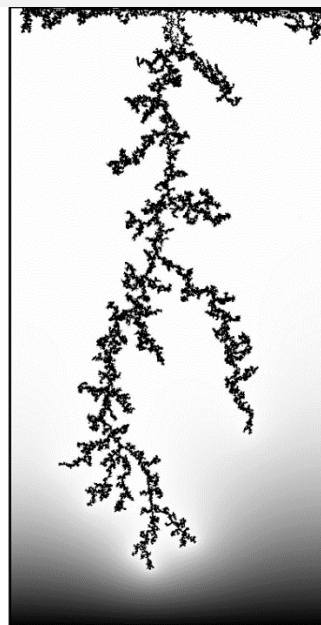
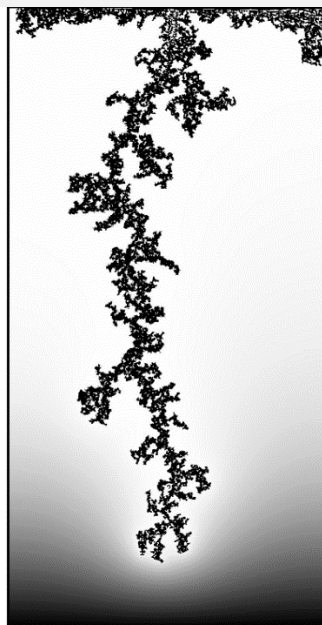
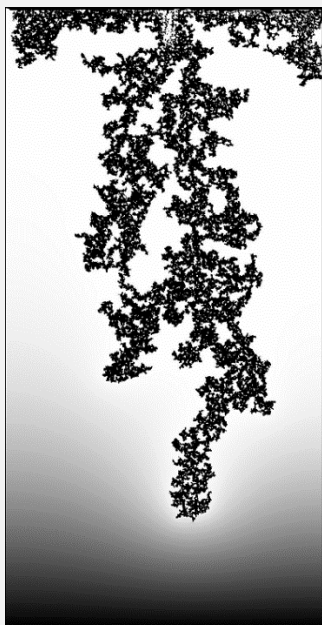


Newsletter 2- 2018

PoreLab

NTNU
Norwegian University of
Science and Technology
UiO
University of Oslo



PoreLab

NTNU-UiO Porous Media Laboratory



Norwegian
Centre of
Excellence

The Research Council of Norway



Norwegian University of
Science and Technology



UiO : University of Oslo

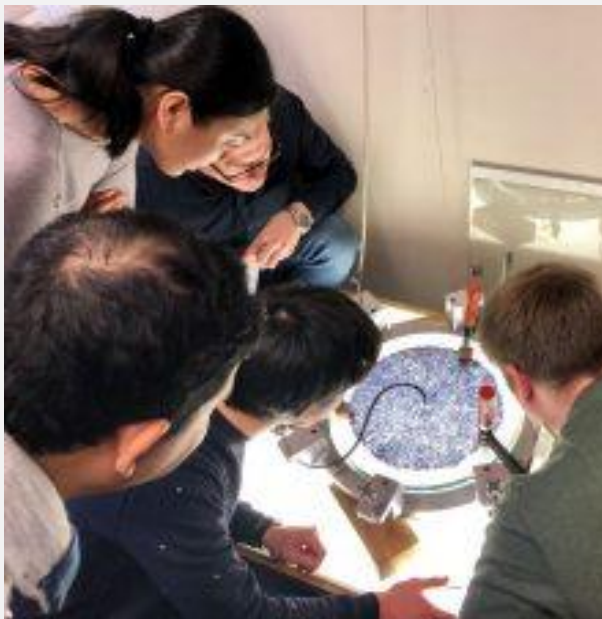
A celebration of the opening of our new premises ...

PoreLab marks the move to new offices at the Petroleumsteknisk Senter by welcoming you all to a gathering. We will have an academic program and there will be served lunch.

When: Friday June 1, at 10.00 – 15.00.

We will send you the detailed program as soon as possible. Everybody are welcome and we hope that PoreLab Oslo will join us!

1ST PORELAB JUNIOR FORUM



Lab tour: experiments on a circular Hele-Shaw cell with a non-deformable porous medium.

The 1st PoreLab Junior Forum took place in the Physics Department, University of Oslo, in March 8th and 9th. The main goal of the forum was to bring together the community of PhDs, PostDocs and early career researchers of PoreLab into a single venue, with the objective of allowing them to better know each other personally and share their respective work/scientific interests. The Forum was divided in 2 days, the main event with presentations and posters happening on the first day and a lab tour happening on the second.

The importance of such a forum is particularly stressed in the case of PoreLab, since the center is physically divided in two local hubs, Oslo and Trondheim. It is very important to make it clear,

particularly to the newest members, that although the center has two physical locations, it is indeed a single center, and collaboration between the groups should not be stopped due to the physical distance. The Junior Forum helped to create the feeling of a single united center. Very explicitly, new collaboration opportunities between NTNU and UiO members have already started as a result of the Forum.

Spoke-persons for Junior Forum will be Olav and Fredrik.

On the second day everybody was invited to a Lab tour of the facilities of the Physics Department in Oslo. The following experiments were presented:

1. Viscous fingering in a circular Hele-Shaw cell with a fixed porous medium.
2. Capillary fingering and viscous fingering in a rectangular Hele-Shaw cell with a fixed porous medium.
3. Plug formation in frictional porous media flows in a cylindrical confinement.
4. Dissolution patterns in a circular Hele-Shaw cell in a deformable porous medium.

The lab tour was very well received by the participants. In particular, some of the PhDs and postdocs who work on the simulation of similar geometries (network models and molecular dynamics) found much interest in having direct contact with the real systems related to their work.

Text and picture: Marcel Moura

NEWLY PUBLISHED ARTICLES

Origin of Pseudo-Stability in Stress-Induced Damage Evolution Processes

Jonas T. Kjellstadli, Eivind Bering, Srutarshi Pradhan, Alex Hansen. In this work, we demonstrate that during a stress-induced damage evolution process where the stress field depends on the spatial structure of a system, the measured average value is not always representative of the true value of a system parameter. Such behavior originates from the bias of the structure-dependent fluctuation, i.e. at some point of the damage evolution, fluctuations lean towards higher/lower ends and this in turn affects the average value of a system parameter.

[Read the paper here.](#)

Mesoscopic Description of the Equal Load Sharing Fiber Bundle Model

Martin Hendrick, Srutarshi Pradhan, Alex Hansen. One aim of the equal load sharing fiber bundle model is to describe the critical behavior of failure events. One way of accomplishing this, is through a discrete recursive dynamics. We introduce a continuous mesoscopic equation catching the critical behavior found through recursive dynamics. It allows us to formulate the model using the unifying framework of absorbing phase transitions traditionally used in the study of non-equilibrium phase transitions. Consequently, this work is a first step towards a field theory for fiber bundle models.

[Read the paper here.](#)

A Renormalization Group Procedure for Fiber Bundle Models

Srutarshi Pradhan, Alex Hansen, Purusattam Ray. We introduce two versions of a renormalization group scheme for the equal load sharing fiber bundle model. The renormalization group is based on formulating the fiber bundle model in the language of damage mechanics. A central concept is the work performed on the fiber bundle to produce a given damage. The renormalization group conserves this work. In the first version of the renormalization group, we take advantage of ordering the strength of the individual fibers. This procedure, which is the simpler one, gives EXACT results -but cannot be generalized to other fiber bundle models such as the local load sharing one. The second renormalization group scheme based on the physical location of the individual fibers may be generalized to other fiber bundle models.

[Read the paper here.](#)

Fluid-Fluid Interfaces of Multi-Component Mixtures in Local Equilibrium

Dick Bedeaux, Signe Kjelstrup. We derive in a new way that the intensive properties of a fluid-fluid Gibbs interface are independent of the location of the dividing surface. When the system is out of global equilibrium, this finding is not trivial: In a one-component fluid, it can be used to obtain the interface temperature from the surface tension. In other words, the surface equation of state can serve as a thermometer for the liquid-vapor interface in a one-component fluid. In a multi-component fluid, one needs the surface tension and the relative adsorptions to obtain the interface temperature and chemical potentials. A consistent set of thermodynamic properties of multi-component surfaces are presented. They can be used to construct fluid-fluid boundary conditions during transport. These boundary conditions have a bearing on all thermodynamic modeling on transport related to phase transitions.

[Read the paper here.](#)

Reducing the exergy destruction in the cryogenic heat exchangers of hydrogen

liquefaction processes

Øivind Wilhelmsen, David Berstad, Ailo Aasen, Petter Nekså, Geir Skaugen. A present key barrier for implementing large-scale hydrogen liquefaction plants is their high power consumption. The cryogenic heat exchangers are responsible for a significant part of the exergy destruction in these plants and we evaluate in this work strategies to increase their efficiency.

In the work, we present a detailed mathematical model of a plate-fin heat exchanger that incorporates the geometry of the heat exchanger, nonequilibrium ortho-para conversion and correlations to account for the pressure drop and heat transfer coefficients due to possible boiling/condensation of the refrigerant at the lowest temperatures.

[Read the paper here.](#)

Investigation of Water Diversion by a Gel System for Enhancing Oil recovery

Ashkan Jahanbani, Jon Kleppe, Ole Torsæter. Poster

[See the poster here.](#)

WELCOME, HAILI!



Haili Long-Sanouiller is the newest employee in PoreLab. She is Postdoc at the Department of Geoscience and Petroleum, NTNU

Hailis research is about to characterize wettability of multiphase flow in porous media by using X-ray mCT technique. Historically, it has always been a challenge to make a proper characterization of wettability in traditional lab experiments. With the development of mCT, it is possible to study local in-situ wettability and contact angle of fluid-fluid interface curvatures based on processed mCT images. The results can be used as input to build models for wettability alteration based on local properties such as pore-size (radius), pore-volume, pore-wall curvature, mineralogy, clay content, etc. by analyzing a smaller set of samples to predict local wettability conditions for samples under similar conditions.

NEWS

Øyvind Wilhelmsen Received Norwegian Research Councils Award for **young outstanding researchers**.

Wilhelmsen and his colleagues focus their research work on what occurs on and along surfaces, and how surficial properties can be exploited both in current and future technologies. This field will have major significance for the development of tomorrow's energy systems. The results of the research carried out by Wilhelmsen and his colleagues will be used in industrial projects involving energy efficient hydrogen liquefaction.

Surfaces of this type are also found in nature. Wilhelmsen has participated in investigating why Arctic reindeer become more energy efficient as they get colder. The explanation lies in the unique high surface area structure of a reindeer's snout. This research has attracted a lot of international attention. [Read the article here](#).



Øyvind Wilhelmsen speaking at a seminar held at the Chemical Process Technology Institute at Imperial College, London. His subject addressed the technical challenges linked to the liquefaction of hydrogen and the need for more accurate thermodynamic descriptions of the cooling media required for this process. Photo: Private source.

EVENTS

Researchers' Night

Researchers' Night will be arranged Friday September 28th at 19:00 - 23:00 in Realfagbygget, NTNU. Researchers' Night annually gathers approximately 1200 students and teachers from upper secondary schools in Trøndelag. **Olav and Jonas** will attend. It is financed by The Norwegian research Council.

The 32nd International Symposium of the Society of Core Analysts

Symposium Theme: “Unconventionals, Carbonates ... What Core Analysis Can Do For Complex Reservoirs”

The 32nd annual SCA Symposium will be held at The Radisson Blue Royale Garden Hotel in Trondheim, Norway. This year’s conference will kick off with a Short Course “**Wettability, measurements and impacts**” on the morning of August 27th followed by 3½ days of technical sessions (including both oral and poster presentations).

Registration with early bird pricing is now open! [Click here to register now.](#)

Any questions? Contact Carl Fredrik Berg.

WEBPAGES

If you have attended a seminar or held a speech at a conference, please let me know. Any news for the website are most welcome. In addition, there is a column for “Featured publications”, in the publication section. Here it is possible to have some selected publications presented in a popular science manner. If you have any questions, please do not hesitate to contact me.

ANY OTHER BUSINESS..

Gallery: Here's the link to the Gallery where we are collecting the porous media related pictures and videos: <https://www.flickr.com/photos/porousmediaart/>. If you have anything that you would like to have posted in the Gallery, please contact Marcel Moura.

PoreLab templates: Marco Sauer Moser has made some new PoreLab templates. You find them in [Dropbox](#).