InterPore News

INTERPORE NEWS

Issue 9, November 18, 2011

## "InterPore member Tissa H. Illangasekare receives EGU Darcy Medal"

Tissa H. Illangasekare, AMAX Distinguished Chair and Professor of Civil and Environmental Engineering, Colorado School of Mines, has been awarded the Henry Darcy Medal by the European Geosciences Union (EGU). This medal has been established by the Division on Hydrological Sciences of the EGU in recognition of the scientific achievements of **Henry Darcy**. It is reserved for individuals in recognition of their outstanding scientific contributions in water resources research and water resources engineering and management (click **here for more information**).

CONTENTS

Professor Illangasekare is a member of InterPore since 2008, when he served on the InterPore Election Committee. He is Director of the Center for Experimental Study of Subsurface Environmental Processes (**http://cesep.mines.edu/**) at Colorado School of Mines, Golden, Colorado. He has been elected Fellow of the AGU in 2005, Fellow of the AAAS in 2006 and Fellow of the American Society of Civil Engineers in 2005. He received an honorary doctorate degree in Science and Technology from Uppsala University, Sweden, in 2010. He is a Registered Professional Engineer, Registered Professional Hydrologist, a Board Certified Environmental Engineer (by eminence) with the American Academy of Environmental Engineers and a Diplomate of the American Academy of Water Resources Engineers affiliated with the ASCE. Professor Illangasekare is Editor of Water Resources Research and past co-editor of Vadose Zone Journal and past Managing Editor for Hydrology in Earth Science Review. He was elected as the vice chair of the Gordon Research Conference on Flow and Transport in Permeable Media, 2010. Thus, he will be chairing the upcoming **conference in Les Diablerets**, Switzerland, June 24-29, 2012.

**Henry Darcy
1803-1858**

Tissa Illangasekare
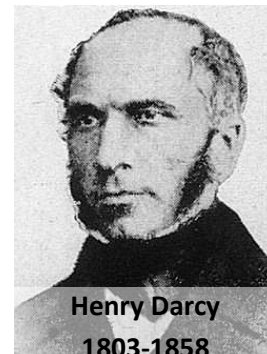
INTERPORE AWARDS

Submit Nominations for Awards to be presented at 2012 InterPore Meeting

InterPore Procter & Gamble Student Award

The Procter and Gamble Student Award is meant to recognize outstanding student poster presentations at the annual InterPore conference. All topics relevant to the mission of InterPore and to the study of flow in porous media, broadly defined, will be eligible for this student award.

InterPore Procter & Gamble Award for Porous Media Research

InterPore would like to announce to its members a new Award, funded by Procter & Gamble: this is the InterPore-Procter and Gamble Award for Porous Media Research-2012. The Award is given in recognition of outstanding contributions to topics related to swelling porous media, very thin porous media, and behaviour at interfaces. Nominees must be members of InterPore.

InterPore Fraunhofer Award for Young Researchers

The International Society for Porous Media, InterPore, on behalf of the Fraunhofer Institute for Industrial Mathematics, ITWM, will grant in 2012 an Award to a Young Researcher at the PhD or Postdoc level, working in the areas of porous and composite materials modelling and computer simulation. Specific areas of research include mathematical modelling at all scales, analysis of deformable porous media, and characterization of porous media structure. The Award will be given in recognition of outstanding contributions to the above topics, and it will be presented during the InterPore conference 2012 at Purdue University.

Please submit your nominations to:

nomination@interpore.org.

For more details and nomination deadlines, please see:
www.interpore.org/awards/

COMMUNITY NEWS

Margot Gerritsen receives the Magne Espedal Professorship for 2011-2013

Prof. Gerritsen has recently been awarded the Magne Espedal Professorship by the Faculty of Mathematics and Natural Sciences, the University of Bergen, Norway. The Magne Espedal professorship was established to commemorate the legacy of Magne Espedal (1942-2010), a preeminent researcher and professor in applied mathematics at the University of Bergen. Magne was a founding member of InterPore. The Magne Espedal Professorship is awarded to an internationally recognized researcher in the areas of applied mathematics, computational science, mathematical modelling and/or energy research.

Margot Gerritsen is a professor at Stanford University, California, in Energy Resources Engineering and the Director of the Institute for Computational & Mathematical Engineering at Stanford since 2001. She earned a MSc in Applied Mathematics from Delft University of Technology, Netherlands, in 1990, and a

Magne Espedal (1942-2010)

PhD in Scientific Computing and Computational Mathematics from Stanford University in 1997. Margot Gerritsen is an expert in computer simulation of fluid flow processes. Her areas of interest include reservoir processes, coastal ocean dynamics, sail design optimization and search engine design.

Margot is a founding member of InterPore and was elected as InterPore's first treasurer. In that capacity she served on the Executive Committee of InterPore from 2009 until 2011. She also chaired the Publicity Committee and still serves on the committee.

To kick off her appointment, professor Gerritsen gave the Magne Espedal lecture 2011 with the title "Energy outlook for the US: why it does not look that great for climate mitigation, and why we are all jealous of Norway" on the 17th of August in Bergen.

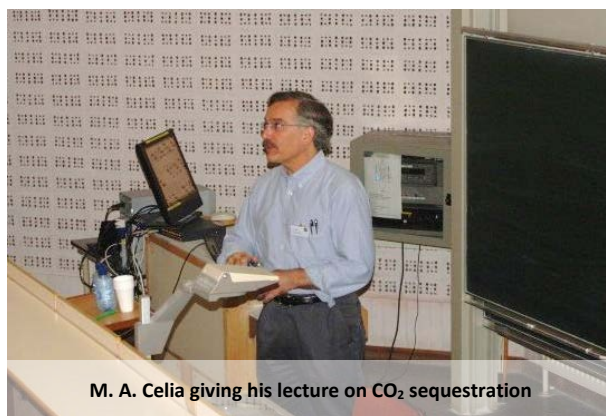After the talk she received a diploma as a token of the appointment.

Prof. Gerritsen holding the diploma

COMMUNITY NEWS

Short report on the 1st Mini-Symposium of the Netherlands Students Chapter of InterPore

The 1st Mini-Symposium of the Netherlands Students Chapter of InterPore on experimental, theoretical and computational aspects of porous media research took place at Utrecht University on the 6th of September.

The mini-symposium was organized within the Inter-Pore framework. Its objective was to bring together scientists from diverse disciplines of porous media research in the Netherlands, finding common re-search lines, exchanging knowledge and identifying possible areas of collaboration.

M. A. Celia giving his lecture on CO$_2$ sequestration

There were a number of invited talks from S. Berg (Shell BV.), S. Bradford (US Salinity Lab), M.A. Celia (Princeton University), J. Huyghe and K. Nicolaij (both TU Eindhoven), M. Kreutzer and W. Rossen (both TU Delft), R. Lammertink (Twente University), B. Lindquist (Stony Brook University), R. Van der Sman and S. Van der Zee (both Wageningen University). The talks covered topics such as CO$_2$ sequestration, mixing effects, ionized porous media, multiphase flows, micro-reactors, biological tissues, etc.

The active participation of the attendants provided fruitful opportunities for intensive interaction between the partic-ipants and the presenters. Challenging questions were posed, creating the platform for creative discussions on topics of mutual interest. Overall, this first mini-symposium was success.

The Student Chapter will repeat this event next year. Shell Rijswijk has agreed to host the next meeting.

For questions, please contact the Netherlands Students Chapter of InterPore via Nikos Karadimitriou (**Karadimitriou@uu.nl**).

INTERPORE FORUM

The InterPore forum

Since 2010 we have a membership forum on our website **www.interpore.org**, which should enable all of us to explore and experience the manifold benefits of InterPore.

In addition to the FlashNews and the InterPore Newsletter, every member can use this platform to share information about activities, events, books, jobs and so on. It also provides the great opportunity to place research questions to others within the community. We strongly hope that this will help to further bridge the gap between different disciplines, institutions and teams with our InterPore Forum, to continue our lively social and scientific network beyond conferences and workshops.

Within the next few days, we want to start filling the InterPore Forum with information on conferences and job opportunities. Therefore this is a good timing for you to get involved with the InterPore Forum.

There are several categories where you can post a thread, including:
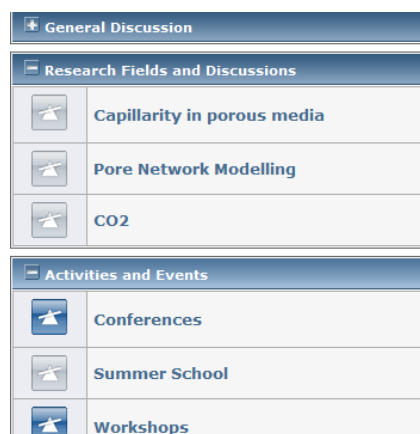
- **General Discussion:** Here, you can post general questions to the InterPore community.
- **Research Fields and Discussion:** Here, questions are discussed and answered. Examples of topics include "Capillarity in porous media", "Pore Network Modelling" and "CO2". Furthermore, everyone is welcome to open up further research fields for discussion within the InterPore Forum.
- **Activities and Events**: In this category, all are invited to communicate to members about upcoming events, such as summer schools, workshops, awards and conferences.
- **Books and Articles:**
  o Is there a book or article which really helped you to understand a topic? Please share this with all of us!
  o You can also publish your most recent paper or (if there are copyright restrictions) at least some information about it.
- **Jobs:** Are there any new job openings to share with the InterPore community?
- **…and much more.**

.

INTERPORE FORUM

Step by step on "how to post a thread"

To participate in the InterPore Forum and exchange knowledge with the InterPore community, you must be registered as an active member with a valid subscription to the InterPore website.

Here, we want to demonstrate how to post a thread to the InterPore Forum, such as sharing a job opportunity with the InterPore community, step by step:

- First, go to the InterPore website.
- Click on the "Forum" button or use the following link to get there directly:
  http://www.interpore.org/forum/
- Log in with your username and password.
- Scroll down to "Jobs".
- Click on "Jobs" and you will see a list of all available posts in this category.
- Click on "new topic" to start a new thread.
- Fill the boxes and click on "Preview" to see a preview (see picture above).
- If satisfied, click on "post" to publish it.
- To be notified whenever someone has answered your thread, check the relevant box below.

RESEARCH SPOTLIGHT

Application of pore-network models in two-phase flow in porous media

By Vahid Joekar-Niasar on the occasion of his InterPore-Fraunhofer Award for Young Researchers

Two-phase flow is the major physical process in many natural and industrial porous media. In the last two decades, with significant improvement of computational and imaging facilities, fundamentals of two-phase flow as well as new theories have been extensively investigated.

Compared to other pore-scale methods for simulating two-phase flow in porous media, pore-network modeling has been used more extensively, as it is relatively simple and computationally less demanding. Pore-network modeling has also its own cons and pros. While pre-processing is required to idealize the pore space geometry and topology into simplified inter-connected geometries, the significant benefit is that larger physical domains can be simulated. Other pore-scale models such as lattice Boltzmann (LB), smoothed particle hydrodynamics (SPH), and level set (LS) methods are resolution based, while pore-network model is resolution-free. When simulating flow in a domain that is physically larger than the REV[1], other methods are impractical for analysis of continuum-scale theories.

Pore-network modeling has four steps:

- **Network generation:** A pore network is usually made of large pores (pore bodies) connected to each other through narrow long pores (pore throats). The topological and geometrical information can be obtained from imaging techniques to construct either a statistically-equivalent network or an exact network based on the imaged sample.
- **Deriving analytical solutions:** Analytical relations to define the pore-scale mechanisms for given pore geometry should be derived. For instance, for a two-phase flow problem, pore-scale flow equation, entry capillary pressure relations, and snap-off capillary pressures relation should be provided.
- **Solving balance equations over the whole network:** Systems of equations should be composed to solve the pressure field and calculate phase flows over the whole network.
- **Averaging from pore-scale to Darcy scale:** Pore-scale quantities will be averaged to obtain a Darcy-scale quantity. In our research, we focused on analysis of capillarity theories developed by Hassanizadeh and Gray, [1990]. These theories propose new physical insights that are absent in classical Darcy's law. They proposed specific interfacial area as a new state variable that can eliminate some complexities related to the hysteresis in capillary pressure-saturation relation. Furthermore, they propose that Darcy's law can be generalized by inclusion of gradient free energy that is related to fluid phases and interfacial area.

---

[1] Representative Elementary Volume

RESEARCH SPOTLIGHT

The following objective was analyzed in our research: **a)** to investigate whether there exists a unique relation among capillary pressure, saturation and specific interfacial area under all drainage and imbibition conditions. If validated, hysteretic behavior of Pc-S curves can be removed by including the specific interfacial area, and **b)** to analyze the functional dependences of non-equilibrium effects on phase pressure difference and specific interfacial area. Consequently, we have developed quasi-static and dynamic pore-network models. The descriptions are given below:

Quasi-static pore-network models: These models provide equilibrium saturation profiles for given boundary pressures. Three models were developed for hypothetical, 2-D micro-model, and 3-D glass bead samples to analyze the uniqueness of P^c-S-a^{nw}. The validation of the pore-network models against experiments showed the reliable applicability of these models to investigate the theory. These models cover different levels of complexity. While the hypothetical model is quite simple (having regular lattice with circular cross sections), the glass bead pore-network model is unstructured irregular with mixed hyperbolic cross sections. Thus, the relationships for entry capillary pressure, specific interfacial area, etc. had to be derived.

Moreover, the wide range of analysis illustrated how P^c-S-a^{nw} surface can change depending on pore geometry. A medium with high porosity was also simulated using quasi-static pore-network models. A medial axis transform was used to extract the topology and geometry of the porous medium and as shown in Figure 1, the drainage and imbibition cycles were successfully simulated using this model.
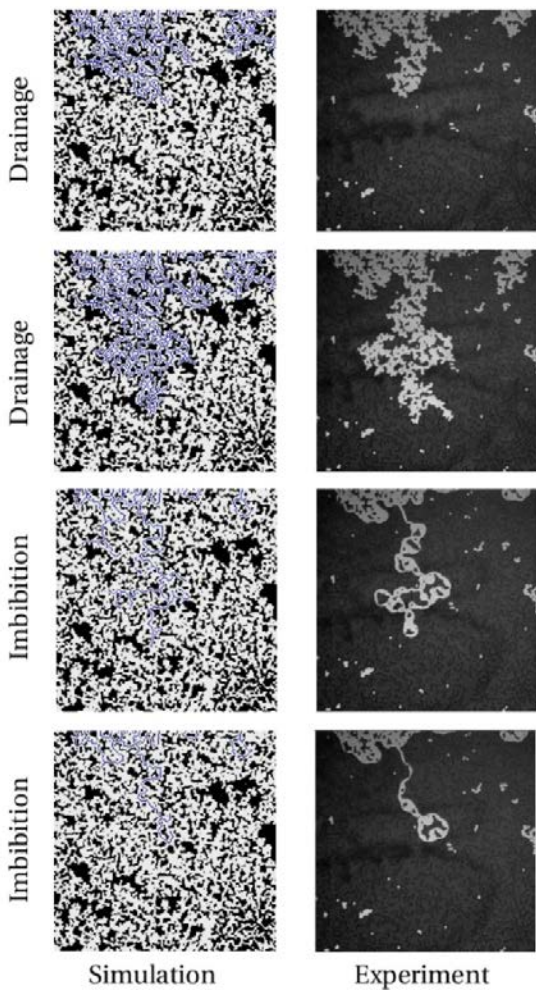

Figure 1: Simulated and observed saturation profiles under drainage and imbibition. A quasi-static pore-network was developed using the medial axis transform. *Right: light grey: non-wetting phase, dark grey: wetting phase, black: solid phase. Left: blue: non-wetting phase, light grey: wetting phase*

RESEARCH SPOTLIGHT

Dynamic pore-network models: The 2nd type of pore-network models are dynamic and were initiated by *Koplik* and *Lasseter* [1985]. These models provide information about change fluids topology with time. But, because of two major technical issues (listed below), they were not used as extensive as the quasi-static ones.

1) In the literature it has been reported that dynamic pore-network models are numerical instable especially at very small flow rates. Thus, ad hoc assumptions were made to stabilize the algorithm. However, this problem was resolved using a two-pressure algorithm and a semi-implicit saturation update. Therefore, we developed the DYPOSIT[2] model [Joekar-Niasar et al., 2010; Joekar-Niasar and Hassanizadeh, 2010]. The DYPOSIT model includes major pore-scale mechanisms, such as counter-current flow within the pores, capillary pinning, snap-off, pinch-off, piston-like movement, variable corner flow, variable capillary pressure, and mobilization of blobs by viscous forces. It was tested for a wide range of capillary number (10^{-8}-10^{-2}) and a wide range of viscosity ratios (0.01-10). Moreover, the consistency between the quasi-static and DYPOSIT model results was validated for gradual stepwise change of pressure at boundaries.
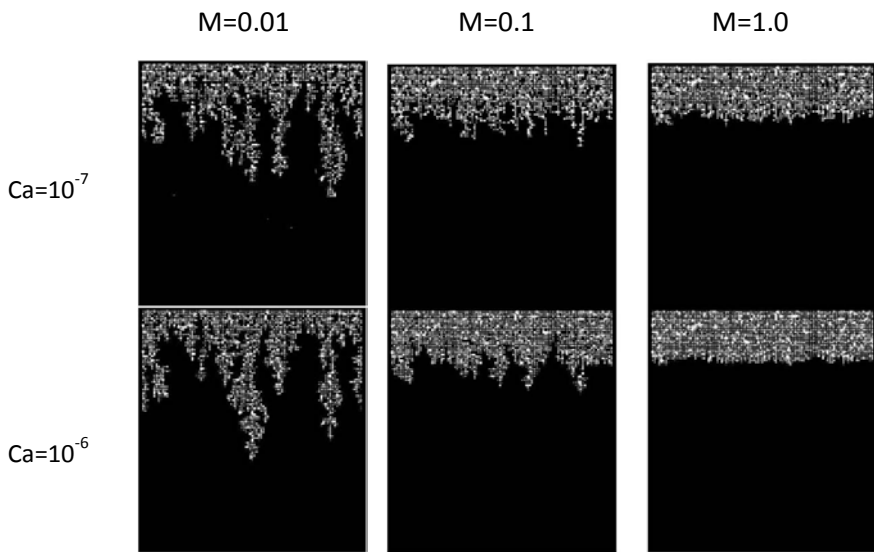
M=0.01   M=0.1   M=1.0

Ca=10^{-7}

Ca=10^{-6}

Figure 3: 3-D saturation profile simulated using the DYPOSIT model for a capillary rise problem.

Figure 2: 2-D saturation profiles at S^w=0.8 for different viscosity ratios and capillary numbers simulated by DYPOSIT.

RESEARCH SPOTLIGHT

2) The second issue is that only few of the previous pore-network models could simulate mobilization of a trapped phase. Those ones that succeeded were based on exhausting and time-demanding search algorithms. In the DYPOSIT model, as the non-wetting phase pressure gradient inside the disconnected blob is solved numerically and the curvature of a capillary interface is dynamically changing with the pressure field, we can calculate the location where the non-wetting fluid will accumulate. In this location, the capillary pressure will build up until it can overcome the entry capillary pressure of a neighboring pore throat. This opening will facilitate mobilization of the disconnected blob or fragmentize it into smaller blobs. For illustration, Fig. 2 shows the change of invasion pattern for different capillary numbers and different viscosity ratios.

Employing versatile formulations in the DYPOSIT model allow it to be used for different two-phase flow scenarios. For instance, the DYPOSIT model has been successfully used to analyze the fate of the fluid-fluid interfacial area under drainage and imbibition under different dynamic conditions. It has been also used to investigate the non-equilibrium effects on phase pressure differences, effects of dynamic conditions on trapping and its consequences for fluid-fluid interfacial area, dynamics of capillary rise in porous media. A snapshot of the capillary rise problem simulated by the DYPOSIT model has been shown in Fig. 3 that illustrates the trapped air. '*The Immiscbles*' (see Joekar-Niasar [2010]) not only provides new technical achievements for pore-network modeling, but also new insights into the physics of two-phase flow in porous media.

References

- Hassanizadeh, S. M. & Gray, W. G. 1990 Mechanics and thermodynamics of multiphase flow inporous media including interphase boundaries. Adv. Water Resour. 13, 169–186.
- Joekar-Niasar, V. 2010, The immiscibles, Utrecht University, ISBN 978-90-5744-179-0; **http://www.geo.uu.nl/~wwwhydro/vahid/vahid.html**
- Joekar-Niasar, V., and S. M. Hassanizadeh 2010, Effect of fluids properties on non-equilibrium capillarity effects: Dynamic pore-network modeling, Int. J. Multiphase Flow, 37, 198–214
- Joekar-Niasar, V., S. M. Hassanizadeh, and H. K. Dahle 2010, Non-equilibrium effects in capillarity and interfacial area in two-phase flow: Dynamic pore-network modelling, J. Fluid. Mech., 655, 38–71
- Koplik, J. & Lasseter, T. J. 1985 Two-phase flow in random network models of porous media.Soc. Petrol. Engng J. 25, 89–110.

MEETINGS&WORKSHOPS

International Workshop on the Impact of Realistic Geological Models on Simulation of CO_2 Storage

The Workshop will take place from the 22nd until the 24th of November, 2011, in Bergen; Norway. The workshop will focus on the present practice and future handling of geological features in sub-surface CO_2 sequestration sites.

Key issues are the impact of sedimentary, tectonic and diagenetic structures on CO_2 plume behaviour, volumetric considerations and leakage risks. The conference will be a forum for the dissemination of the latest ideas in the development and application of advanced computational techniques to problems in water resources and related fields.

International Workshop on,
Impact of Realistic Geological Models on Simulation of CO_2 Storage
November 22-24, 2011, Bergen, Norway
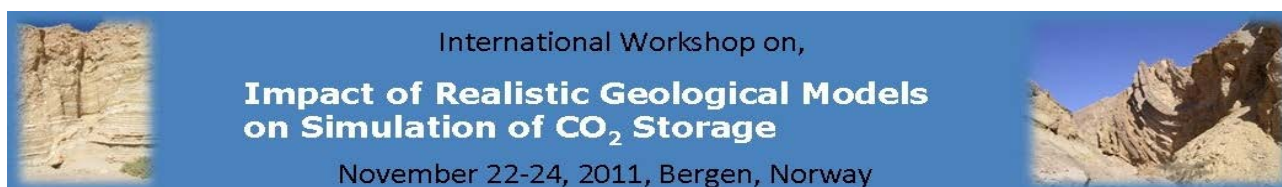
Detailed information on the workshop can be found at:

http://org.uib.no/cipr/Workshop/IGeMS

Registration

The number of participants is limited to 60. Deadline for registration is September 15th. Participants will receive a confirmation by October 15th, and will then be invited to submit abstracts. To register, visit:

http://www.cipr.uni.no/form/form.asp?fid=106

Invited Speakers

- Jonathan, Ennis-King, CSIRO
- Peter Frykman, GEUS
- Philip Ringrose, Statoil
- Anita Torabi, CIPR
- Snorre Olaussen, UNIS
- Daniel Tartakovsky, Univ. of California, San Diego
- Jesus Carrera, UPC Barcelona

MEETINGS&WORKSHOPS

Convenors

The workshop is organised by the IGeMS project (Impact of realistic geological models on CO_2 simulation and storage), collaboration between the University of Bergen, the Centre for Integrated Petroleum research (CIPR), the Norwegian Computing Center and SINTEF, and hosted by CIPR.

Organizing Committee

- Jan Tveranger,
  Center for Integrated Petroleum Research
  (**jan.tveranger@uni.no**)
- Jan Martin Nordbotten,
  Dept. of Mathematics, University of Bergen
  (**jan.nordbotten@math.uib.no**)
- Pål Dahle,
  Norwegian Computing Center
- Halvor Møll Nilsen,
  SINTEF

MEETINGS&WORKSHOPS

4th International Conference on Porous Media & Annual Meeting of the International Society for Porous Media

The 4th International Conference on Porous Media and Annual Meeting of the International Society for Porous Media will take place in Purdue University, Indiana, USA, from the 12th until the 14th of May, 2012. The objectives of the conference are to bring together porous media theoreticians, modellers, and experimentalists from academia and industry and to provide a forum for exchanging ideas and expertise for advancing the porous media science.

INTERPORE @ PURDUE

May 14 - 16, 2012

Scope and Topics

The meeting focuses on problems around developing, producing, and manufacturing porous structures, characterizing them, or analysing flow and transport that, in addition, may involve thermal, chemical electrical and mechanical aspects. The conference aims to cover descriptions of physical mechanisms in porous media at many different scales ranging from angstroms to the 100s of kilometres, using theoretical, numerical or experimental approaches. Some of the main topics of the conference are:

- Engineered Porous Media
- Swelling Porous Media
- Pore-Scale Modelling
- Nonlinear and Complex Processes in Porous Media
- Imaging Applied to Porous Media
- Multiphase Flow in Porous Media
- CO_2 Sequestration - Nuclear Waste Storage
- Thin Porous Media

If you would like to organize a session, please go to
www.physics.purdue.edu/Interpore2012

MEETINGS&WORKSHOPS

Register or submit your abstract now!

Abstract submission (deadline: 15th January 2012):

www.physics.purdue.edu/interpore2012/index.php?page=submissions

To register, please go to:

www.physics.purdue.edu/interpore2012/index.php?page=register

Registration Fees:

- Academic Members: $350 (US)
- Academic Non-Members: $450 (US)
- Academic + 2012 Membership: $400 (US)
- Academic + 2012 Student Membership: $375 (US)
- Industrial Members: $425 (US)
- Industrial Non-Members: $675 (US)
- Industrial + 2012 Membership: $500 (US)
- Accompanying person, gala dinner: $50 (US)

Organizers and Committees

- **Chair:** Prof. **John H. Cushman**
- **Organizing Committee: John H. Cushman, Natalie Kleinfelter-Domelle, Eric Nauman, Laura Pyrak-Nolte, Martin Ostoja-Starzewski, Dongbin Xiu**
- **Program Committee: Todd Arbogast, Lynn Bennethum (Chair), Rudolf Hilfer, Mattias Schmidt, Martin Ostoja-Starzewski**

Detailed information on the conference can be found at:
www.physics.purdue.edu/interpore2012/

MEETINGS&WORKSHOPS

The Sixth International Conference on Thermal Engineering: Theory and Applications

The Sixth International Conference on Theory and Applications of Thermal Engineering will take place in Istanbul, Turkey, from the **22nd** until the **25th of May, 2012**.

Objectives

The conference's main objective is to bring together researchers engaged in the application of experimental, analytical, or theoretical thermal and energy engineering. The suggested topics link together conventional and emerging research areas in thermal energy.

Conference topics include but not limited to:

Biological heat transfer, thermo-diffusion, heat and mass transfer in biomedical devices, biofuels and internal combustion engines, **micro/nano heat transfer**, **multi-phase flow and heat transfer**, double diffusive convection melting and solidification, numerical methods, internal flow and heat transfer, **transport phenomena in porous media**, environmental engineering, **enhanced oil recovery**, **polymer processing**, waste management and waste disposal, heat transfer with non-Newtonian fluid flow, energy management and systems, air conditioning and refrigeration, renewable energy, micro/nanofluidics and life science application, **novel materials**, thermal management, sub-ambient cooling, micro-fabricated thermal management devices and systems, single-phase liquid cooling, novel phase-change cooling techniques, advances in experimental or computational characterization, education and accreditation, nuclear energy, etc.

Important Dates

- Submission of extended abstracts: October 30, 2011
- Notification of an extended abstract acceptance: December 1, 2011
- Submission of revised extended abstract: February 24, 2012
- For more information, please visit **www.ryerson.ca/~ictea** or write to:

Prof Z. Saghir
Ryerson University
Dept. of Mechanical Engineering
Email: **zsaghir@ryerson.ca**

Prof. F. Yardim
Istanbul Technical University
Dept of Chemical Engineering
Email: **ferhat@itu.edu.tr**

MEETINGS&WORKSHOPS

Computational Methods in Water Resources 19th International Conference

The XIX CMWR International Conference will take place at the University of Illinois at Urbana-Champaign, U.S.A., from the **17**[th] until the **22**[nd] of June, 2012. CMWR2012 continues the 36-year tradition of the previous 18 biennial conferences held in North America and Europe.

Detailed information on the conference can be found at:
http://cmwr2012.cee.illinois.edu/

Computational Methods in Water Resources
XIX INTERNATIONAL CONFERENCE

June 17-21, 2012
at the University of Illinois at Urbana-Champaign
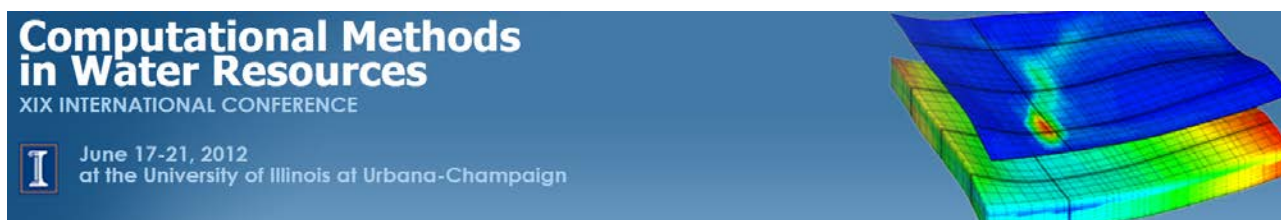
Scope and Sessions

The conference will be a forum for the dissemination of the latest ideas in the development and application of advanced computational techniques to problems in water resources and related fields. Some of the special sessions that may be of particular interest for the InterPore society are:

- Multiphase and Pore-Scale Modelling: Challenges and Perspectives
- Mixing and Reactions across Scales in Porous Media
- Hybrid Multi-scale Models in Subsurface Flow and Transport
- CO2 Sequestration
- Frameworks for Data Assimilation, Uncertainty Analysis and Valuing Information
- Advances in Algorithms for Three-Dimensional Incompressible Flows

The full list of special session can be found:
http://cmwr2012.cee.illinois.edu/specialsessions.html

Register or submit your abstract now!

Registration:	**www.regonline.com/CMWR2012reg**
Abstract submission:	**www.regonline.com/CMWR2012abstracts**
General information:	**http://cmwr2012.cee.illinois.edu/**

MEETINGS&WORKSHOPS

Important dates

- **July 25, 2011**: Abstract submission and Registration opens
- **October 1, 2011**: Abstract Submission closes
- **November 30, 2011**: Notification of acceptance of abstracts
- **March 1, 2012**: Full papers due
- **May 13, 2012**: Early Registration closes
- **June 17-21, 2012**: Conference Dates

Organizers and Committees

Chair: Prof. Albert J. Valocchi

Organizing Committee:
Prof. Michael Heath, Prof. Rainer Helmig, Dr. Chris Kees,
Prof. Praveen Kumar, Prof. Barbara Minsker, Dr. Carol Woodward

Permanent Organizing Committee: Prof. Cass T. Miller, Prof. Philip J. Binning

Keynote Speakers

- **Sabine Attinger**, Helmholtz Center for Environmental Research - UFZ
- **Mike Celia**, Department of Civil and Environmental Engineering, Princeton University
- **Margot Gerritsen**, Energy Resources Engineering, Stanford University
- **William Gropp**, Department of Computer Science, University of Illinois at Urbana-Champaign
- **Jan Hesthaven**, Division of Applied Mathematics, Brown University
- **Marc Parlange**, Ecole Polytechnique Federal de Lausanne, Switzerland
- **Jasper Vrugt**, The Henry Samueli School of Engineering, University of California, Irvine
- **Joannes Westerink**, Civil Engineering and Geological Sciences, University of Notre Dame

Contact Us

Program Questions:
Professor Albert J. Valocchi
Civil and Environmental Engineering
University of Illinois at Urbana-Champaign
Valocchi@illinois.edu

Registration / Logistic Questions:
Michelle Marquart
Online and Continuing Education
University of Illinois at Urbana-Champaign
mmarqua2@illinois.edu
1-217-244-7657

MEETINGS&WORKSHOPS

4th International Conference on Porous Media and its Applications in Science, Engineering and Industry

This conference will build on the 2010 Italian conference (with approx. 120 participants) so that it reflects the research done internationally in the currently active areas of the topic. The presence of the highly successful **Journal of Porous Media** and the Special Topics and Reviews in Porous Media - an International Journal and editions of the very well received **Handbook of Porous Media** as well as the book entitled **Porous Media: Applications in Biological Systems and Biotechnology** will act as an additional impetus to further galvanize this conference.

Venue: Potsdam, Germany –A UNESCO World Heritage Site just outside of Berlin

Date: June 17-22, 2012

Chair: **Prof. Kambiz Vafai**, Department of Mechanical Engineering, University of California, Riverside, USA

Topics

- Natural And Forced Convection In Porous Media
- Evaporation, Condensation, Capillary Effects And Reactive Flow In Porous Media
- Radiation Heat Transfer In Porous Media
- Conduction in Porous Media
- Combined Heat and Mass Transfer in Porous Media
- Particle Transport and Deformable Porous Bodies
- Advanced Mathematical Approaches to the Modelling of Porous Media
- Industrial and Environmental Heat Transfer and Flow in Porous Media
- Process Heat Transfer
- Advances in Numerical Techniques
- Experimental and Measuring Techniques
- Turbulence in Porous Media
- Particle Migration and Deposition in Porous Media
- Bio Transport in Porous Media
- Material Processing Applications

MEETINGS&WORKSHOPS

Oral Abstract Submission Deadline: December 15, 2011

Poster Abstract Submission Deadline: February 1, 2012

Conference publication

A program book including abstracts of all presentations will be distributed to attendees at the conference.

In addition, proceedings of accepted papers will be distributed on site to all attendees. The proceedings will be published by the **American Institute of Physics**.

The deadline for manuscript submission is March 1, 2012.

Details on format, page limits, etc. will be posted here after abstract acceptance notifications are sent out. Note that at least one author must be registered for the conference by April 1 for a paper to be included in the proceedings.

For more Information see:

www.engconfintl.org/12ap.html

© http://quarknet.de/fotos/berlin
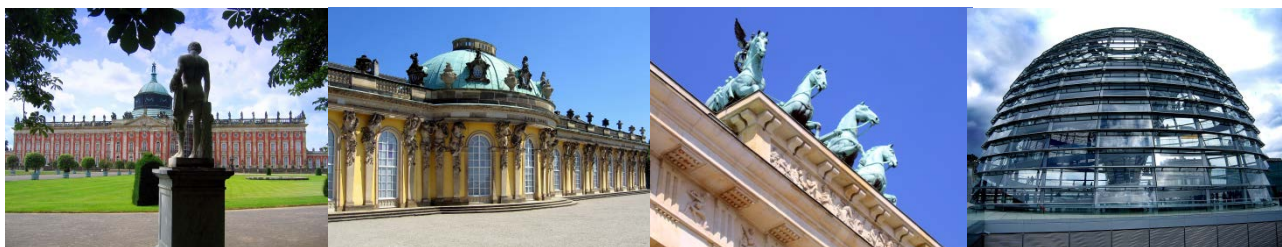
MEETINGS&WORKSHOPS

Special session during EGU General Assembly 2012

Fate and transport of biocolloids and nanoparticles in soil and groundwater systems

Convener: **C. Chrysikopoulos**

Co-conveners: **T. Baumann, S. M. Hassanizadeh, and M. Flury**

Contributions may be focused on:

- fate and transport of biocolloids and nanoparticles in environmental systems
- interactions between biocolloids, nanoparticles and solid surfaces
- biocolloid biodegradation in the presence of solids
- aging and weathering of engineered nanoparticles
- toxicity of products generated from biological disruption of pollutants in the presence of biocolloids
- adverse effects of nanoparticles on aquatic microorganisms
- effects of climate change on biocolloid and nanoparticle migration
- public health risks associated with water and air polluted with biocolloids and nanoparticles

The **deadline** for the receipt of Abstracts is **17 Jan 2012**.

Those who would like to apply for travel support, must submit no later than 15 Dec 2011.

See also **http://meetingorganizer.copernicus.org/EGU2012/sessionprogramme**.

JOB OPPORTUNITIES

Research Engineer position at M-I SWACO

The drilling fluids R&D department in Houston invites applications for a Research Engineer position at its Houston Headquarter. The candidates are expected to have a Master's degree in engineering or science. We are looking for candidates who can lead our efforts in laboratory equipment design and setup for studying drilling fluids, and fluid-rock interactions in solving drilling-related problems such as lost circulation and wellbore strengthening. The candidates are expected to have strong research experience and problem solving skills in drilling and wellbore stability, lab testing techniques, and instrumentations. The candidates will actively interact and collaborate with other members of the R&D department and strong communication skills are required. If you have the qualifications listed above, please send your resume via email to Dr. Quan Guo at: **qguo@miswaco.slb.com**.

About M-I SWACO

With over 13,000 employees in more than 75 countries around the world, M-I SWACO, a Schlumberger company, is a vital part of the world's hydrocarbon exploration and production industry. We are the leading supplier of drilling fluid systems engineered to improve drilling performance by anticipating fluids-related problems, fluid systems and specialty tools designed to optimize wellbore productivity, production technology solutions to maximize production rates, and environmental solutions that safely manage waste volumes generated in both drilling and production operations. M-I SWACO is an Equal Opportunity Employer.

RESEARCH POSITIONS

Research Position at the Institute for Modelling Hydraulic and Environmental Systems

The Institute for modelling Hydraulic and Environmental Systems is looking for a **researcher, PhD student or PostDoc** paid according to **Full-time TVL-E13[3] (40h/week) for up to 3 years** to work on a DFG-funded project called "An integrative approach for conditioning, robust design and control in the subsurface". The project focuses on the problem that uncertainty quantification is merely the first step within a full spectrum of tasks in stochastic modelling, which also includes calibration, robust design, optimal monitoring and predictive control. Monte-Carlo simulation is the most simple and universally applicable option for stochastic modelling, but its computational costs become strictly prohibitive when joining it with the above follow-up tasks.

Polynomial chaos expansions (PCE) are computationally much more efficient, especially for low-parametric systems, and receive a quickly increasing attention. The proposed work will make PCE techniques accessible for the full spectrum of tasks. We will demonstrate the resulting methods by application to CO_2 injection into the deep subsurface. Site characterization and selection, design and control of injection strategies under uncertainty, as well as history matching and optimal monitoring of CO_2 leakage to the surface will be performed within the new framework, leading to better assessment, management and reduction of the involved risks.
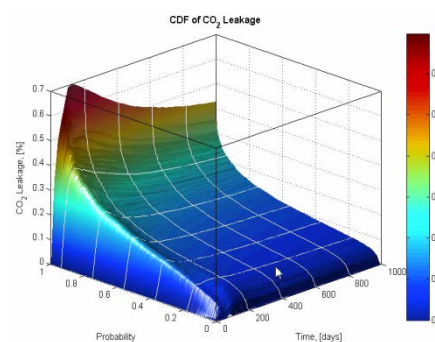
Requirements

The successful candidate should hold a Diplom-Ingenieur or Master of Science degree (or comparable) in Mathematics, Civil/Environmental Engineering, or Process Engineering. Applications of Post-Doctoral fellows are very welcome. We are an equal opportunity employer. Experience in some of these fields is beneficial: statistics, computational fluid dynamics or multiphase flow, control theory, programming in MATLAB or working with Mathematica/Maple. The candidate is expected to work independently and present research results at international conferences and in scientific articles.

---

[3] See for payment details: http://oeffentlicher-dienst.info/tv-l/west/

RESEARCH POSITIONS

What we offer

We offer an active and open research group, the opportunity to pursue a PhD degree, and a highly inter-linked and well-funded research environment. The project is a collaboration with Dr. A. Litvinenko and Prof. H. Matthies from the Department for Scientific Computing at the Technical University of Braunschweig, and with Prof. D. Tartakovsky from the University of San Diego, CA, USA. A three-month research visit to San Diego and several short trips to Braunschweig are planned. Locally, the work will be embedded in the SimTech cluster of Excellence (**www.simtech.uni-stuttgart.de**).
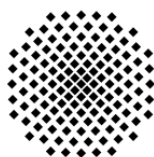
Application

Please send your application documents (cover letter, a short CV, relevant certificates,…) to:

Jun.-Prof. Wolfgang Nowak

Institute for modeling Hydraulic and Environmental Systems, Stochastic Modeling of Hydrosystems

Email: **wolfgang.nowak@iws.uni-stuttgart.de**

RESEARCH POSITIONS

Research engineers for GéoTherWal Project (mobilization program Maple, Wallonia)

Duration of the proposed contract: 2 x 24 months, for each contract

Project Description:

In our temperate climates, heating and cooling homes using geothermal energy from the Earth's crust and in the groundwater helps reducing considerably annual energetic costs. Among several existing systems, the vertical closed system, consisting of one or more loops of tubed drilling (100-200 m) through which a heat transfer fluid circulates, will be studied in this project. The fluid flows through the surrounding soil and back into the heat pump on at the surface, to absorb and transmit energy. To ensure proper heat transfer between the pipe and the ground, drilling is filled with a grout whose composition should allow for proper heat exchange.

The project consists in optimizing the geometry of the vertical borehole heat exchangers in a closed system and the nature of the grout. The objective of this project has two complementary facets: first optimize heat exchange on a small scale in drillings and in the immediate vicinity of it, taking into account the geometry of the heat exchanger and the nature of the grout sealing (near field), and second to optimize the long-term performance of heat reservoir on the basis of in-situ testing at the field scale (far field). The expected result will significantly improve the performance of geothermal wells through innovative approaches.

Description of tasks:

To evaluate and optimize the performance of the geothermal system, three aspects will be developed:

- laboratory tests for characterization of thermal properties of the grout and the pipe geometry, and responses within the wells
- testing in situ, in geological drillings with advanced instrumentation, fibre optics to characterize the thermaevolution of the near field and far field
- detailed analysis of these results with numerical modelling with a finite element code

RESEARCH POSITIONS

Sought profile:

We are looking for two civil engineers (preferably construction and /or mines & geology or equivalent) with skills in the use of numerical methods, particularly finite element, and able to set up experimental devices for measuring in-situ and/or in laboratory. The successful candidates will be familiar with geotechnical and/or geophysics and will be invested in both numerical and experimental works, at the laboratory scale and at the field scale in order to compare the experimental results and modelling. The research will lead to a doctoral thesis.

Wallonie

Work environment:

The project is a collaborative project between two Universities, Liège (ULg) and the Free University of Brussels (ULB), and two industrial partners, OREX, specialized in drilling and thermal tests and Geolys, specialized in environmental geology. The two proposed positions in this appeal are based, respectively at the University of Liege and the University of Brussels. Strong interactions are expected with the different teams of the project.

For the entire project, the proposed tasks will be equally-distributed between laboratory tests, in-situ tests and numerical modelling (as detailed in description of the task). However, the research at ULg will be more focused on numerical modelling and in-situ instrumentations while the research in the ULB group will be more devoted to laboratory developments and constitutive modelling. In their respective research teams (at ULg and ULB), the successful candidates are also expected to participate actively to the other research and/or teaching activities.

Contact:

For more information, please contact:

Professor **R. Charlier** (**Robert.Charlier @ ulg.ac.be**) or Professor **F. Nguyen** (**f.nguyen@ ulg.ac.be**)
Professor **B. François** (**Bertrand.francois@ulb.ac.be**)

Please send your applications (including a CV and a cover letter) to:

Professeur R. Charlier (**Robert.Charlier@ulg.ac.be**)
Département Argenco, secteur GEO³
1, Chemin des chevreuils (Bat. B52)
4000 Liège
Belgique

RESEARCH POSITIONS

Full Professorship in Field-oriented Hydrogeology

The University of Neuchâtel, Switzerland, is seeking to hire a Full professor in Field-oriented Hydrogeology.

Job description

The appointee will establish an internationally recognized field-oriented research program on the structure and functioning of aquifers at the regional scale, develop novel field approaches and apply quantitative methods. She/he will contribute to teaching in French and English, both in the bachelor and master curricula. He/she will develop synergies and collaborations on local, national (in particular with the Universities of Lausanne and Geneva) and international levels.

Starting date: 1st August 2012 or upon agreement.

Requirements: Training in geology with a Ph.D. degree and an internationally recognized research record in hydrogeology.

Applications should be sent by regular mail to the Dean of the Faculty of science, **Prof. Peter Kropf**, Rue Emile-Argand 11, CH-2000 Neuchâtel, as well as by email to **doyen.sciences@unine.ch**.

Deadline: November 15th, 2011.

Applications will include a letter of motivation, a resume (CV) containing a research and a teaching statement, a list of the financements obtained, a list of publications and copies of academic degrees. The candidate will precise his research interests in the domain and the projects he/she's planning to develop in Neuchâtel (max. 3 pages). The candidate will ask 3 experts to send a reference letter directly to the head of the Hiring Committee Prof. D. Hunkeler (**daniel.hunkeler@unine.ch**).

The University of Neuchâtel encourages women to apply.

Additional information can be requested from the head of the Hiring Committee Prof. D. Hunkeler (**daniel.hunkeler@unine.ch)** or the Dean (**doyen.sciences@unine.ch**). Further details can be found at **www.unine.ch/sciences.**

RESEARCH POSITIONS

Faculty members with expertise in soil/rock engineering

College of Engineering, University of Wisconsin-Madison, the Department of Civil & Environmental Engineering and the Geological Engineering Program of the University of Wisconsin- Madison invite applications for two faculty members with expertise in soil and/or rock engineering with ability to maintain a strong research program and distinguished record for creative research and scholarship.

Applicants must be committed to both undergraduate and graduate instruction along with a vigorous research program. Specialty areas of primary research interest include (but are not limited to) emerging areas in soil and/or rock engineering relating to sustainability, conventional and renewable energy resources, extraction and reclamation of mineral resources, innovative environmental technologies including issues such as carbon sequestration, groundwater resources, and sustainable infrastructure.

Positions are available at all ranks with primary appointment in the Department of Civil & Environmental Engineering and joint appointment in the interdisciplinary Geological Engineering Program. Applicants in any field of specialty within geotechnical, geoenvironmental, and geological engineering will be considered.

Information on the UW Geo Engineering Program and the position available can be found at **http://geotech.engr.wisc.edu/**
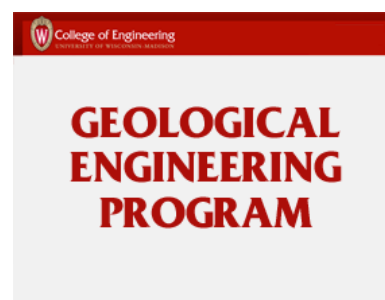
Apply by November 15, 2011 to ensure consideration.

UW-Madison is an equal opportunity/affirmative action employer. We promote excellence through diversity and encourage all qualified individuals to apply. Unless confidentiality is requested in writing, information regarding the applicants must be released upon request. Finalists cannot be guaranteed confidentiality. Please submit application letter, CV, statement of research and teaching interests, and list of at least three references to: **geosearch@engr.wisc.edu**

RESEARCH POSITIONS

Post-Doc in the area of uncertainty and risk modeling

The Collaborative Research Center SFB 837 "Interaction Modelling in Mechanized Tunneling"at Ruhr-Universität Bochum is searching for a Post-Doc in the area of uncertainty and risk modelling for **1 January 2012**.

The applicant is requested to establish a Junior Research Group in the emerging research area Uncertainty and Risk Modelling in engineering sciences. An annual budget will be provided. Remuneration will be granted according to the qualifications of the applicant.

Prerequisites are an excellent Ph.D. degree and experiences in developing methods for the evaluation of fuzziness, fuzzy-randomness and risk in association with modern computational models in engineering sciences. The applicant should be able to integrate this research into the DFG Collaborative Research Centre 837 "Interaction Modelling in Mechanized Tunnelling"; close cooperation within the SFB 837 is explicitly requested. Ruhr-Universität Bochum is committed to promoting the careers of women in research and teaching and would hence like to explicitly encourage applications from female candidates. Applications from severely disabled candidates with equal qualifications will be prioritized.

Applications consisting of the usual documents should be sent to:

Prof. Dr. **Günther Meschke**
Sprecher des SFB 837
Fakultät für Bau- und Umweltingenieurwissenschaften
Ruhr Universität Bochum
44780 Bochum
Germany

RESEARCH POSITIONS

Post-Doc position in Computational Modelling of CO2 Sequestration Delft University of Technology

Department/Faculty: Computational Mechanics, Civil Engineering and Geosciences

Contract: PostDoc: One year, extendable to two/three years.

Salary and Conditions: See **www.vacaturesindelft.nl**

Job Description

Carbon dioxide is one of the primary greenhouse gases contributing to global warming. Studies have shown that reducing carbon dioxide emissions by capturing and storing the emissions underground in a process called sequestration is vital to the wellbeing of our planet. However, one of the biggest risks of any sequestration project is the potential leak of the injected gas back into the atmosphere through abandoned wells or underground cracks.

The objective of this research work is to develop a computationally efficient multi-domain numerical tool for the evaluation and monitoring of long term environmental and structural impact of CO2 sequestration at a regional level. The focus of this work is to develop a computational model for crack initiation and propagation due to regionally induced thermo-hydro-mechanical forces and the establishment of innovative numerical procedures for solving the resulting governing equations. Modelling of crack initiation will be made on the basis of accurate description of the mechanical and gravitational forces, and on the mechanical properties of the involved materials. Proper rules for crack initiation, direction and crack size will be developed on the basis of fracture mechanics and material nonlinearity. Crack propagation due to mechanical and buoyancy forces will be modelled on the basis of the Partition of Unity Method, PUM. Regional differential settlement and subsidence will be modelled on the basis of multi-domain approximation. The models will be implemented in the existing finite element codes JEM/JIVE.

This research project is part of three parallel projects, funded by SenterNovem of the Dutch Ministry of Economic Affairs. The project is immediately available.

RESEARCH POSITIONS

Requirements

The PostDoc candidate should have a PhD in civil engineering, computational geoscience, mechanical engineering or computational physics with a strong background in solid mechanics, porous media and finite element modelling and implementation, and a strong interest in multi-physics modelling and analysis.

The candidate should have good skills implementing the finite element method and programming using, preferably, C++. Moreover should possess good command of English language and affinity to writing scientific articles, and be able to conduct research both independently and in collaboration with team members of the university involved in the project.

Conditions of Employment

PostDoc: One year, extendable to two/three years.

Subject to satisfactory performance, the appointment shall be extended for the duration mentioned above. TU Delft offers an attractive benefits package, including a flexible work week, free high-speed Internet access from home, and the option of assembling a customized compensation and benefits package (the 'IKA'). Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities.

Information and Application

For more information about this position, please contact:

Prof. dr. ir. **L.J. Sluys**, Phone: +31-(0) 15- 2782728, e-mail: **L.J.Sluys@tudelft.nl**

Dr. **R. Al-Khoury**, e-mail: **r.i.n.alkhoury@tudelft.nl** (see www.citg.tudelft.nl)

To apply, please e-mail a cover letter and the following documents to Dr. **Al-Khoury** (the call is open): a CV, details of at least three persons that can provide a reference (name, position and e-mail address of references).

TU Delft is an equal opportunity employer.

RESEARCH POSITIONS

Post-Doc position in the field of Surface Chemistry of Multi-phase flow in Porous Media

Vacancy: 1 x 2 year Postdoc

Location: Shell R&D laboratories in Rijswijk and Amsterdam, The Netherlands

Topic: The Surface Chemistry of Multi-phase flow in Porous Media

One of the major research topics in Shell's R&D laboratory in the Netherlands is Improved and Enhanced Oil Recovery. One way to enhance oil recovery is by injecting brine of modified ionic composition and low salinity level to mobilize additional oil and transport it through the subsurface reservoir. To better understand the fundamental chemistry and physics of this particular improved oil recovery technique, Shell is developing a comprehensive experimental framework. One of the components in this framework is concerned with the surface and geochemistry aspects of multiphase flow in porous media, as a result of interactions on a molecular scale between the various components in the oil, the ions in the brine and the minerals that cover the rock surface, e.g. clay and carbonate minerals. The surface chemistry aspects of the impact of flow of brine of modified composition on these interactions will be studied by means of visualisation techniques such as Scanning Tunnelling Microscopy, Atomic Force Microscopy, and Electron Microscopy as well as techniques providing surface elemental and molecular composition like X-Ray Photoelectron Spectroscopy and Secondary Ion Mass Spectrometry. Interpretation of experimentally observed ionic compositions of produced fluids with help of available Geochemistry Modelling software will complement the interpretation using the analytical techniques.

The postdoc will be mostly involved in conceiving, designing, setting up, executing and interpret ting the required experiment(s). If opportune and possible the candidate will also advise students doing experimental work. The assignment includes data reduction and analysis as well as the development of improved protocols for further deepening of understanding. The focus of the work is on providing a solid physico-chemical understanding of the key mechanisms steering the observations in laboratory scale testing and investigation. A strong interaction with academic peers will be important for the success of this work.

The successful candidate will be working in a strongly motivated group of researchers interested in exploring the more fundamental aspects of multiphase flow in porous media and Improved and Enhanced Oil Recovery.

For more details please contact: **Dick.Ligthelm@shell.com**

ABOUT INTERPORE

INTERPORE: "Similar solutions to diverse applications."

The *International Society for Porous Media* (InterPore)
is a non-profit-making independent scientific organization established in 2008.
The general aim of the Society is to advance and disseminate knowledge for the
understanding, description, and modeling of natural and industrial porous media systems.

Key Aims of the Society

- facilitate connections and collaboration among industrial and academic researchers;
- connect porous media theoreticians, modellers, and experimentalists;
- provide a forum for exchanging ideas and expertise for the improvement of porous media models;
- identify research questions that will lead to major improvements in the theories and models of complex porous media and to define modelling challenges;
- facilitate training and education.

Examples of Industrial & Natural Applications of Porous Media

Fuel cells, paper-pulp drying, food production and safety, filtration, concrete, ceramics, moisture absorbents, textiles, paint drying, polymer composites, and detergent tablets. The most well-known natural porous media involving multiphase flow and transport are soils, aquifers, and reservoirs. But such processes also occur in biological tissues and plants. Recently, there has been growing interest in the biomechanics of porous tissues, engineered tissues, and in-tissue drug delivery.
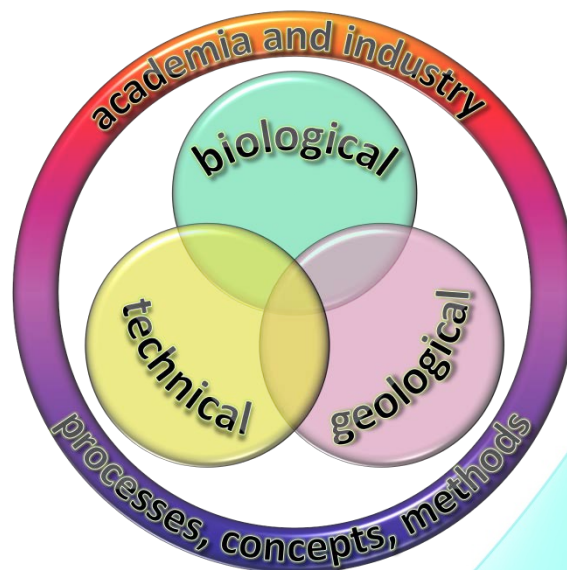
Why should you join InterPore?

InterPore is uniquely positioned to connect experts and practitioners from a diverse field of both scientific and engineering know how as well as industrial applications. This enables faster and unexpected connections resulting in quicker learning and accelerated innovation.

Register online and become a member now!

Website: www.interpore.org
Contact: info@interpore.org

ABOUT INTERPORE