KNUST university in Kumasi.

The planned IOR centre will open in 2019 as a part of the Kwame Nkrumah University of Science & Technology (KNUST) in Kumasi, Ghana. The KNUST University was established in 1951 and has a student population of nearly 50,000. Since oil and gas is an important industry in Ghana, KNUST is establishing an IOR centre after the model of The National IOR Centre of Norway.

Centre PhD student Samuel Erzuah got a visit of Professor Mark Adom-Asamoah (Provost of College of Engineering at KNUST) and Professor Kwabena Nyarko (Head of Department of Petroleum Engineering) September 20th 2018. The Centre PhD student Samuel Erzuah who is also an alumnus of KNUST, came with the KNUST delegates to discuss his future career. The purpose of the visit was to establish a formidable IOR Centre in Ghana by emulating The National IOR Centre of Norway.

«In this regards, the rich experiences acquired by Samuel Erzuah will be priceless,» was the message from Professor Mark Adom-Asamoah.

Centre PhD Samuel Erzuah was of course happy to get this opportunity even before he has a doctorate.

Professor Asamoah and Professor Nyarko also wanted to discuss the opportunities for a collaboration between the universities KNUSt and UiS and the two IOR centres. When the Ghanesian centre is up and running they want a Professor from University of Stavanger to assist in teaching new students in Ghana.

Centre PhD Samuel Erzuah is also given the opportunity to return to UiS and NORCE (his current work place) on research stay.

- Kwame Nkrumah University of Science and Technology (KNUST) is a university in Kumasi, Ashanti, Ghana.
- KNUST is the public university established in the country, as well as the largest university in Kumasi Metropolis and Ashanti.
- The name honors Kwame Nkrumah, the first prime minister and later president of Ghana.

From left: Chair Terje Svabø and the PhD students Rowan Romeyn (UiT), Daniel Bakkelund (UiO), Morten Hansen Jondahl (USN), Sebastian Wolf (UiB), Mona Wetrhus Minde (UiS/The National IOR Centre of Norway) and Vegard Stenhjem Hagen (NTNU). Photo: Kjersti Riiber

MONA PRESENTED THE «IOR TOOL BOX» AT OG21-FORUM IN OSLO

OG21 is Norway's national oil and gas strategy. At OG21-forum high level technology decision makers in the petroleum industry meet to discuss the importance of technology and innovation to value creation in Norway. Therefore, OG21 is an important meeting place for the students at The National IOR Centre of Norway to possible collaborators from the industry. The theme for 2018's OG21-forum was: «How bold technology decisions create value.» As usual the Centre was represented in the student session.

Professor Reidar Bratvold: Creating Value from Uncertainty and flexibility.

PhD student Mona Wetrhus Minde presented the «tool box» for IOR research with the title «How to utilize fundamental knowledge to predict EOR potential at the Norwegian Continental Shelf». After the presentation Minde and the other PhD students (representing all the big universities in Norway) got questions from chair Terje Svabø concerning their views on the future for the oil and gas industry.

One of the key note speakers at OG21-forum was Karl Johnny Hersvik, CEO in AkerBP. He commented on the insudtry's reluctance to share data. «It's time to start sharing, it's time to give other companies access to your data. Nowadays it seems like secracy is the standard,» he said.

Jarand Rystad in Rystad Energy came with this conclusion: «Limited data sharing results in requalification and negative technology decisions.» Rystad mentioned the companies Vår, AkerBP, Spirit and OKEA as companies in the frontline of data sharing.

In addition to Minde, Prof. Reidar Bratvold was giving a presentation in the session called «What controls, drives and limits technology choices on the Norwegian Continental Shelf?» He did also participate in the panel debate.

RESEARCH STAYS

MY TIME AT THE IOR CENTRE

My secondment in The National IOR Centre of Norway was one of the best professional experiences of my career.

An open structure is important for The National IOR Centre of Norway. Cooperation and openness are key words, and we strive to maintain a good contact with our collaborators. Through research mobility, we aim to promote applicable research of a high scientific level.

The Stavanger region is famed for its many natural attractions, wooden houses and university. Many different nationalities are attracted to the University of Stavanger and The National IOR Centre of Norway, making it a highly international destination. My secondment in The National IOR Centre of Norway was one of the best professional experiences of my career (the first stay was in October 2017). From the very first day, arriving in office, I felt welcome and had access to an incredible scientific support network through their staff.

My current research is part of a European Union funded project (NanoHeal). We have been working to identify reaction mechanisms of soft minerals. Calcium carbonate (calcite) is a common soft mineral in nature and industry. A substantial part of world's known largest oil reservoir is hosted by carbonated rocks. These reservoirs are prone to creep, compaction and subsidence during oil production. During the injection of water or CO_2 to enhance oil recovery, the compaction causes well damage and leakage. As these reservoirs are economically interesting for large scale storage CO_2 option, the risk of further compaction resulting from CO_2 injection needs to be assessed. The CO_2 storage in carbonate reservoir thus requires a very high control of long term strength of the reservoir rock.

The main objective of my research was fundamentally to contribute to understand the process of material hardening, for instance, during rock formation, diagenesis, cementation and biomineralisation at atomic scale. This phenomenon proceeds by dissolution and growth in nano-confined condition, generally in presence of considerable stress and impurities. Growth/dissolution at confined and stressed condition is an important mechanism, but poorly understood. Especially when there are organic molecules present. One of the challenges of this research was to find reliable cross-links between dissolution/growth rates of mineral from nano to mega scale. Therefore, for this purpose, an innovative experimental method for chemomechanical conditions in growth/dissolution at confi-

ned and stressed condition was developed in The National IOR Centre of Norway. This multidisciplinary approach has the potential to generate interest because of how it couples the mechanical conditions of growth/dissolution (stresses) with fluid-rock interactions.

This collaboration helps us to better understand at different scales this widespread phenomenon that influences many essential natural processes.
In this experiment we made an artificial core out of fine calcite powder and performing uniaxial strain tests with loading stress up to 30 MPa at 130 °C, and measured basic quantities like stress-strain relationship and axial creep over time. We used two different brines to flood through the artificial cores, one with and one without organic additive. Also, we performed two tests at lower stress, to observe how the cores and grains behaved with a smaller amount of applied stress. Chemical analysis and scanning electron microscope (SEM) analysis were conducted to quantify the grain size distribution, and changes in grain size distribution when the various tests were performed.

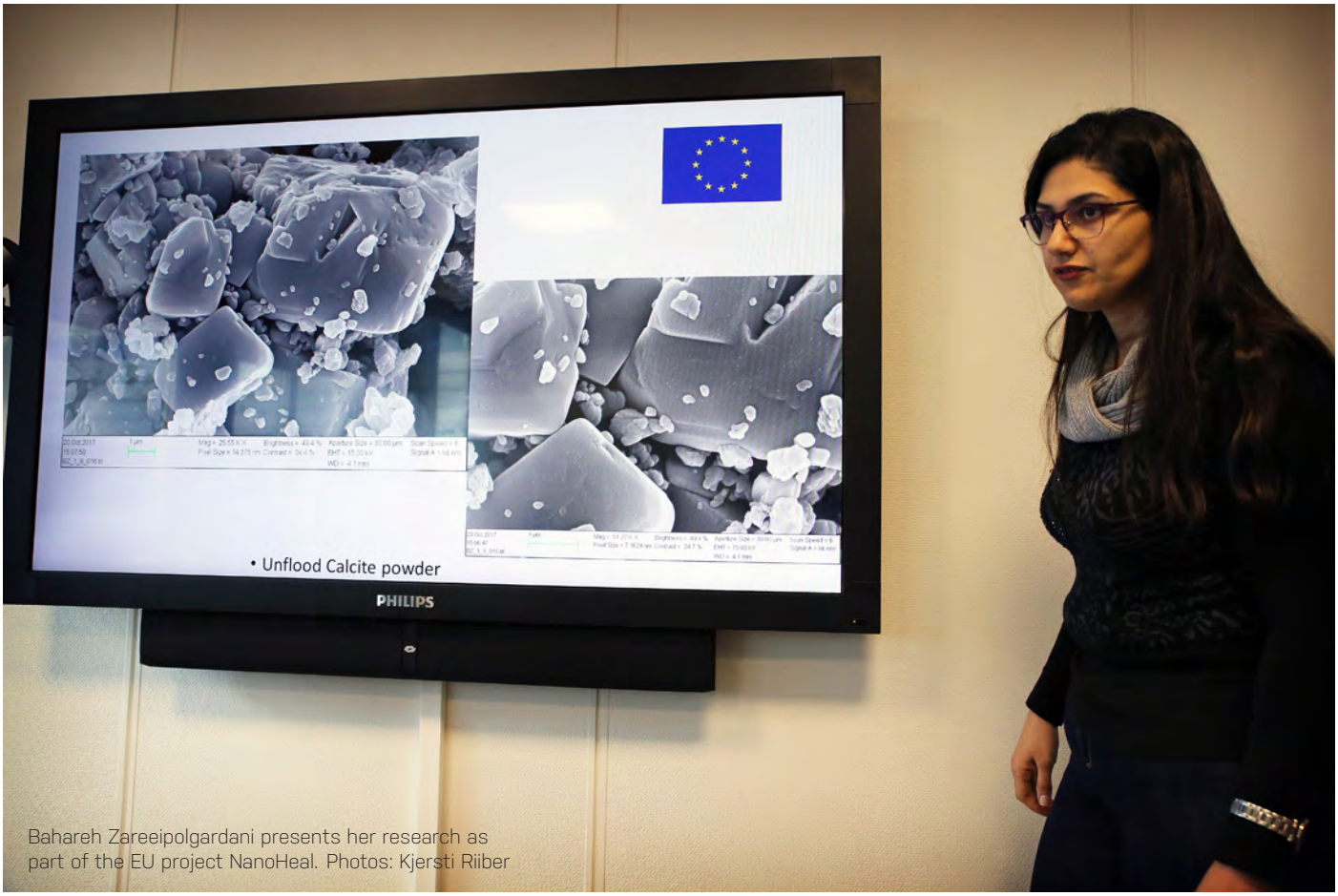
We observed less creep in the core flooded with organic additive. The obtained core has apparently become harder in comparison with the core without organic additive. The SEM investigation also supported this observation. The SEM showed the occurrence of tiny grain size almost non-existent compared to the cores being flooded without an organic additive. This preliminary experiments revealed the differences in the mechanical behaviour and microstructure in the cores flooded with and without organic additives, at overburden pressure.

The EU project NanoHeal: Overview and objectives

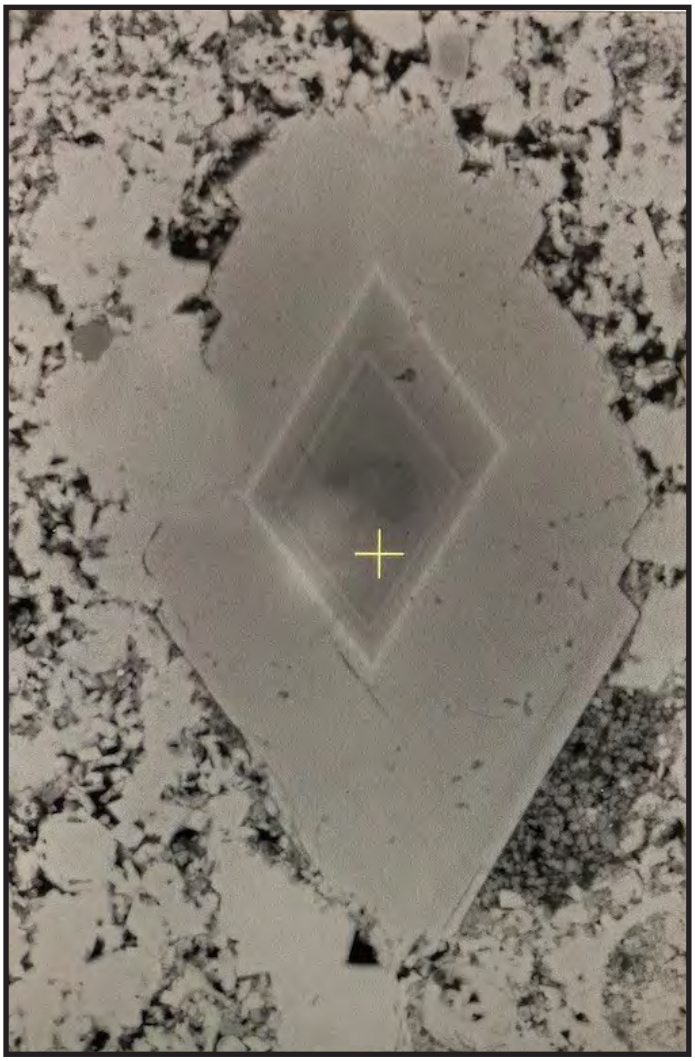
There is a current need to develop new cements with different chemistry, microstructure and mechanical properties. These cements should target current needs in industry, technology, health and conservation science. These scientific, industrial and societal challenges will be addressed through the following aims:

- to develop innovative probes and models for nanoscale processes that open novel perspectives in design and control of organo-mineral materials.
- to measure and improve the strength and durability of
  1) new man-made cemented materials like «green concrete», speciality cements in construction and oil and gas recovery, and biocompatible implants and
  2) natural sedimentary rocks inside reservoirs and as construction materials
- to educate young interdisciplinary researchers at the intersectoral interface between fundamental science and European industry.

Bahareh Zareeipolgardani,
PhD student at Université de Lyon



Bahareh Zareeipolgardani presents her research as part of the EU project NanoHeal. Photos: Kjersti Riiber



Top right: Mounting thin sections inside the machine.
Bottom: Backscatter electron micrograph of authigenic dolomite crystal with distinct ankerite rims (lighter gray); crystal height 50 µm.

FREIBERG – A TOWN OF SCHOLARS AND MINERS

My visit to the Technische Universitaet Bergakademie, Freiberg, Germany was short, but very exciting. I arrived on a sunny November Sunday afternoon, the streets so quiet, that the sound of my luggage wheels on the cobble stone seemed rude. The historical town of Freiberg, Eastern Germany, home to some 40.000 people, was resting. Freiberg was dominated for around 800 years by the mining industries. A symbol of that heritage, the Freiberg University of Mining and Technology, often just known as the Mining Academy (Bergakademie), was established in 1765 and is the second oldest university of mining and metallurgy in the world.

My hosts, Prof Dr Bernhard Schulz and Sabine Gilbricht, are as brilliant in their field as they are hospitable and friendly.

Top: The Stadtbibliothek in Freiberg. Bottom: One of many old town squares, marked by massive buildings, a testimony of hundreds of years of prosperous mining. Private photos

- The Technische Universität Bergakademie Freiberg is a German university of technology with about 4300 students in the city of Freiberg, Saxony.
- It was established in 1765 by Prince Franz Xaver, regent of Saxony.
- It is the oldest university of mining and metallurgy in the world.
- The chemical elements indium (1863) and germanium (1886) were discovered by scientists of Freiberg University.

The purpose of my visit was to run a series of measurements using the Mineral Liberation Analysis method. This is an important and necessary tool for identification and quantification of minerals in rock samples and in addition to other analytical methods, it contributes to a thorough reservoir rock characterization in terms of its mineral composition, structure and texture.

My hosts, Prof Dr Bernhard Schulz and Sabine Gilbricht, are as brilliant in their field as they are hospitable and friendly. Mrs Gilbricht and I had long days together and our conversations, whether about the research, the town history, or our backgrounds as children from behind the Iron Curtain, were always interesting.

Before I left for Freiberg, I was nervous, not knowing what to expect. Leaving Freiberg, I had a sense of familiarity and the satisfaction of a very productive visit. My only regret is that I missed the local traditional Christmas Market by only a few days. I'll be back!

PhD student
Emanuela Kallesten

MASTER DEGREE IN STAVANGER – PHD IN

First time I saw St. John's it looked like a city has been there for hundreds of years and will be there for hundreds of years after I was all gone. Of course, it cannot be compared with cities in Europe with a richer history and even less comparable with historic millennial cities like the ones found in China; but being the oldest European settlement in North America has its perks.

St. John's resembles Stavanger in many ways. It is just that the former is a city designed for cars and the latter for public transportation. The weather is perhaps crazier and snowier in St. John's than in Stavanger. There are plenty of hiking routes nearby; as a matter of fact, St. john's is the door to the 300 [Km] footpath east coast trail which makes the combination of small city and nature very interesting. Furthermore, a small city with a very strong student community and long history of craft beers and Irish pubs just make St. John's like a good spot to research and have fun in the middle of the Atlantic Ocean.

After having carried out my master thesis with The National IOR Centre of Norway as part of my Reservoir Engineering program at the University of Stavanger, I continued working with the IOR Centre during the summer of 2017 until November of 2017. Afterwards, I was offered the chance to pursue my PhD in Oil and Gas Engineering at Memorial University of Newfoundland starting in September of 2018 while working in the Hibernia EOR research group under the supervision of PhD Lesley James and The National IOR Centre of Norway.

Although my research work has just begun, I will mainly be focused in Water Alternating Gas (WAG) process for Hebron field. Hebron field just started its production back in November 2017 despite the fact it was discovered in 1981. It contains a relatively heavy oil between 18 to 25 API with current production of 150 thousand barrels per day and estimated reserves around 700 million barrels. There is plenty of work to be done in Hebron. I am aiming to cover not just the standard version of WAG but rather trying to look into the performances of miscible and immiscible WAG in Hebron, smart water WAG, surfactant WAG as well. Of course, these are just ideas right now, but I am envisioning my PhD research to be the right combination of core flooding experiments and modelling studies.

I believe it is important to go as deep as possible while trying to understand the changes that take place in the reservoir when any EOR process is implemented; thus, the only way to describe the success or failure of the processes is by going back to basic of science. Chemistry and physics should be the focus; therefore, as part of my PhD requirements I have completed one course in Design of Experiments and currently taking one chemistry course called Surface and Interface Science. Moreover, I will also be collaborating with polymer flooding studies and AI EOR screening. Stay put for further updates.

MY STAY IN ST. JOHN'S, NEWFOUNDLAND

St. John's is the capital city of Newfoundland and Labrador, which is located on the east coast of Canada. This city is the perfect combination of big-city luxury and traditional small-town charm. Known as one of the oldest and most easterly cities in North America, St. John's is enriched with culture, history and beautiful sceneries. The colorful houses in downtown St. John's, the beautiful coastline along the road and the hiking trails around the city are the character and charisma the city preserves.

After the completion of my master thesis and the summer job with the IOR center of Norway, I proceed my Ph.D. studies at Memorial University of Newfoundland (MUN) in St. John's, Canada under the supervision of Dr. Lesley James and The National IOR Centre of Norway. My current research is mainly focused on the simulation and experimental work of EOR by Smart Water flooding, the effect of Smart Water on Water Alternating Gas (WAG) injection and chemical EOR screening in Hebron. This field is located in the Jeanne d'Arc Basin, 340 km offshore St. John's, with water depth ranging from 88 to 102m. It came into production in 2017 and is estimated to contain over 700 million barrels of producible hydrocarbons. Smart Water is a modified injection brine that is specially designed for inducing wettability alteration to improve oil recovery. The Smart Water EOR technique comes with low cost, environmentally friendly and also easy to be implemented both in sandstones and carbonates reservoirs. Currently, I have just started the research work on simulations of coreflooding using Eclipse will assist in designing the further lab experimental work. At the same time, I am taking two extra courses, which are Design of Experiment, and Surface and Interface Science, which are supposed to be finished in April 21.

The St. John's campus of MUN is surprisingly big and so far I still haven't covered every corner of the campus. Because of the potential heavy snowstorm here in winter, all the buildings on campus are connected by tunnels, which is something new and interesting to me. As someone from the southern parts of China, I have experienced my first proper winter here in St. John's with lots of snowing days and accumulated snow on the side of the road which is very interesting to walk on. On the first snowing day of this winter, my roommates and I went out to play snowball fight and build snowman together, which is such an amazing experience for me, and I have even seen quite a lot of the local people taking their dogs out to experience the first snow of the year. Overall, I am enjoying the stay here and my research has just started.

ST. JOHN'S, CANADA

Photos: Private

AND LABRADOR

Photos: Private

Dr. Lesley James at IOR NORWAY 2018. Photo: Marius Vervik

COMING BACK TO STAVANGER

Dr. Lesley James from Memorial University of Newfoundland (MUN) is one of the close collaborators of The National IOR Centre of Norway. Dr. James have several publications with Centre researchers. Because of her enthusiasm and dedication several of our students have gotten the opportunity to do research stays in Canada. In 2017 one of the Centre's PhDs, Jaspreet Singh Sachdeva, had a fruitful stay at Memorial. Now both Shijia Ma and Herman Muriel, former MSc students at University of Stavanger, are doing their PhD degree at Memorial. Both are working on EOR screening, Herman for gas (WAG) and Shijia on chemical for an upward fining Hebron field. The plan is to come up with a new screening methodology as well. Centre director Merete Vadla Madland is co-supervising both Herman Muriel and Shijia Ma.

Lesley James is also eager to have a research stay herself – at University of Stavanger. The purpose of the visit is to share in-depth experiences between the two universities in improved oil recovery, specifically the similarities and differences of using Smart Water in chalk vs. calcinated sandstone reservoirs.

«We will also work towards future collaborative opportunities across several disciplines and areas of mutual interest,» James continues.

Madland hopes to further strengthen the collaboration with Dr. James by offering research stays for PhD students.

«We see many similarities in the research being performed at Memorial University and here at UiS, so I definitely hope we can work even closer together in the future,» Madland says.

COLLABORATORS

UNIVERSITY OF BERGEN
KEY CONTACTS: Professor Arne Graue, Associate Professor Martin Fernø at the Department of Physics and Technology, Professor Morten Jakobsen at the Department of Earth Science, UiB.
PhD / postdoc: PhD Mohan Sharma: Displacement mechanisms in heterogeneous reservoirs with CO2 foam for mobility control; upscaling for field applications. Researcher: Dr. Bergit Brattekås: Integrated EOR for heterogeneous reservoirs.

UNIVERSITY OF OSLO
KEY CONTACTS: Professor Dag Dysthe, Dr. Anja Røyne, Professor Anders Malthe-Sørenssen. PhD: Shaghayegh Javadi: Experimental investigation of the effect of fluid chemistry on the adhesive properties of calcite grains.
Bahareh Zareeipolgardani, PhD student at Université de Lyon, has been spending several weeks at the Centre autumn 2018, studying the influence of stress and temperature conditions on calcite powder – a part of the NanoHeal project at UiO.

NTNU / UGELSTAD LABORATORY
KEY CONTACTS: Professor Johan Sjøblom, chief engineer Camilla Dagsgård. Various project cooperation.

SINTEF
KEY CONTACTS: Dr. Knut-Andreas Lie, Dr. Atgeirr Flø Rasmussen, Dr. Xavier Raynaud. NORCE and SINTEF collaborate to develop the open reservoir simulator OPM (Open Porous Media).

DTU / GEO / GEUS
KEY CONTACTS: Professor Ida Lykke Fabricius, Chief Engineer Helle Foged Christensen and Dr. Claus Kjøller. PhD: Tijana Voake
Professor Fabricius is also employed as Professor II at the University of Stavanger and is supervisor for one of the PhD students in The National IOR Centre of Norway, as well as several MSc students.

TNO
KEY CONTACTS: Olwijn Leeuwenburgh, Philippe Steeghs, Rahul Fonseca
Postdoc: Yanhui Zhang
TNO has had a 2-year postdoc research project as official contribution to The National IOR Centre of Norway. The collaboration has continued through 2018.

TU DELFT
KEY CONTACTS: Professor Jan Dirk Jansen (TU Delft), Rafael Moraes (TU Delft / Petrobras)
Professor Jan Dirk Jansen is the head of department of Geoscience & Engineering and professor of Reservoir Systems and Control at the University TU Delft. NORCE is engaged in a research collaboration with TU Delft in production optimization.

CORNELL UNIVERSITY
KEY CONTACTS: Professor Lawrence M. Cathles III
IFE has a partnership with Lawrence M. Cathles at Cornell University on the use of C-dots as tracers in porous media.

UT AUSTIN
KEY CONTACTS: Professor Larry Lake
Project collaboration: Robust Production Optimization. Included in this collaboration is the use of less detailed models (CRM – Capacitance Resistance Model) for reservoir simulation for use in optimization. One of the PhD students and a professor at The National IOR Centre of Norway have been involved in this.

INSTITUTE FOR THE STUDY OF THE EARTH'S INTERIOR (ISEI)
KEY CONTACTS: Professor Eizo Nakamura
Project: Quantification of chemical changes in flooded chalk on homogenized and natural samples with FE-TEM. Former MSc. student Nina Egeland is one of the students whos has been on research stay at ISEI.

TU BERGAKADEMIE FREIBERG, INSTITUTE FÜR MINERALOGIE
KEY CONTACTS: Bernhard Schulz and Jens Gutzmer
TU Bergakademie Freiberg is one of task 2's main partners and several students have been here for analyzing rock samples during the Centre lifetime. In 2018 PhD students Emanuela Kallesten (task 2) and Samuel Erzuah (task 1) had research stays in Freiberg. See more pages 34-35.

ECOLE POLYTECHNIQUE PARIS, FRANCE
KEY CONTACTS: Razvigor Ossikovski and Chiara Toccafondi. At this collaborating laboratory in Paris, the Centre researchers use nanoRaman to identify the mineralogy of the surface of thin section samples.

UNIVERSITÉ DE LYON, FRANCE
KEY CONTACTS: Olivier Tillement
IFE cooperates with Olivier Tillement at Université de Lyon. The cooperation involves characterisation of various characteristics of nanoparticles and complexes. These are components being tested as possible new tracers to determine the oil saturation in a flooded area of a reservoir.

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH (NCAR)
KEY CONTACTS: Senior researchers Dorit Hammerling and Ram Nair.
NCAR's Computing Lab consists of specialists in mathematical and statistical methods to simulate and predict complex stochastic phenomena.

UNIVERSITY OF STUTTGART
KEY CONTACTS: Birane Kane
Former PhD student Birane Kane visited NORCE for 3 months during his time as a doctoral candidate. Kane is working on development of discontinuous Galerkin methods for flow in porous media. His cooperation with Robert Klöfkorn and other researchers on simulator development at NORCE Bergen continues.

RICE UNIVERSITY
PhD student Mohan Sharma (CO2-Foam EOR Field Pilots) had a two week long research stay at Rice University September 2018.

UNIVERSITY OF WYOMING
KEY CONTACTS: Assistant Professor in Rock Physics and Reservoir Modeling, Dario Grana. Postdoc Tuhin Bhakta had a research stay in Wyoming, working on a 4D seismic project. The cooperation continues.

MEMORIAL UNIVERSITY OF NEWFOUNDLAND (MUN)
KEY CONTACTS: Lesley James, Dr. Chemical and Petroleum Engineering.
In 2018 Shijia Ma and Herman Muriel, both MSc students from UiS, went to MUN to do their PhD degree. PhD student Jaspreet Singh Sachdeva stayed at MUN fall 2017.

CHINA UNIVERSITY OF PETROLEUM, BEIJING
KEY CONTACTS: Professor Quan Shi. PhD student Kun Guo stayed with his group at State Key Laboratory of Heavy Oil Processing, the first and only laboratory in China that focuses on the research of heavy oil. It has been equipped with extensive and advanced instruments, making it a good place to conduct the component characterization of heavy oil samples.

SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NM, USA
KEY CONTACTS: Dr. Hongkyu Yoon, technical staff in the Geoscience Research and Applications Group at Sandia National Laboratories, Albuquerque, NM. This project investigates numerically the pore space evolution during water injection by quantifying permeability, wetting changes and trapped oil in high-resolution digital chalk geometries obtained from real rock samples.

THE LIST ALSO INCLUDES:
- Germany: University of Freiburg, University of Münster, Heidelberg University, University of Stuttgart & University of Saarlandes
- USA: National Center for Atmospheric Research, Colorado School of Mines
- UK: University of Warwick & Imperial College London
- Japan: Institute for Planetary Materials Misasa (IPM)
- Luxembourg: Luxembourg Institute of Science and Technology (LIST)
- Italy: University Bicocca Milano

The National IOR Centre of Norway believes in transparency. The best results are found through cooperation. Therefore, it is vital to form a good network. This network helps to ensure the quality of the research, while it also aids in making the Centre stand out when it comes to IOR research worldwide.

A Russian delegation counting 11 scientists and industry experts both from Moscow Petroleum Institute and Lukoil visited the Centre to learn more about cooperation between academia and industry. Future collaboration is always a topic when international delegations visit the Centre. Here postdoc Ivan Dario Pinerez Torrijos is giving a presentation.

Technical University of Denmark, DTU, is a close collaborator of the Centre. When Danish Hydrocarbon Research and Technology Centre (DHRTC) arranged a workshop on salinity water flooding, several of the Centre's researchers gave talks. Here research director Aksel Hiorth and associate professor Tina Puntervold.

Danish Hydrocarbon Research and Technology Centre (DHRTC) came to visit us summer 2018. From left Centre director Merete Vadla Madland, DHRTC director Bo Cerup-Simonsen and research director Aksel Hiorth.

Photos: Kjersti Riiber


Sound of
Science
University
of Stavanger

CONFERENCES & AWARDS

IOR NORWAY 2018

Danielle Morel, Total. Photos: Marius Vervik

PhD students giving a one minute standup.

Alberto Bila, NTNU.

Singers Britt-Synnøve Johansen & Randi Tytingvåg.

State secretary Ingvil Smines Tybring-Gjedde

Matthew Jackson
Imperial College

Gunnar Hjelmtveit Lille, OG21
& Randi Valestrand, NORCE/The National IOR Centre of Norway.

Sissel Opsahl Viig, IFE/The National IOR Centre of Norway

Lawrence Cathles III, Cornell University

Close to 300 participants caught up on new IOR research at 2018's big IOR event at UiS.

The 2018 conference was the 5th hosted by the Centre. 270 participants attended IOR NORWAY 2018, most of them from academia, but also industry and national authorities were represented at this meetingplace.

Rector at University of Stavanger, Marit Boyesen, gave the opening speech, while Centre director Merete Vadla Madland and state secretary Ingvil Smines Tybring-Gjedde from the Ministry of Petroleum and Energy followed up talking about the future of IOR research, the many young talents that will lead the way and IOR in a government perspective.

Tybring-Gjedde gave praise to the Centre for the «excellent results in the midterm evaluation». She also mentioned the high activity level on the Norwegian Continental Shelf, and gave the petroleum students an optimistic message; it is still important to educate brilliant minds to the oil and gas industry. After her speech, she took the time to talk to some of the students.
«We need many of you in the years to come,» she said to the students from the SPE Student Chapter (Society of Petroleum Engineers).

Day one of the conference was summed up with a debate. Professor Reidar Bratvold from UiS, Professor Mojdeh Delshad from UT Austin and Erik Søndenå from Petoro attended. The debate was chaired by Tor Øyvind Skeiseid, who also led the conference, and Jan Ludvig Vinningland from NORCE (former IRIS) and the Centre.

«How do we get the experiments out of the lab and in to the field?» Skeiseid asked the panel.
«There was more willingness to test new technology earlier. We need to take risk on projects where we don't necessarily see the income in 10-20 years from now,» Erik Søndenå from Petoro answered.
«One of the reasons that companies are not investing in field tests, is the personal risk. You have to spend a lot of money now, for income that might not show up,» Reidar Bratvold added.

Mojdeh Delshad said that the answer might be a number of smaller tests to reduce the risk.
«Smaller and cheaper tests with quicker response can be a solution,» she said.

Professor Lawrence Cathles III from Cornell University summed up the conference.
«This has been a unique and thought-provoking meeting at the mid stage of an ongoing project,» he said.
«The Centre has made a great impact already. Now one big challenge remains: How to tie it all together in just 3 years,» Cathles continued and told the students to appreciate meetings like IOR NORWAY.
«This is as good as it gets in a meeting,» he said.

Siv Marie Åsen, The National IOR Centre of Norway/UiS

Tor Øyvind Skeiseid (Svanhild Spanne in the background)

#ONS18: THE SOUND OF SCIENCE

Communications advisor at UiS, Mari Løvås interviews professor and research director Aksel Hiorth and Jarle Haukås, member of technical committee at the Centre and also Reservoir Management and IOR Program Manager at Schlumberger. Photos: Kjersti Riiber

The UiS stand at ONS, Sound of Science. Present at the stand were The National IOR Centre of Norway, UiS Lifelong Learning, Future Energy Hub, Cluster on Industrial Asset Management (CIAM), UiS International Office and UiS Centre for entrepreneurship.

ONS 2018
27 – 30 AUGUST
STAVANGER – NORWAY

University of Stavanger and The National IOR Centre of Norway were strongly present at ONS 2018 (Offshore Northern Seas) the last week in August.

The UiS stand by the Centre Court of the exhibition area had the theme «Sound of Science». Our visitors had the opportunity to listen to a podcast series featuring interviews with researchers. Both students, researchers and management all the way up to the rector attended the stand.

The conference programme at ONS 2018 included 600 speakers taking part in a wide range of programmes and sessions held on seven different arenas. In addition to covering aspects of technology and innovation within the fields of oil, gas and renewable energy, topics also included geopolitics, digitalization, ICT and cyber security, management and much more. There was also a separate technical programme with sessions on for instance drilling, automated operations, oil and gas production in the Barents Sea, IOR and artificial intelligence. The conference programme also featured sessions taking place in the small lecture hall called Centre Court. The theme for the Centre Court programme was The Future Society Lab.

UiS had its own 42 square meter stand that served as a hub for UiS employees. People from The National IOR Centre of Norway, UiS EVU, Future Energy Hub, CIAM, the Faculty of Science and Technology and the Department of Strategy and Communications were present at the stand.

The concept for the stand was «Sound of Science». The UiS has opened a podcast channel where each episode features an interview with a researcher that visitors can listen to at the stand. Several episodes were recorded live at stand during ONS. These podcasts allow the UiS to interact with people outside the university world by communicating what we do and welcoming input from visitors to our stand.

The National IOR Centre of Norway gave five interviews on different subjects (*https://nettop.guru/wordpress/category/sound-of-science/*):

- Collaboration is key – the success story of The National IOR Centre of Norway
  Centre director Merete Vadla Madland and Head of Board Thierry Laupretre

- A research bromance – how to build a lasting relationship between academia and the industry
  Research Director Aksel Hiorth and TC member Jarle Haukås

- Improved oil recovery: Collaborating for better technology and a greener future
  Centre director Merete Vadla Madland

- Collaboration on polymers to recover more oil
  Phd student Siv Marie Åsen

- Large scale onshore testing – the missing link between lab and field in petroleum research
  Department head at IFE, Christian Dye

PhD student Mona Wetrhus Minde getting ready for a live interview with NRK P2. From NRK Erlend Frafjord and Cecilie Langum Becker.

Centre director Merete Vadla Madland & head of board Thierry Laupretre do their podcast interview; «Collaboration is key».

AWARDED WITH INNOVATION PRIZE

Arild Lohne and Oddbjørn Nødland (top left picture) received SR-bank's Innovation Award for 2017. The prize was awarded by Thor-Christian Haugland, Executive Vice President Communications, SR-Bank. Photos: Mari Løvås / Kjersti Riiber / Mette Skretting

SR-bank's Innovation Award 2017 was given to Arild Lohne, NORCE and PhD student Oddbjørn Nødland, UiS. Both are researchers at The National IOR Centre of Norway.

The winners of SR-bank's Innovation Award 2017 have developed a new simulation tool, IORCoreSim, with potentially great positive implications for the oil industry. IORCoreSim can help reduce the amount of polymer used when producing oil, thus saving the environment and achieving better utilization of oil reservoirs. Both Arild Lohne and Oddbjørn Nødland are researchers at NORCE and The National IOR Centre of Norway.

Executive vice president communications, Thor-Christian Haugland in SR Bank, was full of praise when awarding the prize.
«Lohne is a leading researcher in his field. He has the unique talent for combining practical experience from laboratories, knowledge on pores and transferring experimental data to mathematical models. These models describe how chemical processes can contribute to the transport of one or more phases in a porous medium. The research team around him is recognized as a world leader when it comes to modelling, transport and chemical components in a porous medium,» Haugland said. The jury drew particular attention to the PhD candidate Oddbjørn Nødland. «Nødland represents a new generation of up- and coming academics who combine research and innovation. Together the two candidates for this year's innovation award have developed a new simulation tool called IORCoreSim with a potential for great positive implications for the industry. IORCoreSim can contribute to minimize the use of polymers and thereby saving the environment and maximizing recovery of excisting oil reservoirs. Both candidates are assiociated with The National IOR Centre of Norway. The jury would like to draw particular attention to the PhD candidate for working with great dedication, determination and success to motivate the eleven industry partners at the IOR Centre to implement IORCoreSim in their activities.»

Together the two candidates have developed a new simulation tool with a potential for great positive implications for the industry.

Lohne was clearly honoured.
«This award is a recognition of the work we have done and gives us an encouragement to continue. A big thank you to SR-bank and the committee for the prize, and to the IOR Centre that made this possible. I hope that the award will contribute to increased focus among the partners in the Centre to take this tool we have developed in use,» Lohne said when he received the award.

NPD'S IOR PRIZE

The NPD IOR Prize has been awrded annually from 1998 to 2010 – from 2010 the prize has been given every other year. Professor Emeritus Svein M. Skjæveland at the University of Stavanger was one of three nominees to the 2018 prize. Skjæveland has been nominated for his efforts to build the petroleum engineering program at UiS.

The nomination of Skjæveland states: «He has for many years contributed in education, research, management and organization. For several years he directed petroleum activities at both the District College and Rogaland Research (now NORCE). He developed the first master's program in petroleum technology in Stavanger. And later, he contributed to the University College of Stavanger's PhD program in petroleum technology.»
The licensees of Alvheim won the prize.

BEST YOUNG RESEARCHER

The Skjæveland Award 2018 was given during the second day of the conference IOR NORWAY. It is The National IOR Centre of Norway's prize for young researchers. The award is named after the Centre's Director for Academia, Professor Svein M. Skjæveland. The prize goes to a young researcher within IOR (Improved Oil Recovery) who has shown the ability to innovate within his or her field of research.

About the winner: Siv Marie Åsen has recently received a research fellowship from The National IOR Centre of Norway, and has therefore taken leave of her work as a researcher at NORCE. Åsen holds a MSc degree in organic chemistry from the University of Oslo. In recent years, she has worked in the enhanced oil recovery group at IRIS (now NORCE). She was clearly surprised – and thankful – to receive the prize.

DISSEMINATION

NATIONAL SCIENCE WEEK

Centre director Merete Vadla Madland with Ava (4). Photos: Kjersti Riiber

Forskningsdagene

Hanna (10) and Marie (11) are trying to make polymer swirls.

PhD student Ema Kallesten adjusting the microscope.

Emilie Husberg Myklebust trying the chalk hammer at Science Fair.

Who would have thought that a four minute presentation on seismic could be this intriguing? Karen Synnøve Ohm managed to present her research in a way that impressed everyone present at Folken, Stavanger.

Forsker Grand Prix is a contest where PhD students present their research projects. Nine PhD candidates from University of Stavanger, VID vitenskapelige høgskole and Stavanger universitetssjukehus (SUS) competed in the regional dissemination championship. Karen Synnøve Ohm gave a brief introduction to her PhD project on elastic full-waveform inversion. The judges were so impressed that she was picked as the wild card to the second round. Therefore she got to give another four minute presentation on her work.

Unfortuneately Karen Synnøve was beaten by the two candidates she competed against in the second round. Ben David Normann and Ana Llopis Alvarez are also PhD students at Faculty of Science and Technology, UiS. Normann takes his degree at Department of mathematics and physics, Alvarez at Department of safety, economics and planning. They went to Tromsø to compete in the national finals, and Ben David won. Congratulations! In 2019 University of Stavanger will be hosting the national finals, and hopefully The National IOR Centre of Norway and UiS will be represented there.

FORSKER
GRAND PRIX

Hilde Zahl with the nine regional finalists in Folken. Left: Inger Johanne Bergerød (SUS/UiS), Ben David Normann (UiS) (national winner), Johanne Holm Toft (SUS), Mariella Asikanius (VID), Ana Llopis Alvarez (UiS), Karen Synnøve Ohm (The National IOR Centre of Norway/UiS), Saeed Moghadam-Saman (UiS), Une Stømer (SUS/UiS) and Ingrid Løland (VID). Photos: Mari Løvås

THREE MORE CANDIDATES HAVE DEFENDED THEIR PHD THESES

Kun Guo. Photos: Kjersti Riiber

Three of our PhD candidates had their public defence during 2018; Kun Guo in April, Laura Borromeo in June and Mona Wetrhus Minde in November. In 2019 nine more will defend.

The three candidates who defended their PhD theses in 2018, had one thing in common. The number of papers published during their PhD is more than could be expected. Also, the quality of their work is impressive. Kun Guo had already published five journal papers after two years. In all five he was first author and it was in top journals in the petroleum field, such as «Energy & Fuels» and «Fuel». Two more journal papers were reviewed when he defended. Laura Borromeo had four papers and one of them was selected "editor's pick" in the Journal of Applied Physics. The last candidate to defend, Mona Minde, had seven journal papers and eight additional papers. She also had a number of conference contributions in the time of her PhD.

Kun Guo: 12 April – «In-situ and ex-situ catalytic upgrading of heavy crude oil». Supervisors were Zhixin Yu (UiS) and Svein Magne Skjæveland (UiS).
The committee: Joseph Wood (University of Birmingham), Magnus Rønning (NTNU) and Thor Martin Svartås (UiS).

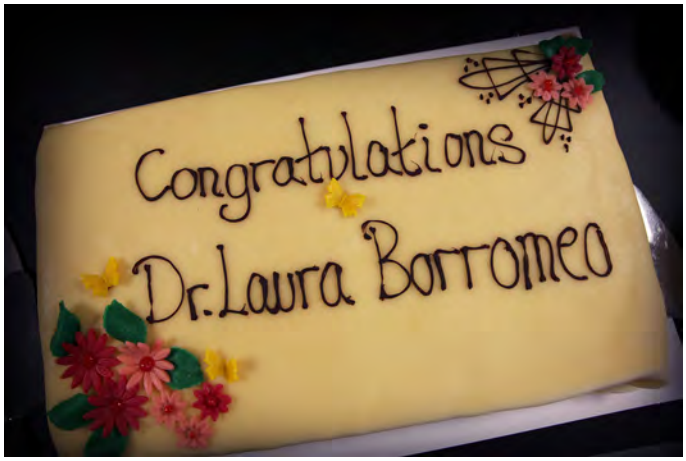
Laura Borromeo: 6 June – «Raman Spectroscopy applied to the mineralogical analysis of flooded chalk». Supervisors: Udo Zimmermann (UiS) and Sergio Ando (University of Milano-Bicocca).

The committee: Peter Vandenabeele (Ghent University), Claudia Conti (National Research Council, Italy) and Lisa Watson (UiS).

Mona Wetrhus Minde: 9 November – «Mineral Replacements in Flooding Experiments Linked to Enhanced Oil Recovery in Chalk».
Supervisors were Udo Zimmermann (UiS) and Merete Vadla Madland (UiS).
The committe: Peter Armitage (British Petroleum, UK), Martin Fernø (UiB), Ana Todosijevic (Wintershall) and Tina Puntervold (UiS).

Coming up 2019:

- Oddbjørn M. Nødland – defended 8 January 2019
- Remya Nair – defends 15 March 2019
- Yiteng Zhang – delivered thesis December 2018
- Mario Lopes da Silva – deliveres thesis spring 2019
- Samuel Erzuah – expected to defend March 2019
- Jaspreet Singh Sachdeva – deliveres thesis end of April 2019
- Mohan Sharma – expected to defend April/May 2019
- Shaghayegh Javadi – defends 2019
- Eystein Opsahl – defends 2019



Laura Borromeo (top) and Mona Wetrhus Minde.

The three candidates who defended their PhD theses in 2018, had one thing in common. The number of papers published during their PhD is more than could be expected.

Three more hardback PhD theses to put in the Centre bookshelf.

The researchers at the Centre travel all over the world, and they bring their results with them. In 2018 we have been present at Eni Norge Reservoir Seminar, The Offshore Strategy Conference, Researcher's Night – SPE Young Professionals Stavanger Section, Sysla Live, SPE Workshop: Improved Decision-Making Through Tracer Technology, SPE Improved Oil Recovery Conference, SPE Norway One Day Seminar, IOR NORWAY 2018, 13th International EnKF Workshop, PDE Software Frameworks (PDESOFT), 80th EAGE Conference & Exhibition in Copenhagen, Nordic Rheology Conference, Modified Salinity Water Flooding Workshop, DTU Copenhagen, Unconventional Resources Technology Conference, SCA Annual Symposium, ONS (Offshore Northern Seas), ECMOR XVI, IEA-EOR 2018, EAGE/TNO Workshop on OLYMPUS Field Development Optimization, SPE Annual Technical Conference and Exhibition, Pumps & Pipes Norway, SPE APOGCE, NFiP Annual PhD seminar 2018, OG21 Forum 2018.

CONFERENCES

Kalmar Ildstad and Ingrid Sølvberg (NPD).

THE CENTRE VISITED NPD

The management team of The National IOR Centre of Norway was invited to the Norwegian Petroleum Directorate (NPD) to present the latest Centre highlights and discuss how the Centre and NPD can work more closely together in the future.

Ingrid Sølvberg, Director, Development and operations in the Norwegian Petroleum Directorate (NPD) stated that The National IOR Centre of Norway and NPD have many joint goals, and that it is important for NPD to follow and understand what the Centre does so that we can help each other reach our goals. One of the conclusions of the meeting was that it can be useful to meet more frequently in the continuation. «We have many joint goals, one of them being to profitably produce as much as possible of the resources in place on the Norwegian Continental Shelf. Therefore, both parts can benefit from an even closer dialogue,» Ingrid Sølvberg said.

VISITORS FROM ALL OVER THE WORLD

The Centre gets visitors from all over the world. Autumn 2018 Moscow Petroleum Institute, Lukoil and Petronas came to see us and learn more about our work. In addition to presenting our model of organizing research centres, we got to know the priorities of international companies and research institutions, the first step towards collaboration.

OG21 had their summer board meeting at UiS. They have given input to the long-term plan for research. Lars Sørum (SINTEF), Merete Vadla Madland (IOR Centre), Gunnar Lille (OG21) and Øystein Lund Bø (UiS). Photo: Kjersti Riiber

THE CENTRE RECOGNIZED IN NATIONAL LONG-TERM PLAN FOR RESEARCH

OG21 is the national oil and gas strategy, and therefore the board has a saying when the government sets up the «Long-term plan for research and higher education».

The National IOR Centre of Norway is mentioned in the revised version of this plan: *«Experiences from The National IOR Centre of Norway show that the centre has become an important platform for developing technology for increased recovery factor on the Norwegian Continental Shelf. Broad collaboration between research communities and industry is key,»* the plan states.

The long-term plan focuses on environmentally friendly production. *«New technology and equipment that can contribute to a more environmentally friendly production of oil and gas is increasing competitiveness and may have a transfer value to other energy areas. Several companies in the oil and gas sector is already engaged in R&D activities and business development within offshore energy production,»* and continues:

«There is also a great need for research-based knowledge related to safeguarding health, environment and safety and prevent major accidents during exploration and extraction in the High North. The petroleum sector has a long-term perspective. That is why it needs to recruit qualified labor to maintain an efficient and secure business at the Norwegian Continental Shelf and at the same time further develop their strong professional environments, both within industry, research communities and public administration. This requires that the relevant education is up to date, keeps high professional and educational quality and has proximity to the field of practice and the industry.»

DISSEMINATION IN NUMBERS

2018 was a very productive year for the researchers at the Centre. Here are some statistics from CRIStin (Current Research Information SysTem in Norway). See full list pages 57-65:

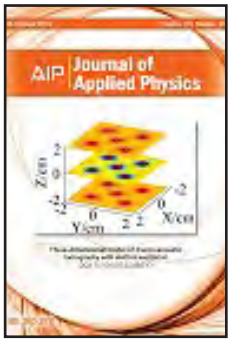
- Journal article: 52
- Conference contribution or scholarly presentation: 137
- Report/dissertation: 37
- Part of a book/report: 28
- Media contribution: 34
- Information materials: 3

HERE ARE THE TASK LEADERS' SELECTED PAPERS FOR 2018

TASK 1

Within the work on Large-scale-testing, mechanical degradation in porous media was, in linear geometry, found to depend on travelled distance.
This paper has been published in SPE Journal. Siv Marie Åsen also received the 2018 Skjæveland award, when she presented this work at IOR Norway. Short abstract: In this work, we challenge the common understanding that mechanical degradation takes place at the rock surface or within the first few mm. The effect of core length on mechanical degradation of synthetic EOR polymers was investigated. We constructed a novel experimental set-up for studying mechanical degradation at different flow rates as a function of distances travelled. The set-up enabled us to evaluate degradation in serial mounted core segments of 3, 5, 8 and 13 cm individually or combined. By recycling we could also evaluate degradation at effective distances up to 20 m. By low rate reinjecting of polymers previously degraded at higher rates, we simulated the effect of radial flow on degradation. Experiments were performed with two different polymers (high molecular weight HPAM and low molecular weight ATBS) in two different brines (0.5% NaCl and synthetic seawater). In linear flow at high shear rates, we observed a decline in degradation rate with distance travelled, but a plateau was not observed.
doi: https://doi.org/10.2118/190225-PA

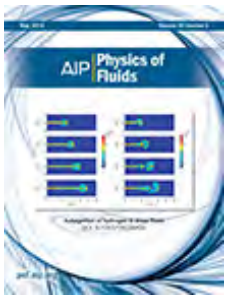
Åsen, S.M., Stavland A., Strand, D. and Hiorth, A. 2018. An experimental Investigation of Polymer Mechanical Degradation at the Centimeter and Meter Scale.



TASK 2

This interdisciplinary paper published in a high ranked physics journal shows the state-of-the-art class of the research. The applied method is absolutely novel wherefore this article has been selected as 'editors choice', which is a great honour and substantiate the high class research of our PhD students. It also shows that there are many other ways to go to investigate chalk and rock types than the usual ones and that research shall be open to new frontiers. The combination of nano-Raman technology with atomic force microscopy and transmission electron microscopy is as well an outstanding approach to rock analyses.
Abstract: One of the most challenging goals of flooded chalk analyses used in Enhanced Oil Recovery (EOR) is to reach high-resolution mineralogical data, in order to detect the composition of new crystals grown after brine injections, with ≤ 1 μm grain size. Understanding how flooding affects chemical induced compaction, mechanical strength permeability, and porosity is paramount in EOR related investigations. Magnesite formation is the most pervasive process when MgCl2 is injected into chalk, and the submicrometric grain size of the new minerals requires a high performing imaging technique and a new methodological approach: in our study, we present the first attempt of applying Tip-Enhanced Raman Spectroscopy (TERS) to rock and mineral samples. It is a new frontier technique that couples Raman Spectroscopy with Atomic Force Microscopy, allowing impressively high-resolution topography and mineralogical maps. Two long term experiments have been analyzed, where chalk cores were flooded for 718 days and 1072 days, at reservoir conditions comparable to hydrocarbon reservoirs in chalk at the Norwegian continental shelf. Few microns squared areas have been imaged by Atomic Force Microscopy using ultra-polished thin sections. First analyses identified a less pervasive secondary growth of magnesite in the 718 days test and an almost pure magnesite composition in the 1072 days test. Transmission Electron Microscopy (TEM) has been employed to confirm the results of TERS and add dark and bright field grain imaging to the investigations. This confirms the need for high-resolution methodologies such as TERS and TEM to fully understand the EOR effects at submicron-scale. Published by AIP Publishing.
doi: https://doi.org/10.1063/1.5049823

Borromeo, L., Toccafondi, C., Minde, M. W., Zimmermann, U., Andò, S., Madland, M.V., Korsnes, R.I., Ossikovski.R. 2018. Application of Tip-Enhanced Raman Spectroscopy for the nanoscale characterization of flooded chalk. Journal of Applied Physics, 124, 173101



TASK 3

This paper addresses the inclusion of mass sources in pore scale models for fluid flow. Previous lattice Boltzmann models has over looked the addition of momentum in the fluid dynamic equations. This would have led to discrepancies in predicted macroscopic flow behavior.
The algorithm proposed in this model increases the versatility of the lattice Boltzmann method. It has, combined with previous IOR center model developments, been used to incorporate osmotic pressure effects in oil-brine systems. It can also be used for pressure control in model setups and has recently been adopted for modeling of acoustic phenomena [Y. Cai, et. al., J. Acoust. Soc. Am. 144(4) p. 2265 (2018)].
Abstract: We present a lattice Boltzmann algorithm for incorporating a mass source in a fluid flow system. The proposed mass source/sink term, included in the lattice Boltzmann equation, maintains the Galilean invariance and the accuracy of the overall method, while introducing a mass source/sink term in the fluid dynamical equations. The method can, for instance, be used to inject or withdraw fluid from any preferred lattice node in a system. This suggests that injection and withdrawal of fluid does not have to be introduced through cumbersome, and sometimes less accurate, boundary conditions. The method also suggests that, through a chosen equation of state relating mass density to pressure, the proposed mass source term will render it possible to set a preferred pressure at any lattice node in a system. We demonstrate how this model handles injection and withdrawal of a fluid. And we show how it can be used to incorporate pressure boundaries. The accuracy of the algorithm is identified through a Chapman-Enskog expansion of the model and supported by the numerical simulations.
doi: https://doi.org/10.1063/1.5024641

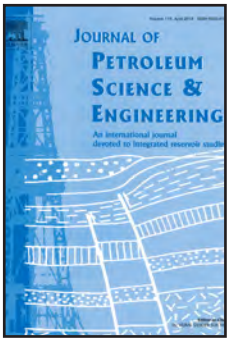
Olav Aursjø, Espen Jettestuen, Jan Ludvig Vinningland and Aksel Hiorth, "On the inclusion of mass source terms in a single-relaxation-time lattice Boltzmann method", Physics of Fluids 30, 057104 (2018)

A predictive model correlating the parameters in the mass transfer-based model Spiegler–Kedem to the pure water permeability is presented in this research, that helps to select porous polyamide membranes for enhanced oil recovery (EOR) applications. The novelty of this research is the development of a model that consolidates the various complex mechanisms in the mass transfer of ions through the membrane to an empirical correlation for a given feed concentration and membrane type. Ten model correlations were developed using results from four polyamide NF membranes, which could determine the rejection, reflection coefficient and solute permeability of individual ions in seawater. The pure water permeability chosen for the model is in the range required for smart water production. The only variables required for this model is the pure water permeability and membrane flux with seawater as feed. The correlations can be used for calculating reflection coefficient and solute permeability of polyamide membranes with a pore size between 0.4 to 0.86 nm and with pure water permeabilities between 5 × 10-12 to 3 × 10-11 m/s/Pa. The suggested method helps to predict NF rejection for smart water production from seawater and for feeds with a high concentration and multi-ionic solutions as in softening and desalination.

doi: https://doi.org10.3390/membranes8030078

Remya R. Nair, Evgenia Protasova, Skule Strand and Torleiv Bilstad, 2018. Implementation of Spiegler-Kedem and Steric Hindrance Pore Models for Analyzing Nanofiltration Membrane Performance for Smart Water Production. Membranes, 8, 78

TASK 4



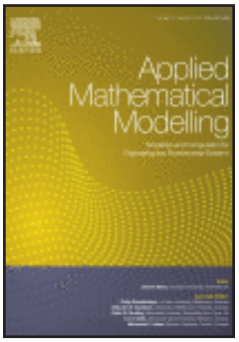
Previous to this PhD project the development of the field-scale chromatographic method called PITT (partitioning interwell tracer technology) to measure remaining or residual oil saturation after water flooding had been slow. The project has resulted in a number of new PITT tracer compounds with sufficient thermal and chemical stability, and with oil/water partition coefficients in the right area. The paper highlighted here is the first in a series of three related papers treating the same subject of stability for different families of chemical compounds.

Short abstract: The selection of compounds used as inter-well tracers has traditionally been done taking into consideration the goal of the test and the ease in analyzing the chemicals used. This often led to improper selection of the tracers and insufficient knowledge about their behavior under typical reservoir conditions, resulting in several unsuccessful inter-well tracer tests. One of the critical characteristics of any conservative tracer is its stability under various reservoir conditions. In this document we present the study methodology and the findings from stability experiments carried out on 5 benzyl alcohols investigated as oil/water partitioning tracers for partitioning interwell tracer tests (PITT). This is the first of three documents reporting such studies on 3 families of chemicals.

doi: https://doi.org/10.1016/j.petrol.2018.04.027

Mario Silva, Helge Stray and Tor Bjørnstad, 2018. Stability assessment of PITT tracer candidate compounds: The case of benzyl alcohols. Journal of Petroleum Science and Engineering, 167, (2018) 517–523

TASK 5



This paper highlights emerging simulation technologies with relation to reservoir simulation. Various common difficulties are addressed, such as higher order discretizations, seamless use of hp-adaptive methods, and user friendly python programming interfaces.

Abstract:
In this paper we present a framework for solving two-phase flow problems in porous media. The discretization is based on a Discontinuous Galerkin method and includes local grid adaptivity and local choice of polynomial degree. The method is implemented using the new Python frontend Dune-FemPy to the open source framework Dune. The code used for the simulations is made available as Jupyter notebook and can be used through a Docker container. We present a number of time stepping approaches ranging from a classical IMPES method to a fully coupled implicit scheme. The implementation of the discretization is very flexible allowing to test different formulations of the two-phase flow model and adaptation strategies.

doi: https://doi.org/10.1016/j.apm.2018.10.013

A. Dedner, B. Kane, R. Klöfkorn, and M. Nolte. Python framework for hp-adaptive discontinuous Galerkin methods for two-phase flow in porous media. Applied Mathematical Modelling, 67:179-200, 2019

TASK 6

This paper demonstrates a new recipe to mitigate ensemble collapse, a well-known phenomenon in ensemble-based history matching method. The new approach outperforms the conventional distance-based localization scheme in terms of its simplicity to implement, adaptability in different types of observation data and applicability to nonlocal observations. Further, the method can be used for nonlocal observations which is still a challenge in the case of distance-based localization. The results from two different seismic history matching problems (one 2D and one 3D) show the efficacy the proposed method by rendering good history matching results. Short abstract: Ensemble-based history-matching methods have received much attention in reservoir engineering. In real applications, small ensembles are often used in reservoir simulations to reduce the computational costs. A small ensemble size may lead to ensemble collapse, a phenomenon in which the spread of the ensemble of history-matched reservoir models becomes artificially small. Ensemble collapse is not desired for an ensemble-based history-matching method because it not only deteriorates the capacity in uncertainty quantification, but also forces the ensemble-based method to later stop updating reservoir models. In practice, distance-based localization is thus introduced to tackle ensemble collapse. Distance-based localization works well in many problems. However, one prerequisite in using distance-based localization is that the observations have associated physical locations. In certain circumstances with complex observations, this may not be true, and it thus becomes challenging to apply distance-based localization.

doi: https://doi.org/10.2118/185936-PA

Luo, X., Bhakta, T. and Naevdal, G., 2018. Correlation-Based Adaptive Localization With Applications to Ensemble-Based 4D-Seismic History Matching. SPE Journal

TASK 7

MEDIA CONTRIBUTIONS 2018

Centre director Merete Vadla Madland is interviewed by TV Vest's Ivan Bråten at IOR NORWAY 2018. Photos: Kjersti Riiber

The Italian broadcast company RAI and their news magazine "Report" made a documentary on the Norwegian oil and gas adventure. Here PhD students Emanuela Kallesten and Tijana Voake are interviewed by journalist Luca Chianca. Matteo Delbò is filming.

Navet i den internasjonale forskningen for IOR

I farten
Oljeteknologi for hjertet

Under tellekanten: Mer olje opp på grønnere og billigere måte

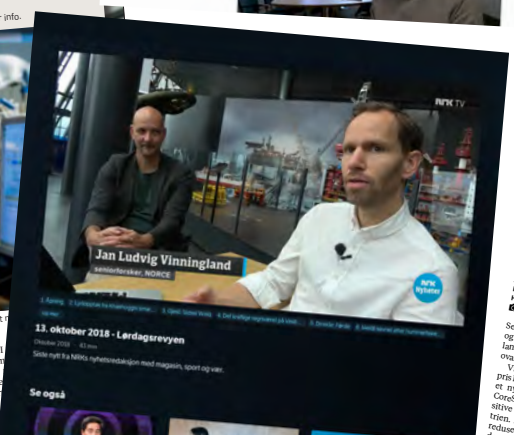
Merete Vadla Madland er sjef for et samarbeid mellom et par hundre forskere, ett universitet, to forskningsinstitusjoner og 11 industripartnere.

Nye mastergrader ikke bare for oljebransjen

To tidligere sokndøler står bak et nytt masterstudium ved Universitetet i Stavanger.

ESPEN A. EIK

EN EGEN KUNST: Professor Aksel Hiorth, her med Tonje Rafshol Hovden, starter til høsten opp et nytt r



Innovasjonspris til Lohne og Nødland

Arild Lohne og Oddbjørn Nødland (ikke til stede) har mottatt SR-banks innovasjonspris for 2017. Prisen ble delt ut av konsernsjef Thor-Christian Haugland i SR-bank, til venstre.

Forskere hedret

• Oljeforskere fikk pris for sitt arbeid

Eva Johansson fikk pris av Lyses

Økt andel kvinnelige professorer på UiS – fra 21 til 27 prosent

De fleste professorene ved UiS er menn, men andelen kvinner stiger stadig. UiS hadde ved utgangen av fjoråret 27 prosent kvinner i professor- og dosentstillinger. Dette er ett prosentpoeng over det nasjonale målet om en kvinneandel på 26 prosent, skriver UiS i en pressemelding.

– Resultatet er marginalt lavere enn i 2016, men tallene viser at tatt opp i «Kvinner til topps»-programmet har tre fått opprykk til professor, mens flere er i ferd med å forberede søknad om kompetanseopprykk, skriver UiS.

– Fortsatt er det på en del områder, som innenfor de matematiske og naturvitenskapelige fagene, svært krevende å rekruttere kvinner, sier Bjaalid.

Situasjonen ved det teknisk-

ECONOMY 2018

OPERATING INCOME AND OPERATING COSTS 2018
(All numbers in 1000)

Remaining as per 31.12 previous year	2 200
UiS – own contribution	15 201
NFR	10 000
User partners	16 400
User partners – in kind	6 199
International – in kind	350
Other income	500
Total operating income	**50 850**
Payroll expenses	20 757
Procurement of R&D services	21 728
R&D services – in kind	6 199
International R&D services – in kind	350
Other operating expenses	1 616
Total operating expenses	**50 650**
Operating profit	**200**

Comments to Operating income and expenses in 2018:

- Positive operating profit for kNOK 2200 was transferred from 2017 to 2018. (Positive profit relates to payment for kNOK 2000 from new partner DEA in 2017).
- Income from The Research Council of Norway (RCN) includes kNOK 3333 for 2017 and kNOK 6666 for 2018. kNOK 3333 will be transferred from RCN in 2019 to cover costs for 2018.
- Income includes payments from 9 user partners. They each paid kNOK 1800 for January to November 2018 apart from DEA who paid kNOK 2000 in 2018.
- Halliburton, Schlumberger, DTU, ISEI and CU each contribute by providing work in-kind.
- Other income relates to IOR NORWAY 2018.
- Payroll expenses includes IOR Management, administration, PhDs, postdocs and technican. Real costs versus RCN rate for PhDs.
- Procurement of R&D services relates to services from NORCE, IFE and TNO.
- Other operating expenses relates to travel costs, laboratory costs, profiling, IOR NORWAY 2018 et cetera.
- Positive operating profit for kNOK 200 is transferred to 2019.

MANAGEMENT TEAM


Merete Vadla Madland
UiS, Centre director
Project Manager


Aksel Hiorth
UiS/NORCE
Research director


Randi Valestrand
NORCE, Research director


Sissel Opsahl Viig
IFE, Director Field Implementation


Sven M. Skjæveland
UiS, Director Academia
Project Manager

ADMINISTRATION


Kjell Gunnar Pettersen
UiS, Administrative coordinator


Iren Lobekk
UiS, Economy advisor


Kjersti Riiber
UiS, Communications advisor


Gro Alstadsæther
NORCE, Finance coordinator


Mette Skretting
NORCE, Administration coordinator

TASK LEADERS


Arne Stavland, NORCE
Task 1 / Project manager


Udo Zimmermann, UiS
Task 2 / Project manager


Espen Jettestuen, NORCE
Task 3 / Project manager


Aksel Hiorth, UiS/NORCE
Task 4 / Project manager


Tor Bjørnstad, IFE
Task 5 / Project manager


Robert Klöfkorn, NORCE
Task 6 / Project manager


Geir Nævdal, NORCE
Task 7 / Project manager

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Ingebret Fjelde, NORCE


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UiS/NORCE


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Geir Ersland, UiB


Jan Ludvig Vinningland,
NORCE


Jan Sagen, IFE


Terje Sira, IFE


Jan Nossen, IFE


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Steinar Groland, IFE


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Amare Mebratu, Halliburton


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Steinar Evje, UiS

Arne Graue, UiB

Yuqing Chang, NORCE

Rolf J. Lorentzen, NORCE

Andreas S. Stordal, IMR

Xiaodong Luo, NORCE

Morten Jakobsen, UiB

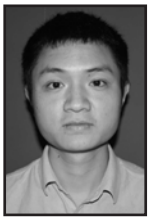
Jarle Haukås, Schlumberger

Wiktor Weibull, UiS

PHD STUDENTS & POSTDOCS


Oddbjørn Nødland, UiS/NORCE
PhD student


Samuel Erzuah, UiS/NORCE
PhD student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Irene Ringen, UiS/NORCE
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Emanuela Kallesten, UiS
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Mona Wetrhus Minde, UiS
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Mario Silva, UiS/IFE
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Mohan Sharma, UiS/UiB
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Yiteng Zhang, UiS/NORCE
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PhD student


Birane Kane, NORCE
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Aruoture Omekeh, NORCE
Postdoc


Bergit Brattekås, UiB
Postdoc


Dmitry Shogin, UiS
Postdoc


Mahmoud Ould Metidji, IFE
Postdoc


Trine S. Mykkeltvedt, NORCE
Postdoc


Pål Østebø Andersen, UiS
Postdoc


Tuhin Bhakta, NORCE
Postdoc


Kjersti Solberg Eikrem, NORCE
Postdoc

PUBLICATIONS 2018

JOURNAL PUBLICATIONS

Agista, Madhan Nur; Guo, Kun; Yu, Zhixin.
A State-of-the-Art Review of Nanoparticles Application in Petroleum with a Focus on Enhanced Oil Recovery. Applied Sciences 2018 ;Volume 8.(6) p. 1-29
UIS

Alcorn, Zachary Paul; Fredriksen, Sunniva; Sharma, Mohan; Rognmo, Arthur Uno; Føyen, Tore Lyngås; Fernø, Martin; Graue, Arne.
An Integrated CO2 Foam EOR Pilot Program with Combined CCUS in an Onshore Texas Heterogeneous Carbonate Field. SPE Reservoir Evaluation and Engineering 2018
UiB UIS

Alyaev, Sergey; Keilegavlen, Eirik; Nordbotten, Jan Martin.
A heterogeneous multiscale MPFA method for single-phase flows in porous media with inertial effects. Computational Geosciences 2018 p. -
NORCE UiB

Andersen, Pål Østebø; Brattekås, Bergit; Nødland, Oddbjørn Mathias; Lohne, Arild; Føyen, Tore Lyngås; Fernø, Martin.
Darcy Scale Simulation of Boundary Condition Effects during Capillary Dominated Flow in High Permeability Systems. SPE Reservoir Evaluation and Engineering 2018
NORCE UiB UIS

Andersen, Pål Østebø; Lohne, Arild; Stavland, Arne; Hiorth, Aksel; Brattekås, Bergit.
"Core Scale Modelling of Cr(III)-Acetate-HPAM Gel Dehydration by Spontaneous Imbibition. SPE Journal 2018
NORCE UiB UIS

Andersen, Pål Østebø; Qiao, Yangyang; Standnes, Dag Chun; Evje, Steinar.
Co-current Spontaneous Imbibition in Porous Media with the Dynamics of Viscous Coupling and Capillary Back Pressure. SPE Journal 2018
UIS

Aursjø, Olav; Jettestuen, Espen; Vinningland, Jan Ludvig; Hiorth, Aksel.
On the inclusion of mass source terms in a single-relaxation-time lattice Boltzmann method. Physics of fluids 2018 ;Volume 30.(5) p. -
NORCE UIS

Bhakta, Tuhin.
Improvement of pressure-saturation changes estimations from time-lapse PP-AVO data by using non-linear optimization method. Journal of Applied Geophysics 2018 ;Volume 155. p. 1-12
NORCE

Borromeo, Laura; Egeland, Nina; Minde, Mona Wetrhus; Zimmermann, Udo; Andò, Sergio; Madland, Merete Vadla; Korsnes, Reidar Inge.
Quick, easy, and economic mineralogical studies of flooded chalk for EOR experiments using Raman spectroscopy. Minerals 2018 ;Volume 8:221.(6) p. 1-19
UIS

Borromeo, Laura; Toccafondi, Chiara; Minde, Mona Wetrhus; Zimmermann, Udo; Andò, Sergio; Madland, Merete Vadla; Korsnes, Reidar Inge; Ossikovski, Razvigor.
Application of Tip-Enhanced Raman Spectroscopy for the nanoscale characterization of flooded chalk. Journal of Applied Physics 2018 ;Volume 124.(17)
UIS

Dedner, Andreas; Kane, Birane; Klöfkorn, Robert; Nolte, Martin.
Python Framework for HP Adaptive Discontinuous Galerkin Method for Two Phase Flow in Porous Media. arXiv.org 2018 p. -
NORCE

Dedner, Andreas; Kane, Birane; Klöfkorn, Robert; Nolte, Martin.
Python framework for hp-adaptive discontinuous Galerkin methods for two-phase flow in porous media. Applied Mathematical Modelling 2018 ;Volume 67. p. 179-200
NORCE

Dziadkowiec, Joanna; Javadi, Shaghayegh; Bratvold, Jon E.; Nilsen, Ola; Røyne, Anja.
Surface Forces Apparatus Measurements of Interactions between Rough and Reactive Calcite Surfaces. Langmuir 2018 ;Volume 34.((25)) p. 7248-7263
UiO UIS

Eikrem, Kjersti Solberg; Nævdal, Geir; Jakobsen, Morten.
Iterated extended Kalman filter method for time-lapse seismic full-waveform inversion. Geophysical Prospecting 2018 ;Volume 67. p. 379-394
NORCE UiB

Erzuah, Samuel; Fjelde, Ingebret; Omekeh, Aruoture Voke.
Challenges associated with Quartz Crystal Microbalance with Dissipation (QCM-D) as a wettability screening tool. Oil & gas science and technology 2018 ;Volume 73.(58) p. -
NORCE UIS

Evensen, Geir; Eikrem, Kjersti Solberg.
Conditioning reservoir models on rate data using ensemble smoothers. Computational Geosciences 2018 ;Volume 22.(5) p. 1251-1270
NERSC NORCE

Guo, Kun; Ding, Yi; Luo, Jun; Yu, Zhixin.
Nickel cobalt thiospinel nanoparticles as hydrodesulfurization catalysts: Importance of cation position, structural stability and sulfur vacancy. ACS Applied Materials and Interfaces 2018 ;Volume 10.(23) p. 19673-19681
UIS

Guo, Kun; Hansen, Vidar; Li, Hailong; Yu, Zhixin.
Monodispersed nickel and cobalt nanoparticles in desulfurization of thiophene for in-situ upgrading of heavy crude oil. Fuel 2018 ;Volume 211. p. 697-703
UIS

Guo, Kun; Li, Hailong; Yu, Zhixin.
Size-dependent catalytic activity of monodispersed nickel nanoparticles for the hydrolytic dehydrogenation of ammonia borane. ACS Applied Materials and Interfaces 2018 ;Volume 10.(1) p. 517-525
UIS

Hong, Aojie; Bratvold, Reidar B; Lake, Larry W..
Fast Analysis of Optimal Improved-Oil-Recovery Switch Time Using a Two-Factor Production Model and Least-Squares Monte Carlo Algorithm. SPE Reservoir Evaluation and Engineering 2018 p. -
UIS

Hong, Aojie; Bratvold, Reidar B; Thomas, Philip; Hanea, Remus Gabriel.
Value-of-information for model parameter updating through history matching. Journal of Petroleum Science and Engineering 2018 ;Volume 165. p. 253-268
UIS

Huang, Xingguo; Jakobsen, Morten; Eikrem, Kjersti Solberg; Nævdal, Geir.
A target-oriented scheme for efficient inversion of time-lapse seismic waveform data. SEG technical program expanded abstracts 2018 p. 5352-5356
NORCE UiB

Jakobsen, Morten; Wu, Ru-Shan.
Accellerating the T-Matrix approach to seismic full waveform inversion by domain decomposition. Geophysical Prospecting 2018
UiB

Jakobsen, Morten; Wu, Ru-Shan; Huang, Xingguo.
Seismic waveform modelling in strongly scattering media using renormalization group theory. SEG technical program expanded abstracts 2018 p. 5007-5011
UiB

Javadi, Shaghayegh; Røyne, Anja.
Adhesive forces between two cleaved calcite surfaces in NaCl solutions: The importance of ionic strength and normal loading. Journal of Colloid and Interface Science 2018 ;Volume 532. p. 605-613
UiO UIS

Johnsen, Thore; Guttormsen, Atle; Osmundsen, Petter.
Bare rør. Dagens næringsliv 2018
UIS NHH NMBU

Johnsen, Thore; Guttormsen, Atle; Osmundsen, Petter.
Feil på feil om Aasta, avkastningen og røret. Dagens næringsliv 2018
UIS NHH NMBU

Johnsen, Thore; Guttormsen, Atle; Osmundsen, Petter.
Forskere som ser bort fra faglig svikt. Dagens næringsliv 2018
UIS NHH NMBU

Johnsen, Thore; Guttormsen, Atle; Osmundsen, Petter.
Mer rør fra WWF. Dagens næringsliv 2018
UIS NHH NMBU

Johnsen, Thore; Guttormsen, Atle; Osmundsen, Petter.
Oljeskatt og virkelighet. Dagens næringsliv 2018
UIS NHH NMBU

Johnsen, Thore; Guttormsen, Atle; Osmundsen, Petter.
Ville skattepåstander. Dagens næringsliv 2018
UIS NHH NMBU

Lorentzen, Sindre; Osmundsen, Petter.
Cost overruns on the NCS: how bad is it?. IAEE International Conference 2018
UIS

Lorentzen, Sindre; Osmundsen, Petter.
Exploration investment on the Norwegian Continental Shelf. IAEE International Conference 2018 UIS

Luo, Xiaodong; Bhakta, Tuhin; Jakobsen, Morten; Nævdal, Geir.
Efficient big data assimilation through sparse representation: A 3D benchmark case study in petroleum engineering. PLoS ONE 2018 ;Volume 13:0198586.(7) p. 1-32
NORCE UiB

Luo, Xiaodong; Bhakta, Tuhin; Nævdal, Geir.
Correlation-Based Adaptive Localization With Applications to Ensemble-Based 4D-Seismic History Matching. SPE Journal 2018 ;Volume 23.(02) p. 396-427
NORCE

Luo, Xiaodong; Lorentzen, Rolf Johan; Valestrand, Randi; Evensen, Geir.
Correlation-Based Adaptive Localization for Ensemble-Based History Matching: Applied To the Norne Field Case Study. SPE Reservoir Evaluation and Engineering 2018
NERSC NORCE

Minde, Mona Wetrhus; Wang, Wenxia; Madland, Merete Vadla; Zimmermann, Udo; Korsnes, Reidar Inge; Bertolino, Silvana R.A.; Andersen, Pål Østebø.
Temperature effects on rock engineering properties and rock-fluid chemistry in opal-CT-bearing chalk. Journal of Petroleum Science and Engineering 2018 ;Volume 169. p. 454-470
UIS

Nermoen, Anders; Korsnes, Reidar Inge; Storm, Eirik Vika; Stødle, Trond Inge Berg; Madland, Merete Vadla; Fabricius, Ida Lykke.
Incorporating electrostatic effects into the effective stress relation — Insights from chalk experiments. Geophysics 2018 ;Volume 83.(3) p. 123-135
NORCE UIS

Nævdal, Geir.
Positive bases with maximal cosine measure. Optimization Letters 2018
NORCE

Oglend, Atle; Haukås, Harald; Guttormsen, Atle; Osmundsen, Petter.
Oljeinntekter er som andre inntekter. Dagens næringsliv 2018
UIS NMBU

Oglend, Atle; Haukås, Harald; Guttormsen, Atle; Osmundsen, Petter.
Underbygger ikke oljeaksjesalg. Dagens næringsliv 2018
UIS NMBU

Oglend, Atle; Osmundsen, Petter.
Evidence on the financialization of oil price risk. IAEE International Conference 2018
UIS

Osmundsen, Petter.
Feil om leterefusjon. Dagens næringsliv 2018
UIS

Osmundsen, Petter; Blomgren, Atle.
Nedsiderisikoen forbundet med lav oljepris er betydelig mindre enn mange har spådd. Nå tar Olje-Norge av igjen. Aftenposten (morgenutg. : trykt utg.) 2018
NORCE UIS

Osmundsen, Petter; Blomgren, Atle.
Nå tar Olje-Norge av igjen. Aftenposten (morgenutg. : trykt utg.) 2018 p. 23-23
NORCE UIS

Palmer, Teresa Lynne; Espås, Thomas Asadi; Skartlien, Roar.
Effects of polymer adsorption on the effective viscosity in microchannel flows: phenomenological slip layer model from molecular simulations. Journal of Dispersion Science and Technology 2018 p. -
IFE NTNU UIS

Qiao, Yangyang; Andersen, Pål Østebø; Evje, Steinar; Standnes, Dag Chun.
A mixture theory approach to model co- and counter-current two-phase flow in porous media accounting for viscous coupling. Advances in Water Resources 2018 ;Volume 112. p. 170-188
UIS

Ravndal, Kristin Torgersen; Opsahl, Eystein; Bagi, Andrea; Kommedal, Roald.
Wastewater characterisation by combining size fractionation, chemical composition and biodegradability. Water Research 2018 ;Volume 131. p. 151-160
NORCE UIS

Rognmo, Arthur Uno; Fredriksen, Sunniva; Eide, Øyvind; Føyen, Tore Lyngås; Graue, Arne; Alcorn, Zachary Paul; Sharma, Mohan; Fernø, Martin.
Pore-to-Core EOR Upscaling for CO2-foam for CCUS. SPE Journal 2018
UiB UIS

Rozhko, Alexander Yu; Bauer, Andreas.
Contact line friction and surface tension effects on seismic attenuation and effective bulk moduli in rock with a partially saturated crack. Geophysical Prospecting 2018 p. -
NTNU UIS

CONFERENCE CONTRIBUTIONS OR SCHOLARLY PRESENTATIONS

Agista, Madhan Nur; Andersen, Pål Østebø; Yu, Zhixin.
Simulation Interpretation of Laboratory Nanofluid Injection in Porous Media. IOR NORWAY 2018; 2018-04-24
UIS

Alcorn, Zachary Paul; Fredriksen, Sunniva; Sharma, Mohan; Rognmo, Arthur Uno; Føyen, Tore Lyngås; Fernø, Martin; Graue, Arne.
Integrated CO2 Foam EOR Pilot Program with Combined CCUS in an Onshore Texas Heterogeneous Carbonate Field. SPE Improved Oil Recovery Conference; 2018-04-14 - 2018-04-18
UiB UIS

Alcorn, Zachary Paul; Sharma, Mohan; Fredriksen, Sunniva; Rognmo, Arthur Uno; Guoqing, Jian; Fernø, Martin; Graue, Arne; Ersland, Geir.
CO2 Field Pilots. Joining Forces; 2018-04-19 - 2018-04-20
UiB UIS

Andersen, Pål Østebø.
Capillary Pressure Effects on Estimating the EOR Potential during Low Salinity and Smart Water Flooding. SPE APOGCE; 2018-10-23 - 2018-10-25

Andersen, Pål Østebø.
Theoretical Comparison of Two Setups for Capillary Pressure Measurement by Centrifuge. IER Research Day; 2018-11-30

Andersen, Pål Østebø; Berawala, Dhruvit Satishchandra.
Analytical and Numerical Modelling of Chemical Compaction in Chalk. Lunch & Learn at UiS; 2018-11-23
UIS

Andersen, Pål Østebø; Berawala, Dhruvit Satishchandra.
Analytical and Numerical Solutions for Interpretation of Chemical Compaction in Chalk. SPE APOGCE; 2018-10-23 - 2018-10-25
UIS

Andersen, Pål Østebø; Lohne, Arild; Stavland, Arne; Hiorth, Aksel; Brattekås, Bergit.
Core Scale Simulation of Spontaneous Solvent Imbibition from HPAM Gel. Lunch & Learn; 2018-03-23
NORCE UIS

Andersen, Pål Østebø; Lohne, Arild; Stavland, Arne; Hiorth, Aksel; Brattekås, Bergit.
Core Scale Simulation of Spontaneous Solvent Imbibition from HPAM Gel. The SPE Improved Oil Recovery Conference 2018; 2018-04-14 - 2018-04-18
NORCE UIS

Andersen, Pål Østebø; Qiao, Yangyang; Standnes, Dag Chun; Evje, Steinar.
Co-current Spontaneous Imbibition in Porous Media with the Dynamics of Viscous Coupling and Capillary Back Pressure. The SPE Improved Oil Recovery Conference 2018; 2018-04-14 - 2018-04-18
UIS

Andersen, Pål Østebø; Walrond, Kenny; Nainggolan, Citra; Vasquez, Eliana; Askarinezhad, Reza; Standnes, Dag Chun; Skjæveland, Svein Magne; Fjelde, Ingebret.
Capillary Pressure from Core Flooding. SPE Research Night; 2018-02-07
NORCE UIS

Andersen, Pål Østebø; Walrond, Kenny; Vasquez, Eliana; Nainggolan, Citra; Askarinezhad, Reza; Standnes, Dag Chun; Skjæveland, Svein Magne; Fjelde, Ingebret.
Experimental and simulation interpretation of capillary pressure and relative permeability from waterflooding experiments. IEA-EOR 2018; 2018-09-03 - 2018-09-07
NORCE UIS

Baig, Mirza Hassan; Nermoen, Anders; Nadeau, Paul Henry; Andersen, Pål Østebø; Austvoll, Ivar.
Digital Image Analysis of Thin Sections for Petrophysical Properties. FORCE Seminar; 2018-04-20
NORCE UIS

Baig, Mirza Hassan; Nermoen, Anders; Nadeau, Paul Henry; Andersen, Pål Østebø; Austvoll, Ivar.
Petrographic Properties Evaluation by Digital Image Analysis of Thin Sections. IOR NORWAY 2018; 2018-04-24
NORCE UIS

Berawala, Dhruvit Satishchandra; Andersen, Pål Østebø; Ursin, Jann Rune.
Controlling Parameters for Shale Gas Production: A Fracture- Matrix Modelling Approach. Lunch and Learn Seminar; 2018-09-28 - 2018-09-28
UIS

Berawala, Dhruvit Satishchandra; Andersen, Pål Østebø; Ursin, Jann Rune.
Controlling Parameters for Shale Gas Production Into a Well-Induced Fracture: A Fracture-Matrix Modelling Approach. SPE Europec featured at 80th EAGE Conference and Exhibition; 2018-06-11 - 2018-06-14
UIS

Berawala, Dhruvit Satishchandra; Andersen, Pål Østebø; Ursin, Jann Rune.
Modelling of CO2 Injection in Shale Gas Reservoirs - Improved Recovery and CCS. IOR NORWAY 2018; 2018-04-24
UIS

Berawala, Dhruvit Satishchandra; Andersen, Pål Østebø; Ursin, Jann Rune.
Modelling of CO2 Injection in Shale Reservoirs. SPE Research Night; 2018-02-07
UIS

Bhakta, Tuhin; Tolstukhin, Evgeny; Pacheco, Carlos; Luo, Xiaodong; Nævdal, Geir.
Petrophysical parameters inversion from seismic data using an ensemble-based method - A case study from a compacting reservoir. ECMOR XVI 16th European Conference on the mathematics of oil recovery; 2018-09-03 - 2018-09-06
NORCE

Bilstad, Torleiv; Nair, Remya; Protasova, Evgenia.
Hazardous Fracking. 6th International Conference on Industrial & Hazardous Waste Management; 2018-09-04 - 2018-09-07
UIS

Bilstad, Torleiv; Nair, Remya; Protasova, Evgenia; Strand, Skule.
Smart Water for IOR. VI November Conference 2018, Brazil-Norway in the 21st Century; 2018-11-12 - 2018-11-13
UIS

Bjørnstad, Tor; Ould Metidji, Mahmoud; Krivokapic, Alexander; Viig, Sissel Opsahl.
Nanoparticles as oil detectives?. IOR Norway 2018; 2018-04-23 - 2018-04-25
IFE

Boboye, Temidayo; Berawala, Dhruvit Satishchandra; Andersen, Pål Østebø; Yu, Zhixin.
Numerical modelling of non-Darcy flow in shale gas production. IER Research Day; 2018-11-30
UIS

Borromeo, Laura; Zimmermann, Udo; Andò, Sergio; Egeland, Nina; Garzanti, Eduardo; Madland, Merete Vadla; Korsnes, Reidar Inge.
Raman spectroscopy and TERS for the oil industry: new tools for mineralogical and chemical characterization. XIII conference GEORAMAN; 2018-06-10 - 2018-10-14
UIS

Brattekås, Bergit; Lohne, Arild; Andersen, Pål Østebø.
Core Scale EME for IOR: Experiment-Modelling-Experiment. IOR Norway 2018; 2018-04-24 - 2018-04-25
NORCE UIS

Brattekås, Bergit; Seright, Randall S.; Ersland, Geir.
Solvent Leakoff During Gel Placement in Fractures: Extension to Oil-Saturated Porous Media. SPE Improved Oil Recovery conference 2018; 2018-04-14 - 2018-04-18
UIS UiB

Bredal, Tine Vigdel; Minde, Mona Wetrhus; Zimmermann, Udo; Madland, Merete Vadla; Korsnes, Reidar Inge; Ruud, Caroline.
Micro- and nano-analyses of fracture-filling after flooding on-shore chalk with different IOR fluids. IOR NORWAY 2018; 2018-04-24 - 2018-04-25
UIS

Chang, Yuqing.
Olympus Field Development Optimization (FDO). IRIS-CIPR: Team-building workshop; 2018-01-18 - 2018-01-18
NORCE

Dedner, Andreas; Kane, Birane; Klöfkorn, Robert; Nolte, Martin.
hp-Adaptive Discontinuous Galerkin Methods for Porous Media Flow. Workshop on adaptive model and solver compuations for multiphase flow in porous media; 2018-05-02 - 2018-05-04
NORCE

Dixit, Aditya; Andersen, Pål Østebø; Standnes, Dag Chun; Shapiro, Alexander; Skjæveland, Svein Magne; Walrond, Kenny.
Interpretation Of steady State Relative Permeability Measurements on Composite Cores with End Effects. IOR NORWAY 2018; 2018-04-24 - 2018-04-25
UIS

Dziadkowiec, Joanna; Javadi, Shaghayegh; Bratvold, Jon E.; Nilsen, Ola; Røyne, Anja.
Adhesive and repulsive forces between calcite surfaces. 32nd European Colloid & Interface Society Conference; 2018-09-02 - 2018-09-07
UiO

Erzuah, Samuel; Fjelde, Ingebret; Omekeh, Aruoture Voke.
Challenges Associated with Quartz Crystal Microbalance with Dissipation (QCM-D) as a Wettability Screening Tool. Solid-Liquid Interfaces: Challenging Molecular Aspect for Industrial Application (SLIMAIA); 2018-03-27 - 2018-03-29
NORCE UIS

Erzuah, Samuel; Fjelde, Ingebret; Omekeh, Aruoture Voke.
Reservoir Rock Wettability Characterization via surface complexation modelling. 13th International Symposium on Reservoir Wettability and its Effects on Oil Recovery; 2018-05-08 - 2018-05-09
NORCE UIS

Erzuah, Samuel; Fjelde, Ingebret; Omekeh, Aruoture Voke.
Wettability Estimation via Oil Adhesion. IOR NORWAY 2018; 2018-04-23 - 2018-04-25
NORCE UIS

Esquivel, Katherine; Andersen, Pål Østebø; Berawala, Dhruvit Satishchandra.
Interpretation of Reactive Flow and its Impact on Compaction in Chalk. IOR NORWAY 2018; 2018-04-24
UIS

Fjelde, Ingebret.
Sulphate In Original Reservoir Chalk Rocks: Release Of Sulphate By Desulphated Sea Water And Effects On Wettability - SPE-190844-MS. SPE EUROPEC featured at 80th EAGE Conference and Exhibition; 2018-06-11 - 2018-06-14
NORCE UIS

Fjelde, Ingebret; Erzuah, Samuel; Omekeh, Aruoture Voke.
IMPROVED OIL RECOVERY AND CO2-STORAGE BY CARBONATED WATER INJECTION. Solid-Liquid Interfaces: Challenging Molecular Aspect for Industrial Application (SLIMAIA); 2018-03-27 - 2018-03-29
NORCE UIS

Føyen, Tore Lyngås; Fernø, Martin; Brattekås, Bergit.
The Onset of Spontaneous Imbibition: How Irregular Fronts Influence Imbibition Rate and Scaling Groups. SPE Improved Oil Recovery conference 2018; 2018-04-14 - 2018-04-18
UiB UIS

Gjersdal, Siri Gloppen; Minde, Mona Wetrhus; Zimmermann, Udo; Madland, Merete Vadla; Hiorth, Aksel; Giske, Nils Harald; Stavland, Arne.
Polymer-injection for IOR purposes at the Norwegian Continental shelf – micro- and nanoanalytical approach for the understanding of phase-formation and its implication for upscaling. IOR NORWAY 2018; 2018-04-24 - 2018-04-25
NORCE UIS

Grana, Dario; Bhakta, Tuhin; Lorentzen, Rolf Johan; Valestrand, Randi; Nævdal, Geir.
Stochastic approaches to seismic reservoir characterization for improved modeling and prediction. IOR Norway 2018; 2018-04-24 - 2018-04-25
NORCE

Guo, Kun; Yu, Zhixin.
Microwave-Assisted Hyperthermia Using Magnetic Nanoparticles for In-Situ Upgrading and Recovery of Heavy Oil. IOR Norway 2018; 2018-04-24 - 2018-04-25
UIS

Haukås, Jarle; Athmer, Wiebke; Bakke, Jan Øystein Haavig; Boersma, Quinten; Bounaim, Aicha; Etchebes, Marie; Folstad, Per Gunnar; Fotland, Bjørn Harald; Moe, Robert Wilhelm; Pacheco, Carlos; Tolstukhin, Evgeny.
Analysis of enhanced permeability using 4D seismic data and locally refined simulation models. Reservoir & Production Management; 2018-10-23 - 2018-10-24

Haukås, Jarle; Athmer, Wiebke; Bakke, Jan Øystein Haavig; Boersma, Quinten; Bounaim, Aicha; Etchebes, Marie; Folstad, Per Gunnar; Fotland, Bjørn Harald; Moe, Robert Wilhelm; Pacheco, Carlos; Tolstukhin, Evgeny.
Analysis of enhanced permeability using 4D seismic data and locally refined simulation models. IOR NORWAY 2018; 2018-04-24 - 2018-04-25

Haukås, Jarle; Athmer, Wiebke; Bakke, Jan Øystein Haavig; Boersma, Quinten; Bounaim, Aicha; Etchebes, Marie; Folstad, Per Gunnar; Fotland, Bjørn Harald; Moe, Robert Wilhelm; Pacheco, Carlos; Tolstukhin, Evgeny.
Analysis of enhanced permeability using 4D seismic data and locally refined simulation models. Happy hour with Reservoir Engineers; 2018-10-31 - 2018-10-31

Hiorth, Aksel.
Overview IOR Centre. 3rd Joining Forces Seminar; 2018-04-19 - 2018-04-20
NORCE UIS

Hiorth, Aksel; Nødland, Oddbjørn Mathias; Stavland, Arne; Jettestuen, Espen; Aursjø, Olav; Vinningland, Jan Ludvig; Nossen, Jan; Sagen, Jan; Sira, Terje.
Simulation Tools for Predicting IOR Potential on the Norwegian Continental Shelf. IOR NORWAY 2018; 2018-04-23 - 2018-04-25
IFE NORCE NTNU UIS

Hong, Aojie; Bratvold, Reidar B; Lake, Larry.
Fast Analysis of Optimal IOR Switch Time Using a Two-Factor Production Model and Least-Squares Monte Carlo Algorithm. SPE Norway One Day Seminar; 2018-04-18 - 2018-04-18
UIS

Hong, Aojie; Bratvold, Reidar B; Lake, Larry; Ruiz Maraggi, Leopoldo.
Integrating Model Uncertainty in Probabilistic Decline Curve Analysis for Unconventional Oil Production Forecasting. Unconventional Resources Technology Conference (URTeC); 2018-07-23 - 2018-07-25
UIS NTNU

Huang, Xingguo; Jakobsen, Morten; Eikrem, Kjersti Solberg; Nævdal, Geir.
A target-oriented inversion of time-lapse seismic waveform data. International workshop on seismic-wave scattering and imaging; 2018-07-19 - 2018-07-21
NORCE UiB

Jakobsen, Morten; Eikrem, Kjersti Solberg; Nævdal, Geir; Huang, Xingguo.
Time-lapse full waveform inversion as a smart monitoring tool for future IOR. IOR Norway 2018; 2018-04-24 - 2018-04-25
NORCE UiB

Jakobsen, Morten; Psencik, Ivan; Iversen, Einar; Ursin, Bjørn.
Nonlinear inverse scattering in anisotropic elastic media. International workshop on Seismic-Wave Scattering, Imaging and Inversion; 2018-07-19 - 2018-07-21
UiB

Javadi, Shaghayegh; Dziadkowiec, Joanna; Røyne, Anja; Bratvold, Jon E.; Nilsen, Ola; Hiorth, Aksel.
Synthetic CaCO3 surfaces in aqueous solutions – AFM and Surface Force Apparatus (SFA) measurements. IOR Norway 2018; 2018-04-24 - 2018-04-26
NORCE UiO UIS

Kallesten, Emanuela Iedidia; Madland, Merete Vadla; Korsnes, Reidar Inge; Zimmermann, Udo; Andersen, Pål Østebø.
Permeability and Stress State. IOR NORWAY 2018; 2018-04-24
UIS

Kavli, Emilie; Minde, Mona Wetrhus; Zimmermann, Udo; Madland, Merete Vadla; Korsnes, Reidar Inge; Erba, Elisabetta.
The impact of paleontological components on IOR experiments and upscaling from pore to core and larger scales. IOR NORWAY 2018; 2018-04-24 - 2018-04-25
UIS

Klöfkorn, Robert.
IOR Center Task 6 – Higher Order Methods and Open Source Simulation Tools. IRIS-CIPR: Team-building workshop; 2018-01-18 - 2018-01-18
NORCE

Klöfkorn, Robert.
Status of hp-Adaptivity in DUNE-Fem and OPM. Dune User Meeting 2018; 2018-11-05 - 2018-11-06
NORCE

Korsnes, Reidar Inge; Minde, Mona Wetrhus; Madland, Merete Vadla; Zimmermann, Udo.
Can we control water induced compaction in chalk reservoirs? Experiences from in-situ core and pore scale studies. DHRTC - MODIFIED SALINITY WATER FLOODING WORKSHOP; 2018-06-15 - 2018-06-15
UIS

Korsnes, Reidar Inge; Minde, Mona Wetrhus; Madland, Merete Vadla; Zimmermann, Udo.
Core Scale Experiments and Submicron Studies. Meeting with scientific commitee; 2018-04-26 - 2018-04-26
UIS

Korsnes, Reidar Inge; Minde, Mona Wetrhus; Zimmermann, Udo; Madland, Merete Vadla.
Pore-Fluid Composition and Mechanical Properties of the Reservoir Understanding the Geomechanical Effects of EOR Fluids. IEA-IOR; 2018-09-04 - 2018-09-06
UIS

Lie, Knut-Andreas; Mykkeltvedt, Trine Solberg; Møyner, Olav.
Fully implicit WENO schemes on stratigraphic and fully unstructured grids. ECMOR XVI - 16th European Conference on the Mathematics of Oil Recovery; 2018-09-03 - 2018-09-06
NORCE SINTEF

Lorentzen, Rolf Johan; Bhakta, Tuhin; Grana, Dario; Luo, Xiaodong; Valestrand, Randi; Nævdal, Geir.
History Matching of Real Production and Seismic Data in the Norne Field. IEA-EOR Energy Technology Network Symposium; 2018-09-06
NORCE

Lorentzen, Rolf Johan; Bhakta, Tuhin; Grana, Dario; Luo, Xiaodong; Valestrand, Randi; Nævdal, Geir.
History Matching of Real Production and Seismic Data in the Norne Field. Foredrag ved ConocoPhillips; 2018-08-30
NORCE

Lorentzen, Rolf Johan; Bhakta, Tuhin; Grana, Dario; Luo, Xiaodong; Valestrand, Randi; Nævdal, Geir; Sandø, Ivar.
History matching real production and seismic data for the Norne field. EnKF Workshop 2018; 2018-05-28 - 2018-05-30
NORCE

Luo, Xiaodong.
Big data assimilation and uncertainty quantification in ensemble-based 4D seismic history matching. The 13th International EnKF workshop; 2018-05-28 - 2018-05-30
NORCE

Luo, Xiaodong; Bhakta, Tuhin.
Towards automatic and adaptive localization for ensemble-based history matching. The 13th International EnKF workshop; 2018-05-28 - 2018-05-30
NORCE

Luo, Xiaodong; Bhakta, Tuhin.
Towards Automatic And Adaptive Localization For Ensemble-Based History Matching. ECMOR XVI - 16th European Conference on the Mathematics of Oil Recovery; 2018-09-03 - 2018-09-06
NORCE

Luo, Xiaodong; Bhakta, Tuhin; Evensen, Geir; Jakobsen, Morten; Lorentzen, Rolf Johan; Nævdal, Geir; Valestrand, Randi.
Big data assimilation and uncertainty quantification in 4D seismic history matching. IOR NORWAY 2018 Workshop; 2018-04-23 - 2018-04-23
NORCE UiB

Luo, Xiaodong; Bhakta, Tuhin; Jacobsen, Morten B.; Nævdal, Geir.
Efficient big seismic data assimilation through sparse Representation. 4D seismic meeting with Norske Shell; 2018-01-23 - 2018-01-23
NORCE

Luo, Xiaodong; Bhakta, Tuhin; Nævdal, Geir.
Data driven adaptive localization for ensemble-based data assimilation problems. CMWR2018: COMPUTATIONAL METHODS IN WATER RESOURCES XXII; 2018-06-03 - 2018-06-07
NORCE

Luo, Xiaodong; Lorentzen, Rolf Johan; Valestrand, Randi; Evensen, Geir.
Correlation-Based Adaptive Localization for Ensemble-Based History Matching: Applied to the Norne Field Case Study. SPE Norway One Day Seminar; 2018-04-18 - 2018-04-18
NERSC NORCE

Luo, Xiaodong; Lorentzen, Rolf Johan; Valestrand, Randi; Evensen, Geir.
History Matching Using an Iterative Ensemble Smoother with Correlation-Based Adaptive Localization - A Real Field Case Study. 80th EAGE Annual Conference and Exhibition 2018; 2018-06-11 - 2018-06-14
NORCE

Madland, Merete Vadla.
Det Nasjonale IOR-senteret. Adm. direktør NFR besøkte UiS; 2018-01-31 - 2018-01-31
UIS

Madland, Merete Vadla.
Orientering om Det Nasjonale IOR-senteret. Åpen dag ved Universitetet i Stavanger; 2018-03-06 - 2018-03-06
UIS

Madland, Merete Vadla.
Smart Solutions for Future IOR. IOR NORWAY 2018; 2018-04-24 - 2018-04-25
UIS

Madland, Merete Vadla.
The main R&D activites within The National IOR Centre of Norway. Møte med ressursgruppen for energi i Næringsforeningen; 2018-01-22 - 2018-01-22
UIS

Madland, Merete Vadla.
The National IOR Centre of Norway. Visit at Shell in Stavanger; 2018-01-23 - 2018-01-23
UIS

Madland, Merete Vadla.
The National IOR Centre of Norway - What can Petronas learn from us?. Møte med Petronas; 2018-11-06
UIS

Madland, Merete Vadla.
The National IOR Centre of Norway - What can Russia learn from us?. Møte med Moscow Petroleum Institute; 2018-10-26
UIS

Madland, Merete Vadla.
The National IOR Centre of Norway – Where, why and how?. ONS; 2018-08-29 - 2018-08-29
UIS

Madland, Merete Vadla; Hiorth, Aksel.
The main activities of The National IOR Centre of Norway. Møte med ressursgruppen for energi i Næringsforeningen; 2018-01-22 - 2018-01-22
NORCE UIS

Madland, Merete Vadla; Hiorth, Aksel; Valestrand, Randi; Viig, Sissel Opsahl.
Scientific status and progress. Møte med OD; 2018-10-17
IFE NORCE UIS

Madland, Merete Vadla; Kallesten, Emanuela Iedidia; Ringen, Irene; Riiber, Kjersti.
Hvordan skvise olje ut av en stein?. Forskningsdagene; 2018-09-22
UIS

Madland, Merete Vadla; Valestrand, Randi.
Where, why , how – The National IOR Centre of Norway. Norsk Olje og Gass besøkte UiS; 2018-05-30 - 2018-05-30
NORCE UIS

Minde, Mona Wetrhus; Korsnes, Reidar Inge; Egeland, Nina; Madland, Merete Vadla; Zimmermann, Udo.
Mineralogical alterations in calcite powder flooded with MgCl2 to study underlying Enhanced Oil Recovery (EOR) mechanisms. CPM 8; 2018-05-06 - 2018-05-09
UIS

Minde, Mona Wetrhus; Sachdeva, Jaspreet Singh; Zimmermann, Udo; Madland, Merete Vadla; Korsnes, Reidar Inge; Nermoen, Anders.

Mineral alterations in water wet and mixed wet chalk due to flooding of seawater-like brines. IOR NORWAY 2018; 2018-04-24 - 2018-04-25
NORCE UIS

Nair, Remya; Protasova, Evgenia; Bilstad, Torleiv.
Toxic produced water becomes smart water. 6th International Conference on Industrial & Hazardous Waste Management; 2018-09-04 - 2018-09-07
UIS

Nair, Remya; Protasova, Evgenia; Strand, Skule; Bilstad, Torleiv.
Smart Water Production by Membranes for Enhanced Oil Recovery in Carbonate and Sandstone Reservoirs. IOR Norway; 2018-04-24 - 2018-04-25
UIS

Nygård, Jan Inge; Andersen, Pål Østebø.
Scaling of recovery during immiscible WAG injection. IER Research Day; 2018-11-30

Nygård, Jan Inge; Walrond, Kenny; Andersen, Pål Østebø.
Controlling Parameters During WAG Injection – A Simulation Study. IOR NORWAY 2018; 2018-04-24
UIS

Nygård, Jan Inge; Walrond, Kenny; Andersen, Pål Østebø.
Controlling parameters during WAG injection – A simulation study. SPE Research Night; 2018-02-07
UIS

Nævdal, Geir.
The past and the future. IRIS-CIPR team building workshop on mathematical modeling; 2018-01-18 - 2018-01-18
NORCE

Nævdal, Geir.
4d seismic and history matching - activities at the IOR center. Besøk fra National IOR Centre of Norway til Shell; 2018-01-23
NORCE

Nødland, Oddbjørn Mathias; Hiorth, Aksel; Lohne, Arild.
IORCoreSim - Research simulator to explore possible EOR mechanisms at the core scale and beyond. NFiP Annual Seminar; 2018-11-16 - 2018-11-16
NORCE UIS

Nødland, Oddbjørn Mathias; Lohne, Arild; Stavland, Arne; Hiorth, Aksel.
Core scale modelling of EOR transport mechanisms. IOR NORWAY 2018; 2018-04-23 - 2018-04-25
NORCE UIS

Ohm, Karen Synnøve.
Værmelding under bakken. Forsker Grand Prix; 2018-09-25
UIS

Omekeh, Aruoture Voke; Hiorth, Aksel.
Particle growth kinetics: A physio-chemical modelling approach. IOR NORWAY 2018; 2018-04-23 - 2018-04-25
NORCE UIS

Opsahl, Eystein; Kaster, Krista Michelle; Verpe, Ingrid; Svendsen, Linn; Meling, Silja Helene; Kommedal, Roald.
Biodegradability of Enhanced Oil Recovery Polymers in Seawater and Their Effect on the Microbial Community. Microbial ecology in applied and natural systems; 2018-05-28 - 2018-05-29
UIS

Osmundsen, Petter.
Exploration is under attack. Exploration manager forum meeting; 2018-05-24 - 2018-05-24
UIS

Osmundsen, Petter.
Forecasting exploration drilling costs on the Norwegian continental shelf. 41st IAEE International conference; 2018-06-10 - 2018-06-13
UIS

Osmundsen, Petter.
Norsk petroleumsbeskatning -Tilpasset dagens utfordringer?. Energiåret 2018; 2018-02-01 - 2018-02-01
UIS

Osmundsen, Petter.
Norsk petroleumsskatt i konkurranse med andre petroleumsprovinser. Møte med økonominettverket; 2018-05-15 - 2018-05-15
UIS

Osmundsen, Petter.
Norsk petroleumsskatt i konkurranse med andre petroleumsprovinser. Skatteseminar 2018; 2018-05-07 - 2018-05-09
UIS

Osmundsen, Petter.
Norsk petroleumsskatt i konkurranse med andre petroleumsprovinser. Presentasjon for ledelsen innen leting m.fl., Oljedirektoratet; 2018-05-28 - 2018-05-28 UIS

Osmundsen, Petter.
Tilknytningstariffer. Kontrakter og risikodeling i modne felt. Presentasjon for OD; 2018-06-18 - 2018-06-18
UIS

Ould Metidji, Mahmoud; Krivokapic, Alexander; Silva, Mario; Cathles, Lawrence; Bjørnstad, Tor.
Nanotracers intended for EOR-operations. SPE Workshop: Improved Decision-Making Through Tracer Technology; 2018-03-14
IFE UiO

OULD-METIDJI, Mahmoud; Lopes Da Silva, M.H.; Ferrando-Climent, L.; Krivokapic, A.; Bjørnstad, Tor.
Future Prospect For Reservoir Tracer Technology: Benefits, Obstacles and Development. SPE Improved Oil Recovery Conference IOR 2018; 2018-04-14 - 2018-04-18
IFE UiO

Ringen, Irene; Lindanger, Markus; Raaholt, Magnus K.; Hiorth, Aksel; Stavland, Arne.
Polymer adsorption at different brine salinities. IOR NORWAY 2018; 2018-04-23 - 2018-04-25
NORCE UIS

Ringen, Irene; Shogin, Dmitry.
What do we know - from experiments and theory - about the impact of salinity on polymer rheology?. Seminar in non-Newtonian Fluid Dynamics; 2018-11-26 - 2018-11-26
UIS

Rognmo, Arthur Uno; Fredriksen, Sunniva; Eide, Øyvind; Føyen, Tore Lyngås; Graue, Arne; Alcorn, Zachary Paul; Sharma, Mohan; Fernø, Martin.
Pore-to Core EOR Upscaling for CO2-foam for CCUS. SPE EUROPEC featured at the 80th EAGE Annual Conference and Exhibition 2018; 2018-06-11 - 2018-06-14
SINTEF UiB UIS

Sachdeva, Jaspreet Singh; Nermoen, Anders; Korsnes, Reidar Inge; Madland, Merete Vadla.
Effect of presence of oil and water on chalk mechanics. IOR NORWAY 2018; 2018-04-23 - 2018-04-25
NORCE UIS

Sachdeva, Jaspreet Singh; Nermoen, Anders; Korsnes, Reidar Inge; Madland, Merete Vadla.
How the Presence of Oil and Water Affects Chalk Mechanics at Isotropic Stresses. 80th EAGE Annual Conference and Exhibition 2018; 2018-06-11 - 2018-06-16
NORCE UIS

Sachdeva, Jaspreet Singh; Sripal, Edison A.; Nermoen, Anders; Korsnes, Reidar Inge; Madland, Merete Vadla; James, Lesley A..
A Laboratory Scale Approach to Wettability Restoration in Chalk Core Samples. International Symposium of the Society of Core Analysts; 2018-08-27 - 2018-08-30
NORCE UIS

Shogin, Dmitry.
A closer look at apparent viscosity and apparent shear rate. Seminar in non-Newtonian Fluid Dynamics; 2018-11-19 - 2018-11-19
UIS

Shogin, Dmitry.
Experimental description of polymeric liquids: The material functions. Seminar in non-Newtonian Fluid Dynamics; 2018-11-05 - 2018-11-05
UIS

Shogin, Dmitry.
Flow phenomena in polymeric liquids. Seminar in non-Newtonian Fluid Dynamics; 2018-10-31 - 2018-10-31
UIS

Shogin, Dmitry.
Fundamental research on polymers at the National IOR Centre of Norway. Visit from MPI (Russia); 2018-10-26 - 2018-10-26
UIS

Shogin, Dmitry.
Models of polymeric liquids: Hierarchy, underlying principles and limits of applicability. Seminar in non-Newtonian Fluid Dynamics; 2018-11-12 - 2018-11-12
UIS

Shogin, Dmitry.
The dumbbell models of diluted polymer solutions, Part 1. Kinetic theory and Kramers' formalism. Seminar in non-Newtonian Fluid Dynamics; 2018-11-28 - 2018-11-28
UIS

Shogin, Dmitry.
Understanding non-Newtonian fluid flows: the synergy between advanced physical theories, experiments, and numerical modelling. Integration meeting; 2018-10-18 - 2018-10-18
UIS

Shogin, Dmitry.
Understanding the stress tensor of a general fluid.. Seminar in non-Newtonian Fluid Dynamics; 2018-10-30 - 2018-10-30 UIS

Shogin, Dmitry; Lozhkina, Anastasiia; Lutskina, Marina.
Describing IOR polymer solutions with differential tensor non-Newtonian fluid models. SAC-møte ved det Nasjonale IOR-Senteret; 2018-04-26 - 2018-04-26
UIS

Shogin, Dmitry; Lozhkina, Anastasiia; Lutskina, Marina.
Describing IOR polymer solutions with differential tensor non-Newtonian fluid models. IOR Norway 2018; 2018-04-23 - 2018-04-25
UIS

Silva, Mario; Bjørnstad, Tor.
Non-Conservative Tracers for Temperature Assessment in the Interwell Region of Oil Reservoirs. SPE Workshop on "Improved Decision-Making Through Tracer Technology"; 2018-03-14 - 2018-03-15
UiO

Thu, Rowena Su Wen Shi; Minde, Mona Wetrhus; Zimmermann, Udo; Madland, Merete Vadla; Korsnes, Reidar Inge; Kalai, Dori Yosef.
Systematic specific surface area analyses on rocks to implement as a necessary, quick and informative method to understand geomechanical parameter in IOR experiments. IOR NORWAY 2018; 2018-04-24 - 2018-04-25
UIS

Valestrand, Randi.
Open modelling software and benchmark test cases. COLLABORATION IN A DIGITAL ENVIRONMENT TO INCREASE COMPETITIVENESS; 2018-06-07 - 2018-06-07
NORCE

Vinningland, Jan Ludvig; Aursjø, Olav; Jettestuen, Espen; Hiorth, Aksel.
Digital EOR from pore to core. FORCE Lunch & Learn; 2018-11-23 - 2018-11-23
NORCE UIS

Vinningland, Jan Ludvig; Aursjø, Olav; Jettestuen, Espen; Madland, Merete Vadla; Hiorth, Aksel.
Effects of nucleation on mineral dissolution and precipitation predicted from reactive pore scale simulations. EGU2018; 2018-04-08 - 2018-04-13
NORCE UIS

Vinningland, Jan Ludvig; Aursjø, Olav; Jettestuen, Espen; Madland, Merete Vadla; Hiorth, Aksel.
Insight into core scale oil release from pore scale simulations. SPE EUROPEC featured at 80th EAGE Conference and Exhibition; 2018-06-11 - 2018-06-14
NORCE UIS

Vinningland, Jan Ludvig; Valestrand, Randi; Hiorth, Aksel; Bjørnstad, Tor; Klöfkorn, Robert; Viig, Sissel Opsahl; Jettestuen, Espen; Skjæveland, Svein Magne; Zimmermann, Udo; Stavland, Arne; Nævdal, Geir; Madland, Merete Vadla.
The National IOR Centre of Norway. 6th November Conference; 2018-11-12 - 2018-11-14
IFE NORCE UIS

Voake, Tijana; Nermoen, Anders; Korsnes, Reidar Inge; Fabricius, Ida.
Temperature cycling and its effect on stress-strain relationships in high porosity chalks. IOR Norway 2018; 2018-04-24 - 2018-04-25
NORCE UIS

Yu, Zhixin; Guo, Kun.
H2 production from hydrolysis of ammonia borane: the effect of Ni particle size, carbon support, alloying with Cu, and SiO2 support size. Lecture at Institute of Solid State Physics, Chinese Academy of Sciences; 2018-07-12
UIS

Zhang, Yiteng.
Production Optimization in Reservoir Management Through the Ensemble-Based Trust-Region Method. IOR NORWAY 2018; 2018-04-24 - 2018-04-25
UIS

Zhang, Yiteng; Lorentzen, Rolf Johan; Stordal, Andreas S..
Practical Use of the Ensemble-Based Conjugate Gradient Method for Production Optimization in the Brugge Benchmark Study. SPE Norway One Day Seminar; 2018-04-18 - 2018-04-18
HAVFORSK NORCE UIS

Zhang, Yiteng; Stordal, Andreas S.; Lorentzen, Rolf Johan; Chang, Yuqing.
A Novel Ensemble-Based Conjugate Gradient Method for Reservoir Management. SPE Norway One Day Seminar; 2018-04-18 - 2018-04-18
HAVFORSK NORCE UIS

Åsen, Siv Marie; Stavland, Arne; Strand, Daniel; Hiorth, Aksel.
An Experimental Investigation of Polymer Mechanical Degradation at cm and m Scale (SPE-190225-MS). IOR NORWAY 2018; 2018-04-23 - 2018-04-25
NORCE UIS

Åsen, Siv Marie; Stavland, Arne; Strand, Daniel; Hiorth, Aksel.
An Experimental Investigation of Polymer Mechanical Degradation at cm and m Scale. The SPE Improved Oil Recovery Conference 2018; 2018-04-14 - 2018-04-18
NORCE UIS

Åsen, Siv Marie; Stavland, Arne; Strand, Daniel; Hiorth, Aksel.
How far into the reservoir is mechanical degradation of polymers an issue?. IEA-EOR 2018; 2018-09-03 - 2018-09-07
NORCE UIS

REPORTS/DISSERTATIONS

Baig, Mirza Hassan.
Digital Image Analysis for Petrophysical Evaluation. Universitetet i Stavanger 2018 84 p.
NORCE UIS

Borromeo, Laura.
Raman Spectroscopy applied to the mineralogical analysis of flooded chalk. : Universitetet i Stavanger 2018 217 p.
UIS

Bredal, Tine Vigdel.
Micro- and nano-analyses of fracture-filling after flooding on-shore chalk with different IOR fluids. : Universitetet i Stavanger 2018
UIS

Ceballos, Anibal.
Simulation of Oil Recovery Process – Co-current Spontaneous Imbibition in Fractured Reservoirs. Universitetet i Stavanger 2018 107 p.
NORCE UIS

Chauhan, Jaldeepsinh S..
Transport of CO2 In Porous Media – A Visualisation Study. : Universitetet i Stavanger 2018 164 p.
UIS

Dieset, Jacob.
Age and Provenance study of Paleoarchean rocks from the Singhbhum Craton (India). : Universitetet i Stavanger 2018
UIS

Dixit, Aditya.
Simulation of core scale Experiments - improved interpretation of steady state relative permeability measurements. Danmarks Tekniske Universitet, DTU 2018 56 p.
UIS

Esquivel, Katherine.
Interpretation of reactive flow in chalk flooded with MgCl2 - A simulation study. : Universitetet i Stavanger 2018
UIS

Gjedrem, Christian.
Effect of Sand Screen Erosion on Reservoir Performance. : Universitetet i Stavanger 2018
NTNU

Gjersdal, Siri Gloppen.
TEM, SEM and optical microscopy analyses of Berea sandstone cores flooded with sodium silicate polymer fo IOR purposes. : Universitetet i Stavanger 2018
UIS

Gummedal, Helena.
Effect of crude oil adsorption and asphaltene precipitation on sandstone wettability. : Universitetet i Stavanger 2018
UIS

Guo, Kun.
In-situ and ex-situ catalytic upgrading of heavy crude oil. : The National IOR Centre of Norway / Universitetet i Stavanger 2018 225 p.
UIS

Hetland, Bente.
Smart Water injection into sandstone reservoirs for EOR - Optimal mineral sample preparation and influence of feldspar minerals. : Universitetet i Stavanger 2018
UIS

Jakobsen, Anna Bogunovic.
Adsorption of basic crude oil components onto carbonate chalk surfaces - effect on initial wettability. : Universitetet i Stavanger 2018
UIS

Kapstad, Simen.
Optimizing carbonate core restoration procedures - Effect of crude oil saturation and mild cleaning. : Universitetet i Stavanger 2018
UIS

Kausar, Tayyaba.
Simultaneous AVO inversion and seismic lithology cube estimation by using PP and PS angle stack seismic data of the Oseberg Field, North Sea. : Universitetet i Stavanger 2018
UIS

Kavli, Emilie.
Characterization of Nannofacies in Upper Cretaceous Chalks used in IOR research. : Universitetet i Stavanger 2018
UIS

Khan, Md Ashraful Islam.
pH Development Analysis of Alkaline and Low Salinity Water Flooding in sandstone cores. : Universitetet i Stavanger 2018
UIS

Kiani, Mazdak.
Smart Water EOR-potential in sandstone reservoir cores. : Universitetet i Stavanger 2018
UIS

Kinnerud, Espen.
Streaming Potential - Berea sandstone saturated with NaCl and Isopar H. : Universitetet i Stavanger 2018
UIS

Klewiah, Isaac.
Adsorption of Polar Oil Components onto Chalk: Impact of Silica on Initial Wetting. : Universitetet i Stavanger 2018
UIS

Li, Geng.
Data Assimilation Methods in Seismic Inversion. : Universitetet i Stavanger 2018
UIS

Linevyuk, Nataliya.
Simulation study of co-current spontaneous imbibition. : Universitetet i Stavanger 2018 50 p.
UIS

Lozhkina, Anastasiia.
Understanding steady shear flow viscometric functions of IOR polymers. : Universitetet i Stavanger 2018
UIS

Lutskina, Marina.
Describing viscosity of IOR polymer solutions with differential non-Newtonian fluid models. : Universitetet i Stavanger 2018
UIS

Mburu, Andrew.
Well Modelling of H2S Production on a Field in the North Sea. : Universitetet i Stavanger 2018
UIS

Minde, Mona Wetrhus.
"Mineral Replacements in Flooding Experiments Linked to Enhanced Oil Recovery in Chalk". Stavanger, Norway: Universitet i Stavanger 2018 (ISBN 978-82-7644-799-6) 311 p.
UIS

Nainggolan, Citra.
Core Flooding for Analysis of Capillary End Effect and Multiphase Flow Properties. Universitetet i Stavanger 2018 77 p.
UIS

Nergård, Kenneth.
Investigation of Geomechanical Effects and Other Controlling Parameters on Shale Gas Production. Universitetet i Stavanger 2018 56 p.
UIS

Pedersen, Joakim.
Modelling study: Effect of FM composition on initial reservoir wettability. : Universitetet i Stavanger 2018
UIS

Riiber, Kjersti.
Annual Report 2017 - The National IOR Centre of Norway. Stavanger: The National IOR Centre of Norway / Universitetet i Stavanger 2018 76 p.
UIS

Rodriguez, Maria Antonieta Alcantara.
Ground penetrating radar and seismic study to determine glacial deposit stratigraphy. : Universitetet i Stavanger 2018
UIS

Sandvik, Siri.
Simulation of oil recovery by wettability alteration – interpretation of Smart water imbibition experiments at reservoir conditions. Universitetet i Stavanger 2018 71 p.
NORCE UIS

Stanislavskiy, Vladislav.
Investigating the impact of solvent salinity on the viscometric functions of IOR polymers. : Universitetet i Stavanger 2018
UIS

Thu, Rowena Su Wen Shi.
Systematic Specific Surface Area Analyses on Rocks to Implement as a Necessary, Quick, and Informative Method to Understand Geo-Mechanical Parameter in IOR Experiments. : Universitetet i Stavanger 2018 253 p.
UIS

Vasquez, Eliana.
Relative Permeability and Capillary Pressure Estimation from Core-flooding Experiments studying Capillary End Effects. Universitetet i Stavanger 2018 74 p.
UIS

Wang, Wenxia.
Geological and Engineering Aspects of Chemo-Mechanical Compaction during Flooding Experiments on High-Porosity Chalks. : Universitetet i Stavanger 2018 252 p.
UIS

PART OF BOOKS/REPORTS
Alcorn, Zachary Paul; Fredriksen, Sunniva; Sharma, Mohan; Rognmo, Arthur Uno; Føyen, Tore Lyngås; Fernø, Martin; Graue, Arne.
Integrated CO2 Foam EOR Pilot Program with Combined CCUS in an Onshore Texas Heterogeneous Carbonate Field. I: SPE Improved Oil Recovery Conference. Society of Petroleum Engineers 2018 ISBN 978-1-61399-570-9.
UiB UIS

Andersen, Pål Østebø.
Capillary Pressure Effects on Estimating the EOR Potential during Low Salinity and Smart Water Flooding. I: SPE Asia Pacific Oil & Gas Conference and Exhibition, 2018. Society of Petroleum Engineers 2018 ISBN 978-1-61399-595-2.

Andersen, Pål Østebø; Berawala, Dhruvit Satishchandra.
Analytical and Numerical Solutions for Interpretation of Chemical Compaction in Chalk. I: SPE Asia Pacific Oil & Gas Conference and Exhibition, 2018. Society of Petroleum Engineers 2018 ISBN 978-1-61399-595-2.
UIS

Andersen, Pål Østebø; Lohne, Arild; Stavland, Arne; Hiorth, Aksel; Brattekås, Bergit.
Core Scale Simulation of Spontaneous Solvent Imbibition from HPAM Gel. I: SPE Improved Oil Recovery Conference. Society of Petroleum Engineers 2018 ISBN 978-1-61399-570-9.
NORCE UiB UIS

Andersen, Pål Østebø; Qiao, Yangyang; Standnes, Dag Chun; Evje, Steinar.
Co-current Spontaneous Imbibition in Porous Media with the Dynamics of Viscous Coupling and Capillary Back Pressure. I: SPE Improved Oil Recovery Conference. Society of Petroleum Engineers 2018 ISBN 978-1-61399-570-9.
UIS

Berawala, Dhruvit Satishchandra; Andersen, Pål Østebø; Ursin, Jann Rune.
Controlling Parameters for Shale Gas Production from a Well-Induced Fracture: A Fracture Matrix Modelling Approach. I: 80th EAGE Annual Conference & Exhibition 2018. European Association of Geoscientists and Engineers 2018 ISBN 978-94-6282-254-2.
UIS

Berawala, Dhruvit Satishchandra; Andersen, Pål Østebø; Ursin, Jann Rune.
Controlling parameters for shale gas production into a well-induced fracture: a fracture-matrix modelling approach. I: SPE Europec featured at 80th EAGE Conference and Exhibition, 11-14 June, Copenhagen, Denmark. Society of Petroleum Engineers 2018 ISBN 978-1-61399-606-5. p. -
UIS

Bhakta, Tuhin; Tolstukhin, Evgeny; Pacheco, Carlos; Luo, Xiaodong; Nævdal, Geir.
Petrophysical parameters inversion from seismic data using an ensemble-based method - A case study from a compacting reservoir. I: ECMOR XVI - 16th European Conference on the Mathematics of Oil Recovery, 3–6 September 2018, Barcelona, Spain. European Association of Geoscientists and Engineers 2018 ISBN 978-94-6282-260-3. p. -
NORCE

Brattekås, Bergit; Ersland, Geir; Seright, Randall S..
Solvent Leakoff During Gel Placement in Fractures: Extension to Oil-Saturated Porous Media. I: SPE Improved Oil Recovery Conference. Society of Petroleum Engineers 2018 ISBN 978-1-61399-570-9.
UiB UIS

Erzuah, Samuel; Fjelde, Ingebret; Omekeh, Aruoture Voke.
Wettability Estimation by Oil Adsorption Using Quartz Crystal Microbalance with Dissipation QCM-D. SPE-190882-MS. I: 80th EAGE Annual Conference & Exhibition 2018. European Association of Geoscientists and Engineers 2018 ISBN 978-94-6282-254-2. p. -
NORCE UIS

Fjelde, Ingebret.
Sulphate in Original Reservoir Chalk Rocks: Release of Sulphate by Desulphated Sea Water and Effects on Wettability. I: SPE Europec featured at 80th EAGE Conference and Exhibition, 11-14 June, Copenhagen, Denmark. Society of Petroleum Engineers 2018 ISBN 978-1-61399-606-5. p. -
NORCE UIS

Føyen, Tore Lyngås; Fernø, Martin; Brattekås, Bergit.
The Onset of Spontaneous Imbibition: How Irregular Fronts Influence Imbibition Rate and Scaling Groups. I: SPE Improved Oil Recovery Conference. Society of Petroleum Engineers 2018 ISBN 978-1-61399-570-9. p. -
SINTEF UiB UIS

Hoteit, Ibrahim; Luo, Xiaodong; Bocquet, Marc; Köhl, Armin; Ait-El-Fquih, Boujemaa.
Data Assimilation in Oceanography: Current Status and New Directions. I: New Frontiers in Operational Oceanography. : GODAE OceanView 2018 ISBN 1720549974.
NORCE

Lie, Knut-Andreas; Mykkeltvedt, Trine Solberg; Møyner, Olav.
Fully implicit WENO schemes on stratigraphic and fully unstructured grids. I:

ECMOR XVI - 16th European Conference on the Mathematics of Oil Recovery, 3–6 September 2018, Barcelona, Spain. European Association of Geoscientists and Engineers 2018 ISBN 978-94-6282-260-3. p. -
NORCE SINTEF

Lorentzen, Rolf Johan; Bhakta, Tuhin; Grana, Dario; Luo, Xiaodong; Valestrand, Randi; Nævdal, Geir.
History Matching Of Real Production And Seismic Data In The Norne Field. I: ECMOR XVI - 16th European Conference on the Mathematics of Oil Recovery, 3–6 September 2018, Barcelona, Spain. European Association of Geoscientists and Engineers 2018 ISBN 978-94-6282-260-3.
NORCE

Luo, Xiaodong; Bhakta, Tuhin.
Towards Automatic And Adaptive Localization For Ensemble-Based History Matching. I: ECMOR XVI - 16th European Conference on the Mathematics of Oil Recovery, 3–6 September 2018, Barcelona, Spain. European Association of Geoscientists and Engineers 2018 ISBN 978-94-6282-260-3.
NORCE

Luo, Xiaodong; Bhakta, Tuhin; Nævdal, Geir.
Data driven adaptive localization for ensemble-based data assimilation problems. I: Proceedings of Computational Methods in Water Resources (CMWR) 2018. : Computational Methods in Water Resources (CMWR) 2018 ISBN 000-0-00-000000-0.
NORCE

Luo, Xiaodong; Lorentzen, Rolf Johan; Valestrand, Randi; Evensen, Geir.
Correlation-Based Adaptive Localization for Ensemble-Based History Matching: Applied to the Norne Field Case Study. I: SPE Norway One Day Seminar 2018. Society of Petroleum Engineers 2018 ISBN 978-1-61399-609-6.
NERSC NORCE

Luo, Xiaodong; Lorentzen, Rolf Johan; Valestrand, Randi; Evensen, Geir.
History Matching Using an Iterative Ensemble Smoother with Correlation-Based Adaptive Localization - A Real Field Case Study. I: 80th EAGE Annual Conference & Exhibition 2018. European Association of Geoscientists and Engineers 2018 ISBN 978-94-6282-254-2.
NORCE

Nermoen, Anders.
Porosity Evolution during Chemo-Mechanical Compaction. I: Porosity: Process, Technologies and Applications. The Shard, 32 London Bridge Street, London SE1 9SG, United Kingdom: IntechOpen 2018 ISBN 978-1-78923-042-0. p. 201-220
NORCE UIS

Puntervold, Tina; Strand, Skule; Pinerez Torrijos, Ivan Dario; Hopkins, Paul Andrew; Austad, Tor.
Enhancing Oil Recovery from Dolomitic Reservoirs- Investigation of Temperature Limitations. I: SPE EOR Conference at OGWA. Society of Petroleum Engineers 2018 ISBN 978-1-61399-569-3. p. -
UIS

Rognmo, Arthur Uno; Fredriksen, Sunniva; Alcorn, Zachary Paul; Sharma, Mohan; Føyen, Tore Lyngås; Eide, Øyvind; Graue, Arne; Fernø, Martin.
Pore-to Core EOR Upscaling for CO2-foam for CCUS. I: SPE Europec featured at 80th EAGE Conference and Exhibition, 11-14 June, Copenhagen, Denmark. Society of Petroleum Engineers 2018 ISBN 978-1-61399-606-5.
SINTEF UiB UIS

Sachdeva, Jaspreet Singh; Nermoen, Anders; Korsnes, Reidar Inge; Madland, Merete Vadla.
How the Presence of Oil and Water Affects Chalk Mechanics at Isotropic Stresses. I: 80th EAGE Annual Conference & Exhibition 2018. European Association of Geoscientists and Engineers 2018 ISBN 978-94-6282-254-2. p. -
NORCE UIS

Temizel, Cenk; Putra, Dike; Najy, Anas; Pinerez Torrijos, Ivan Dario; Puntervold, Tina; Strand, Skule.
An NPV-Based Comparison of Performance of Subsurface Conformance Materials in EOR. I: SPE EOR Conference at OGWA. Society of Petroleum Engineers 2018 ISBN 978-1-61399-569-3. p. -
UIS

Temizel, Cenk; Putra, Dike; Najy, Anas; Pinerez Torrijos, Ivan Dario; Puntervold, Tina; Strand, Skule.
Optimization of Steam Injection Processes in Reservoirs with Subsidence and Uplift. I: SPE EOR Conference at OGWA. Society of Petroleum Engineers 2018 ISBN 978-1-61399-569-3. p. -
UIS

Zhang, Yiteng; Lorentzen, Rolf Johan; Stordal, Andreas S..
Practical Use of the Ensemble-Based Conjugate Gradient Method for Production Optimization in the Brugge Benchmark Study. I: SPE Norway One Day Seminar 2018. Society of Petroleum Engineers 2018 ISBN 978-1-61399-609-6. p. -
HAVFORSK NORCE UIS

Zhang, Yiteng; Stordal, Andreas S.; Lorentzen, Rolf Johan; Chang, Yuqing.
A Novel Ensemble-Based Conjugate Gradient Method for Reservoir Management. I: SPE Norway One Day Seminar 2018. Society of Petroleum Engineers 2018 ISBN 978-1-61399-609-6. p. -
HAVFORSK NORCE UIS

Åsen, Siv Marie; Stavland, Arne; Strand, Daniel; Hiorth, Aksel.
An Experimental Investigation of Polymer Mechanical Degradation at cm and m Scale. I: SPE Improved Oil Recovery Conference. Society of Petroleum Engineers 2018 ISBN 978-1-61399-570-9. p. -
NORCE UIS

MEDIA CONTRIBUTIONS

Bratvold, Reidar B; Mohus, Erlend.
Feltene gir mindre olje enn tenkt. Dagens Næringsliv [Newspaper] 2018-10-28
NTNU

Dye, Christian Jarle; Løvås, Mari.
Large scale onshore testing – the missing link between lab and field in petroleum research. [Radio] 2018-08-09
UIS

Hiorth, Aksel.
Fra olje til hjerteforskning. [Radio] 2018-01-09
UIS

Hiorth, Aksel.
To nye masterprogram til UiS. Byas [Internet] 2018-11-20
UIS

Hiorth, Aksel; Bogale, Nigussie; Vinningland, Jan Ludvig; Gulsrud, Thor Ole.
Vil bruke oljeteknologi – på hjertepasienter. NRK [TV] 2018-02-02
NORCE SUS UIS

Hiorth, Aksel; Evje, Steinar.
Nye mastergrader ikke bare for oljebransjen. Dalane Tidende [Newspaper] 2018-11-27
UIS

Hiorth, Aksel; Haukås, Jarle; Løvås, Mari.
A research bromance – how to build a lasting relationship between academia and the industry. [Radio] 2018-08-29
UIS

Hiorth, Aksel; Vinningland, Jan Ludvig; Bogale, Nigussie.
Oljeteknologi for hjertet. Dagens Medisin [Business/trade/industry journal] 2018-01-25
NORCE SUS UiO UIS

Hong, Aojie.
Aojie (29) har allerede doktorgrad, men synes selv at han er litt sent ut. Byas [Internet] 2018-01-09
UIS

Lohne, Arild.
Forskere hedret. Dagsavisen Rogalands Avis [Newspaper] 2018-10-31
NORCE

Lohne, Arild.
Innovasjonspris til Lohne og Nødland. Stavanger Aftenblad [Newspaper] 2018-11-09
NORCE

Madland, Merete Vadla.
Improved oil recovery: Collaborating for better technology and a greener future. UiS podkast [Internet] 2018-08-09
UIS

Madland, Merete Vadla.
IOR NORWAY 2018. TV Vest [TV] 2018-04-25
UIS

Madland, Merete Vadla.
Navet i den internasjonale forskningen for IOR. Norsk sokkel [Business/trade/industry journal] 2018-07-18
UIS

Madland, Merete Vadla.
Økt andel kvinnelige professorer på UiS – fra 21 til 27 prosent. Dagsavisen Rogalands Avis [Newspaper] 2018-02-10
UIS

Madland, Merete Vadla; Laupretre, Thierry.
Collaboration is key – the success story of The National IOR Centre of Norway. UiS podkast [Internet] 2018-08-31
UIS

Madland, Merete Vadla; Riiber, Kjersti.
Mer olje opp på en grønnere og billigere måte. Forskning.no [Internet] 2018-02-11
UIS

Minde, Mona Wetrhus.
Miljøbevegelsen er kritisk til Johan Sverdrup. NRK P2 [Radio] 2018-08-27
UIS

Osmundsen, Petter.
Aker BP får tilbake 13 mrd. fra staten. Dagens Næringsliv [Newspaper] 2018-12-04
UIS

Osmundsen, Petter.
Equinor hoping wind will blow subsidy its way. Upstream [Business/trade/industry journal] 2018-10-12
UIS

Osmundsen, Petter.
Gir statens regnestykke stryk. Dagens Næringsliv [Newspaper] 2018-11-22
UIS

Osmundsen, Petter.
Karbonavgiften fungerer effektivt. Stavanger Aftenblad [Newspaper] 2018-12-05
UIS

Osmundsen, Petter.
Mener norsk oljeskatt er «satt i spill». Dagens Næringsliv [Newspaper] 2018-02-21
UIS

Osmundsen, Petter.
Norway facing questions over 'preferential' petroleum tax. Upstream [Business/trade/industry journal] 2018-02-16
UIS

Osmundsen, Petter.
Norway in 'fiscal fight' for investments. Upstream [Business/trade/industry journal] 2018-02-22
UIS

Osmundsen, Petter.
Norway tax system in the spotlight. Upstream [Internet] 2018-11-22
UIS

Osmundsen, Petter.
Norway's $1 Trillion Fund Slammed for 'Propaganda' on Oil Stocks. Bloomberg [Internet] 2018-10-05
UIS

Osmundsen, Petter.
Oljetopp mener norsk oljeskatt og reguleringer på sokkelen fører til kostnadsgalopp. Dagens Næringsliv [Newspaper] 2018-03-11
UIS

Osmundsen, Petter.
Riggspelet. Borehol i paradis. Dag og Tid [Newspaper] 2018-04-28
UIS

Osmundsen, Petter.
Spår milliardtap på gigant-rør. NRK [Radio] 2018-06-28
UIS

Osmundsen, Petter.
Spår milliardtap på gigant-rør. NRK [Internet] 2018-06-28
UIS

Osmundsen, Petter.
Statoil faces flak over transition strategy. Upstream [Business/trade/industry journal] 2018-04-20
UIS

Osmundsen, Petter.
Tough Norwegian taxes can tip scales. Upstream [Business/trade/industry journal] 2018-03-02
UIS

Åsen, Siv Marie.
Collaboration on polymers to recover more oil. UiS Podkast [Radio] 2018-08-09
NORCE UIS

INFORMATION MATERIALS
Riiber, Kjersti.
IOR NORWAY 2018 - Master's Corner.
UIS

Riiber, Kjersti.
IOR NORWAY 2018 - Smart Solutions for Future IOR (proceedings).
UIS

Riiber, Kjersti.
Welcome to IOR NORWAY 2018.
UIS

The National IOR Centre of Norway

www.uis.no/ior