

IOR NORWAY 2018

SMART SOLUTIONS FOR FUTURE IOR



"A UNIQUE OPPORTUNITY TO ENGAGE WITH
IOR PROFESSIONALS AND RESEARCHERS FROM
NORWAY AS WELL AS EUROPE AND FURTHER AFIELD"

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**The National
IOR Centre
of Norway**

OG21`s vision and strategic objectives

VISION: TECHNOLOGIES AND INNOVATION FOR A
COMPETITIVE NORWEGIAN PETROLEUM SECTOR

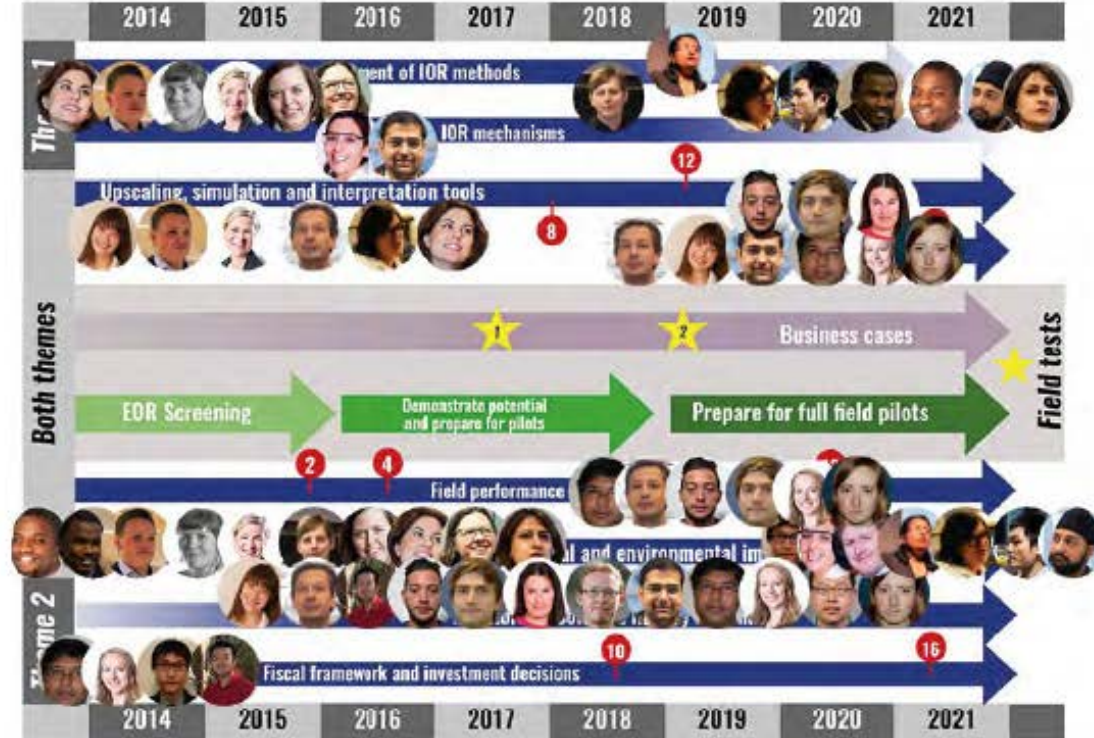
Maximize
resource
utilization.

Minimize
environmental
impact.

Improve
productivity and
reduce costs.

Develop
innovative
technologies

Attract, develop and retain the best talents



PhD students and postdocs contributing to the research projects at The National IOR Centre of Norway in 2017: Laura Borromeo, Oddbjørn M. Nødland, Bergit Brattekkås, Mona Wetthus Minde, Irene Ringer, Teresa Palmer, Dmitry Shogin, Remya Nair, Emanuela Iedida Kallestén, Kun Guo, Samuel Erzuah, Arutture Voke Omekeh, Jaspreet Singh Sachdeva, Shaghayegh Javadi, Tijana Voake, Mohan Sharma, Anna Kvashchuk, Mario Silva, Mahmoud Ould Metidji, Thomas Brichart, Trine Solberg Mykkeltvedt, Tuhin Bhakta, Kjersti Solberg Eikrem, Karen Synnøve Ohm, Aojie Hong, Eystein Opsahl, Yifeng Zhang, Pål Østebø Andersen and Yanhui Zhang.

At the midterm evaluation it was time for our PhD students and postdocs to shine.

An evaluation panel consisting of five experts within different fields of academic research, business and industry partners and PhD students and postdocs at the site visit in September 2017. The quotes below are from the evaluation report written after the site visit:

«The evaluation team met an impressive spectrum of enthusiastic and capable PhD students, postdocs

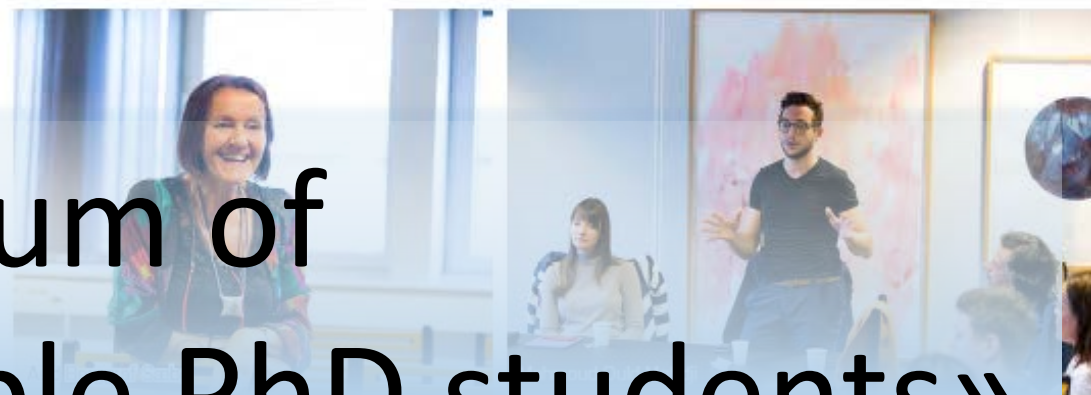
into the roadmap and contributed to the overall objectives. The students' multi-disciplinary background provides an excellent foundation for this cohort of PhD students and exposure to industry-facing problems and methods. Currently, the students' main access to the industrial partners is through discussions in seminars, workshops and other

The panel also highlighted our students' opportunities to travel abroad:

«There are numerous examples of international researcher exchanges and PhD students were positive about the international experience they were able to gain from their membership of the Centre.»

Before the site visit, the PhD students had placed themselves in the Centre's roadmap. At the site visit they

positive working environment for PhD students that recognises their contributions to the Centre: for example, by arranging activities for the whole student cohort to develop soft skills, facilitate cross-discipline learning and social networks. This enhances the students' experience and is building social capital for their future careers. The future plan, including the STEP (Students & Partners) programme, where all students will contribute to the



«An impressive spectrum of enthusiastic and capable PhD students»

«One of the highlights have been how well the PhD students have been integrated in the Centre activities, both in house, but also included in industry visits, presentations and discussions. The possibilities to present and discuss one's work internally and with industry has enabled me to get a better understanding of how my work impact others' research and which questions the industry want answered.»

Mona Wetthus Minde

«The IOR Centre encourages their students to visit abroad universities, which is a very good opportunity for the students to broaden their horizon and collaborate with other excellent researchers.»

Aqije Hong

«The IOR Centre inspires their PhD students to get insights about what the industry requires from them and how to present our work in the most efficient way. The Centre encourages to have a creative working environment for their students and helps to integrate with other researchers in the Centre.»

Remya Nair

«The social environment at the Centre is wonderful. It is a pleasure for me to work amongst the leading intellectuals and researchers from the oil and gas industry with everyone aiming on common goals, only one mind pressing the oil recovery challenge. Continental S

Continental S

«The management team puts a big emphasis on the social environment and regularly promotes team building activities. In particular for me, being stationed in Oslo at IFE, this is a great attitude. It allows me to get to know everyone, what they're doing, and even developing personal relationships with some people. It's very easy to talk to everyone affiliated with the Centre, from fellow PhD candidates to its head. It's a healthy and motivating environment»

Mario Silva

«My project aims to scale-up the technology of using foam for mobility control for CO2 EOR from Lab to Field. This is a collaboration project involving seven universities from Europe and the USA, and six oil companies. The journey so far has been really exciting with the laboratory studies, reservoir simulation, and baseline data acquisition in field, acting as precursor to the pilot in a heterogeneous carbonate reservoir which is scheduled to start in March this year»

Mohan Sharma

«I am fortunate to work with the best! I highly respect my supervisors, both as scientists and as persons. They are supportive and at the same time challenge and encourage new approaches

Emanuela Kallestén

20 PhDs and 13 post docs

Top left: Dmitry Shagin, Mahmoud Ould Matidji, Mario Silva
Middle left: Samuel Erzuash, Bergit Brattakke, Oddbjørn M. Nørdland, Emanuela Kallestén, Shaghayegh Javadi
Bottom left: Anna Kvashchuk, Irene Ringer, Mona Wetthus Minde, Remya Nair, Yitang Zhang



We learn from our young talents





Our talented,
hardworking & ambitious
MSc students



«There are numerous examples of international research exchanges..»



PhD student Jaspreet Singh Sachdeva with The National IOR Centre of Norway spent two months working with wettability in chalk in St. John's, Canada.

To understand how chalk reservoirs deform during the injection of seawater-like brines has been the topic of discussion since quite a long time now. Considerable research has been carried out on the chemically induced compaction in chalk reservoirs. This research has primarily focused on water wet chalk and has shown how seawater and other simplified seawater-like brines alter stiffness, strength and time dependent mechanical parameters. My work involves evaluating the effect of presence of oil in the pore spaces on mechanical stability of chalk, i.e. how different wettabilities dictate chalk mechanics. The overall mechanical behavior measured over a approximately equal to 0.1 m scale core arises from a sum of grain-grain contact behaviors. It is assumed that if grain-grain contacts, that dictate mechanics of the frame work, remain water wet, the wettability is inconsequential to the mechanical parameters describing chalk core behavior, and vice versa. To understand these effects in more detail, it was of paramount importance to evaluate as to what degree the wettability of chalk cores can be controlled in the lab.

I got the opportunity to carry out wettability estimation studies over a duration of two months during Fall 2017 at the Hibernia Enhanced Oil Recovery Laboratory at Memorial University of Newfoundland (MUN) in St. John's, Canada under Dr. Lesley James. Her research group focuses on sustainable oil production by increasing oil recovery rates through enhanced oil recovery.

The main objective of my work, as stated above, was to follow a systematic approach to evaluate the degree to which wettability estimation is possible in chalk cores. The brine composition, oil composition and aging temperature were kept constant, and aging time was the laboratory control variable. Three different methods were used to evaluate wettability, viz. contact angle measurement, Amott-USEM test, and SEM-MLA analysis. The repeatability of the WI estimate was also tested, i.e. how experimental controls led to repeatable wettability determinations. The work also included using a structured approach with the abovementioned different methods to quantify the degree of uncertainty linked to WI estimation and the aging procedure to control wettability of chalk. With a comprehensive suite of samples, we were able to reproduce the conditions required to restore the chalk cores to the desired wettability. The results of this work will be presented at the Society of Core Analysts Annual Symposium in Trondheim, Norway in August 2018.

Besides working at MUN, I got to enjoy the natural scenery and landscape in and around St. John's as well. St. John's is the capital and largest city in Newfo-

undland and Labrador. The easternmost point of North America, Cape Spear, is only 16 kilometers away from St. John's and provides great opportunities to take breath-taking pictures during the sunset with the grand North Atlantic Ocean in the backdrop. Signal Hill, in the heart of the city, provides beautiful panoramic view of the whole city. There is a lot of diversity in St. John's like the rest of Canada, and the city has so many restaurants and food joints with a wide range of cuisines to enjoy a good meal anytime of the day. Canadians are very enthusiastic about two things: hockey and maple syrup. I had some interesting conversations with the local people on those topics as well. Canadians are known to be calm, down-to-earth and well-mannered people and I found it to be true during my interactions with the locals.

I can describe my trip to Canada in one sentence: You cannot buy happiness, but you can visit Canada and that is pretty much the same thing.

I met so many people and made quite a few friends within a short span of two months that I will cherish forever. The people I met made my stay a very pleasant and an unforgettable one. I felt sad while leaving, but had this happy feeling to finally been able to go back home in Norway before the super-cold winters of Canada set in. I miss everyone I met back in St. John's and wish everyone good luck with their studies, jobs and lives in general! We will meet again sometime somewhere around the globe! Au revoir.

Jaspreet Singh Sachdeva



From left: Jaspreet Singh Sachdeva, Lesley James and Edison Sirpal.

Our creative, inspiring & supportive talents



CLIMATE DEBATE, RESEARCH SQUARE & VISIT FROM GOSEN SCHOOL



Centre director Merete Vadla Mæland participated in a climate debate at the university library together with professor Oluf Langhelle, dean Pystein Lund Bæ and leader of the Research Network for Sustainable Energy, Siri Kvalvig.



When the pupils from BB at Gosen school visited the Centre, the day consisted of both freezing cold nitrogen and a cool ice cream lunch. Here PhD student Maria Watchus Mende does experiments with liquid nitrogen.



Forskningsdagene



PhD student Sanne Lohrzen shows the pupils how chalk looks like in a microscope. Photos: Kjersti Røiber





OG21-FORUM: They are the future

Sharing our results

The researchers at The National IOR Centre of Norway travel all over the world and bring their results with them. In 2017 representatives from the Centre have been present at, among others, the Norge Reservoir Seminar, FORCE Seminars, The Energy Year 2017, Short Oil & Gas Symposium, TNO Workshop Mature Fields in the North Sea: Searching for Synergies, IOR NORWAY 2017, IEA-GOT Mature Fields, Trondheim, SPWLA Annual Symposium, SIAM GS 2017, Science Week, SEG Annual Meeting, ENUMATH 2017 Conference, Reservoir & Production Management – NPE, OPM Meeting, The November Conference, OG21-forum, SETAC, Adipex, Short Course on Solvent Flooding and Enhanced Oil Recovery, NFIP Annual PhD Seminar and Colloids and Complex fluids for Energies.

LUNCH & LEARN

In addition to all the dissemination done off campus, the Lunch & Learn events have been very popular back on campus at University of Stavanger. After a total of 11 Lunch & Learn events in 2016, the Centre only arranged two sessions at UiS in 2017 – with Lesley James, Associate professor and Chevron Chair in Petroleum Engineering at Memorial University and postdoc Pål Østebø Andersen from The National IOR Centre of Norway/UiS. In addition to this, PhD students Emanuela Kallestén and Mona Wethrus Minde gave a Lunch & Learn for 150 employees at ConocoPhillips in Tananger.

From left: Anders Matheson, Yiteng Zhang, Rolf Johan Lorentzen, Xiaodong Luo, Tor Harald Sandve, Sergey Alyaev, Geir Evensen, Robert Klöforn, Anna Kvasshuk, Trine Mykkelvedt and Yuding Chang.
Photo: Søren Arentsen / IRIS



IOR NORWAY 2017

The most important event, and one of the main arenas for dissemination, is The National IOR Centre of Norway is co-organising the IOR NORWAY conference. A total of 400 participants joined in on the three-day conference and the workshop during the main conference.

OG21

The National IOR Centre of Norway was well represented at OG21 in November 2017. PhD student Yiteng Zhang gave a presentation in the student session. It should also be mentioned that centre director Merete Vadla Madland was appointed to the OG21 board by Minister of Petroleum and Energy, Terje Svipknes, summer 2017.

DISSEMINATION IN NUMBERS

2017 was a very productive year for the researchers at the Centre. Here are some statistics from CRISin (Current Research Information System in Norway):

- Journal article: 31
- Conference contribution or scholarly presentation: 117
- Book: 2
- Report/dissertation: 49
- Part of a book/report: 46
- Media contribution: 30
- Commercialisation: 1
- Information materials: 2



**Managing Geological Uncertainty
with Decision Analysis in
Reservoir Management**

Probabilistic History Matching, Robust Production
Optimization, and Value-of-Information

Aojie Hong

Faculty of Science and Technology

PhD Thesis UIS no. 371 - December 2017



***In-situ* and *ex-situ* catalytic
upgrading of heavy crude oil**

Rational design and synthesis of nanocatalysts

Kun Guo

Faculty of Science and Technology

PhD Thesis UIS no. 387 - April 2018



Congratulations
Dr. Agüa Hong
& Dr. Kun Guo





Attract, develop and retain the best talents:
Pål Østebø Andersen



..and Dmitry Shogin

Anything may be possible
or..?





The 2018 user partners and observers:



