

FIRST ISSUE RELEASED



Volume I, Issue 1, Fall 2010

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Welcome from the Chair

Welcome to the first issue of the ARMA e-Newsletter! It is a modest beginning, which we hope will improve in content and appearance in future issues. The ARMA Publications Committee and in particular its Newsletter Editorial Subcommittee chaired by Wolfgang Wawersik have worked very hard to bring this project to fruition and are proud of this first issue. Special thanks to Wendy DiBenedetto, of Advantek International Corp., who did a marvelous job designing the newsletter.

However, in order to continue publishing timely material of interest to you the ARMA members, we need your support in the form of contributions to the newsletter. We do not have paid personnel hunting for news in the rock mechanics field. We rely entirely on you!

ARMA e-Newsletter will publish YOUR contributions, such as:

- Technical Notes
- Case Studies
- Policy issues
- Latest ARMA news
- Announcements of interest to members
- Miscellaneous items

Guidelines for Technical Notes and Case Studies submissions can be found in the ARMA website. Click [HERE](#) to download the [Author Guidelines for ARMA E-Newsletter](#)

We welcome your input regarding this first issue of the newsletter. Please send your comments, critiques, suggestions to: newsletter@armarocks.org

Thank you in advance for your active support of this new ARMA initiative.

Bezalel Haimson
Chair, ARMA Publications Committee



In the Spotlight

Two ISRM presidents and Peter Smeallie, ARMA's Executive Director, will address *Networks of URLs for International, Interdisciplinary Innovations (III)*.

Visit: <http://www.arms2010.org/>



45th US Rock Mechanics / Geomechanics Symposium

June 26 – June 29, 2011

The Westin San Francisco Market Street, San Francisco, CA

POLICY Issues

Excerpts from M. Holt, Library of Congress, Nuclear Waste Disposal, July 16, 2010 and DOE Postings of January, August and September 2010

Management of civilian radioactive waste has posed difficult issues for Congress since the beginning of the nuclear power industry in the 1950s. Federal policy is based on the premise that nuclear waste can be disposed of safely, but proposed storage and disposal facilities have frequently been challenged on safety, health, and environmental grounds. Although civilian radioactive waste encompasses a wide range of materials, most of the current debate focuses on highly radioactive spent fuel from nuclear power plants.

The Nuclear Waste Policy Act of 1982 (NWPAA) calls for disposal of spent nuclear fuel in a deep geologic repository. NWPAA established the Office of Civilian Radioactive Waste Management (OCRWM) in the Department of Energy (DOE) to develop such a repository and required the program's civilian costs to be covered by a fee on nuclear-generated electricity, paid into the Nuclear Waste Fund. Amendments to NWPAA in 1987 restricted DOE's repository site studies to Yucca Mountain in Nevada.

DOE submitted a license application for the proposed Yucca Mountain repository to the Nuclear Regulatory Commission (NRC) on June 3, 2008, and NRC docketed the application on September 8, 2008.

The NRC license must be based on radiation exposure standards set by the Environmental Protection Agency (EPA), which issued revised standards on September 30, 2008. The State of Nevada strongly opposes the Yucca Mountain project, disputing DOE's analysis that the repository would meet EPA's standards. Risks cited by repository opponents include excessive water infiltration, earthquakes, volcanoes, and human intrusion.

The Obama Administration "has determined that developing the Yucca Mountain repository is not a workable option and the Nation needs a different solution for nuclear waste disposal," according to the DOE FY2011 budget justification. As a result, no funding for Yucca Mountain or OCRWM is being requested for FY2011. DOE filed a motion with NRC to withdraw the Yucca Mountain license application on March 3, 2010. DOE's withdrawal motion has drawn legal challenges from states that have defense-related and civilian waste awaiting permanent disposal. An NRC licensing board denied DOE's withdrawal motion on June 29, 2010, a decision that may be reviewed by the NRC commissioners.

Alternatives to Yucca Mountain are to be evaluated by the Blue Ribbon Commission on America's Nuclear Future. The Commission is to study options for temporary storage, treatment, and permanent disposal of highly radioactive nuclear



OPINIONS: Joe's Corner

Questions to ARMA members: what kinds of innovations in International Interdisciplinary Innovations (III) are of interests to rock mechanics, geological engineering, and geomechanics? ARMA always have presentations of civil-engineering, mining, petroleum, and multidisciplinary interest. I am sure that more cross-disciplinary collaboration and coordination (CCC) is welcome by all communities. Would it be a good idea to have a CCC session at the next ARMA Symposium in San Francisco? Please let me know who might be interested in CCC—who could join in the discussions and give presentations? Should we aim towards "Energy, Environment, and Economy" (EEE) as the theme for some future gatherings?

Obviously III, CCC, EEE are just a few examples of acronyms. If you do a Google search, you will find out that III is the second most widely quoted triplets from AAA to ZZZ (WWW is the most popular one). Please let me know if you have more interesting or unique acronyms for projects or activities? We could collect acronyms for fun and future reference. Many physics collaborations involving hundreds of investigators use distinctive/distinguishing acronyms (e.g., DIANA). I am sure that my ARMA bio-geo-engineering colleagues have already come up with equally interesting ones (e.g., LUCI). I will report for your entertainment on this topic in a future ARMA e-newsletter.

Joe S.Y. Wang



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POLICY Issues

ware, along with an evaluation of nuclear waste research and development programs and the need for legislation. A draft report is to be issued within 18 months and a final report within two years.

DOE's Office of Nuclear Energy (NE) is to take over the remaining functions of OCRWM and "lead all future waste management activities," according to the FY2011 budget justification.

Substantial funding has been requested for NE to conduct research on nuclear waste disposal technologies and options and to provide support for the Blue Ribbon Commission.

Congress provided \$198.6 million to OCRWM for FY2010 to continue the Yucca Mountain licensing process but terminate all development activities related to the proposed repository. DOE plans to reprogram the FY2010 funding toward shutting down the program.

The Blue Ribbon Commission on America's Nuclear Future was established in January 2010 and is chaired by Lee Hamilton, now Indiana University, and Brent Scowcroft, The Scowcroft Group. Other members include E. Moniz, MIT, former DOE undersecretary and former Associate Director, OSTP; P. Domenici and C. Hagel, former US Senators; A. Carnesdale, UCLA; P. Sharp, Resources for the Future; and experts associated with the Nuclear Regulatory Commission and backgrounds in nuclear engineering and environmental sciences.

The latest Blue Ribbon Commission meeting was held Sept. 21-22, 2010 with a listing of over 20 papers. Remarks by V.H. Reis, Senior Advisor, DOE Office of Science, included the statement "The spent fuel issue is technically solvable with a combination of dry casks for interim storage and long-term disposal in a salt repository similar to the Waste Isolation Pilot Plant (WIPP) in Carlsbad New Mexico. Dry cask storage is used throughout the nuclear industry and the WIPP has been operating successfully for over ten years – with strong community support. WIPP has been licensed by the EPA for 10,000 years and is located deep within a salt formation that has been stable for around 250

million years." (By current law the WIPP can only accept defense waste, but the technology could be applicable to commercial waste as well.)

From the perspective of geologic disposal, noteworthy presentations addressed the siting of radioactive waste disposal facilities and international views of the US program for geologic disposal including decisions about Yucca Mountain. Surprisingly to the ARMA editorial subcommittee, it appeared that considerable attention was devoted to details of a large centralized surface storage facility for spent fuel and high-level waste in Spain.

Visit: <http://brc.gov/>
<http://www.energy.gov/news/8584.htm>
<http://www.energy.gov/news/8698.htm>



Photo courtesy of iaea.org



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TECH Notes

Some Rules and Laws for Examining Discontinuous Rock Masses on Exposed Natural Surfaces

Richard E. Goodman, prepared for an ARMA Field Trip in Big Cottonwood Canyon, Utah, June 27, 2010

1. (Shi's First Law) – Any movement of a rock block opens some joints and produces offsets on others.
2. (Goodman's Third Law) – Any movement of hard rock blocks creates voids in the rock mass. [This derives from Goodman and Green's law: in order to deform, rock has to go somewhere.]
3. (Goodman's Second Law) – An exposed face formed by the surface of some discontinuity (or joint) means that a block (or overburden) has slid or been removed from that surface. If you see a joint face, a block either slipped on that surface, or toppled from it, or its cover was eroded away.
4. On a two-dimensional rock exposure, joints or other discontinuities appear as a pattern of intersecting straight or curved lines ("traces"). (Straight lines for planar joints on planar surfaces; curved lines for planar joints on curved surfaces or for curved joints.)
5. (Shi's Second Law) – Intersecting joint traces generate polygons on the exposed rock surface.
6. (Hatzor's Law) – Removal (loss) of a block leaves a block mould. Each mould's faces identify a real joint pyramid on the portion of the exposed surface containing the mould.

7. (Barry Cooke's Law) - The rock mass tries hard not to fail.
8. (Murphy's Law) - If a rock block will fail, it will do so at a terrible time.
9. (Goodman's First Law). Rock is heavy. Implication: It will cost a lot to keep it in a place where it doesn't really want to stay.

Contact: rgoodman@mcn.org

Faces from Salt Lake City June 2010



Member News

Azra Tutuncu

(Colorado School of Mines, ARMA President) has accepted the Harry D. Campbell Chair position in the Petroleum Engineering Department at Colorado School of Mines effective in August, 2010. She was also appointed to Director of the Unconventional Natural Gas Institute (UNGI) at CSM.



Mark Zoback

(Stanford University, ARMA Vice President) is serving on a National Academy of Engineering (NAE) Committee investigating the Deepwater Horizon accident in the Gulf of Mexico. The committee was established on request of the U.S. Department of Interior to conduct a technical analysis of the causes of the Deepwater Horizon explosion and oil spill. The analysis will complement investigations by the US Coast Guard, the Minerals Management Services, and a presidential commission. The committee consists of nine experts and is chaired by Donald C. Winter, former Secretary of the Navy.





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ARMA News

ARMA Business Plan:

Member Summary

The ARMA Board of Directors has placed a member summary of the ARMA Business Plan on the ARMA web site. After an overview of ARMA and its history, the plan describes the purpose of ARMA, benefits of membership, the business of ARMA, unique features, collaborations, and an achievement plan.

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The ARMA Board of Directors and the Organizing Committee for the 45th US Rock Mechanics / Geomechanics Symposium would like to invite you to attend the 2011 San Francisco Symposium. As you know, San Francisco was the site of the highly successful 2008 meeting. We are planning a great menu of field trips and activities to help explore the many technical and sight-seeing features available in the Bay area. The technical program is taking shape but we can use your help with organizing technical sessions and submitting papers.

Abstracts can be submitted online at www.armsymposium.org. The minimum word length is 300 and the maximum is

Deadlines

ABSTRACTS and
PAPER SUBMITTAL

11/01/2010: Abstract submittal

12/1/2010: Notification to authors

3/01/2011: Paper submittal

600 words. Abstracts should include a brief description of work performed, results of the work, and significance. Figures may be included as necessary to explain the abstract. All abstracts and accepted papers will be reviewed by experts in appropriate subject areas through an online process, and authors will be notified promptly.

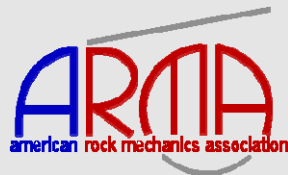
This year we will make our acceptance decisions based on a review of abstracts to help authors more time to make arrangements, such as applying for visas, to participate in the symposium. If your abstract is accepted and your paper is consistent in terms of quality and content, you will be assigned a presentation slot on the program agenda.

If you have any questions or you would like to help organize a technical session, please contact me at your convenience.

Anthony Iannacchione

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Member News



Charles Fairhurst (above left)

University of Minnesota

Derek Elsworth (above right)

(Pennsylvania State University)

were invited speakers at the September 2010 DURA/DUSEL meeting concerning science opportunities and plans. Their presentations were entitled *Biology, Geoscience and Engineering* (Elsworth) and *Grand Challenges in Earth Resource Engineering* (Fairhurst)

References:

[Fairhurst Presentation](#)

[Elsworth Presentation](#)

Bezalel Haimson

(University of Wisconsin) was the keynote presenter at the Fifth International Symposium on Rock Stress, in Beijing, China, August 2010. His topic was



"The effect of lithology, inhomogeneity, topography, and faults, on in situ stress measurements by hydraulic fracturing, and the importance of correct data interpretation and independent evidence in support of results". Haimson also was convener of a special session entitled *Limitations of the Hydraulic Fracturing Method and Ways to Overcome Them*. Proceedings are published by Balkema.



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In OTHER News



New ISRM Petroleum Geomechanics Commission

ISRM has established a Petroleum Geomechanics Commission with Maurice Dusseault, University of Waterloo, as president. Currently the Commission has nine members, but would like to add another 2-3 members for complete geographical and subject representation. The commission has the objective to promote fundamental and practical understanding of rock mechanics as applied to engineering use of sedimentary basins at depth, accessed by boreholes. These uses include geomechanical aspects of oil and gas exploration and production, geothermal energy development, deep underground storage of materials or energy, injection disposal of liquid and solid wastes, and sequestration of CO₂, C, CS₂, or other forms of carbon.

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Deep Underground Science and Engineering Laboratory (DUSEL) and 2010 Meeting of the DUSEL Research Association (DURA)

The Deep Underground Science and Engineering Laboratory (DUSEL) will be located at Homestake, SD and is dedicated to basic research in particle and nuclear physics, geology, hydrology, geo-engineering, geomechanics, microbiology, and chemistry. Homestake is the deepest mine in North America with rooms at 8000 ft. Planning for DUSEL is executed

by the DUSEL Research Association which held its first Annual Meeting during September 1-2 at the Fermi National Accelerator Laboratory (Fermilab) in Batavia, IL. The goals and agenda of the meeting are available at:

Visit: www.dusel.org/workshops/fallworkshop10/index.htm
www.DUSEL.org
www.int.washington.edu/DUSEL/

New ASTM Standard for Measuring Abrasiveness of Rock

ASTM D7625-10

Abrasiveness describes a behavioral characteristic of rock under excavation by any type of mechanical machines, when this behavior is playing an important role in any machine's performance prediction process. The standard covers the determination of abrasiveness of a rock formation using the so-called CERCHAR-Abrasiveness- Index - method (CAI). The CAI method consists of measuring wear on the tip of a cone-shaped steel stylus with known Rockwell Hardness. The wear is caused by scratching the stylus against either a freshly broken or saw-cut surface of a rock specimen for a 10-mm distance using a prescribed contact force and velocity. Details of the test and the equipment involved are described in ASTM D7625-10.

Contact: hazeri@terrastesting.com

Visit: www.astmnewsroom.org/default.aspx?pageid=2212



Programs & Institutes

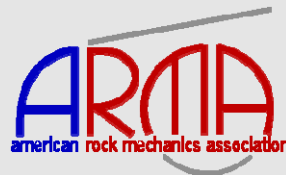
UNGI

A New Institute for Unconventional Resource Recovery at CSM

Unconventional resources represent high-cost initiatives that require novel approaches to access, develop, and produce in an environmentally sensitive manner. Engineers and scientists face significant challenges in unlocking these reservoirs in an economically viable manner especially when their heterogeneity, stress anisotropy and fluid sensitivity are incorporated into their already complex behavior. In addition to economic challenges, the concerns for land, surface and groundwater contamination with completion and fracturing fluids require close attention to selecting chemical additives, monitoring and controlling fracture pathways created as a result of the stimulation operations. This is why geomechanics research and associated implementations are critical for the success of the recovery of unconventional resources.

With increasing oil and gas industry and federal research funding for unconventional reservoirs in the last few years, the Colorado School of Mines (CSM) multidisciplinary, integrated research and education programs have launched an initiative entitled the *Unconventional Natural Gas Institute (UNGI)*. It will assist the oil and gas industry on unconventional resource exploration and development, both from educational and research perspectives. The UNGI creates a bridge between government and industry to pursue this vast energy-resource opportunity in an environmentally sensitive and economically viable manner.

[-more-](#)



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In OTHER News

International Workshop on Multiscale and Multiphysics Processes

Professor Renaldo Borja was convener and host of the International Workshop on Multiscale and Multiphysics Processes at Stanford University in June, 2010. The workshop highlighted the diverse and complex processes encountered in geomechanics in terms of scale (from nanometer to kilometer) and scientific scope. Topics included coupled physics phenomena such as thermo-poro-mechanical processes, chemical species reactivity and transport, liquefaction and solidification of sediments, strain localization, double porosity continua, frictional faulting, and more. Contributions were also invited on the development of multiscale numerical techniques as well as laboratory and field investigation methods supporting numerical techniques. Proceedings of the workshop will be published by Springer Verlag, Springer Series in Geomechanics and Geoengineering.

Visit: www.stanford.edu/~borja/iwg

Education Sustainability— SME Task Force

Graduate Student Poster Contest

The Educational Sustainability Task Force of the Society of Mining Engineers (SME) is initiating a Graduate Student Poster Contest to be held at the 2011 SME Annual Meeting in Denver, Colorado. The Contest will be open to any SME



student member who is currently enrolled in a minerals-related graduate program. Abstracts should be e-mailed no later than December 1, 2010 to Dr. Rick Sweigard at rsweigard@engr.uky.edu. They should include all author names, complete contact information, the school they attend, title and abstract itself not more than 250 words, name of faculty advisor, and the authors' disciplines.

Visit: www.smenet.org/page/uploads/files/GraduateStudentPosterContest.pdf



NETL Carbon Sequestration Newsletter

The National Energy and Technology Laboratory (NETL) issues and maintains an excellent newsletter to provide information on recent activities and publications related to carbon sequestration. It covers domestic, international, public sector, and private sector news. For example, last August the newsletter reported the selection of 15 projects to develop technologies aimed at storing carbon dioxide (CO₂) in geologic formations. The selections will receive \$21.3 million over three years. A science section in the newsletter lists recently published journal articles. Announcements identify funding opportunities and the schedules of conferences including new funding for advanced geothermal systems and the date of a Water/Energy Symposium.

Visit: listserv.netl.doe.gov/mailman/listinfo/sequestration

Programs & Institutes

UNGI—continued

UNGI is an umbrella organization focusing and building on the unconventional natural gas research studies and expertise at Colorado School of Mines. It is a "Center of Excellence" focused on tight gas, shale gas, coal bed methane, hydrates, and deep gas. Collaborations have been established with oil-shale, heavy-oil-sand and heavy-oil-carbonates research centers at Mines plus a number of engineering and earth sciences departments. The Institute acts as a bonding organization to strengthen existing research programs and showcase the interdisciplinary research work that is being performed in the building of additional infrastructure from a personnel and equipment standpoint, and participate in large projects. Active industry membership and involvement is ongoing and encouraged to aid quick transfer of new discoveries to field engineering applications. It is anticipated that UNGI will play a key role as an information clearinghouse for government agencies and the public in the area of unconventional resource exploration and development.

UNGI held its first workshop at the Colorado School of Mines on October 21, 2010. The title of the workshop was *Technical and Economic Challenges in Commercial Development of Unconventional Gas Reservoirs*.

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Visit: ungi.mines.edu



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In OTHER News

Geoscience Research in Office of Basic Energy Sciences (OBES)

Geoscience activities in OBES, Department of Energy, contribute to the solutions of Earth Sciences-related problems in multiple DOE mission areas by providing a foundation of scientific understanding. Examples of these applications include: the potential for geophysical imaging, geothermal energy production, and coupled hydrologic-thermal-mechanical-reactive transport modeling to predict geologic repository performance. In the near term, geosciences research continues its basic activities including fundamental rock physics and fluid flow. In the mid-term, the activity initiates new research efforts on imaging earth processes with attention to improved small scale imaging and large-scale imaging. In the longer term, Geosciences activities will link analytical capabilities with computational capabilities at the nano-, micro-, and macro-scales to provide understanding of processes occurring at natural time and length scales.

Ongoing Geosciences work in OBES is summarized in the *Geosciences Summary Book 2009* by participating organization. Examples include research on high-temperature rock constitutive behavior (p.183); porous geomaterials: micro processes and macroscopic behavior (p.198); coupling between deformation and fluid diffusion (p.210); faulting including non-planar faulting; also heterogeneity, permeability, and elastic rock properties (pp. 225-232).

Visit: http://www.science.doe.gov/bes/archives/summaries/Geosciences_Summary_Book_FY2009.pdf
http://www.science.doe.gov/bes/reports/files/GEO_rpt.pdf



Workshops & Conferences

[Geological Society of America \(GSA\) Annual Meeting](#)
[October 31 - November 3, 2010, Denver, CO](#)

Papers are presented in 30 divisions including Engineering Geology, Environmental Geosciences, Geology and Society, Geophysics, Structural Geology and Tectonics, and Geosciences and Education.

[American Geophysical Union, 2010 Fall Meeting](#)
[December 13-17, 2010 San Francisco, CA](#)

The Frontier Lecture at this meeting will be *Society's Growing Vulnerability to Natural Hazards and Implications for Geophysics Research* presented by Julia Slingo DSc, OBE, Chief Scientist, United Kingdom Met Office.

[SME Annual Meeting](#)
[February 27 - March 2, 2011 Denver, CO](#)

[12th ISRM International Congress on Rock Mechanics and 50th Anniversary Celebration of ISRM](#)
[October 16-21, 2011 Beijing, China](#)

Currently, four workshops are proposed for the days preceding the technical programs—on rock bursts, geophysics, nuclear waste, and underground research laboratories (URL). Abstract submission deadline for US residents is October 22, 2010. Abstracts are limited to 1 page, including figures and up to 500 words. ARMA will notify authors of acceptance by 30 November 2010.