



INTERPORE NEWS

Issue 7, May 2011

A report on the 3rd InterPore Conference

March 29-31, 2011, Bordeaux, France



New President-Elect of the InterPore community, Prof. Ehlers, is giving his presentation.

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The 3rd InterPore Conference took place from the 29th until the 31st of March, 2011, in Bordeaux, France.

The main objectives of the 3rd InterPore Conference were:

- 🔍 to provide a forum for interaction between different academic communities working on different aspects of porous media;
- 🔍 to provide a forum for interaction between the academic and the industrial community;
- 🔍 to provide solutions from commercialized products to academic demands and vice versa.



Discussion during the poster presentations

The conference was successful in all terms. The oral and poster presentations, from people coming from Academia or Industry, covered the whole spectrum of the Porous Media science. The conference was held in a “formally-informal” environment, making the interaction between the participants even more effective. The presence of leading companies that act in the field of porous media and their applications, provided with valuable information for experimental purposes but also for computational ones.



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The participants were significantly more than in the previous meetings, showing that our society is expanding, covering more areas of interest and increasing the interaction between different disciplines. A total of 285 participants made around 200 presentations. This included 69 contributed talks, 131 posters, five plenary lectures and 28 invited talks.

The participants came from 23 countries, including Algeria, Australia, Brazil, China, Cyprus, Czech Republic, Denmark, France, Germany, Israel, Italy, Morocco, Norway, Poland, Russia, Spain, Sweden, Switzerland, The Netherlands, Tunisia, Turkey, United Kingdom and the United States.

There were 26 companies present, including, Procter and Gamble, Commissariat à l'énergie atomique (CEA), IFP Energies Nouvelles, Philip Morris Products SA, Numerical Rocks, VSG, Fraunhofer ITWM, Statoil, Institut de Radioprotection et de Sûreté Nucléaire (IRSN), Institut National de l'Environnement Industriel et des Risques (INERIS), Springer, National Radioactive Waste Management Agency (ANDRA), Xradia, BRGM, Rhodia, Matelys, SCA Personal Care, CHLOE, TOTAL, EXXON Mobil, SNECMA, Nagra, Institut national de recherche en informatique et en automatique (INRIA), Schlumberger, GRS (Germany), Bronkhorst.



At the reception in the city hall





HONORARY MEMBER

Kambiz Vafai is the recipient of InterPore Honorary Membership Award 2011



Kambiz Vafai's citation by Martinus van Genuchten

It is an enormous pleasure, as well as a great honor, for me to have nominated Professor Kambiz Vafai for the InterPore Honorary Membership Award. He is a perfect choice because of his many extraordinary contributions to porous medium science and technology, and his continual service to the profession, for the past 30 years or more. We were colleagues at UC Riverside. We didn't do any research together, but I knew of him very well because he is well-known as an innovative, dedicated, and highly productive researcher and teacher.

Ever since his graduate studies in Mechanical Engineering at UC-Berkeley in the late 1970s, Kambiz has been a relentless force in the development, advancement, and promotion of porous media science and its application to industrial innovation. The description of InterPore Honorary Membership Award states that it is reserved for individuals who have made extraordinary contributions to porous medium science and technology, who are world renown in the porous media community, and whose contributions are consistent with the aims and ideals of InterPore. Now, Kambiz is the embodiment of such a description. He is contributed to porous media community through research as well as services.

First and foremost, Kambiz is a leading scientist. Most impressive to me is the wide range of applications of his work in industry. He has done pioneering work in many different areas such as his experimental and theoretical studies of aircraft brake housing, non-Darcian flow and momentum boundary layer in porous media, the physics of non-equilibrium heat and mass transfer in porous beds, thermal interactions between solid and vapor phases and their effects on fluid flow and heat transfer, original in-depth analyses of buoyancy-induced flows in open-ended and partially open cavities.

His research is documented in an impressive array of quality papers. He has authored thus far some 240 publications. His most recent book, to be published by Taylor and Francis in 2011, is entitled "Porous Media, Applications in Biological Systems and Biotechnology". Kambiz is one of only four individuals within the heat transfer community worldwide to be recognized by ISIHighlyCited.com as being among the most highly cited researchers in engineering. His 1981 paper with C.L. Tien ("Boundary and inertia effects on flow and heat-transfer in porous media", Int. J. Heat and Mass Transfer) received the highly coveted ASME classic paper award. In yet another paper in 1984 ("Convective flow and heat transfer in variable porosity media," Journal of Fluid Mechanics), he characterized the variable porosity effects analytically. No wonder that his ISI h-index is a very impressive 34.



Kambiz has served the profession through a wide range of activities and initiatives, such as being member or chair of an endless array of committees and workshop, serving close to 100 times as invited speaker, and serving as member of the editorial board of seven different journals (International Journal of Heat and Mass Transfer, International Communications in Heat and Mass Transfer, Experimental Heat Transfer, International Journal of Fluid Flow and Heat Transfer, Numerical Methods for Heat and Fluid Flow Journal, and Numerical Heat Transfer).

Most important for the porous media community was his initiative in 1998 to start the Journal of Porous Media. As its Editor-in-Chief, Kambiz has worked tirelessly to bring this journal to maturity so that it is now one of the leading outlets internationally for porous media research. In addition, Kambiz started the international conference series on Porous Media and its Applications in Science, Engineering and Industry. Already held three times and sponsored by NSF and ECI (in 1996, 2007, and 2010), this series has become the major event for porous media researchers. Because of its popularity, the conference is now planned to be held biennially. The next conference, which again will be directed by Kambiz himself, will take place in June of 2012 in Potsdam, Germany.

Another initiative has been the compilation of two volumes of the authoritative "Handbook of Porous Media" (2000, 2005) that became best sellers and are widely referenced in porous media literature. His latest initiative has been the start of a new journal called Special Topics & Reviews in Porous Media - An International Journal. The first three issues of the journal appeared last year.

In view of his enormous accomplishments in research and student education and his many professional activities, it should be no surprise that Kambiz has received many awards over the years. For example, he received the 1999 ASME Classic Heat Transfer paper award and has won the College of Engineering outstanding research award at Ohio State University at all professorial levels (assistant, associate, and full professor). He was awarded six US patents, with an additional two US patents pending at their final stages.

Kambiz was elected a Fellow of the American Society of Mechanical Engineers (ASME), a Fellow of American Association for Advancement of Science (AAAS), a Fellow of the World Innovation Foundation, and an Associate Fellow of the American Institute of Aeronautics and Astronautics. He was an invited visiting professor at the Technical University of Munich in Germany, the University of Bordeaux, the Paul Sabatier University in France, and the Technical University of Naples in Italy. He further presented invited or keynote lectures in some 15 different countries all over the world.

All this shows that the international community fully recognizes and appreciates the many impressive contributions of Professor Kambiz Vafai over the years. It is most appropriate that the InterPore Society has recognized his scientific and professional contributions by selecting him as an InterPore Honorary Member.

Martinus Th. van Genuchten
(Brazil, March 2011)



HONORARY MEMBER

Kambiz Vafai's response

Dear members of InterPore, members of the Award Committee and President Helmig:

I am very much honored by this highly prestigious award. I would like to thank the members of the award committee for bestowing such a high honor on me. I would like to sincerely thank Dr. Rien Van Genuchten for nominating me for this award. I would also like to thank my other nominators.

It is indeed a pleasure to be at this meeting and experience the wealth of information and ideas that have been presented at this InterPore conference. I am very impressed by the abundance of topics and quality of presentations and the interactions amongst the audience at this conference.

I see this society as a very vibrant and highly interactive society that will form the shape of things to come within the porous media community. It is indeed an organization that brings together the best of minds in this area and provides a venue for growth of ideas.



Kambiz Vafai holding the certificate

I am proud to have been associated with such a high caliber organization. I look forward to see an impressive growth of this organization in the future and its role in shaping many aspects of research in porous media. Porous media is indeed an extremely important subject in many key technologies and InterPore stands to provide the leadership and growth of many pertinent aspects of these key technologies. Once more, I thank you all again for this prestigious award and for providing such a great learning atmosphere.

With my best wishes,

Kambiz Vafai

 **RESEARCH AWARDS****Professor John H. Cushman received the InterPore Proctor & Gamble Award 2011****John H. Cushman's citation by
Laura Pyrak-Nolte and Lynn Ben-
Bennethum**

It is my pleasure to read this citation for John Cushman, winner of the InterPore Proctor and Gamble

Award for Porous Media Research. This award symbolizes why we love having John at Purdue. He is a great colleague and scientist, a pillar of the porous media community, and has a great ability to collaborate across disciplines across the entire campus.



John was awarded the InterPore Proctor and Gamble Award for Porous Media Research in recognition of his outstanding contributions to topics related to swelling porous media, very thin porous media, and behavior at interfaces. Over the last 30 years, he has made seminal contributions to a number of aspects of porous media. John has over 190 publications and a long list of invited presentations at many national and international conferences and universities. He has also contributed to porous media research through appointments to editorial boards and memberships on national and international boards.

In the spirit of InterPore, which seeks to advance and disseminate knowledge for the understanding, description, and modeling of natural and industrial porous media systems, John cross-fertilizes novel ideas between mathematics, geosciences, biology and pharmacology. His contributions to porous media have included increasing our understanding of microporous systems and nanofilm behavior in multiphase media; statistical mechanics for scaling transport behavior; multiphase transport in swelling media such as clays, polymers and gels; and dispersion of motile microbial populations in porous media via Lévy flight random walks. The applications of his work range from groundwater pollution to microfluidics in mica slit-pores to fluid interactions with swelling porous media to drug-delivery polymers. As an indication of the interdisciplinary nature of his research, Prof. Cushman has held visiting appointments in the departments of Applied Mathematics (Pontificia Universidade Católica do Rio de Janeiro, 1995), Environmental Fluid Mechanics (University of Rome, 1998), and Molecular and Cellular Biology (Harvard University, 2001).

In an age of increasing specialization, John has maintained breadth and depth by including elements of theory, computation, and experimentation in his research. While it is clear from his publications and books that his most significant contributions are in theory development, the nanofluidic experiments, and the more recent particle tracking velocimetry experiments, provide an important validation of the theories developed under his leadership.

 **RESEARCH AWARDS**

John has the ability to interact with scientists from a variety of scientific disciplines. The breadth of topics covered by his recent publications includes: blood flow, drug delivery substrates, fluid transport in foods, swelling biopolymers, transport of motile micro-organics. Colleagues in both geophysics and soil science have recognized Professor Cushman's outstanding contributions by bestowing on him the rank of Fellow of the Geological Society of America (in 2010), Fellow of the American Geophysical Union (in 1996), Fellow of the Soil Science Society of America (in 1990), and he is a recipient of Purdue's Herbert Newby McCoy Award (in 1995).

The awarding of the InterPore Procter and Gamble Award to John Cushman is a fitting tribute to an outstanding multidisciplinary scientist deserving of such recognition.

John H. Cushman's response

Let me begin by thanking Professor Laura Pyrak-Nolte for giving that wonderful and overly flattering introduction and the people that were involved in preparing my nomination, especially my former student Professor Lynn Bennethum, whom I understand was the ring-leader behind the effort.



John H. Cushman holding the certificate

It is with the greatest of pleasure that I accept this award, but before I go further, let me give credit where credit is due to my many wonderful graduate students and post-doctoral students that I've had the pleasure to work with over the years. One of them, Professor Marcio Murad, is here at this wonderful dinner in Bordeaux today. I also would like to thank Procter and Gamble for initiating this award and for their generous financial contribution, half of which I've already had the pleasure to spend entertaining my former students at a SIAM meeting in LA a week ago.

Swelling systems and their vicinal fluids have played a major role in my research program since Philip F. Low first introduced me to them some 30 years ago. I'm sure if he was still alive, he'd be delighted to know that I received this award today. After listening to Laura's excellent commentary, it seems pointless for me to elaborate on our research any further, so again, thank you P&G and thank you The International Society for Porous Media (InterPore) for this award and please continue to enjoy your dinners.

Thank you.



RESEARCH AWARDS

InterPore-Fraunhofer Award for Young Researcher 2011 for Vahid Joeekar-Niasar



Vahid's citation by Hans Bruining

The InterPore Honors and Awards Committee has elected Vahid Joeekar-Niasar as



Fraunhofer

ITWM

the winner of the InterPore-Fraunhofer Award for Young Researchers, in recognition of outstanding contributions to the theory of two-phase flow in porous media and the analysis of capillarity effects in two-phase flow using computational models.

Vahid earned his MSc in 2003 in Environmental Engineering from Sharif University of Technology in Tehran. He started his Ph.D. studies at Utrecht University in January 2006 and defended his Ph.D. in March, 2010, with distinction Cum Laude. This distinction is given to only 1% of graduates from Utrecht University. Based on his Ph.D. thesis, Vahid has published nine papers in leading journals such as Water Resources Research, Journal of Multiphase Flow, Transport in Porous Media, Critical Reviews in Environmental Science and Technology and Journal of Fluid Mechanics. He has been active as member of the Organizing Committee of workshops and conferences. In 2009, he was the organizer of the summer school "Role of Interfacial Area in Two-Phase Flow and Transport in Porous Media: Theory, Experiment, Modeling", held in Utrecht University. He was a co-convener and chairman of sessions in AGU Fall Meetings. He has given invited talks at Shell Global Solutions International, University of Bergen, Royal Netherlands Academy of Arts and Sciences (KNAW), Stuttgart University and Purdue University. He has also served as a Technical Reviewer for Advances in Water Resources, AIChE Journal, Energy and Fuels, Journal of Colloid and Interface Sciences, Transport in Porous Media and Vadose Zone Journal. He is currently co-guest editor of a special issue of Transport in Porous Media on pore-scale modeling. He has now a post-doctoral position with the Department of Earth Sciences, working on the SOWACOR project "Simulations of electro-osmotic flow considering dynamics of chemical properties." He has successfully extended his already complex dynamic pore-network model of two-phase flow to account for osmotic effects.

We are sure that we are going to hear more of Vahid in the near future.

Vahid's response

First of all, I would like to thank Hans Bruining for such a kind introduction. Since five years ago that I know Hans, he has been always nice to me especially in his introduction for the award. It is an honor for me to be nominated and accepted for the Young Research Award by InterPore Society. Today I should thank specially two persons: Prof Majid Hassanizadeh as the supervisor of my PhD and Professor Ruud Schotting for his excellent support and for nominating me for this award.



RESEARCH AWARDS

Almost five years ago Majid made me familiar with the wonderful world of multiphase flow and specifically pore-scale modeling and since last year Ruud and I have had lots of fun struggling with pore-scale simulation of electro-osmosis in clay. I would like also to thank the organizers of the InterPore Society. It was a very useful and informative conference in which many top scientists attended. Thank you.



(From left to right) J. H. Cushman, K. Vafai, W. Ehlers, R. Helmig in the gala dinner

Procter&Gamble Student Award for M. Musielak and E. Shahraeni

The Honors & Awards Committee of InterPore evaluated a number of student's poster presentations and selected the following two PhD students to receive the Procter&Gamble Student Awards:

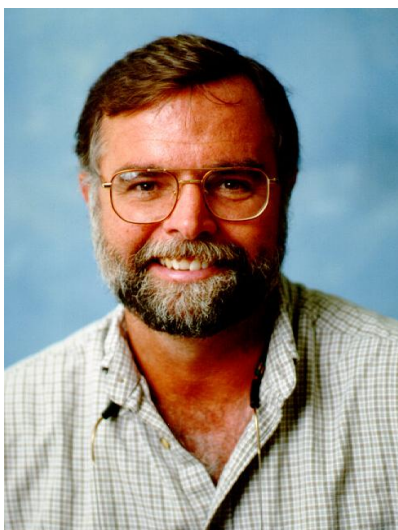
- ❶ M. Musielak (Fluid mechanics Institute of Toulouse-France) for the poster "Modeling the Transfer of Gaseous Pollutant through Fissured Concrete Slabs"
- ❷ E. Shahraeni from ETH Zurich-Switzerland for the poster "Surface wetness affecting coupling with atmosphere during evaporation from porous media".



RESEARCH SPOTLIGHT

Work on swelling and films

By John H. Cushman on the occasion of his InterPore P&G Award



The behaviour of fluids in contact with solid surfaces is central in many contexts. If the fluid exists within a matrix of solids that deforms, the behaviour of the fluid becomes immensely complex on the molecular scale, and as well, on higher scales (see fig.1). Good examples of such systems are soils, foods, proteins, biological membranes, and more generally any lyophilic colloid. Continuum mixture-scale processes occurring in such systems might include food drying, chromatography, gel-electrophoresis, macro-molecular folding, soil consolidation, and detergent tablet expansion and dissolution. Solutes play an important role in determining the behaviour of these systems as well. Typical examples are foods, soils and drug delivery (see fig 1), polymers where sugar, salt and drug transport influence fluid dynamics, and product applicability in practical situations.

Until recently there was no theory which adequately accounted for the interaction between the solid and fluid phases in lyophilic colloidal systems. Neither the traditional Darcy's law nor its semi-empirical modifications adequately accounted for swelling due to lyophilicity. For solute transport, neither the traditional Fick's law nor its semi-empirical modifications adequately account for diffusive fluxes in multi-component swelling systems, nor do double layer and related theories adequately help explain swelling systems.

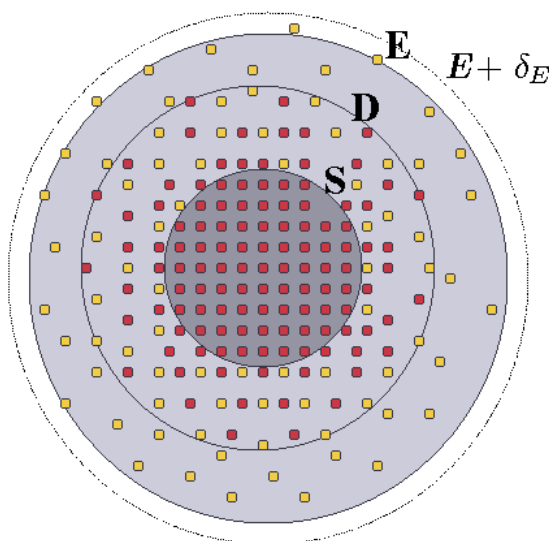


Figure 1: Swelling drug delivery system:

- **S (Swelling Front):** water acts as a plasticizer reducing the glass transition temperature to the experimental temperature causing the polymer to flow and swell;
- **D (Diffusion Front):** high drug loading of poorly soluble drugs (maximum solubility is reached);
- **E (Erosion Front):** polymer disentanglement caused by macromolecular-level snake-like motion of polymer;
- **E+ δE (Boundary Layer):** where reptation takes place.

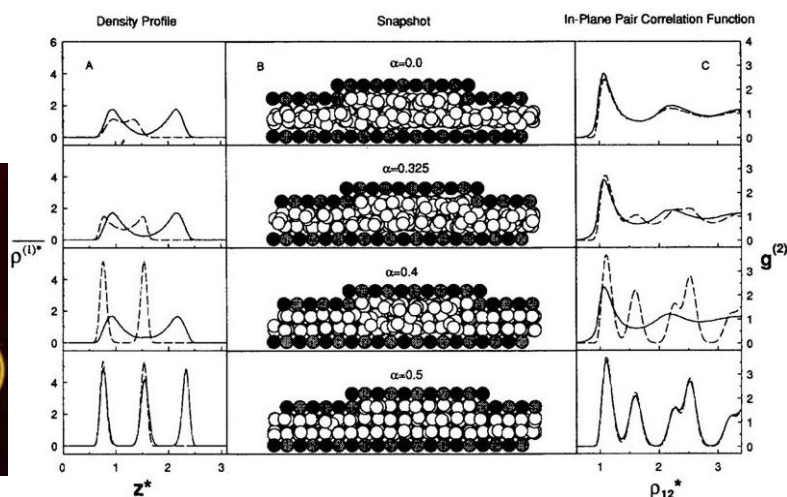
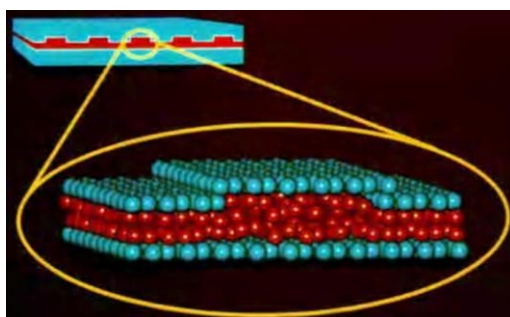
(Weinstein, T., J. H. Cushman and L. S. Bennethum (2008) Two-Scale, Three-Phase Theory for Swelling Drug Delivery Systems. Part I: Mixture Theory. J. Pharm Sci 97(5): 1878-1903).



Our group has recently made substantial inroads into developing a theory to model these systems. We have largely focused on swelling and shrinking over multiple scales (ranging from angstroms to kilometres). Throughout our work we've assumed that at least four discrete scales exist in a multiphase, multiconstituent mixture: molecular, microcontinuum, mesoscale and macroscale.

The **molecular scale** is defined as the scale of motion wherein knowledge of the discrete molecular structure and dynamics of the constituents, constituting the individual phases and interfaces, is required to adequately predict the local behaviour of the system. We've applied statistical mechanics and polar field theories at this scale (see fig. 2). The constitution of matter on the molecular scale is dictated by the choice of interaction potentials.

Figure 2: Snapshots of fluid molecules in a corrugated pore: Right panel illustrates the role of wall alignment.



(Curry, J.E., Zhang, F., J.H. Cushman, M. Schoen, D.J. Diestler (1994): Transiently coexisting nanophases in ultrathin films confined between corrugated walls. *J. Chem. Phys.* 101(12):10824-10832).

On the **microcontinuum scale**, molecular interactions are imperceptible and each constituent in a phase or interface behaves as if it were a continuum possessing continuous mass density. The constituents within a phase or interface form overlaying continua. We've applied the classical continuum theory of mixtures to each phase and interface on this scale, reproducing classical results.

The **mesoscale** applies to the "mixture" of phases and interfaces. In analogy to the microcontinuum scale, the mixture of phases and interfaces is viewed as a set of overlaying continua. That is, each phase, interface and constituent possesses a continuous mass density at each spatial point within the entire body. We've derived novel Darcy's and Fick's laws as well as a generalization of Terzaghi's effective stress principle at that scale.



RESEARCH SPOTLIGHT

For a clay-water mixture (fig 3), the **macro-continuum scale** is the largest scale considered. On the micro-continuum scale, clay platelets and vicinal water exist; on the mesoscale the vicinal water and clay plates are homogenized forming clay particles; on the macroscale the clay particles are homogenized with the bulk water in the larger pores to form a clay soil. The clay soil consisting of vicinal water, bulk water and swelling clay particles again gives rise to generalizations of Darcy's and Fick's laws as well as a generalized Terzaghi stress principle. These and other constitutive results have been combined with conservation of mass and energy, as well as initial and boundary conditions, to form closed systems.

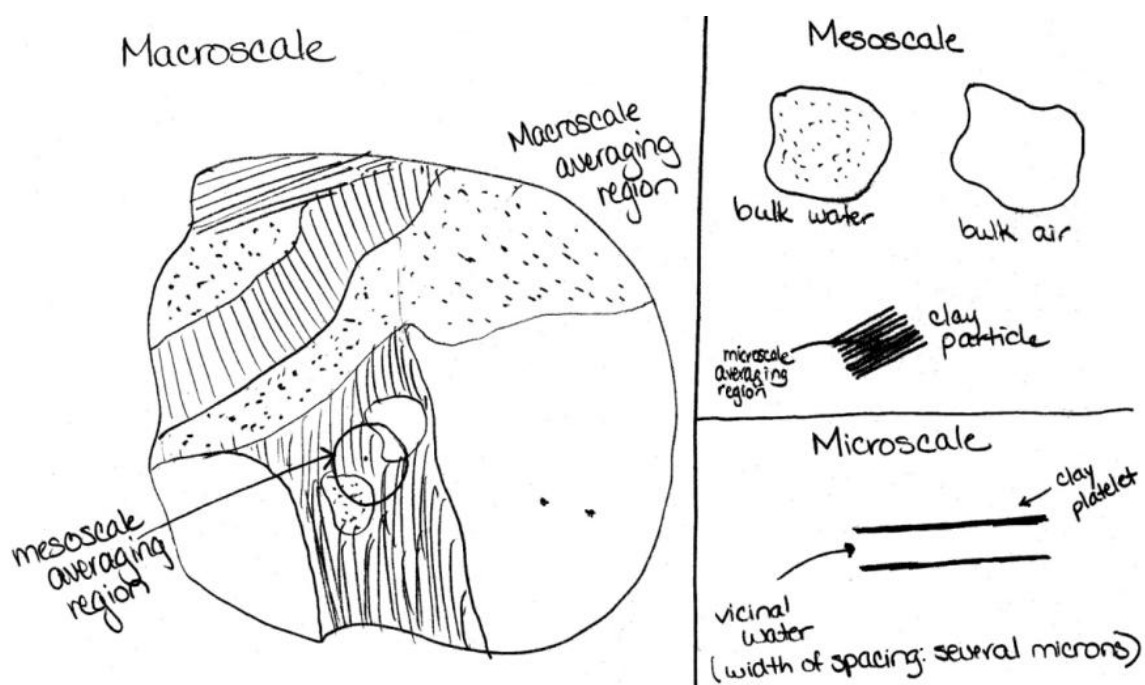


Figure 3: The three scales for a clay-water mixture:

- Microscale: platelets and vicinal water are distinct phases,
- Mesoscale: platelets and vicinal water have been homogenized to form particles, and
- Macroscale: particles are homogenized with bulk water.

(Kleinfelter-Domelle, N. and J. H. Cushman (2011): The Role of Connectivity in the Theory of Saturated/ Unsaturated Flow in Swelling Porous Media. Water Resources Research, submitted).



JOB OPPORTUNITIES

Assistant/Associate Professor in Soil Mechanics

Engels -- Faculty/department Civil Engineering and Geosciences

Level PhD

Maximum employment 38 hours per week (1 FTE)

Duration of contract 4 years initially

Salary scale €3195 to €5920 per month gross

Civil Engineering and Geosciences

The Faculty of Civil Engineering and Geosciences provides leading, international research and education in road and water engineering, earth sciences, traffic and transport control, and delta technology. Innovation and sustainability are central themes. The research addresses global social issues and is closely interwoven with education as well as with the work carried out by a broad spectrum of knowledge institutions. The faculty consists of 17 sections distributed among the Departments of Design & Construction, Hydraulic Engineering, Transport & Planning, Water Management and Geotechnology.

Delft University of Technology is the largest technical university in the Netherlands and internationally leading in scientific research. The Geo-Engineering Section resides within the Department of Geotechnology, which is one of five departments within the Faculty of Civil Engineering and Geosciences. There is considerable scope and encouragement for interdisciplinary research. Currently there are collaborations with the Sections of Structural Mechanics, Hydraulic Engineering, Offshore Engineering, Applied Geology, Petroleum Engineering and Applied Geophysics and Petrophysics.

The Geo-Engineering Section has nine full-time and eight part-time academic staff members, a support staff of four, and around 30 PhD and post-doctoral researchers. Areas of expertise include soil mechanics, foundation engineering, underground space technology, engineering geology and geo-environmental engineering. The section boasts a world-class experimental laboratory including two geotechnical centrifuges and excellent computational facilities. It has close links with the onshore and offshore industries and with the Dutch research institute Deltares.

Job description

Applications are invited for an Assistant/Associate Professor in Soil Mechanics, to be based within the Geo-Engineering Section in the Faculty of Civil Engineering and Geosciences. The section focuses on internationally leading research into the testing, characterisation and modelling of, and engineering in, problematic and heterogeneous soils. Current research initiatives include the short- and long-term behaviour of deltaic soft clays and organic soils such as peat, the liquefaction and internal erosion of loose sands and other estuarial deposits, and the behaviour of stiffer clays associated with deep geological disposal. Research is also being conducted on geo-materials arising from industrial processes. Applicants from any area of experimental or computational soil mechanics are welcome to apply. Particular areas of interest for the section include the mechanics of soft soils, the



JOB OPPORTUNITIES

mechanics of unsaturated soils, offshore geo-mechanics, and numerical methods. The successful candidate will be expected to contribute fully to the educational activities of the Geo-Engineering Section at the undergraduate and post-graduate levels.

Requirements

Applicants should possess a PhD in Soil Mechanics or a related discipline. They should be able to demonstrate outstanding research potential and have published in peer-reviewed, international scientific journals. The successful candidate will be expected to initiate, acquire, execute and coordinate research projects. Team-building qualities and communication skills are therefore important. Close cooperation with other members of the scientific staff of the section and wider university is essential. Inspiring lecturing skills are considered crucial for stimulating student interest.

Conditions of employment

Initially this will be a temporary contract for four years, with the intention of converting the contract into permanent employment after four years. The salary of the Assistant Professor is based on scale 11 or 12 (maximum € 4970 gross per month with a full-time appointment) and for the Associate Professor it is based on scale 13 or 14 (maximum € 5920 gross per month with a full-time appointment). The TU Delft also has an attractive package of secondary employment benefits, such as a flexible working week, a free ADSL connection at home and the opportunity to put together an individual remuneration package via the individual choice model terms of employment. Benefits and other employment conditions are in accordance with the Collective Labour Agreement for Dutch Universities.

TU Delft has signed the Charter Talent to the Top and wants to increase the number of women within its staff. Women are especially encouraged to apply.

TU Delft sets specific standards for the English competency of the teaching staff. TU Delft offers training to improve English competency.

Information and application

For more information about this position, please contact Prof. M.A. Hicks, phone: +31 (0)15-2787433, e-mail: m.a.hicks@tudelft.nl. To apply, please e-mail a detailed CV, a list of publications, three references and a letter of application by 1 June 2011 to Mr. W.A. Maertens, Recruitment-CITG@tudelft.nl.

When applying for this position, make sure to mention vacancy number CITG11-16.



MEETINGS ETC

Les Rencontres Scientifiques d'IFP Energies nouvelles

IFP Energies nouvelles, Rueil-Malmaison, France n 16 - 18 November 2011

International Conference on Flows and Mechanics in Natural Porous Media from Pore to Field Scale – Pore2Field

To address the new challenges of the 21st century, such as climate change, environmental impacts, energy diversification and water resource management, research has been stepped up in a variety of fields, including the geological storage of CO₂, the production of shale gas and tight gas reservoirs and EOR processes. A better understanding of flows and related physical processes (reactive flows, mechanics, etc.) is essential to effectively tackle these topics and come up with appropriate technical solutions. To achieve this, it is necessary to consider different scales, from the pore scale (micrometers) to the field scale (hundreds of meters). One of the major difficulties involved is effectively grasping the coupling between different scales and related physical phenomena. Processes that occur on a microscopic scale determine mechanical and flow behaviors on a larger scale. In addition, a coarser description is necessary on a large scale due to a lack of detailed knowledge of the field and the need to keep computational costs down.

What makes the problem challenging is the need for a unified description linking the different scales and the physics involved. While characterization and modeling on different scales are giving rise to active and promising theoretical, experimental, and numerical research, there is still a need to improve integration of all the relevant scales and the associated physical phenomena at an early stage.

This international conference will be a scientific and technical event bringing together players from the worlds of academic research, applied research and industry. They will be able to discuss research advances, recent developments, R&D needs, challenges and applications in the field of flow and mechanical modeling of porous and fractured rocks.

The main topics tackled at the conference will be:

- Pore-scale 3D imaging and modeling
- Pore-scale modeling of multiphysics phenomena
- Continuum description of flows and coupled phenomena
- Upscaling at field scale
- Monitoring and data integration
- Advanced case studies and applications in field modeling

Important dates

| | |
|-------------------|---|
| 2 May 2011 | Deadline for abstracts submission |
| 30 May 2011 | Notification of acceptance or rejection-Invitation to submit an extended abstract |
| End of June 2011 | Registration opening-Guidelines for oral and poster presentations |
| 17 September 2011 | Deadline for extended abstracts submission. |

Authors are invited to submit an abstract for oral or poster presentation. Guideline for submission on www.rs-pore2field.com.



RESEARCH POSITIONS

PhD project on

Pore-network modeling of flow and transport in complex porous media

Main Project: Engineering of bio-based substrates on buildings and infrastructure as a basis for natural protection.

Surface of building materials are sometime covered by a thin natural layer, often in the form of biofilms. This could be a protective layer reducing the corrosion of the material. The main objective of this project is to determine conditions under which such protective layers can be created, developed and maintained through natural processes. We wish to develop a bio-geological engineering approach to creating such a layer and to reduce the rate of corrosion at the surface of building materials. The approach includes the utilization of naturally-occurring processes, such as the development of a microbial ecosystem on the surface of a building material. In addition to reducing corrosion, the designed functionality of the material should be maintained or even improved.

The PhD-research advertised here is aimed to identify, quantify, and describe mechanical and biogeochemical processes occurring at the pore scale within the naturally-occurring layer covering the surface of building materials. This information will be used in the development of a pore-network multi-physics simulator integrating the most important processes occurring in such a layer. This micro-scale model will provide essential information required for upscaling micro-scale processes to the macro-scale.

This research will be coordinated with two other PhD projects: one carried out at the Department of Microbial Ecology of the Netherlands Institute of Ecology, working on the characterization of the microbial ecosystem of the surface of building materials and the assessment of factors that determine the protective action of naturally-occurring communities (contact: H.vanVeen@nioo.knaw.nl); and the other, performed at Section of Geo-Engineering, Delft University of Technology, working on the characterization and quantification of coupled mechanical and biogeochemical processes at the macroscale (contact: T.J.Heimovaara@TUDelft.nl).

We are seeking candidates holding MSc in Civil, Mechanical, Chemical, or Petroleum Engineering, Physics, or Applied Mathematics, who are experienced in the development of computational models. They should have a strong background in engineering mathematics and physics. For more information on this project, please contact Prof. S.M. Hassanizadeh (hassanizadeh@geo.uu.nl, Tel. +31302537464)



RESEARCH POSITIONS

Postdoc Position Available

University of Wyoming

An NSF-funded postdoctoral position is available 6/1/2011, with an annual stipend of 42,000 USD plus full employee benefits. The position is for 2 years, with potential extension to the 3rd year pending funding availability. The project will use parallel simulation to conduct porous medium permeability upscaling & uncertainty analysis in carbon geostorage modeling, in collaboration with the Los Alamos National Laboratory. The research code used is PFLOTRAN: <http://ees.lanl.gov/pflotran/>

A proof-of-concept study has been completed & is described here:

<http://pubs.acs.org/doi/abs/10.1021/es103187b>

Required skills: Programming skills; familiarity with numerical techniques for solving partial differential equations. Preferred skills: Experience with high performance computing (HPC) and Message Passing Interface (MPI); HPC-related libraries, e.g., PETSc, HDF5, mesh partitioning. Interested applicant should email a CV to Dr. Ye Zhang (yzhang9@uwyo.edu). The CV should include the name and contact information of 3 referees and a concise (up to 2 pages) description of research interest. The applicant should hold a PhD degree at the time of the appointment. Application review begins now and will continue until the position is filled.

The University of Wyoming (UW) is an affirmative action/equal opportunity employer. UW is dedicated to ensuring a safe and secure environment for our faculty, staff, students, and visitors. To achieve that goal, UW conducts background investigations on all prospective employees.

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 **RESEARCH POSITIONS**

2 year Postdoc Position in Multi-phase flow in porous media

Shell R&D laboratory Rijswijk, The Netherlands

One of the major research topics in Shell's R&D laboratory in the Netherlands is Enhanced Oil Recovery. One way to enhance oil recovery is by injecting mixtures of surfactants and / or polymers (and other chemical additives) to mobilize additional oil and transport it through the subsurface reservoir. To better understand the fundamental physics underlying these processes we are developing a comprehensive experimental and modeling framework. One of the experimental components in this framework is a transparent micro-model (microfluidics cell) in which the various fluid- / thermo- dynamics processes can be studied in detail. The postdoc would be involved in exploring and modeling these processes using a variety of tools from simple analytical techniques to complex numerical simulations. The focus of the work is on providing a solid quantitative, physical understanding of the key mechanisms involved at this scale of 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 Enhanced Oil Recovery.

For more details please contact: Cor.vanKruijsdijk@shell.com

Global Freshwater Initiative

Stanford University's Dept. of Environmental Earth System Science and Woods Institute for the Environment seek applications for a post-doctoral fellow in quantitative water resources analysis in support of the Global Freshwater Initiative (GFI). A major goal of the GFI is to develop integrated hydrologic-economic models used for comparative policy evaluation primarily among developing nations. An initiative of the Woods Institute, the GFI is highly interdisciplinary, linking quantitative analysis of hydrologic systems, economics, and institutions. For additional information on the GFI, please see <http://woods.stanford.edu/ideas/global-freshwater-initiative.html>. Effort of the post-doctoral fellow will be split among site-specific studies, developing proposals, and supporting collaborations. Applicants must have a demonstrated ability to generate new research questions, collect data from multiple sources, run hydrologic models, conduct economic analysis, and evaluate water allocation strategies. Stanford University is an equal opportunity employer and is committed to increasing the diversity of its staff. It welcomes nominations of and applications from women and minority groups, as well as others who would bring additional dimensions to the university's research, teaching and clinical missions.

Interested applicants should email a CV, transcripts, one relevant publication, a one-page statement describing past research and future goals, and the names and addresses of three references to Steven Gorelick (gorelick@stanford.edu) by **June 1, 2011**.

 **RESEARCH POSITIONS**

Graduate Research Assistantships

University of Nebraska-Lincoln

Job Descriptions and Requirements: Research assistantships are available for PhD students starting in fall 2011 to work in areas of porous materials and periodic structures for noise control. The positions include a tuition waiver and monthly stipend. Students who have completed a Master degree in mechanical engineering, architectural engineering, physics and other related fields are preferred, but exceptional students who have completed a Bachelor's degree and have experience related to the research will also be considered. Funding is also available for international students with good English communication skills (written and oral).

Information and Application: For more information about this position, please contact Dr. Siu-Kit Lau, Phone: (402) 554-3861, email: slau3@unl.edu.

To apply, please email a cover letter and a resume to Dr. Siu-Kit Lau. To meet deadlines for the coming fall semester, candidates should send information as soon as possible.

Postdoctoral Fellow Vacancy

A Postdoctoral fellow is sought for the Department of Geotechnical Engineering at Tongji University, Shanghai, China. The appointee will work with Prof. Mingjing Jiang contributing to the development of constitutive models of problematic soils and numerical analysis methods. This is an excellent opportunity for an enthusiastic, highly-motivated individual to broaden his/her horizons through active collaboration with researchers across the world.

Applicants should have a PhD (awarded or near completion) in geotechnical engineering or relevant majors. A strong background and preferably experience in finite element method (FEM) and discrete element method (DEM) is preferred. Good scientific writing skills are essential.

The post is available immediately and is funded for two years in accordance with the regulation set by Tongji University.

If you are qualified, please send your resume to Prof. Mingjing Jiang, email: ingjing.jiang@tongji.edu.cn. For further information please contact Dr. Fang Liu, email: liufang@tongji.edu.cn.



RESEARCH POSITIONS

Postdoc Position Available

University of Waterloo

A postdoctoral fellow (PDF) is sought to develop novel simulation methods for carbon sequestration problems. Working within the Earth Sciences and Civil & Environmental Engineering departments at the University of Waterloo, this position will be part of a wider multi-university research program on the risk assessment and management of carbon capture and storage in a Canadian context.

The initial contract for the position will be for one year, with the potential for an extension up to three years. The qualified applicant will have a proven background in development of numerical methods and simulations codes based on the finite element method. They will have a proven publication record. Experience with Matlab, FORTRAN and/or C/C++ is a must. Experience with the eXtended or Generalized Finite Element Method (XFEM/GFEM), two phase flow in geological formations and/or uncertainty analysis will be beneficial.

Applications must include: a cover letter giving a brief description of the Applicant's interest in the position and qualifications, a curriculum vitae and a list of references. Applications are to be sent to Dr. R. Gracie at rgracie@cee.uwaterloo.ca.



ABOUT INTERPORE

The *International Society for Porous Media* (InterPore)

is a non-profit-making independent scientific organization established in 2008.

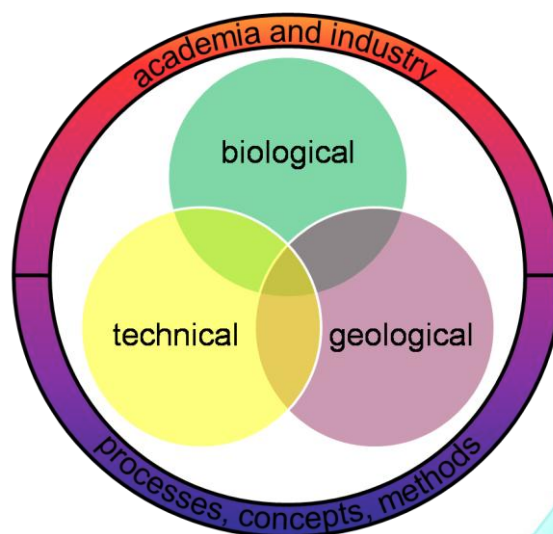
The general aim of the Society is to advance and disseminate knowledge for the understanding, description, and modeling of natural and industrial porous media systems.

Key Aims of the Society

- facilitate connections and collaboration among industrial and academic researchers;
- connect porous media theoreticians, modelers, 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 modeling 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.

You can become a member by registering online or contacting InterPore.

Honors and awards committee

Chairperson: Mike Celia (Princeton University). Jacob Bear (Technion, Haifa), Mary Wheeler (U. Texas, Austin), Rodrigo Rosati (Procter & Gamble, Germany), and Jan Nortbotten (Bergen University, Norway).

INTERPORE: "Similar solutions to diverse applications."

Website: www.interpore.org

Contact: info@interpore.org



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