



INTERPORE NEWS

Issue 10, March 30, 2012

InterPore Publicity Committee needs your help: "What a member says" on our new website

The Publicity Committee would like to better advertise the benefits of our society to potential members of InterPore. In specific, we plan a column "What a member says" on the front page of our future internet presence, which is currently under construction.

This measure has been inspired by the Filtration Society, who has a similar feature on their website (www.filtsoc.org). Thus, we are looking for authentic statements of InterPore members (students, institutional members, individuals from industry or academia) that capture why it is worth to join InterPore.

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We are asking you, our members, to support this endeavour and submit your own statements!

To illustrate what we are looking for, we invited two of our members to provide nice examples:

"InterPore represents a unique opportunity for P&G to link the scientific challenges behind absorbent products to the best-in-class porous media experts and identify potential solutions and partners to collaborate with, make unobvious connections and recruit the best talents with specific porous media background."

(Mattias Schmidt, PhD Physics, Research Fellow and member of the Victor Mills Society at Procter & Gamble)

"Shell's interests in porous media flows are very broad, ranging from fundamental aspects of single and multiphase flow to complex processes relevant to enhanced oil recovery. We seek to complement our strong in-house R&D capabilities through active partnering and Open Innovation schemes. Especially in the Netherlands, there are many groups doing excellent research in porous media flows and InterPore helps us to get connected more closely to these experts."

(Steffen Berg, Project Leader Rock & Fluids Physics at Shell)



Your statements should remain below 300 characters, including blanks. We would iterate with you on the wording, and publish your statements in a later FlashNews issue. If you have a corporate logo that we may use, please include it.

To submit statements or if you have any questions, please contact:

wolfgang.nowak@iws.uni-stuttgart.de.

Thanks a lot in advance!

Wolfgang Nowak (From the Publicity Team)



InterPore's presence at 2011 AGU Fall Meeting

Several InterPore members have been active at the 2011 AGU Fall Meeting that took place from the 5th until the 9th of December, 2011, in San Francisco, California. The AGU fall meeting is probably the largest annual conference in our fields, with typically more than 15.000 registered visitors, sessions and presentations. Therefore, we asked some members to give you a short report on what has happened within their sessions.



AGU FALL MEETING 2011

San Francisco, California, USA | 5-9 December

Complexities of Flow and Transport in Porous Media

Conveners: S.M. Hassanizadeh, V. Joekar-Niasar, R. Helmig, R. Allen-King, A.H. Demond, M.N. Goltz, D. Or, and L.S. Bennethum

The session entitled "Complexities of flow and transport in porous media" has been held for the fourth consecutive year at the AGU Conference. This session, which was the second largest session in the Hydrology Discipline, could get three 2-hour oral slots and one poster session. Each oral session took 2 hours and featured 8 oral talks. In total, 24 oral presentations and 32 posters were presented. This session was evaluated very fruitful according to the audience' feedbacks.

(S.M. Hassanizadeh)

The Multiscale Nature of Mixing and Reaction in Heterogeneous Media: Advances in Experiment and Theory

Conveners: A.M. Tartakovsky, M. Willmann, T. Le Borgne, A. Englert, M. Dentz

This session focused on the Multiscale nature of mixing and reaction in heterogeneous porous media. The aim of this session was to shed new light and contribute to the ongoing discussion on the diverse (non-Fickian) mixing and reaction phenomena observed in heterogeneous media, based on new experimental, modelling and theoretical approaches.



Heterogeneous porous media exhibit physical and chemical heterogeneities on multiple scales ranging from the pore to the reservoir scale. Depending on the spatial and temporal observation scales, the mixing and reaction dynamics can be very different from the ones expected for equivalent homogeneous media. These issues were addressed in 12 oral and 21 poster presentations, with an above average scientific quality. Both oral and poster sessions were well attended, and lead to lively discussions.

The session highlights were the invited talks by Philippe Gouze from University of Montpellier 2, CNRS, in Montpellier, France (Multiscale characterization of porosity, permeability and reactive surface changes during dissolution), Ruben Juanes from the Massachusetts Institute of Technology in Cambridge, USA (Mixing and velocity disorder: From viscous fingering to heterogeneous media), Jan Nordbotten from the University of Bergen, Norway (Multiscale modeling and simulation of porous media) and Carl Steefel from the Lawrence Berkeley National Laboratory in Berkeley, USA (Pore scale modelling of mixing-induced carbonate precipitation).

The sessions made clear that recent developments of numerical modelling tools and experimental techniques, as well as new theoretical developments, have advanced our understanding of the complex mixing and reaction processes in multiscale heterogeneous media. New imaging techniques allow to have a closer look at porescale processes and understand the dynamics of reaction and permeability changes. New ideas on mixing in porous media shed light on the flow mechanisms that lead to enhanced mixing and reaction. It is clear that there is a critical mass of people at the moment working on this issue, which promises a rapid advance in this field in the future.

(Marco Dentz)

Fate and Transport of Emerging Contaminants, Microorganisms, Colloids, and Engineered Nanoparticles in the Environment

Conveners: D.M. O'Carroll, W. Zhang, C.A. Ramsburg, S.A. Bradford, R.W. Harvey

At the 2011 AGU Fall Meeting, Drs. O'Carroll, Zhang, Ramsburg, Bradford and Harvey convened the session on "Fate and Transport of Emerging Contaminants, Microorganisms, Colloids, and Engineered Nanoparticles in the Environment". The session was a tremendous success with invited talks from Prof. Brent Sleep (University of Toronto), Prof. Gregory Lowry (Carnegie Mellon University), Prof. Sharon Walker (University of California, Riverside) and Prof. Arturo Keller (University of California, San Barbara). The sessions included another 14 outstanding oral and 38 poster presentations. A number of students and postdoctoral fellows participated in the session, providing enthusiasm and elevating the scientific dialogue of the session.

(D. O'Carroll)



INTERPORE NEWS

Model/Parameter Uncertainty Quantification and Impacts on Risk and Decision Making

Conveners: W. Nowak, S.M. Ezzedine, D. Bolster, S.A. McKenna, S. Srinivasan, D.M. Tartakovsky

This session looked into challenges for prediction and decision-making under uncertainty as they arise in the subsurface. Affected application problems include groundwater contamination, CO₂ sequestration, and nuclear waste storage. The session combined model/parameter identification, uncertainty quantification, risk assessment and decision-making. It is a direct follow-up of last year's session with a similar title. Equipped with two oral and one poster slot, it belongs to the more successful fraction of sessions at the annual AGU fall meeting.

The session succeeded in attracting brilliant invited speakers, excellent scientific contributions, and a broad audience ranging from practitioners and students to top-notch scientists. The hallway in front of the session room evolved into an efficient and considerable networking area for news exchange within the involved communities and the InterPore members that visited the conference.

All contributions to this session had a very high quality level and triggered good questions and discussions. The presented talks included, to name just a few examples, identification of material structures and parameters on small to large scales, prediction uncertainty in anomalous transport, and scaling of Kozeny-type relations close to the percolation threshold.

What I liked most about this session was the well-visited poster session with definitively more and deeper-than-average discussions at the posters. The audience was large during the talks, even on Monday morning at 8am. My personal highlight is that the room suddenly filled up with more than 200 persons (far beyond capacity, with people sitting in the centre aisle and peeking in through the back doors) just before the invited talk of Peter Kitanidis on "recent advanced in geostatistical inversion". Peter Kitanidis is the 2011 recipient of the AGU Hydrologic Sciences Award. After that, the attendance went back to the stable and respectable average of about 100 listeners, as quickly as it filled up before.

(W. Nowak)



INTERPORE NEWS

Shell joining InterPore as Institutional Member

Shell recently joined InterPore with an institutional membership. Steffen Berg, Project Leader in the Rock & Fluids Physics team at Shell, initiated the membership. He explains: "InterPore has been on our radar screen as an important R&D network for some time. Since I met Majid Hassanizadeh from Utrecht University at a summer school on interfacial area in porous media flows in 2009, I continued to collaborate with Majid, who did not miss any opportunity to promote InterPore. The Dutch InterPore Meeting 2011 finally convinced Shell to join, as we realized that there are many common interests concerning the understanding of porous media flows."



Shell's interests in porous media flows are very broad ranging from fundamental aspects of single and multiphase flow to complex processes relevant to, e.g., enhanced oil recovery and reactive transport during CO₂ sequestration. At Shell, research is typically conducted in interdisciplinary teams, including both experiments and modeling.

Shell considers innovation, technology competence and strong R&D capabilities as critical success factors. This strategy is reflected in a sustainable R&D investment of more than US\$ 1 Billion/year over the last years, more than any other International Oil Company.

While Shell is already well linked into industry R&D networks, InterPore offers competence in more fundamental subject matters. With declining "easy oil", the production of hydrocarbons becomes more challenging, requiring innovative technical solutions and sophisticated processes, which calls for deep scientific insight. Past experience has shown that the right combination of theoretical insight, advanced modeling and experimentation is the key to success. A current example, gaining more and more momentum, is the theme of "Digital Rock". In this case, advances in imaging technology (e.g. micro computed tomography) combined with the dramatic increase



Steffen Berg

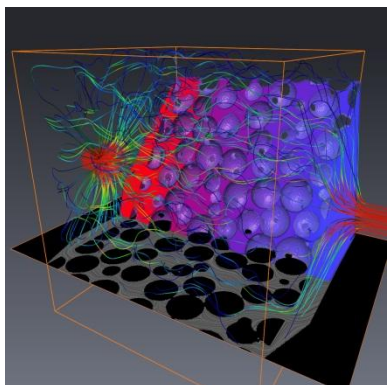
in computational power is used to measure and model multiphase flow at the pore scale. The goals are ambitious: The initial aim is to reliably predict two-phase flow properties in porous rock, but in the longer term we are looking to applying this approach to increase the recovery factor from our reservoirs and to reliably sequester CO₂. Shell seeks to complement its strong in-house R&D capabilities through active partnering and *Open Innovation* schemes. Leveraging internal and external ideas helps to enhance quality and accelerate technology development. Steffen Berg concludes: "Especially in the Netherlands, there are many groups doing excellent research in porous media flows. InterPore helps Shell to get connected more closely to these groups."



RESEARCH SPOTLIGHT

From 3D images to simulations, practical issues and software tools

By Nicolas Combaret and Daniel Lichau, Visualization Sciences Group (VSG), Bordeaux, France.
{nicolas.combaret, daniel.lichau}@vsg3d.com



The Visualization Sciences Group (VSG) has recently joined InterPore as new institutional member. In this research spotlight, they report on the core expertise they bring to our society.

A variety of tools are used to reliably model porous media from 3D images: image processing, segmentation, registration, quantification, pre-processing for simulation. VSG's Avizo® Fire software is an integrated, customizable and extensible framework that supports the full image-to-simulation workflow, for prototyping and implementing routine workflows for 2D/3D image analysis and characterization.

3D image processing

Improving the quality and accurately segmenting the acquired images are key to capturing the features that are relevant for simulations:

- ❖ Images may require artifact reduction to compensate acquisition issues such as CT beam hardening or FIB-SEM shear/drift and shadowing;
- ❖ Image noise must be reduced while preserving interfaces, for instance using basic median filter or more advanced adaptive bilateral, anisotropic diffusion, or non-local mean filters;
- ❖ Many segmentation techniques can be used for optimal labelling of single or multiple phases, such as adaptive thresholding or variants of watershed algorithm.

Image-based quantification and characterization

Prior to simulations, substantial quantitative information can be directly extracted from 3D images:

- ❖ Extensive measurements of characteristics such as pore space distribution, connectivity (see fig. 1) and anisotropy, grain separation, shape factor and orientation, can be obtained directly from 3D discrete images, relying for instance on mathematical morphology algorithms;



RESEARCH SPOTLIGHT

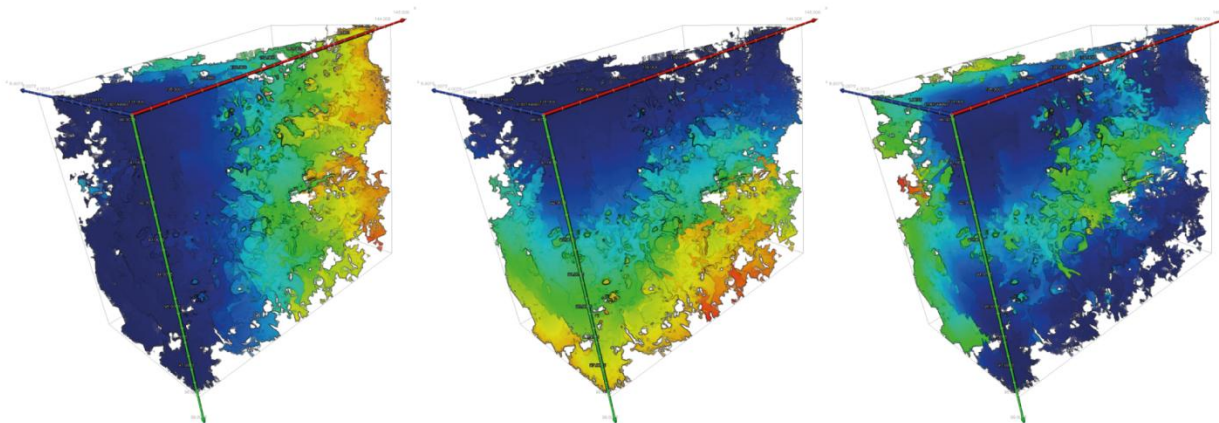


Fig. 1: Permeable path distribution along axes (colours represent geodesic distances).

- Images using various sizes, resolutions, dimensions and modalities (e.g. micro-CT and FIB-SEM), can be registered to examine and merge material features such as porosity at different scales. Image registration also enables accurate analysis of 3D images sequences from experiments.

Modeling and numerical simulation

Physical properties can be computed from segmented 3D images by using several approaches (see fig. 2).

- Finite Element Modeling requires effective and adaptive meshing of phases from the 3D images. FEM simulation may still turn out to be computationally prohibitive for complex geometry representative of porous media.
- Pore Network Modeling is intended to be less computationally demanding. Faithful geometry approximation relies on pore space partitioning techniques, such as topology-preserving skeletonization, spatial graph extraction, and watershed (see [2]).
- Direct image-based approaches do not require demanding conversions to geometric models. Developed in collaboration with ICMCB – CNRS (D. Bernard), Avizo XLab Hydro uses a finite volume method to calculate absolute permeability in two ways: the simulation of an experiment and the calculation of the intrinsic permeability tensor - representative of property in arbitrary directions. [3] and [4] demonstrate their applicability to realistic cases.



RESEARCH SPOTLIGHT

Conclusion

Any parameter changes used for 3D image processing, filtering, reconstruction, segmentation, and representative volumes selection have an impact on the simulation results. Integrating these processes into a single framework enables more efficient and accurate evaluation of image-to-simulation workflows.

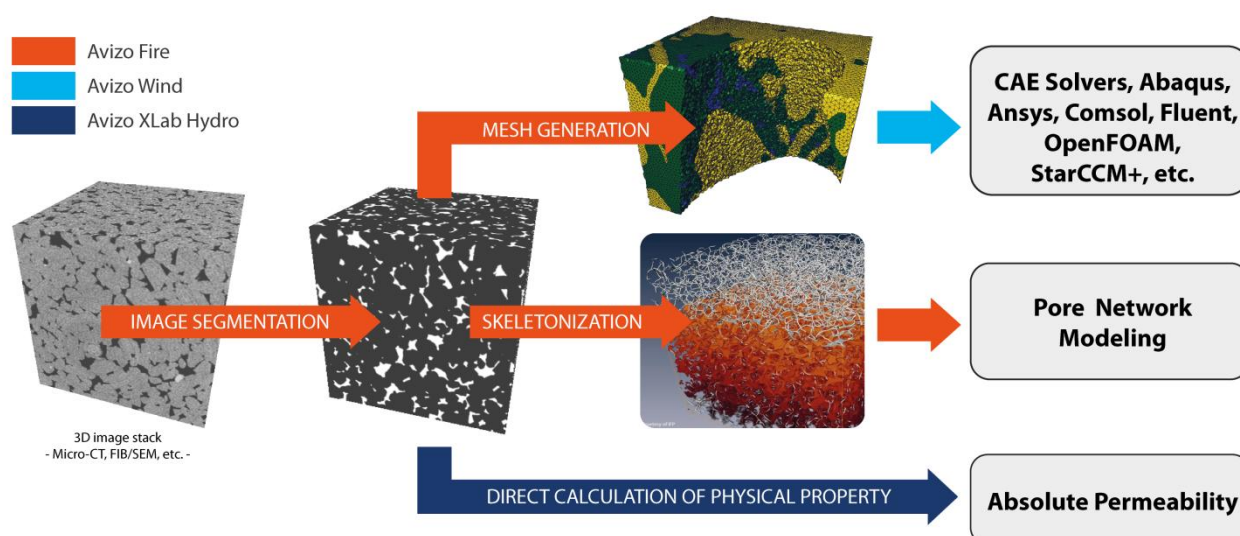


Fig. 2: Image-to-simulation workflows.

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- [3] Porosity and permeability analysis on nanoscale FIB-SEM 3D imaging of shale rock, S. Zhang, R. Klimentidis, P. Barthelemy, SCA Symposium 2011, Austin, USA. Sept 18-21, 2011
- [4] The analysis and simulation of rock properties using FIB-SEM and virtual material studio, S. Zhang, F. Della Maestra, N. Combaret, R. Klimentidis, P. Barthelemy, R. Albou, D. Lichau, NAFEMS World Congress, Boston, USA. May 23-26, 2011



INTERPORE AWARDS

Rien van Genuchten to receive the Honorary Membership Award 2012

It is a great pleasure for us to inform the InterPore society that Martinus Th. (Rien) van Genuchten will receive the 2012 Honorary Membership Award of the International Society for Porous Media, InterPore. This is done in recognition of his enormous achievements in the area of subsurface fluid flow and contaminant transport, and in recognition of his great contributions to increasing the visibility, credibility and prestige of the porous media research community. Congratulations!

Rien van Genuchten holds B.Sc. and M.Sc. degrees in Irrigation and Drainage from the Wageningen University, The Netherlands, and a Ph.D. degree in Soil Physics from New Mexico State University, USA. After several positions at prestigious universities and research institutions (including Princeton, UC Riverside, the ETH in Zürich, and the US Salinity Laboratory), he is currently Collaborating Professor in the Department of Mechanical Engineering of the Federal University of Rio de Janeiro in Brazil.



The present state-of-the-art in porous media research is simply unthinkable without his enormous achievements during the past 30 years or more. His many contributions have an immeasurable impact in such widely varying fields as soil physics, hydrology, geology, the environmental sciences, and civil engineering. His most famous contribution is the popularly used "van Genuchten model" for the water retention and hydraulic conductivity functions of unsaturated porous media. Far beyond that famous model, he advanced our knowledge of especially vadose zone hydrology through his contributions in analytical and numerical modeling of subsurface flow and transport, parameter optimization, dual-porosity/permeability characterization of structured media, root-water uptake processes, and software development.

His publication record is self-explanatory, including more than 250 ISI-cited papers with an H-index of 52. His 1980 classic on the hydraulic properties of unsaturated media has been cited some 5300 times, one of the most cited papers in research. Equally important has been long-time service to the profession in various committees, boards, panels, and as founding editor of the Vadose Zone Journal. An outstanding characteristic of Dr. van Genuchten's personality is his genuine concern and support for young scientists.



INTERPORE AWARDS

The Honorary Membership Award is reserved for individuals who have made extraordinary contributions to porous media science and technology, who are world renown in the porous media community, and whose contributions are consistent with the aims and ideals of InterPore. This award is given to only one individual per year. The award consists of a certificate, lifetime InterPore membership, and a travel grant of 1,000 € for participation in the InterPore Annual Meeting and Conference. The Award Ceremony will take place during the Annual Meeting of InterPore, which this year will be held May 14-16 at Purdue University, West Lafayette, Indiana.

Response by Rien van Genuchten

Many, many thanks to the InterPore Society for awarding me this great honor. I am especially humbled by following two others in this, Jacob Bear and Kambiz Vafai, who I admire tremendously. What pleases me most is that the award comes from a professional society whose ideals I very much share: to bring together and facilitate collaboration between porous media theoreticians, modelers, and experimentalists from both academia and industry. Clearly, we all need each other and cannot work anymore in isolation. My thanks go out to all of my family, friends, coauthors and colleagues who collaborated, guided or otherwise inspired me over the years. Thanks again.

 **INTERPORE AWARDS****Prof. Andro Mikelic selected for InterPore Procter & Gamble Award for Porous Media Research**

The InterPore Procter and Gamble Award for Porous Media Research is given in recognition of outstanding contributions to topics related to swelling porous media, very thin porous media, and modelling of interfaces between porous media. The award includes both 5,000 € and an award certificate.

The International Society for Porous Media (InterPore) awarded Prof. Mikelic for his enormous achievements in the area of Porous Media Research. He currently works at the Université Lyon, Department of Mathematics. His current research interest is within the field of homogenization theory and applications as well as fluid mechanics and turbulence theory. For more information please visit the webpage of Prof. A. Mikelic (<http://amikelic.free.fr/>).

The Awarding Ceremony will take place during the **Annual Meeting of InterPore**, which this year will take place May 14-16 in Purdue. We will report the award speech and Prof. Mikelic's response in a later issue of FlashNews.

P&G



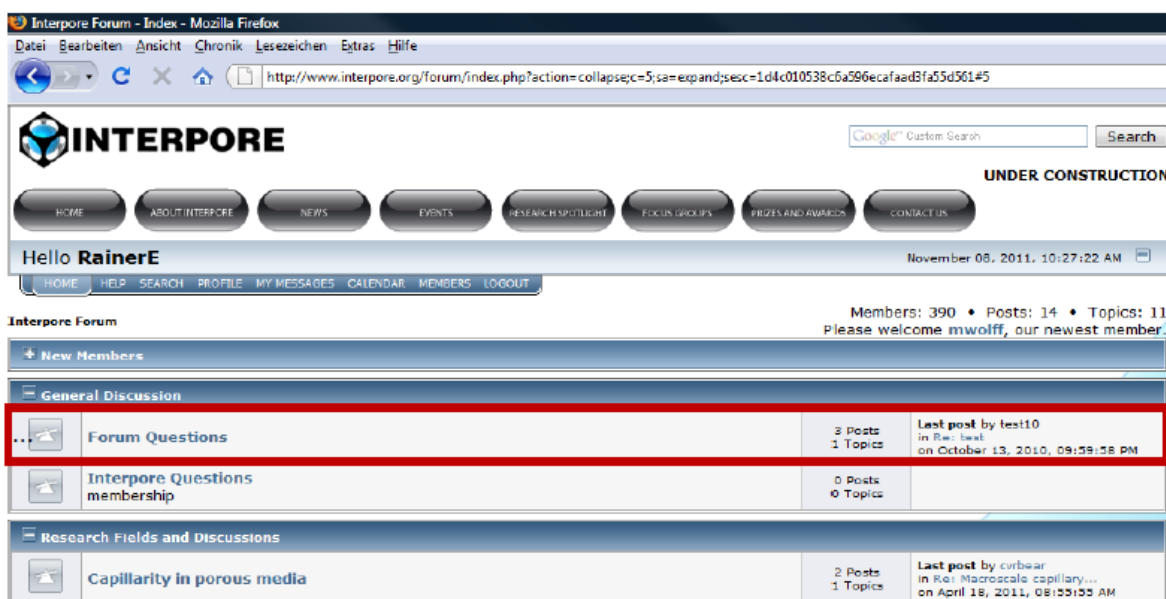
INTERPORE FORUM

Examples from the Forum Questions

Where to get answers, when things get complicated? The **InterPore Forum** provides a unique platform to ask other InterPore members to help you with your problem.

Go to www.interpore.org/forum and login with your member account. Then open up the question for discussion, for example with the **Forum Questions** Section under the **General Discussion**. Today, we choose one Forum Question regarding the effect of hysteresis in porous media to highlight the benefits you can get from using the **InterPore Forum**.

The following question was posted to the InterPore Forum: *“How do you compute the critical curvature at drainage and why, for a cylindrical pore, we need a factor of two between radius of imbibition and radius of drainage, which leads to hysteresis, that for a straight circular cylinder we would not have expected?”*



Interpore Forum - Index - Mozilla Firefox

http://www.interpore.org/forum/index.php?action=collapse;c=5;sa=expand;secc=1d4c010538c6a596eca5ad3fa55d56145

INTERPORE

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HOME ABOUT INTERPORE NEWS EVENTS RESEARCH SPOTLIGHT FOCUS GROUPS PRIZES AND AWARDS CONTACT US

Hello RainerE November 08, 2011, 10:27:22 AM

HOME HELP SEARCH PROFILE MY MESSAGES CALENDAR MEMBERS LOGOUT

Interpore Forum Members: 390 • Posts: 14 • Topics: 11
Please welcome mwolff, our newest member.

+ New Members		
- General Discussion		
...	Forum Questions	3 Posts 1 Topics Last post by test10 in Re: test on October 13, 2010, 09:59:58 PM
...	Interpore Questions membership	0 Posts 0 Topics
- Research Fields and Discussions		
...	Capillarity in porous media	2 Posts 1 Topics Last post by curbear in Re: Microscale capillary... on April 16, 2011, 08:59:53 AM

The **answer** to this problem was given by another InterPore member, **Prof. Danny Or** from the ETH Zurich, Institute of Terrestrial Ecosystems:

While most popular modeling approaches concerning porous media assume cylindrical pores, Tuller and Or (1999) introduced the relevance of angular pores which feature corners and snap-off phenomena.



INTERPORE FORUM

Mason and Morrow (1991) developed the MS-P method to define the critical radii of curvature at snap-off for the two different capillary pressure modes (drainage and imbibition). This method is of great interest, as it provides an analytical solution for the capillary pressure relationship in simple pore geometries, like straight pores with triangular or square cross sections.

Moreover, in the paper of Tuller and Or (1999), a relationship between the critical radii of curvature at snap off for imbibition and drainage is given. This relationship is only dependent on the pore geometry: cross sectional area and pore perimeter.

However, for a cylindrical pore, this relationship could be simplified, and the radius of curvature at snap-off for imbibition is twice as high as the one for drainage. This means that a cylindrical pore will experience hysteresis, even if a zero contact angle is assumed. But this goes against what the Laplace equation could predict assuming spherical interfaces and zero contact angle in a capillary tube: the tube will fill and drain at the radius of the pore.

This is a result of the force balance on the interface acting under these two processes – one is spontaneous (imbibition) and the other (drainage) is forced. The explanation of Mason et al. (1991) relies to some extent on the classical work of Lenormand et al. (1983) and Kalaydjian and Legait (1987). Special attention should be given to the general expression and the discussion leading to equation 1. Please have a close look at the general expression and discussion leading to their equation 1. Such ratio of r_{imb}/r_{dr} (< 2) is in fact commonly observed in porous media and there should be a distinction between air entry and water entry pressures.

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COMMUNITY NEWS

Jacob Bear stepping down as editor of Transport in Porous Media Journal

After more than 25 years of outstanding leadership Prof. Jacob Bear (Honorary Member of InterPore) is stepping down as editor of the highly regarded journal "Transport in Porous Media" (TIPM). TIPM has a strategic alliance with InterPore. The following excerpt from Jacob Bear's letter to the InterPore society shows his vision (the complete letter will be printed in the next issue of the InterPore Newsletter).

"In the early 1980s, I had a dream: an international high level journal devoted to 'original research work on the physical and chemical aspects of transport of extensive quantities such as fluid mass, mass of components and energy, in multiphase, possibly deformable, porous medium domains, as encountered in a variety of scientific and engineering disciplines' (quoted from the original TIPM objectives)".



Jacob Bear

In his letter to the society Jacob Bear discusses how research in the field of transport in porous media has matured over the years and has been developed to become a research discipline on its own. The field developed from the first conference in 1969 on "Fundamentals of Transport Phenomena in Porous Media" in Haifa, Israel, to his effort of establishing the TIPM journal and, last but not least, leading to the foundation of InterPore as the society for Porous Media. In his letter to the society, he also addresses the diversity of the field and interdisciplinary work aligned with the research area of porous media and how the Journal of TIPM has evolved and increased in importance for the community.

"The number of submitted papers has been steadily growing, and, although the size of the journal has also been increased, the selection of the good papers has become more difficult. At the same time, the range of authors' disciplines has also widened ..."



Martin Blunt

After 25 years as editor of TIPM, he introduces Prof. Martin Blunt, Imperial College, London, as his successor and finishes his letter with acknowledging colleagues, publisher, reviewers and associate editors for their tremendous work and efforts contributing to the community of porous media.

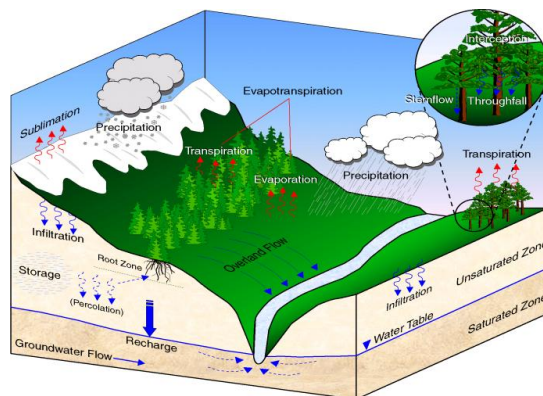
InterPore would like to thank Jacob Bear for his outstanding commitment to porous media science, and wishes him all the very best for the future.



COMMUNITY NEWS

International Research Training Group (IRTG) “Integrated Hydrosystem Modeling”

The International Research Training Group (IRTG) “Integrated Hydrosystem Modeling” at the Universities of Tübingen (Germany), Hohenheim (Germany), and Waterloo (Canada) targets at developing and applying numerical models of flow and reactive solute transport in coupled hydrosystems comprising of land-surface and subsurface compartments. These models are needed to assess the impacts of environmental change on water quantity and quality at catchment scale. The IRTG offers a structured PhD program at the German partner universities with joint international training and supervision. The main work place is in Tübingen; a six-month research stay at Waterloo is integral part of the training. The program starts on **June 1, 2012**.



Theme A: Flux Balances at the Land Surface

- ❖ A.1 Water Transport through Plants
- ❖ A.2 Groundwater Recharge under Climate and Land-Use Change
- ❖ A.3 Soil Uptake and Emissions of Atmospheric Pollutants

Theme B: Biogeochemical Reactions in Catchments

- ❖ B.1 Validity of Travel-Time Based Reactive Transport Models
- ❖ B.2 Slow Microbial Transformations in Oligotrophic Aquifers
- ❖ B.3 Compound-Specific Isotope Fractionation at Catchment Scale

Theme C: Uncertainty Assessment of Large-Scale Models

- ❖ C.1 Prioritising Uncertainty Sources in Coupled Hydrosystem Models
- ❖ C.2 Optimal Design of Monitoring in Coupled Hydrosystems
- ❖ C.3 Assimilation of Land-Surface Observations in Coupled Hydrological Models

Theme D: Evolution of Catchments

- ❖ D.1 Physics-Based Modelling of Erosion at Catchment Scale
- ❖ D.2 Chemical Weathering at Catchment Scale
- ❖ D.3 Modelling of Vegetation Dynamics Coupled to Physics Based Hydrology.

More information on the IRTG can be found at
<http://www.hydrmod.uni-tuebingen.de>



MEETINGS & WORKSHOPS

Gordon Research Seminar on Flow & Transport in Permeable Media

June 23rd to 24th in Les Diablerets, Switzerland

“Moving through Scales from Pore to Field Permeable Media Systems: Challenges and Knowledge Gaps”

The Gordon Research Seminar on Flow & Transport in Permeable Media is a unique forum for graduate students, post-docs, and other scientists with comparable levels of experience and education to present and exchange new data and cutting edge ideas. The meeting will focus on the scientific challenges of understanding multiscale phenomena of flow and transport in permeable media systems.

Possible topics may include, but are not limited to, the following areas investigated by theoretical, experimental and numerical approaches:

- ❖ characterization of pore scale phenomenon,
- ❖ upscaling pore scale processes to continuum scale,
- ❖ multiscale numerical methods,
- ❖ coupled flow and geochemical/geomechanical processes, and
- ❖ flow and transport in heterogeneous and fractured systems.



The Research Seminar will be held in conjunction with the Flow & Transport in Permeable Media Gordon Research Conference. Please see



[B. Jha, L. Cueto-Felgueroso, R. Juanes,
Phys. Rev. E 84, 066312 (2011)]

www.grc.org/programs.aspx?year=2012&program=grs_flow
for the Research Seminar and

www.grc.org/programs.aspx?year=2012&program=flow
for the Research Conference.

The research Seminar will be chaired by Sarah E. Gasda and co-chaired by Vahid Joekar-Niasar. Majid Hasanizadeh will give a Keynote Lecture.

Application deadlines are **February 23rd** for speakers and **May 26th** for posters. Please follow the above links for application details.



RESEARCH POSITIONS

Job opportunities

InterPore is more than happy to present you again several interesting job opportunities within academia and industry. On our InterPore Forum, we host a large data base with interesting job offers. We, as the editorial board of the InterPore Newsletter are happy to accept job opportunities from members as well as non-member parties. Within our newsletter, we would like to briefly announce some of the opportunities you can find within our Forum. In order to get the full information, please visit the InterPore Forum.

<http://www.interpore.org/forum/index.php?board=24.0>



Two post-doctoral modelling positions in the area of environmental systems

The first research position is in the area of hydrogeology and requires conducting numerical simulations of water flow and solute transport in coastal systems [...]. The second research position is in the area of Environmental Fluid Mechanics and requires conducting numerical simulations of mixing of fluids in open water. The qualified candidate would have ... [\[more\]](#).

Postdoctoral researcher position

A postdoctoral position (minimum term, 1 year and renewable) in the field of numerical modelling for groundwater flow and solute transport in porous media ... [\[more\]](#).

2 PhD and 1 Post-doctoral Position in Coastal Hydrogeology

The project will involve geostatistical modeling of the Hawaiian Islands and the Bengal Basin as well as groundwater flow and solute transport simulation of land-ocean water fluxes... [\[more\]](#).

Post-doctoral Opportunity in Hydro-Economics

The successful candidate will work with an interdisciplinary team on economics experiments involving decision-making for groundwater resources ... [\[more\]](#).

Full-time post-doctoral research associate for six years

We seek a candidate with the interest and ability to teach geotechnical engineering courses and to develop and sustain an internationally competitive research program ... [\[more\]](#).



RESEARCH POSITIONS

Research Assistant/ Postdoctoral Researcher (Hydrogeologist/Geoscientist)

The interdisciplinary research team focuses on 3 main research areas: (I) water resources management on a regional scale, (II) the fate of organic contaminants in the subsurface, and, (III) the development of novel methods to remediate soil and groundwater contaminations ... [\[more\]](#).

Eight PhD student positions

Eight PhD student positions are available in the following research themes related to Water Resource Systems: Flood hydrology, Regional nutrient management, Aquatic microbiology, Soil moisture remote sensing, Diffuse water pollution, Mechanics of structures, Socio-hydrology and environmental economics, Micro-meteorology, ... [\[more\]](#).

PhD position on reactive transport of isotopes

We look for a PhD student to undertake reactive transport modelling of environmental isotopes in the vadose zone ... [\[more\]](#).



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.

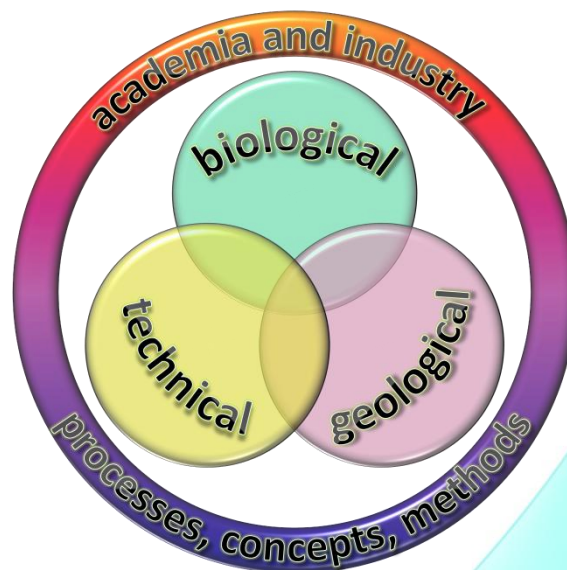
The general aim of the Society is to advance and disseminate knowledge for the understanding, description, and modeling of natural and industrial porous media systems.

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.



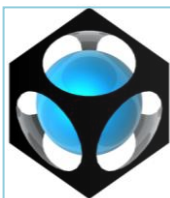
Why should you join InterPore?

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!

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Contact: info@interpore.org



ABOUT INTERPORE

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Articles and news items on the study and characterisation of porous media,
especially when relevant to other types of porous media,
are welcomed for publication in this newsletter, issued three or four times a year.

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