THE HISTORY OF ARMA: 1994-2024

Peter Smeallie, Executive Director, 1994-2024

ARMA early organizers. Front row from left: Jean-Claude Roegiers, Priscilla Nelson, Bernard Amadei. Back row from left: Stephen Brown, Gregg Scott, Jaak Daemon, Peter Smeallie, Tom Doe, Don Banks, Steve Glaser.

This history of ARMA is dedicated to Hill Montague, who helped with all aspects of the rock mechanics symposia from 2009 through 2024. His technical knowledge was only surpassed by his delightful temperament. Hill died soon after the 2024 symposium. I received over 200 notes of condolence from ARMA members. He was also my brother-in-law and a dear friend. –P. Smeallie

Hill on his perch at the Library of Congress, his full-time employer.
Photo: P. Smeallie

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CHAPTER ONE: THE BEGINNING 1994-2004

Background

The American Rock Mechanics Association (ARMA) did not emerge from a vacuum. Like other professional organizations, such as the American Geophysical Union, it was preceded by a standing committee at the U.S. National Academy of Sciences (now the National Academies of Sciences, Engineering, and Medicine). In the 1950's, the nascent field of rock mechanics was primarily centered in Europe in response to disasters such as the terrible Malpasset Dam failure in southern France in 1959. The U.S. wasn't far behind.

The First Symposium on Rock Mechanics was held at the Colorado School of Mines in April 1956. According to Charles Fairhurst, who attended, "it was the first time an interdisciplinary group of engineers and scientists met in the United States to discuss the special features of engineering in rock *in situ*."[1]

In 1964, the Academy took note and established an ad hoc Committee on Rock Mechanics to conduct a study on the research needs for rock mechanics. The committee concluded that a permanent committee on rock mechanics should be established leading in 1967 to the formation of the U.S. National Committee for Rock Mechanics (USNC/RM).[2] U.S. National Committees at the Academy exist to represent the U.S. scientific/engineering communities in international unions. In the case of the USNC/RM, the committee represented the U.S. as the adherent to the recently formed International Society for Rock Mechanics (ISRM).

However, the USNC/RM went beyond international representation to correspond to the mission of the host National Academy of Sciences which is to advise the federal government of matters of science and technology. The original stated purposes of the USNC/RM were:

- To serve the national interests of the United States by recommending to government, industry, and the universities actions for advancing the science and engineering of rock mechanics;
- To provide coordination and promote cooperation among the technical and professional societies and organizations involved in rock mechanics; and
- To affect appropriate participation in all activities of the ISRM.[3]

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[1] Fairhurst, C. Sixty Years of Rock Mechanics 1956-2016. Invited Contribution, Hydraulic Fracturing Journal, Issue 13, 2017. This paper summarizes rock mechanics activities in the U.S. prior to the founding of ARMA.

[2] Brady. B. The U.S. National Committee for Rock Mechanics: History, Purpose and Method of Operation. Unpublished paper. ARMA archives.

[3] National Academy of Sciences. U.S. National Committee for Rock Mechanics. Unpublished paper. ARMA archives.

The USNC/RM operated within the confines of the engineering division of the Academy's operating arm, the National Research Council. It was an active committee issuing annual reports on the state of the art such as the report in 1993, *Stability, Failure, and Measurements of Boreholes and Other Circular Openings*.[4]

The USNC/RM organized the annual rock mechanics symposia, maintained the U.S. adherence to the ISRM, and represented the U.S. rock mechanics community in the scientific and engineering world. It successfully operated under the guidance of the Academy's Geotechnical Board until 1994 when changes at the Academy resulted in some important changes for the USNC/RM.

The Geotechnical Board was disestablished with its mandate transferred to the Board on Infrastructure and the Constructed Environment. The USNC/RM was then transferred to the Board on Earth Sciences and Resources (BESR). The USNC/RM operated until 2001 when it was subsumed by a new committee under BESR named the Committee on Geotechnical and Geological Engineering (COGGE).

It was almost meant not to be

The annual US Rock Mechanics / Geomechanics Symposium, a staple and integral part of ARMA, was almost curtailed 34 years ago. At the time, the symposium was run by the U.S. National Committee for Rock Mechanics, a unit of the National Academy of Sciences. I was a recent hire to direct the Geotechnical Board under which the committee operated. I was hired in May 1990 and was directed by my boss to go out to the Colorado School of Mines in June and shut down the symposium series. The given reason was purported to be certain participants claiming they were members of the Academy of Sciences by virtue of attending. So off I went to Golden and was met on the college quad by Tom Doe, who introduced himself and proceeded to give me a tutorial on the importance of the symposium to the field of rock mechanics. He explained the critical role of rock mechanics on issues of national concern such as infrastructure, resource recovery, and national security. I took notes, attended the three-day event, then went back to Washington and convinced my boss to allow the symposium to continue.

So, the School of Mines was the site of my first symposium in 1990 and the location of my last in 2024. It is fitting and rewarding that the largest and most successful annual symposium in June 2024 was at the Colorado School of Mines in Golden. –P. Smeallie

The changes at the Academy rattled the U.S. rock mechanics community such that in 1994:

> A group of leaders in the U.S. rock mechanics community formed an ad hoc committee to consider how to maintain a national organization for U.S. rock mechanics, including representation on ISRM. Convinced of the importance of rock mechanics as a discipline and the need for a national organization in the U.S….it was decided to form a

[4] U.S. National Committee for Rock Mechanics. Stability, Failure, and Measurements of Boreholes and Other Circular Openings. Washington, DC: The National Academies Press, 1993. https://doi.org/10.17226/9177.

professional association, the American Rock Mechanics Association (ARMA) with Peter [Smeallie] as Executive Director.[5]

The Founding of ARMA

Soon after the 1994 rock mechanics symposium (the first North American Rock Mechanics Symposium) in Austin, Texas, a group of rock mechanics' leaders convened a special meeting in Boulder, Colorado at the invitation of Bernard Amadei and joined by Steve Brown, Jaak Daemen, Tom Doe, Steve Glaser, Jane Long, Jim Monsees, Priscilla Nelson, Gregg Scott and Peter Smeallie. The stated objective was to "investigate the feasibility of having the U.S. rock mechanics community organized separate from the NRC [National Research Council, operating arm of the National Academy of Sciences]."[6]

A walk in the woods

In the early 1990's, the U.S. National Committee for Rock Mechanics, a unit of the National Academy of Sciences, was being criticized by in-house officials for producing reports that benefitted the community, but did not have significant impact beyond this. The committee did not agree, and meetings were tense as Academy officials detailed complaints. As staff director of the committee, I was caught between the two schools of thought. At one particularly tense session at the Academy's center in Irvine, Calif., I needed to leave the meeting a get some refreshing Pacific Ocean air. I was joined by committee member, Bernard Amadei. We went for a walk under the eucalyptus and redwood trees on the University of California Irvine campus. Bernard suggested we think of what would be best for the rock mechanics community and not confine ourselves to the national committee. I had just been in Washington, DC and noted the new headquarters building for AGU near DuPont Circle had the logo above the door for all to see. Shouldn't we be looking to follow AGU's lead as the organization was also a spin-off from the Academy? We tried to visualize our own sign on a headquarter building. And we knew then that breaking away was in the cards. –P. Smeallie

In an extraordinary work session, the group essentially laid out the foundation of ARMA including agreeing on the name, the American Rock Mechanics Association. The limitations of having the community represented by the USNC/RM were made apparent. As a committee of the Academy, the primary purpose of the USNC/RM was to advise the government rather than to serve the needs of the rock mechanics community. Committee membership was through appointment by the Academy. Individual memberships were not possible. Traditional activities of a professional association such as education and training, publication, committee formation, and adoption of bylaws were precluded by association with the Academy.

The group went on to articulate how might an "ideal" organization be configured. The organization:

- Should be open to membership;

[5] Fairhurst, op. cit.
[6] First Organizational Meeting of the American Rock Mechanics Association (ARMA): Summary of Discussion, 8 July 1994. Unpublished document. ARMA archives.

- Should seek liaison with collegiate societies and associations;
- Should elect officers and a board of directors'
- Should appoint an executive director;
- Should work to assume U.S. adherence to ISRM; and
- Should work to assume lead organization to run the US Rock Mechanics Symposium.

As per usual with a new venture, discussion turned to funding. In addition to eventual membership and potential contracts and grants, the need for an immediate infusion of funds was apparent. Just to register as a business and apply for non-profit status would take considerable support. A group of ARMA enthusiasts stepped forward as Founders and contributed enough cash to get the organization founded.[7]

The question of professional society or association came up during the meeting. A society was seen as focused more on the interests of its members in terms of certification and achievement whereas an association would welcome anyone interested in rock mechanics to join and would focus more on the interests of the community. In addition, the unique aspect of ARMA is its appeal to professionals from the petroleum, mining and civil engineering fields. Each of these fields have long-standing professional societies to which members of ARMA belonged. It was decided to seek incorporation as a non-profit association.

In parallel, the ARMA board set up the ARMA Foundation, a 501(c)(3) non-profit organization dedicated to the public education of rock mechanics. The Foundation provided an avenue for individuals and corporation to make tax deductible charitable donations. It also allowed certain government agencies restricted to making grants to C3 organizations.

Getting Underway

Between the initial organizational meeting in July 1994 and the first meeting of the nascent Board of Directors again in Boulder in January 1995, a flurry of activity took place. Articles of incorporation for ARMA were filed with the Commonwealth of Virginia, and ARMA was officially incorporated as a non-stock corporation in Virginia on 18 November 1994. ARMA retained Joseph Bowman as the attorney-of-record

[7] ARMA Founders: Abulazeez Abdulraheem, Omar Almisned, Bernard Amadei, Don Banks, Wesley Bender, Paul Branagan, Chris Breeds, Pierre Choquet, N.D. Edward Cording, N.D. Cristescu, Jaak Daemen, Tom Doe, Kittitep Fuenkajorn, Leonard Germanovich, Steve Glaser, Sid Green, Phillip Halleck, Roger Ilsley, Anthony Ingraffea, Peter Kolitsch, Robert Kranz, Kumar Kulatilake, Stephen Laubach, Wunan Lin, Priscilla Nelson, David Poppler, Dick Robbins, Eugene Robinson, Jean-Claude Roegiers, John Rowley, Thomas Ryan, Richard Schultz, Greg Scott, Peter Smeallie, Ron Steiger, William Thumm, Ed Van Eeckhout, Wolfgang Wawersik, Musharraf Zaman, Ziqiong Zheng, Karl Zipf, MTS Systems Corp.

and registered agent for ARMA. A corporate book was opened. Financial and membership analyses were developed and discussed by selected leaders via telephone conference calls.

By then, the new World Wide Web had an early subscriber, as “RockNet” was established as the ARMA home page within the Mosaic program on the internet. Initial contacts were made with corresponding professional societies to test establishing liaison arrangements. Two press releases were issued, and a descriptive piece on ARMA was written for inclusion in the proceedings of the 35th U.S. Rock Mechanics Symposium to be held in Reno, Nevada in June 1995.[8]

At the January 1995 meeting, the board agreed to the following:

- Adoption of bylaws;
- Adoption of a constitution;
- Approved Priscilla Nelson as President with Charles Fairhurst as President-elect;
- Approved Jean-Claude Roegiers as Treasurer;
- Approved Bernard Amadei as Secretary;
- Approved Peter Smeallie as Executive Director; and
- Approved membership rates and categories.[9]

Four standing committees were established: Association Liaison Committee, Finance Committee, Meetings and Conferences Committee and Nominations Committee. Each committee was critical in the formative years of ARMA.

Introduction to the Community

One of the key challenges for the young organization was to introduce itself to the U.S. rock mechanics community. A newsletter was issued that announced the formation of the association. There was some pushback among professionals who did not want to lose the status of being connected to the National Academy of Sciences. But when informed that the Academy was less than enthusiastic about the USNC/RM, especially the committee’s inability to allow individual membership, the opposition subsided.

In June 1995, at the 35th US Rock Mechanics Symposium in Reno, Nevada, Priscilla Nelson, as President of ARMA, and Jane Long, as Chair of the US National Committee

[8]Minutes of First Board Meeting of the American Rock Mechanics Association, 26-27 January 1995. Boulder, Colorado. Unpublished document. ARMA archives.

[9] In addition to the elected ARMA officers and staff, other newly installed board members (who were attending the meeting) were: Don Banks, Steve Brown, Jaak Daemen, Tom Doe, Steve Glaser, Gregg Scott, and Larry Myer (for Jane Long). Jim Monsees was unable to attend.

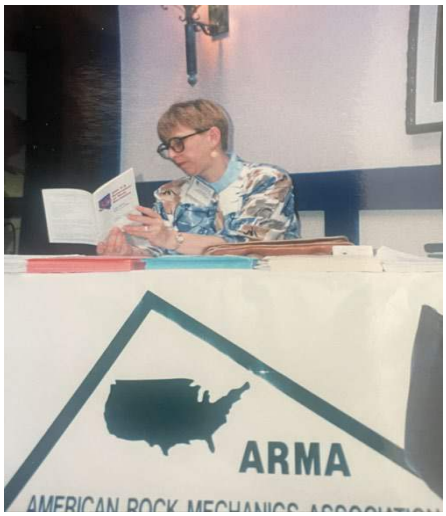
for Rock Mechanics, issued a joint communique to the rock mechanics community.[10] It read, in part:

> How should these two organizations relate to each other and where are we going in the future? The NRC [National Research Council] has always had the primary mission to provide special studies that address technical, and especially policy, needs for the government, and the U.S. National Committee for Rock Mechanics has actively and successfully pursued such studies. In addition, USNC/RM has sponsored the Rock Mechanics Symposium, collected membership dues for ISRM, and managed the rock mechanics awards.
>
> ARMA is a private organization owned by its members to serve its members. Its interests are to promote and act as an advocate for the profession, to develop communications links for interactions with other societies and for enhanced resource and educational services, and to generally improve the states of the art and practice. As a private organization, ARMA can carry out many activities that cannot be done at the NRC.
>
> In fact, the charters of ARMA and USNC/RM are in many respects quite complementary. It is possible that ARMA could begin to take over many of the professional activities currently done by USNC/RM, as well as adding professional activities never done by anyone for rock mechanics. As chairman of USNC/RM and President of ARMA, we see any shifting of responsibilities as an evolutionary process. For example, we want to avoid the confusion of having both organizations collect dues. In the last meeting of USNC/RM, it was decided to delegate collection of next year's ISRM dues to ARMA because ARMA can perform this function more efficiently. We also expect that Columbia University and ARMA will jointly propose to run the 1997 Rock Mechanics Symposium.
>
> Differences of opinion exist about what USNC/RM and ARMA should be and do. We are committed to continuing the discussion of the roles of ARMA and USNC/RM, and to finding other logical and efficient ways to work together. It is our view that the process will lead to a USNC/RM that acts more effectively as a policy/technical resource for the government and that ARMA will take over some of the responsibilities previously taken by USNC/RM, add others, and look to the USNC/RM to establish vision with the authority derived from its assembled expertise and the stature of the National Academies of Sciences and Engineering.
>
> The evolution of the two organizations, USNC/RM and ARMA, will continue as each expands into its responsibilities. We welcome input from any and all of you. We are certain that together we will be able to ensure an increasingly bright future for rock mechanics and rock engineering in the United States and abroad.
>
> As President of ARMA and Chairman of USNC/RM, we must continue to invest in the success of both organizations. We are committed to this process because we see that it is in the interest of you, the rock mechanics community.
>
> Very Truly Yours,
>
> Priscilla P. Nelson
> President, ARMA
>
> Jane C. S. Long
> Chair, USNC/RM

[10] Nelson, P. and Long, J. Joint Communique to the Rock Mechanics Community, 5 June 1995. Unpublished document. ARMA archives.

The USNC/RM continued in existence for another half-dozen years when it was disestablished and merged into the Committee on Geological and Geotechnical Engineering (COGGE) in 2001. The committee's scope was expanded beyond rock mechanics to include all engineering applications of earth sciences.[11]

ARMA's introduction to the community really found legitimacy at the 35th Rock Mechanics Symposium in June 1995. A meeting of the new ARMA board of directors was convened at the symposium.



ARMA President Priscilla Nelson soliciting members in Reno at the 1995 Rock Mechanics Symposium. Photo by P. Smeallie

A central proposal concerning the U.S. representation in ISRM was developed to be presented to the USNC/RM. The approved motion had five parts:

1. ARMA to be official adherent to ISRM and maintain ISRM individual membership.
2. The NRC to transmit ISRM membership funds for 1995 to ARMA.
3. That ARMA receive future ISRM membership funds directly.
4. That ARMA assume responsibility for distribution of ISRM information.
5. That ARMA will return with a new proposal for ARMA management of ISRM interactions for 1996 and beyond.

In January 1996, the USNC/RM turned over the membership function of ISRM to ARMA and, soon thereafter, the adherence of the United States from the National Academy of Sciences to ARMA.

ARMA had its first official role in the US Rock Mechanics Symposium, held in June 1997 at Columbia University in New York City. ARMA partnered with Columbia to sponsor the exhibit floor and to cooperate on program and other elements.

[11] Committee on Geological and Geotechnical Engineering. https://www.nationalacademies.org/our-work/committee-on-geological-and-geotechnical-engineering.

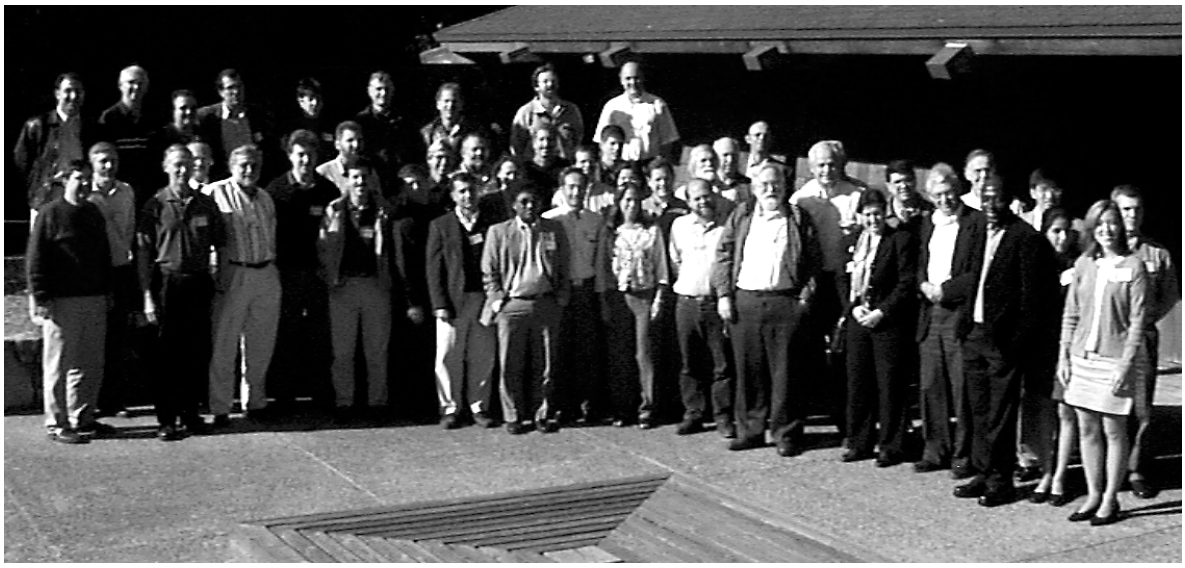
Asilomar

As ARMA began to get its feet on the ground, and folks began asking, what are the issues needing to be addressed, ARMA sponsored a forum on New Directions for U.S. Rock Mechanics, held at the Asilomar Conference Center in Pacific Grove, California, 18-20 October 1998.[12] The goal of the forum, supported by a grant from the National Science Foundation, was to focus on 1) a strategic vision for the future of rock mechanics in the United States, 2) the identification and delineation of critical issues facing the rock mechanics community, 3) the role of research in addressing these issues, and 4) critical areas of research in each of the topic areas addressed at the forum, including examples of specific research initiatives.

Participants believed that fundamental improvements of in-situ characterization were of primary importance. Obtaining valid information from large volumes of rock is essential to improve the practice of rock mechanics. Research and application of remote imaging and nondestructive evaluation of the subsurface should provide a source of economically feasible data from extremely large volumes of rock. Data uncertainty was another issue needing attention. Forum participants recommended conducting research on stochastic techniques to allow uncertainty to be dealt with in a rational manner.

Asilomar Conference Center, Pacific Grove, California

[12] This material is drawn from: Glaser, S.D. and Doolin, D.M. New Directions in Rock Mechanics: A Forum Sponsored by the American Rock Mechanics Association. Report to National Science Foundation, CMS-9816724, 31 December 1999. International Journal of Rock Mechanics and Mining Sciences, 37(4), 683-698.



Attendees at the Asilomar conference. Photo by P. Smeallie

Over the next 25 years, the word “Asilomar” was used in ARMA conversations about the future of U.S. rock mechanics. It painted a challenging picture for ARMA, summarized in the report from the forum:

> The practice of rock mechanics and rock mechanics research in the United States stands today at a crossroads. The research climate of the previous 30 years is changing rapidly, a result of changes in corporate, governmental and academic roles. Although certain aspects of the discussion at Asilomar highlighted pessimism with respect to today’s undeniably more challenging research climate, the formal recognition that rock mechanics must adapt to survive may be the single most important positive result of the meeting. The interdisciplinary nature of rock mechanics problems and the training required to solve such problems are valuable to the scientific, engineering and social communities at large. Survival of rock mechanics in part means promoting rock mechanics along interdisciplinary lines. To this end, the rock mechanics community should take a cue from the apparent difficulty of the rock mechanics’ endeavor: rock is a difficult and confounding material. Maintaining and growing the U.S. rock mechanics community built by today’s retiring pioneers may prove no less difficult and confounding; there is no silver bullet.[13]

Securing the Annual Symposium

The spirit of cooperation between ARMA and the USNC/RM continued in 1997. Following a joint meeting early in the year, ARMA prepared a proposal to transfer the ownership of the US Rock Mechanics Symposium to ARMA from the USNC/RM. A joint

[13] Ibid. Page 29.

letter from Jane Long, Chair of the USNC/RM and Charles Fairhurst, President of ARMA, in June 1997 announced the transfer to the community:

> The U.S. National Committee for Rock Mechanics (USNC/RM) and the American Rock Mechanics Association (ARMA) are pleased to announce a transfer of responsibility for the US Rock Mechanics Symposia. Effective with the 37th US Rock Mechanics Symposium in 1999 [in Vail, Colorado], responsibility for the symposia will shift from the USNC/RM to ARMA.
>
> Rock mechanics problems represent critical or limiting factors in major areas of national concern, such as energy and mineral resources, infrastructure and excavation, underground storage and waste disposal, and siting of critical facilities. The complementary relationship between the USNC/RM and ARMA will strengthen both organizations and help promote a renaissance in rock mechanics in the United States.[14]

Early in 1998, the USNC/RM also transferred representation of the U.S. on the tri-lateral agreement with Canada and Mexico to run the bi-annual North American Rock Mechanics Symposium (see accompanying sidebar).

Vail Rocks 1999

Planning for the 1999 first ARMA-run US Rock Mechanics Symposium began soon after USNC/RM transferred responsibility to ARMA. Given the lack of experience in running large meetings, ARMA contracted with Expomasters, a meeting management firm in Denver. The 1999 symposium was chaired by Bernard Amadei, professor of civil engineering at the University of Colorado in Boulder.

The symposium was held in early June 1999 in Vail, Colorado. Attended by 330 participants, the symposium featured over 200 presentations focusing on the contributions of rock mechanics and rock engineering to the civil, mining, and petroleum industries.

United States, Canada, Mexico Cooperation

Representatives from the three rock mechanics national societies in North American met in the Fall of 1992 in Austin, Texas, to discuss entering into an agreement to establish the North American Rock Mechanics Symposium (NARMS), a tri-lateral program to rotate a rock mechanics symposium every second year to either the U.S, Canada, or Mexico. Representative from the USNC/RM, the Canadian Rock Mechanics Association (CARMA), and the Sociedad Mexicana de Mecanica de Rocas (SMMR) reached agreement to hold at least three NARMS, the first in Austin in 1994, the second in Montreal in 1996, and the third in Cancun in 1998. A second round was held in Seattle in 2000 and Toronto in 2002. However, SMMR was unable to successfully plan a symposium for 2004. (ARMA then held a US Rock Mechanics Symposium in Houston in 2004.)

Canada and the United States through CARMA and ARMA then implemented a bi-lateral agreement to hold joint meetings every other year. The first Canada-U.S. Rock Mechanics Symposium was held in Vancouver, Canada, in 2007; the second joint meeting was held in Asheville, North Carolina, in 2009. The NARMS and the joint Canada-U.S. agreement did not operate after 2009.

[14] Fairhurst, C. and Long, J. Open letter to the rock mechanics community, 29 June 1997. Unpublished document. ARMA archives.

Presentations focused on case studies in geophysics, mineral and fluid extraction, construction, field testing and instrumentation, laboratory testing, computer modeling, underground waste and nuclear waste disposal, measurement of stresses, and rock deformation. By all measures Vail Rocks ’99 set a high bar for future ARMA meetings.

Prior to the start of Vail Rocks, ARMA organized a workshop entitled “Industry-Government-University Partnership in Rock Mechanics and Rock Engineering: Challenges and Opportunities.”[15] The objectives of the workshop were to develop a consensus among industry, government and university participants on the future course of education and research in rock mechanics and rock engineering and to prepare an action plan with recommendations for future collaborative work. From the workshop report:

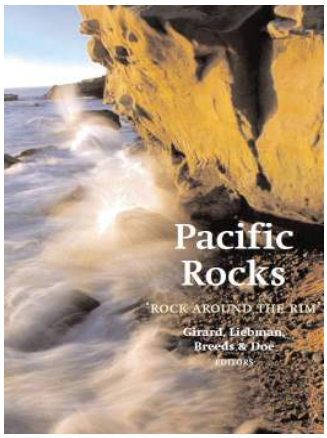
> The survival of rock mechanics means promoting rock mechanics along interdisciplinary lines, exploring new global markets, breaking the traditional internal divisions, and developing collaborative partnerships. The workshop participants strongly believed that partnerships between academia, industry and government agencies can provide win-win benefits to all parties involved and to society at large. More specifically, (1) Partnerships provide ways of integrating research and education into the real world of design and construction, (2) Industry/government partners benefit from faculty and student expertise, access to university laboratory, computing and library resources. In return, university partners benefit from the experience and expertise of industry/government partners with management, marketing, design, installation, and performance monitoring, (3) Partnerships provide new venues and opportunities for researchers and educators to become more aware of industry’s real problems, and (4) Partnerships allow educators and students to be exposed to real case studies, to gain appreciation for the importance of applying fundamentals to solve practical problems, and ultimately to gain first hand practical experience through research, sponsorship or internships. As a result, students develop better technical and communication skills, an enhanced learning experience and are better prepared to enter the workforce upon graduation.

Logo for Vail Rocks ’99 graced specialty beer bottles

[15] Amadei, B., Smeallie, P., Heuze. F. Workshop on Industry-Government-University Partnership in Rock Mechanics and Rock Engineering: Challenges and Opportunities. A report by ARMA to the National Science Foundation. Contract No. CMS-9819033, 30 September 2000.

Pacific Rocks 2000

Outreach to countries outside the U.S. began in earnest in 2000 with a Seattle location for the Fourth North American Rock Mechanics Symposium (NARMS). Called Pacific Rocks 2000, the Seattle conference attracted 33 percent of its 351 attendees from outside the U.S., including 13 percent from Australia and Pacific Rim countries in Asia, beginning a new constant for ARMA's activities: significant participation from outside the United States. The NARMS agreement solidified U.S./Canada interaction with lesser but important interaction with Mexico. Tom Doe from the Seattle office of Golder Associates chaired the conference.



Proceedings book cover for 2000 symposium

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DC Rocks 2001

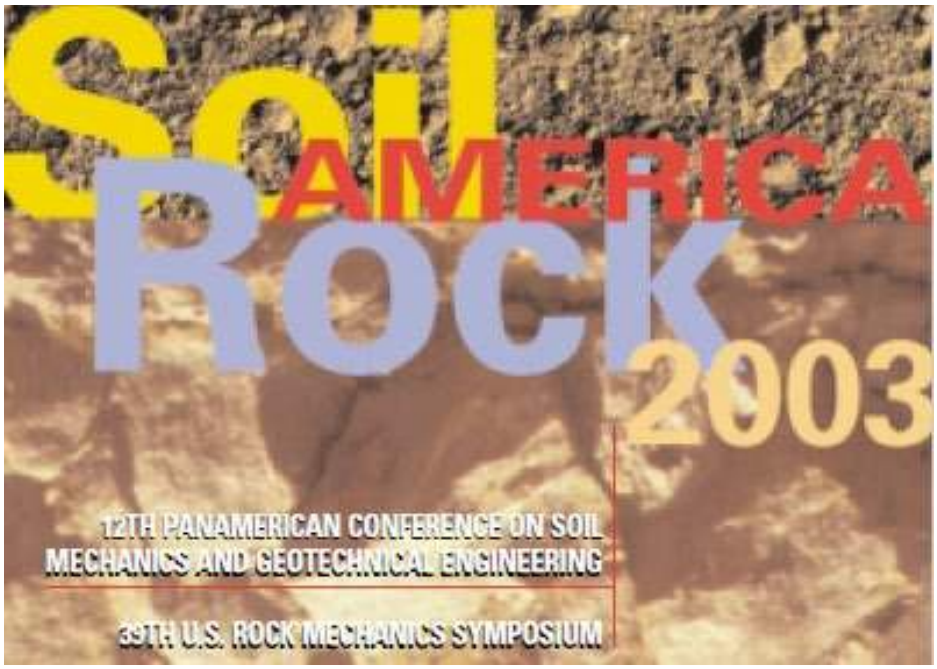
DC Rocks, the 38th US Rock Mechanics Symposium, was held in Washington, DC, in July 2001. Three hundred and seventy-five participants attended the symposium, more than one-third of whom were from outside the U.S. A general ARMA meeting was held to ask "*what would you like ARMA to do for you?*" This open forum provided an opportunity for current and prospective ARMA members alike to contribute their ideas in defining the future direction of the organization. An overarching theme was to improve communication among members and between members and ARMA. The banquet speaker was Jim Garvin, the chief scientist for NASA's Mars Exploration Program, who described the "evolving face of Mars" in terms of rock mechanics' opportunities. Derek Elsworth from Penn State University was chair of the meeting.

DC Rocks 2001 participants gather for Independence Day fireworks at the base of the Washington Monument in the rain. Photo by P. Smeallie

Soil and Rock America 2003

Soil and Rock America 2003 was held in June 2003 on the MIT campus in Cambridge, Massachusetts.[16] The meeting was a successful collaboration between the 12th Panamerican Conference on Soil Mechanics and Geotechnical Engineering, the Annual Geo-Institute Meeting of the American Society of Civil Engineers and ARMA's 39th US Rock Mechanics Symposium. This collaboration was a first and unique endeavor. It would follow that the theme would be integration, combining soil and rock engineering in the conference technical program. The conference also fostered international integration, combining the Panamerican Conference with the two major U.S. conferences in these fields. Six hundred and fifty-five participants attended; 402 papers were published in the proceedings. Herbert Einstein was a co-chair of the event and the point of contact for ARMA.

[16] This section drawn from: Einstein, H., Culligan, P., Whittle, A. Soil and Rock America: Final Report, 16 July 2004. Unpublished document. ARMA archives.



The 39th symposium joined the 12th Panamerican conference on soil mechanics.

Gulf Rocks 2004

The sixth NARMS meeting was to have been held in Mexico, but circumstances prevented the Mexican society from organizing the NARMS meeting. ARMA then planned and conducted the NARMS as Gulf Rocks '04. The conference was held in the multi-cultural city of Houston, Texas, having proximity and close ties to Mexico. Houston was and is a major hub for the energy industry. The prospectus for symposium read, in part:

> The meeting will envelop an integration of multidisciplinary topics dealing with the role of rock mechanics in security and risk management. Assurance of the integrity of structure and space used by humans brings to focus the current resurgence of the importance of soft rocks and shallow horizons in both the energy and defense areas as well as for mineral extraction and underground construction. Diversification of our Continent's energy supply balance has prompted a serious look into offshore hydrates and shallow heavy oils, a tremendous Canadian resource. Deeper formations, whether for storage, mining, or hydro-carbon extraction, bring new issues with higher temperatures and pressure. Finally, the proliferation of Knowledge management tools leads to integration across disciplines and boundaries.[17]

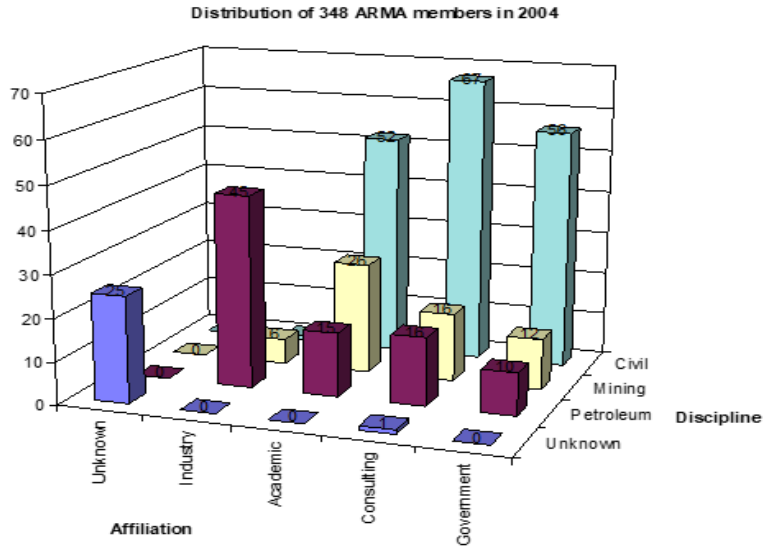
Two hundred and twenty participants attended with a diversity of countries represented. Ahmed Abou Sayed chaired the symposium.

[17]Gulf Rocks '04 Program Brochure. ARMA archives.

Logo for Gulf Rocks 2004

Summary of 1994-2004

The first decade of ARMA's existence was primarily organizational, given the disperse community of rock mechanics professionals. By the close of 2004, membership in ARMA had increased to 348 members. The largest group in the association was represented by civil engineers from the consulting field. This would change in the following years as the petroleum engineering field moved into unconventional geomechanics. Finances were a constant challenge to the association, and the board made a decision at the close of the first decade to remove the external management contracts for the annual symposium and to manage the event in-house. This would significantly change the prospects for ARMA as it entered its second decade.



Civil engineering was dominant profession in 2004.

CHAPTER TWO: THE SECOND DECADE 2005-2014

Assessment of the First Decade and Plans for the Second

The first order of business for the ARMA Board of Directors in February 2005 was to look back on ARMA's first decade and develop a vision for the next decade. Over its first decade, ARMA had grown to an organization of roughly 400 individuals, a loyal membership base, a good percentage of whom regularly attended the annual symposium. ARMA's finances, however, had never been flush, even if all its bills were always paid. Each of the four annual symposia, for which ARMA retained financial oversight, had returned only a small surplus.

Most ARMA members affiliate with other professional societies (ASCE, SPE, SME, AEG, etc.). As an association organized around a technical scientific/engineering field, most members' primary affiliation is the professional society to which they belong. This was not seen as an impediment to ARMA's growth; rather, its emphasis on the multi-disciplinary aspects of rock mechanics was (and is) seen as ARMA's most attractive feature.

The ARMA Board met in Salt Lake City, Utah, early in 2005. At this seminal meeting, much of the session was dedicated to generating ideas for ARMA's future. ARMA's goal is to continue to be the focal point for rock mechanics professionals and their activities. Its mission, as outline by the board, is to:

1. provide outstanding service to rock mechanics professionals through its annual conference, newsletter, digital library and other information;
2. provide services and advice to members, government, and the public on all rock mechanics topics; and
3. recognize outstanding professional accomplishments in rock mechanics.[18]

Ideas generated at this meeting laid the foundation for ARMA's continuing maturity. Recognizing achievement for distinguished members via a Fellows program was developed. ARMA should take advantage of recent advances in digital technology to create a digital library containing all past rock mechanics proceedings. Establishing technical committees for members to join and coalesce would enhance membership. Finally, the board agreed to continue to expand the international appeal of its annual symposium by working to improve the scope and quality of the papers and presentations.

A major decision was made soon after concerning ARMA revenues. As noted earlier, ARMA retained an event management firm, Expomasters, to run the annual symposium. Expomasters, run by Mark and Lynn Cramer, did excellent work and were largely

[18] Minutes of Board Meeting of the American Rock Mechanics Association, 26 February 2005. Salt Lake City, Utah. Unpublished document. ARMA archives.

embraced by the ARMA community. However, the yearly management fee prevented ARMA from realizing any significant surplus. Therefore, starting with the 2005 symposium in Alaska, ARMA staff would run all aspects of the program. The primary source of income for ARMA is the annual symposium. Membership fees provide a much lesser amount.

Alaska Rocks 2005

The 40th US Rock Mechanics Symposium was held in June 2005, at the University of Alaska, Anchorage. The symposium was conducted in cooperation with the Canadian Rock Mechanics Association. The theme of Alaska Rocks 2005 was *Rock Mechanics for Energy, Mineral and Infrastructure Development in the Northern Regions*. The symposium was attended by 240 persons from 40 countries; 183 papers were presented with four keynote presentations. Four short courses were offered. Proceedings were distributed on Compact Discs (CDs) for the first time with some participants wanting printed hard copy, but all participants glad not to have to carry the multiple volumes home. The symposium featured an award ceremony where Professor Richard Goodman received the Outstanding Achievement Award for his extensive contributions to the field.

The symposium was organized by faculty members from the University of Alaska, Fairbanks, G. Chen, S. Huang, and W. Zhou, assisted by the Executive Director of ARMA, P. Smeallie.

A Memorable Field Trip

ARMA symposia usually feature both technical tours and field trips (sometimes called special events to avoid confusion). The difference is a technical tour is a visit with technical or substantive value in rock mechanics or a related field while a field trip, often call accompanying persons' tours, is primarily to visit interesting and well-known sites that a visitor or tourist would appreciate. In my 30 years of attending and managing the symposia, one trip stands out: the visit to Prince William Sound in Alaska. The dinner cruise left from Whittier and the ARMA participants viewed the tidewater glaciers of Barry Arm and the waterfalls and inlets of Esther Passage; a spectacular route traveled by few. The trip from Anchorage to Whittier was by motorcoach with a guide pointing out the spectacular landforms visible from the bus. When the bus entered a road tunnel, the guide announced he would take a break for the couple of minutes through the tunnel which engendered a murmur of disagreement from the rock mechanics on board forcing the bus to reduce speed and allow passengers to take photos of the unlined tunnel. –P. Smeallie

A dinner cruise held on Prince William Sound went late into the evening in long summer daylight. Photos: P. Smeallie

Continued Growth

As the decade progressed, ARMA continued to steadily increase membership and revenue. By the end of 2006, ARMA had about 552 members. The international percentage share of membership also increased to about 18 percent in mid-2006. ARMA maintained its position as contact point for governmental agencies seeking solid technical information on rock mechanics.

A special committee was formed to make recommendations regarding the organization of future symposia, particularly, the nature of ARMA and any host university. Led by Sid Green, the committee made a number of recommendations that came to fruition as the years moved on.[19] For example, each of these items has been realized within the three-decade tenure of ARMA:

- Expand the annual symposium to reach an attendance of 600 within two years and 700-800 within four years.
- ARMA should have full managerial and financial responsibility for the symposium. Local organizing and technical committees can be selected by ARMA.
- Obtain 200 full papers and 150 posters per symposium.
- Publish (digital library or hard copy) the proceedings in order to obtain quality papers.
- Hold the symposia at a nice setting, a resort, or a large conference center.
- Excess monies should be put back into developing the symposium.
- The symposia should try new and innovative sessions.
- Emphasize multi-disciplinary and multi-industry nature of ARMA.

One Petro

A significant step forward took place in 2006 when ARMA and SPE signed an agreement for ARMA to join SPE's worldwide digital library, OnePetro.[20] In exchange for royalties, OnePetro would make available for purchase in digital format the entire compendium of US Rock Mechanics Symposium papers from 1956 on. ARMA's job was to secure copyright release for those proceedings held by third parties, which it did for most, but not all proceedings.

Access to OnePetro has expanded to cover other ARMA conferences such as the International Geomechanics Symposium sponsored by ARMA and the Society for Exploration Geophysicists. Revenue from the royalty stream provides a significant portion of ARMA's annual income.

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[19] Green, S. Proposed Arrangements for Future Rock Mechanics Symposium. Submitted to the ARMA Board of Directors, 18 June 2006. Unpublished document. ARMA Archives.

[20] Agreement Between SPE Services Corporation and American Rock Mechanics Association: OnePetro Document Delivery Royalty Agreement. Agreement signed by both parties November 2006. Unpublished document. ARMA archives.

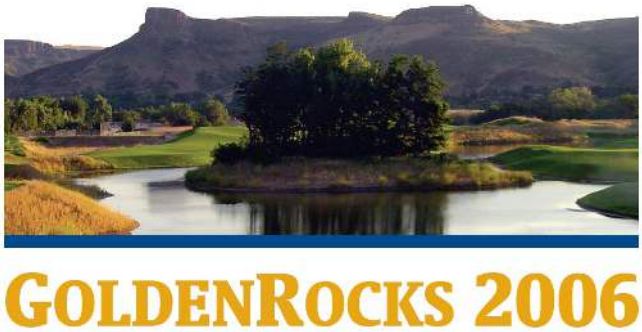
The Story of the ARMA Logo

As ARMA entered its second decade, I determined that the association needed a new logo. The existing logo, in black immediately above, had run its course and was graphically anemic and outdated. The designer, a practicing rock engineer, wrote: "The ARMA logo is designed after a Mohr Circle, which is a plot of stress transformation equations. The shape of the so called "failure envelope", i.e., the stress states when the material will fail (break, fracture, etc.), is characteristic of the material. The ARMA logo suggests an envelope typical of geomaterials such as soils and rocks, i.e., a curve in the tensile stress region that converges into a straight line in the compressive stress region. This follows the shape of the A to the left and the straight line above the R, M, and A to the right. The M and A suggest the Mohr circle, which is under the failure envelope--that means the material has not failed, i.e., the structure is designed well and bears the load it's supposed to bear. The Mohr Circle is a fundamental concept in rock mechanics (also in solid mechanics and engineering mechanics, in general)." --P. Smeallie

GoldenRocks 2006

The 41st US Rock Mechanics Symposium, "GoldenRocks 2006," took place in June 2006, at the Colorado School of Mines in Golden. This was the 50th anniversary of the symposium; the theme of the symposium was "50 years of Rock Mechanics – Landmarks and Future Challenges." The symposium was co-sponsored by the Canadian Rock Mechanics Association.

Three hundred and forty participants attended with 182 papers presented and included in the proceedings. Keynote addresses were delivered by a key group of recognized experts including Evert Hoek, Charles Fairhurst, and Richard Goodman. An innovative workshop on Laser and Photogrammetric Methods for Rock Face Characterization was very popular and was attended by 42 participants. The symposium experimented with a so-called "mini-commercial session" where exhibitors had the opportunity to better describe their products through short presentations held during the coffee breaks. Two exhibitors participated in these sessions, and each drew about 25 participants. The symposium was chaired by Professor Ugur Ozbay from the School of Mines.



In 2007, the symposium was held in Vancouver hosted by the University of British Columbia and CARMA. The ARMA board was concerned that the topics in Canada (at that time) were heavily focused on mining and civil and that the U.S. petroleum sector, now the largest sector in ARMA, was less interested. The board decided to hold the U.S. symposium annually and cease the U.S./Canada joint meeting at the 2009 meeting in Asheville, North Carolina.

ARMA Fellows

At the start of ARMA's second decade, the board entertained discussion on ways to recognize members of the rock mechanics community who have achieved outstanding accomplishments in the field. The board designed a program used by other professional societies, viz., a college of fellows or in ARMA's case, ARMA Fellows.[21]

Accomplishments are demonstrated by work experience, publications, inventions, technology advancements, and mentoring of individuals. Consideration is also given to accomplishments outside of the technical field of rock mechanics including public service, elections and appointments to positions of responsibility, prominent committee functions, executive positions, business development, and charitable functions.

New ARMA Fellows are elected by current Fellows and must be members of ARMA. Fellows meet annually at the symposium, usually over a special dinner. Fellows contribute in numerous ways to ARMA, not the least of which is to attend the annual symposium to network and socialize with younger professionals and students. A formal ARMA Fellows-Future Leaders Mentoring Program allows Fellows to provide advice to pre-selected mentees from ARMA's Future Leaders Program on professional careers and opportunities. Fellows also serve as informal advisors to the board on policy and important issues.

[21] Information on the ARMA Fellows Program including list and biographies of current Fellows can be found on the ARMA website: http://armarocks.org/about/fellows/

The first class of ARMA Fellows at the 2008 Symposium in San Francisco. From left: Chuck Dowding, Herbert Einstein, Charles Fairhurst, Richard Goodman, Sid Green, Bezalel Haimson, Francois Heuze, Jean-Claude Roegiers, Bernard Amadei. Missing: Priscilla Nelson. Photo: P. Smeallie

ARMA Fellows at the annual dinner at the top floor of the Hancock Tower in Chicago at the 2012 Symposium. Seated from left: Chuck Dowding, Herbert Einstein, Mark Zoback, Sid Green. Standing from left: Charles Fairhurst, Mike Hardy, Bezalel Haimson, Derek Elsworth, Jean-Claude Roegiers. Photo: P. Smeallie

ARMA Fellows at the annual dinner at the City Club Atlanta during the 2023 Symposium. Seated from left: Emmanuel Detournay, Joe Labuz, Mark Board, Maurice Dusseault, John Curran, Laura Pyrak-Nolte, Steven Glaser. Standing from left: Peter Smeallie (not a Fellow), John Rudnicki, Bill Dershowitz, Priscilla Nelson, Antonio Bobet, John McLennan, Mark Diederichs, Sid Green. Photo: City Club staff

San Francisco 2008

In 2008, ARMA broke with one tradition and started another. Until 2008, symposia were titled with themes, such as the 1999 Rock Mechanics for Industry, or regional affiliation, such as Pacific Rocks 2000. Recognizing that most people refer to past symposia by their location, the board decided to name symposia by the cities in which they are held. The tradition that was started in 2008 was returning repeatedly to San Francisco given its favorable location and attraction. In addition to 2008, symposia were located there in 2011, 2013, 2015 and 2017. The high cost of holding an in-city meeting was the primary factor in dropping San Francisco from future venues.

Golden Gate Bridge, San Francisco. Photo: San Francisco Convention & Visitors Bureau

The 42nd US Rock Mechanics Symposium, held in June 2008, in downtown San Francisco was attended by 408 registrants from 33 countries. Almost half of the registrants were from outside the U.S. One hundred seventy-two papers were presented along with 40 posters. Seventeen exhibitors enrolled along with 11 sponsoring organizations, 4 short courses and 3 workshops. Sarah Wilson from McMillen Jacobs Associates chaired the meeting.

With the increase in attendees, the membership in ARMA stood at 566 by the end of 2008. Twenty-five percent were from outside the U.S.

Short Courses

For five years from 2004 through 2008, ARMA organized three-to-five-day educational short courses on rock mechanics and rock engineering. The courses provided a working overview of rock mechanics for practitioners who need to interact with geological engineers or to participate in rock engineering projects. The courses were held in various locations in the U.S. and were limited to 35 attendees.[22]

Instructors were selected for their practical experience and recognized expertise in applied, theoretical and experimental rock mechanics. They were:[23]

- Bernard Amadei, University of Colorado;
- Richard Goodman, University of California, Berkeley;
- Francois Heuze, Lawrence Livermore National Laboratory;
- Dennis Lachel, Lachel Associates;
- Steve Brandon, Lachel Felice & Associates; and
- Herbert Einstein, Massachusetts Institute of Technology.

Attendees and instructors during lunch at Chautauqua Dining Hall in Boulder, Colorado. Photo: P. Smeallie

[22] The courses were held in Boulder, Colorado (2004); Emeryville, California (2005 and 2006); Alexandria, Virginia (2007); and Springfield, Virginia (2008).

[23] Instructor affiliations at the time of the short course.

The course contents for a five-day session included:

- Rock masses and structures in rocks;
- Elements of geological exploration;
- Elasticity, stresses, and strains;
- Mechanical and thermal properties of rock materials;
- Mechanical properties of rock discontinuities;
- In-situ tests of rock mass strength and deformability;
- Rock mass strength criteria;
- Rock mass classifications;
- Measurements of rock mass deformations;
- Measurements of in-situ stresses;
- Dynamics of underground structures;
- Block failure mode in excavations;
- Introduction to stereographic projection;
- Stability analysis for wedge sliding modes;
- Key block analysis for slopes and underground chambers;
- Analysis of toppling and block sliding modes;
- Tunnel construction; and
- Tunnel design with analytical and empirical methods.

Asheville 2009

Asheville is a beautiful city located in the mountains of western North Carolina. Its remoteness in the mountains is part of its charm, but, coupled with a severe economic recession in the U.S., resulted in a historic low attendance at the 43rd US Rock Mechanics Symposium. However, many of the 209 participants remarked that the technical program and the ability to network with everyone there made it one of the best meetings to date.

Asheville featured the first of 10 annual lectures sponsored by MTS Corp. Derek Elsworth delivered this first MTS Lecture on *Geomechanics Through the Alchemist's Prism Complex Process Couplings Related to Deep Geologic Sequestration and Energy Recovery*. The newly formed ARMA Fellows discussed *What Does the Future Hold for Rock Mechanics.* Maurice Dusseault and Jean Claude Roegiers went at it at the first *Bicker and Beer* debate: *What have we learned over the past 50 years, and why is it important?* Professor Erik Westman from Virginia Tech chaired the symposium.

Asheville participants were treated to a North Carolinian barbeque (only vinegar-based sauce, please) at Taylor's Ranch. Photo: P. Smeallie

Sid Green, second from left, and Jean-Claude Roegiers, far right, welcomed newly inaugurated ARMA fellows from left Don Banks, Ahmed Abou Sayed, and Derek Elsworth. Photo: H. Montague

Awards

Since the early 1970's, the U.S. National Committee for Rock Mechanics and, since 2003, ARMA, have issued annual awards for various categories of rock mechanics.[24] The awards recognize outstanding contributions and careers in rock mechanics and rock engineering through six annual awards. The Distinguished Service Award, approved by the Board of Directors in 2020, recognizes outstanding, significant contributions made by ARMA members to the organization. Presidential Citations recognize timely and significant contribution by anyone in service to ARMA and are decided solely by the ARMA president. The ARMA awards are:

- Rock Mechanics Research Award;
- Applied Rock Mechanics Research Award;
- Case History Award;
- Dr. N.G.W. Cook Ph.D. Dissertation Award;
- M.S. Thesis in Rock Mechanics Award;
- Outstanding Contributions to Rock Mechanics Award;
- Distinguished Service Award; and
- Presidential Citation.

Wen-lu Zhu, University of Maryland, receives the best research award in 2008 from ARMA president Sarah Wilson. Photo: H. Montague

[24] Information about the rock mechanics awards including all recipients from the early 1970's to 2024 can be found on the ARMA website at: http://armarocks.org/about/awards/.

Salt Lake City 2010

In 2010, ARMA held the 44th US Rock Mechanics Symposium in Salt Lake City, Utah. The symposium, chaired by Sid Green and John McLennan, addressed contemporary issues such as carbon sequestration, energy resource production, civil engineering infrastructure, and research and development through the proposed Deep Underground Science and Engineering Laboratory (DUSEL). A record 444 persons from 23 countries attended the event, presenting close to 300 oral and poster presentations. The symposium featured 20 invited speakers including Dick Robbins who delivered the MTS Invited Lecture. A special workshop on geomechanics preceded the symposium and was attended by 80 people.

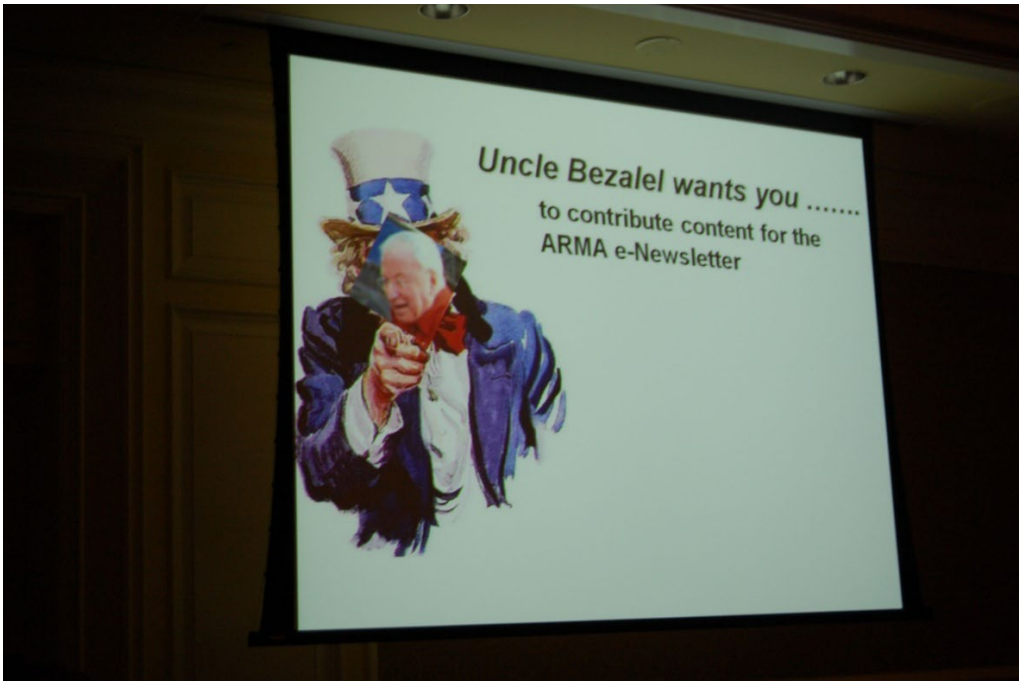
Panelists at the Geomechanics Workshop in Park City, Utah. From left: Charles Dowding, William Pariseau, Richard Goodman, John Curran, Maurice Dusseault. Far right: Moderator Priscilla Nelson. Photo: P. Smeallie

Outreach

Dissemination and outreach have always been a significant aspect of ARMA operations. But that is not to say there was unanimity on the means and methods of carrying out effective communications. ARMA was established at the dawn of the age of the World

Wide Web; indeed, ARMA debuted its rudimentary web site, RockNet, soon after its founding in 1995[25].

ARMA issued monthly "E-News" between 1997 and 2009 that comprised association news of activities, opportunities, and industry events. In 2010, after extensive planning by Wolfgang Wawersik and Bezalel Haimson, ARMA released the first issue of ARMA e-Newsletter, later titled ARMA Letters. A fully designed, multi-page PDF on-line publication, the issue was released three times a year from 2010 through 2022. These 34 issues were all under the editorial direction of Dr. Haimson with Jim Roberts serving as an accomplished assistant editor.[26]



Slide solicitation by Bezalel Haimson for newsletter contributions. Photo by: H. Montague

ARMA Letter masthead of last issue in 2022.

[25] The website was developed by Stephen Brown from New England Research. Its tag line was a play on a U.S. Army recruitment slogan: "You're in the ARMA now."
[26] All 34 issues of ARMA can be found on the ARMA website at: https://armarocks.org/arma-letters

In some ways, ARMA Letters fell victim to the Covid pandemic as ARMA outreach began to focus on technical webinars via Zoom, YouTube repositories, LinkedIn messaging and other social media. In July 2022, ARMA issued its first ARMA Monthly News, a comprehensive report on all ARMA activities that has continued to the present time. ARMA technical committees also issue periodic newsletters to their respective communities. The ARMA Technical Committee on Hydraulic Fracturing is particularly productive in outreach activities with “ARMA HFC Newsletter;” the Committee on Induced Seismicity has released a few issues of “What’s Shaking.”

San Francisco 2011

The 45th US Rock Mechanics/Geomechanics Symposium, held in San Francisco in June 2011, featured 280 podium or poster presentations with over 500 participants from 37 different nations. The symposium name was expanded to include “geomechanics” in recognition that a substantial part of the community referred to rock mechanics as geomechanics. The symposium subjects covered the usual petroleum, mining, and civil engineering to sessions on developing huge underground openings at great depths to enhanced hydraulic fracture propagation in unconventional reservoirs. Other topics included the use of underground urban spaces as an underutilized resource for storage, waste disposal, and infrastructure; risks found with large-scale carbon sequestration and compared those with the use of unconventional natural gas from shale deposits; and the need for predictive and analytical tools for large-scale CO_2 capture and storage. Anthony Iannacchione from the University of Pittsburgh chaired the symposium.

The evening banquet open to all attendees is a major component of the symposium. Photo: H. Montague

Future Leaders

In 2012, ARMA board member Mike Hardy suggested that ARMA recognize exceptional younger ARMA members in an organized program, entitled ARMA Future Leaders. The purpose would be to bring fresh ideas for the continual development of ARMA. These younger members, of outstanding promise, would be selected based on demonstrated service to ARMA and the community and the expectation of leadership in future activities.[27]

Future Leaders at the 2014 symposium in Minneapolis
Photo by H. Montague

The program was an instant success in terms of recruitment of candidates and in the dossier of activities undertaken by subsequent classes of leaders. ARMA Fellow and former president Charles Fairhurst commented in an email in June 2012: “The pace of technological change especially [with regard to] computation, communication,

[27] Information about the Future Leaders Program, including a listing of all classes, can be found on the ARMA website at: https://armarocks.org/about/future-leaders/.

globalization…is something that these young people must see from a very different perspective than the current 50-plus generation…so, we need to listen to the 'new generation.'" Leaders serve three-year terms. From its inception through 2024, eight members of the ARMA Board of Directors were former Future Leaders.

One critical element of the Future Leaders program is its self-directed operation. Leaders select new classes each year (ratified by the board), determine joint or singular activities, and generally assert leadership that benefits themselves and ARMA. Activities for which Leaders are involved include:

- Selection of Early Career Keynote speakers at the Rock Mechanics/Geomechanics Symposium;
- Service on symposium organizing committees;
- Serve as reviewers and session chairs at symposium; and
- Assist on ARMA Monthly News.

Future Leaders at the 2015 symposium in San Francisco. Photo by H. Montague

Chicago 2012[28]

The 46th US Rock Mechanics/Geomechanics Symposium took place in Chicago in June 2012. It was attended by 600 participants from more than 30 countries. The symposium comprised 44 technical sessions and two poster sessions, with a total of more than 350 papers presented. Fifty percent of the papers were from countries outside the U.S. The presentations at the meeting were loosely grouped into four tracks: petroleum, mining, civil, and interdisciplinary.

Antonio Bobet, who chaired the symposium, in his paper observed that a majority of the sessions were multidisciplinary with presentations and participation of professionals from different industries. Another trend identified was the "greater involvement of rock mechanics/geomechanics in addressing new societal demands for water, energy, and sustainability. The search for new sources of energy is turning towards geothermal energy and unconventional resources, where mechanics, temperature, fluid flow, and chemistry issues all fall into the realm of our profession."

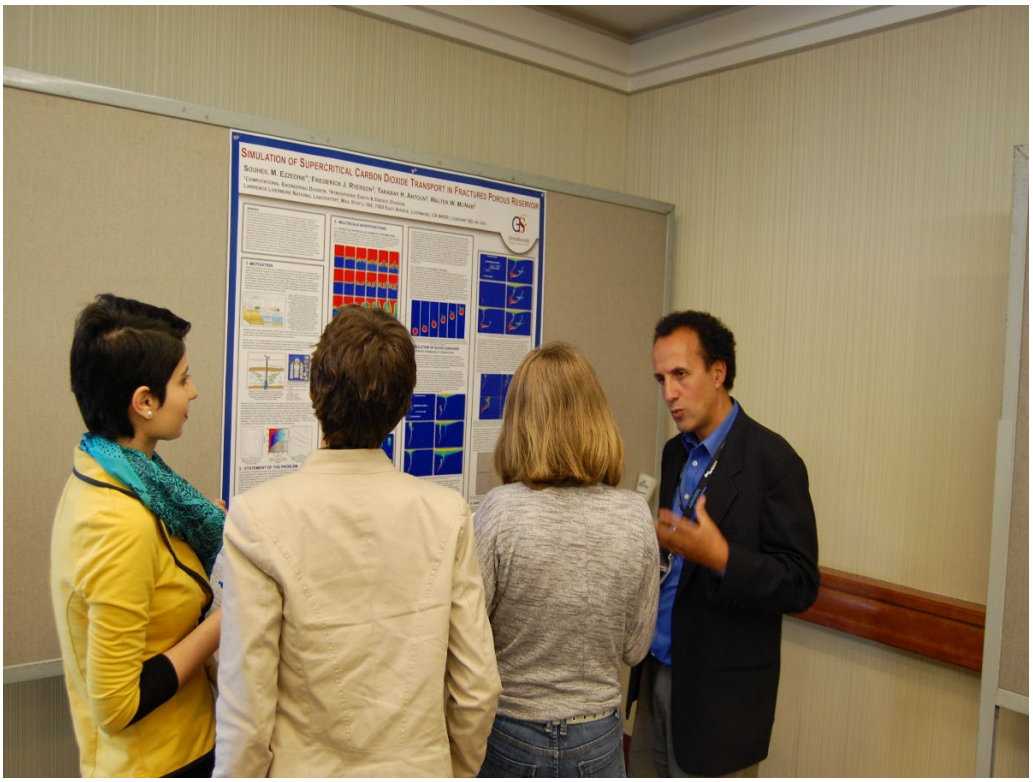
The symposium also included five plenary lectures, two workshops, two short courses and three technical tours.

A Nip in the Bud

Sometimes you just have to use deception to keep things rolling. For a number of years, a gregarious Russian professor would attend the annual symposium. And without fail, he would bring a bottle of vodka in a decorative container to the banquet. And the first pours for toasts would be for my wife Katharine and me. But neither of us drink vodka. So, we were confronted with how best to fake it. By the second year, we developed a way to transfer the vodka in the shot glasses to a container under our seats and replace the vodka with water. And toast away we would with delicious H_2O. Here is a photo of one of the beautiful containers our Russian friend left us. -P. Smeallie

ARMA symposia included a small, but loyal range of exhibitors including MTS Systems Corp. for close to a decade. Photo: H. Montague

[28] This section is based on article by Bobet, A. "The 46th US Rock Mechanics/Geomechanics Symposium (Chicago, 22-28 June 2012)." ARMA e-Newletter. Fall 2012. Vol. II No. 3 (Issue 7). Available on: https://armarocks.org/arma-letters/



An essential part of the symposium is the poster sessions, increasingly popular especially with student authors. Photos: H. Montague

ARMA Committees

Organizationally, ARMA has operated by committees reporting to the board. Some are committees of the board either standing or ad hoc. Some committees are topically driven, such as the Publications Committee and the Awards Committee. In addition, since 2013, ARMA has maintained up to six technical committees.

Committees of the Board ARMA bylaws require two standing committees of the ARMA Board of Directors. The Executive Committee comprising the officers of the association and a standing member of the board works closely with staff to assure effective and efficient management of ARMA. The Nominations Committee is responsible for vetting and recommending to the board, on a bi-annual basis, nominees for board member replacement.

The board also establishes committees that have a continuous mandate; the Awards Committee and the Publications Committee are examples. The board from time to time stands up ad hoc committees and task forces with specific charges. Examples of ad hoc committees are:

- Governance Committee (2016) to advise the board on management issues including updating bylaws and guidance on membership on the Technical Committees;
- Communications Task Force (2021) to advise board on email-based communications platforms, website-based platforms, and social media platforms;
- A board appointed task force (2021) recommended ARMA adopt policies and procedures to encourage diversity, equity and inclusion as a benefit to the profession, and a diversity champion was appointed by the board to oversee this action;
- Advisory Committee (2022) to advise board on long-term growth issues; and
- Membership Committee (2022) to develop an execution plan for increasing (and providing continuous) membership over time with an emphasis on industrial members, increasing number and prominence of female members, and expanding international membership.

Finally, the board would task various members to develop periodic strategic and business plans, at least three task forces on symposium quality, and a number of efforts to address whether ARMA should develop its own journal.

Technical Committees As hydraulic fracturing became widespread, the importance of geomechanics in unconventional petroleum application became evident. By 2013, interested members of ARMA formed the Technical Committee in Hydraulic Fracturing to encourage technical sessions at the symposium and to develop thematic workshops on issues of importance. By 2015, ARMA members in other technical fields organized to establish other technical committees. By 2024, there were six committees:[29]

- Technical Committee on Hydraulic Fracturing (TCHF);
- Technical Committee on Induced Seismicity (TCIS);

[29]Information about the ARMA Technical Committees can be found on the ARMA website at: https://armarocks.org/about/committees/technical-committee-guidelines/

- Technical Committee on Drilling Mechanics and Engineering (TCDME);
- Technical Committee on Underground Storage and Utilization (TCUSU);
- Technical Committee on Tunneling (TCT); and
- Technical Committee on Artificial Intelligence and Data (TCAID).

The mission of the ARMA Technical Committees is to support and conduct activities that contribute to the development and dissemination of knowledge in rock mechanics and geomechanics, to engage current and prospective ARMA members in technical activities, and to support the vision of ARMA.

Each of the committees has a board-approved membership roster, but ARMA developed a unique way to allow its membership and others outside ARMA to participate in the committee activities by establishing committee-focused community membership. Community members need not be ARMA members, although they are encouraged to join ARMA to take full advantage of the entire suite of ARMA activities. While community members are non-voting members, they are encouraged to organize technical sessions at the symposia, workshops and webinars. Those technical committees that have community members maintain their own rosters and mailing lists. This community approach has had a positive impact on ARMA membership and symposium attendance.

San Francisco 2013[30]

The 47th US Rock Mechanics/Geomechanics Symposium was held in San Francisco, California on 23-26 June 2013. The symposium featured 350 papers, four keynote speakers, 44 technical sessions, two poster sessions, four short courses, three workshops, 15 exhibitors, three technical tours and a large number of exciting special activities. A record 631 participants from 39 countries attended the event.

Plenary session event. Photo: H. Montague

[30] This section is based on article by Pyrak-Nolte, L., Rostami, J., Morris, J., Chan, A., Ewy, R. Summary of the 47th U.S. Rock Mechanics / Geomechanics Symposium (San Francisco, 23-26 June 2013). ARMA Letters. Fall 2013. Issue 10. Available on ARMA website: https://armarocks.org/arma-letters/

The technical sessions featured topics from civil, mining and petroleum engineering as well as cross-disciplinary topics that involve experts from many branches of science and engineering:

> The civil engineering sessions focused on rock slopes, constitutive models, laboratory-scale rock mechanics, tunnels and caverns, dams and foundations, and discrete geomechanics….Mining-related topics were presented in seven oral sessions as well as one poster session that included topics in coal mining, numerical modeling, ground control, mine seismicity, deep hard-rock mining, weak rocks and evaporite, and production-related rock mechanics issues….Participation from the petroleum community continued to see growth in the symposium. A large number of high-quality papers were submitted on topics such as experimental rock mechanics, fracture mechanics, geomechanics for conventional and unconventional resources….A diverse collection of topics, ranging from CO_2 storage and utilization to rock heterogeneity and scaling, from coupled processes in intact and fractured rock to the challenges facing high-performance computing, and from geophysics to uncertainty quantification was covered during the interdisciplinary sessions.

Charles Fairhurst and Evert Hoek in conversation at the 2013 symposium.
Photo: P. Smeallie

Deep Underground Science and Engineering Laboratory[31]

During the first decade of the 21st century, the science and engineering communities were excited about the proposed Deep Underground Science and Engineering

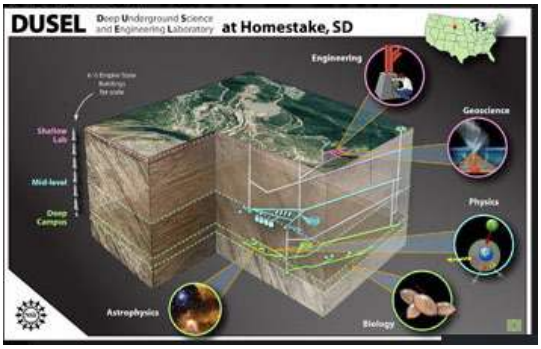
[31] This section is based in part on article by Elsworth, D., Wang, J., Roggenthen, B., Moser, D., Murdoch, L., Onstott, T. DUSEL Gets Caught Up in Heavy SURF. ARMA Letters. Winter 2012. Vol II, No. 1, (Issue 5). Available on ARMA website: https://armarocks.org/arma-letters/

Laboratory (DUSEL) to be located at the Homestake Mine in Lead, South Dakota. The purpose of the state-of-the-art research facility was to conduct experiments in astrophysics and particle physics, in biology, in geosciences, and in engineering. ARMA members and ARMA itself were part of the process for planning for this multi-billion dollar project. The Homestake Mine was one of largest and deepest gold mines in the country. It closed in 2002. The existing mine would provide space for scientific and engineering laboratories and experiments deep enough to shield such experiments from solar particles.

What's in a name?

In the early years of the discussion for the proposed underground laboratory at Homestake Mine, the issue of what to call it surfaced. At one point, it was to be the National Underground Science Laboratory, or NUSL. Those of us advocating for inclusion of parallel engineering work knew we had to get "engineering" into the title, knowing full well if you are not named, you may not exist in the funding cycle. I recall making the facetious argument to colleagues that "NUSL" pronounced "new'-sell" sounded like an abbreviated sneeze while "DUSEL" which included engineering in the title could be pronounced "dew-sell" with the accent on the second syllable thus having a nice French ring to it and was much preferable. The lab did become DUSEL but not because of my acronym argument. –P. Smeallie

In September 2002, the ARMA Foundation, with support from the National Science Foundation, held a workshop in Washington, DC to begin to develop an agenda of research related to rock mechanics for the proposed site. This preliminary agenda was augmented a year later by ARMA at the 10th Congress of the International Society for Rock Mechanics in Johannesburg, South Africa.[32] The purpose of the workshop was to define the scope of activities for a proposed EarthLab[33], an underground research laboratory to be developed in conjunction with the proposed deep neutrino detector at Homestake. EarthLab would have involved the construction of large caverns at depth to provide opportunities for research in earth science and engineering.



The DUSEL cutaway logo from 2007.

[32] Elsworth, D., Smeallie, P., Heuze, F. An NSF-Sponsored Workshop on Deep Underground Science and Engineering Laboratories (DUSELs). In Conjunction with 10th Congress of the International Society for Rock Mechanics, Johannesburg, South Africa. American Rock Mechanics Association. October 2003.

[33] McPherson, B.J., Elsworth, D., Fairhurst, C., Kessler, S., Onstott, T.C., Roggenthen, Wang, H. EarthLab: A Subterranean Laboratory and Observatory to Study Microbial Life, Fluid Flow, and Rock Deformation. Geosciences Professional Services, Inc. June 2003.

Plans for scientific research continued during the first years of the new century. But in 2011, the National Science Foundation did not move forward with DUSEL as initially planned. However, parts of the mine's underground infrastructure were repurposed, and the Sanford Underground Research Facility (SURF) was established to continue scientific research, including experiments in neutrino physics, dark matter, and more.

Minnesota 2014

Always a vigorous debate, the question of whether to hold the annual symposium at a university or at a hotel or conference center came up when deciding the venue for the 48th US Rock Mechanics/Geomechanics Symposium. The origins of the event are

ARMA's crack symposium team. From left: Katharine and Peter Smeallie, (Golden Gopher, not part of staff!), Hill Montague, Jim Roberts, Katy Greco. The same staff has been at every symposium since 2009. Photo: H. Montague

grounded in academe. However, many ARMA members preferred the convenience of single-site meetings, i.e., a hotel where the meeting rooms and overnight rooms are in one building as opposed to off-site hotels and dormitories and classroom meeting spaces. The ARMA board realized that the last meeting set at a university was in 2006 at the School of Mines. Like Mines, the University of Minnesota (UMN) holds an important place in the development of rock mechanics in the U.S. So, in 2012, the decision was made to come back to university settings and awarded to venue to UMN for the 2014 symposium with Joseph F. Labuz and Emmanuel Detournay as co-chairs.

Theater in the Coffman Memorial Union was the site of the meeting's plenary sessions. Photo: H. Montague

The 48th US Rock Mechanics/Geomechanics Symposium was held on the UMN campus on 1-4 June 2014.[34] It was noted that UMN was host to the 5th symposium 1961, 8th in 1966, 16th in 1975, and 29th in 1988. Returning to a theme for the symposium, the symposium focus was *Rock Mechanics across Length and Time Scales* with an emphasis on natural and engineered processes. Chair Labuz observed: "Scaling topics ranged from the very fast, such as acoustic emission, to the very slow, such as salt creep, and from the very small, such as microcracking in rock fracture, to the very large, such as a reservoir for CO_2 sequestration."

The symposium drew 492 registrants, with 40 percent from 32 countries. Forty-eight concurrent technical sessions and two poster sessions were held with 224 oral presentations and 38 posters for a total of 262 papers. The timely topic area of hydraulic fracturing led the symposium with 33 papers. The ARMA Future Leaders organized their own workshop on *How to Give an Effective and Engaging Presentation* starting a tradition of complementary workshops on introductory material.

[34]This section is based in part on article by Labuz, J. 48th U.S. Rock Mechanics / Geomechanics Symposium at the University of Minnesota. ARMA e-Newsletter. Fall 2014. Available on ARMA website: https://armarocks.org/arma-letters/

Charles Fairhurst and his former advisees. From left: Wolfgang Wawersik, Jaak Daeman, Bezalel Haimson, Francois Cornet, John Hudson, Emmanuel Detournay, Charles Fairhurst, Michael Hardy, Jean-Claude Roegiers, Steven Crouch. Photo: H. Montague

CHAPTER THREE: THE THIRD DECADE 2015-2024

The Growth of ARMA

With the great recession receding in the U.S., ARMA began to experience a healthy growth spurt. The symposia from 2010 through 2014 were well attended and financially sound. The Minnesota conference in 2014 returned the largest surplus to date, allowing ARMA to establish a reserve from which it has not waivered since. OnePetro's annual royalty schedule contributed significantly to ARMA's financial stability.

Membership doubled from 2004 to 2015 from 348 to 700. An unexpected change began in this period also. More younger members were indicating that ARMA was their preferred or only professional organization. Although this observation was not measured, there was a noticeable increase in members volunteering for committees and symposium tasks. "Steady growth" became the mantra of the executive director's reports to the board.

This growth, however, resulted in a doubling of the workload. Contractors were brought onboard for membership services, financial bookkeeping, communication, and other services that arose, particularly associated with the annual symposium. As usual, many members, especially board members, stepped in with voluntary services, assuring ARMA developed in a way amenable to its members.

San Francisco 2015

This third San Francico symposium saw 574 participants attend this 49th U.S. Rock Mechanics/Geomechanics Symposium at the St. Francis Hotel on Union Square. The symposium featured 48 technical sessions on petroleum engineering, mining engineering, civil engineering and interdisciplinary topics. The program included four keynote addresses, poster sessions, exhibits, technical tours, and special events. Two short courses were offered: *Rock Fracture Process Modeling Using FDEM*, and *InSAR and Its Application to Mining*. Three one-day workshops are included: *Workshop on Geomechanics in Unconventionals for Industry Professionals: From Characterization to Production; Workshop on Digital Rock Physics Derived Rock Mechanics Properties;* and *Workshop on How to Give an Effective and Engaging Presentation.* Joseph Morris from Lawrence Livermore Laboratory chaired the meeting.

Richard Goodman led a technical tour on geologic engineering in the Bay Area. Photo: G. Izadi.

ARMA Foundation

Over ARMA's three decades, the ARMA Foundation has undertaken a number of workshops and activities in support of enlightening the community and the public at large on issues of importance from the rock mechanics/geomechanics fields. The National Science Foundation (NSF) was a sponsor of many of the workshops with the purpose of learning basic research needs that NSF could potentially support.

ARMA Foundation Workshops included:

- New Directions in Rock Mechanics. National Science Foundation. Principal Investigators: Thomas Doe and Peter Smeallie.1998.
- Workshop on Industry-Government-University Partnership in Rock Mechanics and Rock Engineering: Challenges and Opportunities. National Science Foundation. Principal Investigators: Bernard Amadei and Peter Smeallie. 2000.
- Rock Engineering Issues in Underground Urban Infrastructure Construction Workshop on Research Needs. National Science Foundation. Principal Investigators: Peter Smeallie and Charles Dowding. 2001.
- Rock Mechanics in Extreme Environments: A Workshop to Explore Applications of Rock Mechanics in Challenging Settings. National Science Foundation. Principal Investigator: Peter Smeallie. 2001.

- Deep Underground Science and Engineering Laboratories (DUSELs). National Science Foundation. Principal Investigators: Derek Elsworth, Peter Smeallie, Francois Heuze. 2003.
- Rock Mechanics and Enhanced Geothermal Systems: A Workshop to Explore Research Needs. Derek Elsworth, Peter Smeallie, Francois Heuze. 2003.
- Enhanced Geothermal Systems: Do They Have a Future?. U.S. Department of Energy. Peter Smeallie. 2004.
- A Decade of Progress: A Forum on Advanced Drilling Technologies. U.S. Department of Energy. 2007.
- Research Partnership Between US and Afghan Universities in Geosciences and Geoengineering. National Science Foundation. Principal Investigators: Peter Smeallie and Don Banks. 2009.
- Education in Underground Science and Engineering in the United States. National Science Foundation Principal Investigator: Peter Smeallie. 2010.
- Science and Engineering for Geothermal Energy in Sedimentary Basins. National Science Foundation. Convenors: John Holbrook, John McLennan, and Will Pettit. 2017.
- Geothermal Battery Energy Storage. Pre-Concept Meeting. National Science Foundation. Convenor: Sid Green. 2017.

The ARMA Foundation, as a charitable foundation, received grants from corporations. For a number of years Chevron contributed funds that were used to underwrite student participation in the annual symposium.

Houston 2016

More than 700 attendees from 35 countries participated in what was the largest symposium to date. The 50th US Rock Mechanics/Geomechanics Symposium took place in June 2016 in Houston, Texas. The delegates heard close to 400 papers from the 725 abstracts submitted. There was a strong petroleum presence; interdisciplinary papers made up nearly half the presentations at the symposium.

Four keynote speakers addressed the participants: Peter Kaiser (MTS Lecture), Jean Claude Roegiers (who received ARMA's Outstanding Contribution to Rock Mechanics Award), Richard Goodman (delivered ARMA's first Distinguished Lecture), and Bill Ellsworth (who spoke on induced seismicity). David Yale chaired the conference.

Authors meet at breakfast for session discussions in Houston. Photo: H. Montague

Richard Goodman delivered the first ARMA Distinguished Lecture. Photo: H. Montague

ARMA Distinguished Lecture

In 2014, the ARMA board approved the establishment of a lecture series to feature extraordinary contributors to rock mechanics and geomechanics. The lecture would feature distinguished individuals to speak on what they have done and where they see the future unfolding. The lecture would be given every other year at the annual symposium.

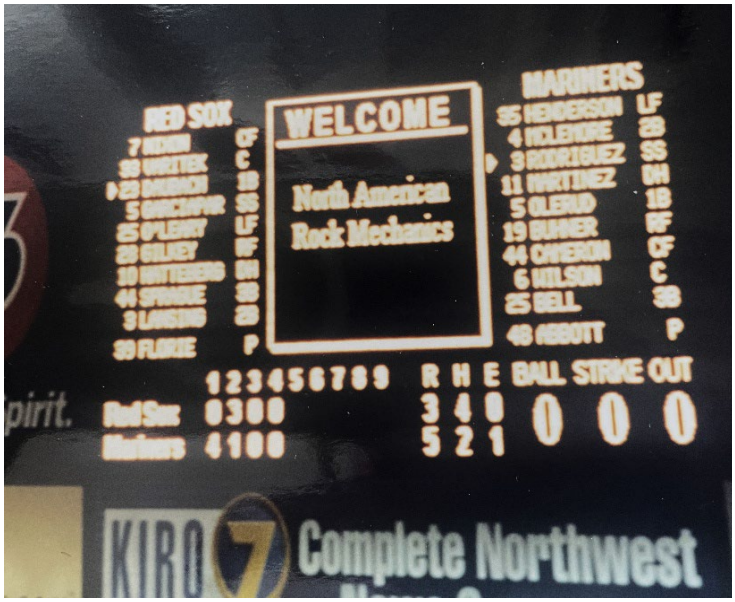
The first ARMA Distinguished Lecture was given in Houston in 2016 by Richard Goodman, Cahill Professor of Geotechnical Engineering Emeritus, University of California–Berkeley and ARMA Fellow. His lecture was titled: *Comments and Observations on the Analysis of Discontinuous Rock Masses in Rock Engineering.*

Charles Fairhurst, Professor Emeritus, University of Minnesota; Co-Founder, Itasca Consulting Group; and ARMA Fellow and former president, delivered the second ARMA Distinguished Lecture in Seattle in 2018. The subject was: *Rock Engineering—Where is the Laboratory?*

The third lecture was given in 2022 (2020 was skipped because of the Covid pandemic) in Santa Fe by Mark Zoback, Professor of Geophysics, Emeritus, Stanford University, and ARMA Fellow and former president. The title of his lecture was: *Lithologically-Controlled Variations of the Least Principal Stress with Depth and Its Effect on Multi-Stage Hydraulic Fracturing and Earthquake Propagation.*

Buy Me Some Peanuts and Cracker Jacks

The great cultural historian Jacques Barzon once wrote: "anyone who wishes to understand America, must first understand baseball." And ARMA did its best to introduce its symposium attendees to professional baseball. Games were offered during symposia in Seattle, San Francisco, and New York.



Scoreboard in Seattle welcomes ARMA to the NARMS meeting in 2000. Photo: P. Smeallie

The fourth lecture was delivered in Golden, Colorado, in 2024 by Peter Kaiser, Professor Emeritus, Laurentian University, Sudbury, Canada, and president, GeoK Inc. His talk was titled: *From common to best practices in rock engineering.*

San Francisco 2017

The 51st US Rock Mechanics/Geomechanics Symposium took place in June 2017 in San Francisco, California. A record 471 papers were presented including over 200 posters. Participants numbered 635 from 37 nations. Five keynote speakers addressed the participants: Francois Cornet (MTS Lecture), David Yale, Derek Elsworth, Maria Nikolinakou, and Erik Westman. Three workshops and two short courses preceded the symposium. Technical tours went to Stanford University's rock mechanics labs, the SLAC National Accelerator Laboratory, and U.S. Geological Survey.

2017 Symposium Chairs: Steve Glaser, Sarah Wilson, Haiying Huang. Photo: H. Montague

A special issue of the ARMA e-Newsletter was dedicated to the highlights of the 2017 symposium and is reprinted here to give the reader a sense of the rich content of keynote addresses. In addition, summaries of three workshops at the symposium are presented.[35]

> ***Francois Cornet.*** Limits of elasticity for modeling stress fields in geological formations, and the effect of gravity on an orthotropic visco-poro-elastic formation. He then proposed a new model for analyzing the regional stress field in intraplate regions where no tectonic activity is presently identified.
> ***Maria Nikolinakou.*** Development of transient evolutionary models that couple three geologic processes: salt deformation, basin sedimentation and porous fluid flow. These models enable the study of the kinematic evolution of a salt basin.

[35] This section is based on material in ARMA e-Newsletter. Fall 2017 (Issue 22). Edited by Haimson, B. Available on: https://armarocks.org/arma-letters/

Erik Westman. History of seismic tomography, the concept behind using p-wave arrival times for mapping stress redistribution, and presented two examples of its usage in deep mines.

Hydraulic Fracturing Workshop. Covered the wide range of uses that this unique technique facilitates from the measurement of *in-situ* stress at great depth to production stimulation in sandstone formations to making production possible in large shale deposits.

Workshop on Emerging Advances in Geomechanics. Organized by the ARMA Future Leaders. Focused on multi-disciplinary problems of geomechanical engineering applications including unconventional oil and gas production, mass mining processes, deep geothermal energy utilization, and underground storage of nuclear waste.

Workshop on How Laboratory Geomechanics Testing Adds Value to Exploration and Production. Specialized geomechanics testing techniques were presented, followed by quality control methods for reviewing test results. This was followed by ways to design a laboratory geomechanics program for a specific reservoir or operating environment. Examples of laboratory geomechanics studies benefitting exploration and production activity were provided.

Student Chapters and Activities

In 2012, student and faculty at the Colorado School of Mines petitioned the ARMA board to form a student chapter. The ARMA board approved this first ARMA student chapter. Since then, 28 more universities have started ARMA student chapters, representing hundreds of students worldwide.[36] Current ARMA student chapters can be found at the following schools:

1. Colorado School of Mines (2012)
2. Texas Tech (2015)
3. Virginia Tech (2017)
4. Missouri University of Science and Technology (2018)
5. The University of Texas, Austin (2019)
6. Texas A & M (2020)
7. University of Texas, Permian Basin (2020)
8. University of Houston (2020)
9. University of North Dakota (2020)
10. Monash University, Australia (2020)
11. University of Kentucky (2020)
12. India Institute of Technology, School of Mines (2021)
13. Universidad Nacional de Medellin, Colombia (2021)
14. University of Toronto, Canada (2021)
15. China University of Petroleum, Beijing (2021)

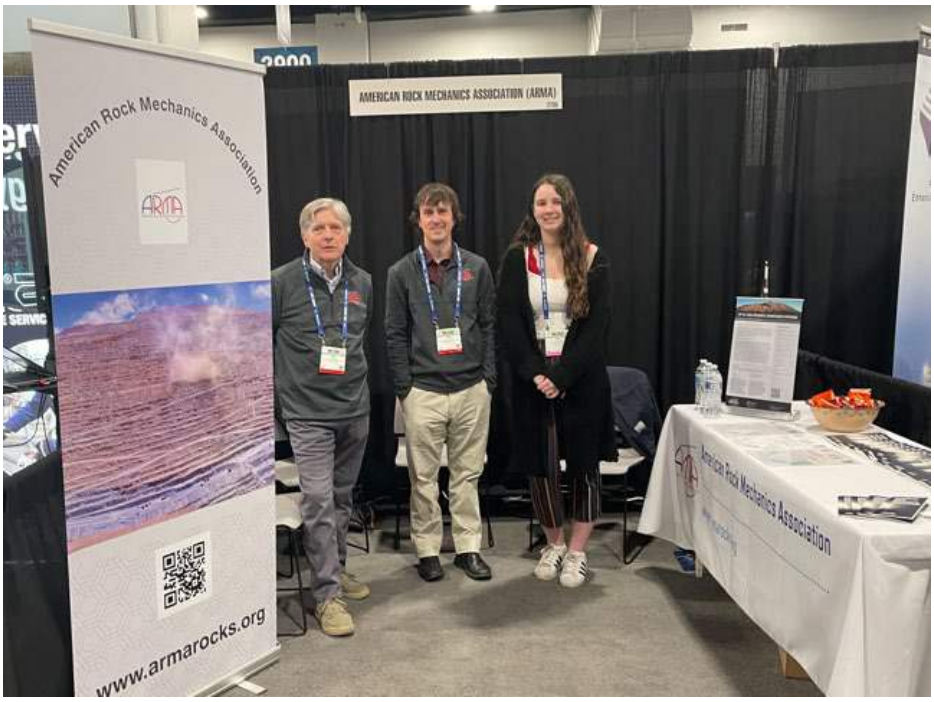
[36] Information on the ARMA Student Chapters can be found on the ARMA website: https://armarocks.org/about/student-chapters/

16. King Fahd University of Petroleum and Minerals, Saudi Arabia (2022)
17. King Abdullah University of Science and Technology, Saudi Arabia (2022)
18. Seoul National University. South Korea (2022)
19. University of Wyoming (2022)
20. Waseda University, Japan (2022)
21. New Jersey Institute of Technology (2022)
22. American University of Beirut, Lebanon (2022)
23. University of Utah (2023)
24. University of New South Wales-Sydney, Australia (2023)
25. Chengdu University of Technology, China (2023)
26. University of Alberta, Canada (2023)
27. Taiyuan Institute of Technology, China (2024)
28. University of Quebec at Chicoutimi, Canada (2024)
29. Southwest Petroleum University, Chengdu, China (2025)

Students at ARMA Student Chapter at King Fahd University of Petroleum and Minerals in Saudia Arabia host ARMA President Gang Han.

Student Design Competition. Starting in 2021, with support from Itasca Consulting Group, ARMA sponsored a student design competition. The ARMA Student Design Competition offers undergraduate and graduate students an opportunity to test their knowledge, creativity, team-work, and problem-solving skills by exposing them to a real-life rock engineering-related case-study problem. The winners of the competition are recognized at the annual symposia.

Student Research Competition. The ARMA Student Research Competition offers members of ARMA Student Chapters an opportunity to present their graduate research work at a professional-level event. The winners of the competition are recognized at the annual symposia.

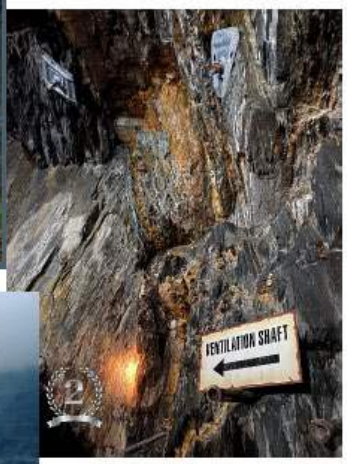


Colorado School of Mines Student Chapter President Isabella West join ARMA board members Mark Board and Gabe Walton at the ARMA booth at the 2023 SME Annual Meeting in Denver. Photo: P. Smeallie

ARMA Photo Contest. In 2021 and 2022 the ARMA-Monash Student Chapter at the Department of Civil Engineering, Monash University, Australia organized an international rock mechanics photo contest through ARMA.

ARMA Student Chapters Grant Program. In 2023, the ARMA board appropriated funds designated to ARMA Student Chapters for activities that reinforce the agendas of both the chapter, the overall success of all student chapters, and the purpose and aims of ARMA itself. Examples of appropriate activities include:

- Participation by the chapter in annual ARMA symposiums or other conferences, meetings, exhibits, and educational or promotional opportunities;
- Creating and maintaining a chapter website, with links to the ARMA's website; and
- Chapter events, such as student competitions, online presentations, or other activities, either by a single chapter or jointly with other chapters.



1st: Ferney Londoño, Colombia.
2nd: Fatemeh Amirpoorsaeed, Aus.
3rd: Amelia Kennedy, Aus.

1st: Tom Roper, Acciona, *Aus.*
2nd: Eva Grasso, Jacobs, *Aus.*
3rd: Amelia Kennedy, *Aus.*

2021 ARMA Photo Contest winners.

A Low-Country Board Meeting

ARMA Board meetings typically were held in hosted offices, future symposium hotel meeting rooms, and airport lounges where members would fly-in, fly-out on the same day. So it was a board benefit when we scheduled a meeting in February 2017 in Charleston, South Carolina. In addition to its usual full agenda, the meeting featured low-country cuisine, a guided walking tour of the historic district, and visits to Drayon Hall and Middleton Estate. This was the one meeting in the 30-year history to add such activities, and it was in appreciation of the board contributions to ARMA. –P. Smeallie

Historic street in Charleston. Photo: P. Smeallie

The board meeting took place in the historic Mills House Hotel in Charleston, S.C.

Seattle 2018

The 52nd US Rock Mechanics/Geomechanics Symposium was held in Seattle, Washington from 17-20 June 2018.[37] This symposium brought together more than 736 professional scientists, engineers, and students from academia, industry, and government in the areas of civil, environmental, geological, mining, geophysical, geothermal, and petroleum engineering; there were attendees from 38 nations. In addition to more than 400 technical presentations, the venue hosted five plenary keynote lectures, two technical tours, two short courses and one workshop. The symposium was followed by the 2nd Discrete Finite Network Engineering (DFNE) Conference which shared one day of presentations and exhibits with the symposium.

DFNE Workshop reception in Seattle. Photo: H. Montague

Charles Fairhurst delivered the 2nd ARMA Distinguished Lecture with an exciting and thought-provoking presentation on “Rock Engineering–Where is the Laboratory?” One workshop and two short courses preceded the symposium. Technical tours visited the Snoqualmie Powerhouse, the I-90 Rock Slope Stability project, and Whidbey Island to view landslides, lahars, tsunamis, and earthquakes as they affect rock engineering in the Pacific Northwest.

[37]This section is a reprint in part on an article by Schultz, R. in ARMA Letters. Fall 2018 (Issue 25). Available on: https://armarocks.org/arma-letters/

The technical sessions provided exciting opportunities to present and discuss the newest fundamental findings and applications obtained through analytical and numerical modeling, laboratory experiments, and field-scale studies. Some 476 papers accepted from more than 800 abstracts were scheduled for presentation in podium and poster formats including 218 in petroleum geomechanics, 45 in civil and environmental engineering, 98 in mining engineering, and 115 in interdisciplinary topics including geo-thermal. Conrad Felice and Bill Dershowitz co-chaired the meeting.

International Geomechanics Symposia

In 2018, ARMA joined the Dhahran Geoscience Society to hold a workshop on the role of geomechanics in stimulation. The workshop, organized by ARMA's Technical Committee on Hydraulic Fracturing and its chair, Gang Han, was held in Manama, Bahrain. The workshop, titled "The Role of Geomechanics in Stimulation," focused on demonstrating the values of hydraulic fracturing technologies and facilitating their connections with field operations.

Organizers of the first ARMA international meeting in Bahrain: Gang Han, Khalaf Al Temimi, Peter Smeallie, Mark Zoback, Joe Morris, John McLennan, Maurice Dusseault in Bharain. Photo: DGS Staff.

The three-day workshop consisted of opening reception, commercial exhibits, geomechanics training, technical presentations, keynote luncheon, discussion breakouts, and social activities. In total, 109 attendees participated in the meeting, representing seven operators, fifteen service providers, and fourteen technology developers. Countries represented included many in the Middle East: Saudi Arabia, Oman, Kuwait, and UAE. Participants shared knowledge and experience, discussed challenges, and demonstrated the values of geomechanics.

The second ARMA international conference took place in August 2019 in Beijing, China. The theme of the conference was “From Conventional Geothermal Systems to Enhanced Geothermal Energy: Technology Sharing with the Oil and Gas Industry.” One hundred fifty participants from 15 countries and districts, representing more than 50 institutions attended. This was the first ARMA meeting in China, and its results cemented a beneficial exchange between China and ARMA.

The 2020 and 2021 International Geomechanics Symposia were held virtually because of the pandemic, but both featured a continued transfer of information to viewers. The participation of selected ARMA Fellows in both events (“Rock with ARMA Fellows”) contributed to the success of a somewhat difficult medium for learning.

The 2022 International Geomechanics Symposium took place in Abu Dhabi, U.A.E. The Society for Exploratory Geophysics cosponsored the event with ARMA with endorsements from the Dhahran Geoscience Society, American Association of Petroleum Geologists, Society of Petrophysicists and Well Log Analysts, and the Society of Petroleum Engineers. The conference was hosted by ADNOC (Abu Dhabi National Oil Company). Two hundred participants from 30 countries attended with 122 presentations.

Old meets new in UAE. Photo: P. Smeallie

Symposium organizers in Abu Dhabi. Photo: SEG Staff

The meeting continued in 2023 as a multi-discipline, multi-industry, and multi-society technical conference on geomechanics. The meeting was held in Saudi Arabia, was hosted by Aramco, and supported by two Saudi ministries (the Ministry of Energy and the Ministry of Industry and Mineral Resources). Focusing on the role of geomechanics for efficient and sustainable energy supply, the technical program covers a wide range of geomechanics applications in petroleum, mining, geothermal, energy storage, and CO_2 sequestration.

Plenary session at 2024 IGS conference in Kuala Lumpur, Malaysia. Photo: SEG Staff

New York 2019

The 53rd US Rock Mechanics/Geomechanics Symposium took place in June 2019 in Brooklyn, New York. Over 500 papers were presented including over 250 posters. Participants numbered 775 from 42 nations.

Bruno Gonçalves da Silva from the New Jersey Institute of Technology co-chaired the symposium. He passed away soon after the event. Photo: H. Montague

The 11th Annual MTS Lecture, *Why observe,* was delivered by Herbert Einstein, Professor of Civil and Environmental Engineering, Massachusetts Institute of Technology. *Resilient Extraterrestrial Habitats on the Moon and Mars* was the subject of the keynote by Antonio Bobet, Professor, School of Civil Engineering, Purdue University.

Students gather to speak with Herbert Einstein at the Student Career Reception during the symposium. Photo: P. Smeallie

The Early Career Keynote Address on *Micro-macro Damage and Healing Rock Mechanics,* was delivered by Chloe Arson, Associate Professor, School of Civil and Environmental Engineering, Georgia Institute of Technology. Marlene Villeneuve Senior Lecturer, University of Canterbury, New Zealand, presented a keynote on *Teaching Rock Engineering Effectively in the 21st Century*. The last keynote, *Mining Deeper: The Importance of Understanding Brittle Fracture Mechanisms*, was the subject of the talk by Erik Eberhardt, Professor and Director of the Geological Engineering Program, University of British Columbia, Canada.

Special events included an evening performance of Phantom of the Opera. Photo: Shackman Associates

Two workshops-one on induced seismicity and the other on hydraulic fracturing—accompanied the symposium. Evangelia Ieronymaki, Assistant Professor, Civil and Environmental Engineering, Manhattan College and the late Bruno Gonçalves da Silva from the New Jersey Institute of Technology chaired the meeting.

54rd US Rock Mechanics/Geomechanics Symposium

The 54th US Rock Mechanics/Geomechanics Symposium was a victim of the global pandemic, not being held as scheduled in June 2020 in Golden, Colorado at the Colorado School of Mines. Over 500 papers were accepted for inclusion in the proceedings and are posted on OnePetro. In lieu of onsite presentations, ARMA offered numerous virtual presentations by paper authors. Called “The Endless Summer,” the paper presentations and other topical presentations proved immensely successful. ARMA rescheduled the 2020 Golden symposium to 2024.

While the 2021 55th symposium was not face-to-face, 619 registrants from 40 countries participated in ARMA’s first virtual conference. Seventy-five technical sessions were

presented and over 400 papers were submitted to OnePetro as proceedings. A fifth technical track on geothermal rock mechanics was added. A first panel on *Women in Rock Mechanics* highlighted the ARMA efforts to improve diversity, equity, and inclusion in ARMA and in the community at large. Virtual highlights included committee receptions, music gala, culture night, award ceremonies, and others.

	Central Daylight Time (Houston)	Central European Summer time	China Standard Time	Monday	Tuesday	Wednesday	Thurday	Friday
12:00-13:00	07:00-08:00	14:00-15:00	20:00-21:00		Social hour for Australia,	Rock Photos	ne Zones	China Night
12:40-12:50	07:40-07:50	14:40-14:50	20:40-20:50	Welcome				
12:50-13:00	07:50-08:00	14:50-15:00	20:50-21:00	Session chair set up and prepare for first session of the day				
13:00-13:50 Parallel sessions (B/C/D/E/F)	08:00-08:50 Parallel sessions (B/C/D/E/F)	15:00-15:50 Parallel sessions (B/C/D/E/F)	21:00-21:50 Parallel sessions (B/C/D/E/F)	1.1.B: Mining 1	2.1.B: Mining 3	3.1.B: Mining 4	4.1.B: Mining 5	5.1.B: Mining 6
				1.1.C: Civil 1	2.1.C: Civil 3	3.1.C: Civil 4	4.1.C: Civil 6	5.1.C: Civil 7
				1.1.D: P-Conventional 1	2.1.D: P-Conventional 5	3.1.D: P-Conventional 7	4.1.D: P-Conventional 11	5.1.D: P-Conventional 13
				1.1.E: P-Unconventional 1	2.1.E: P-Unconventional 4	3.1.E: P-Unconventional 6	4.1.E: P-Unconventional 10	5.1.E: P-Unconventional 13
				1.1.F: Interdisciplinary 1	2.1.F: Interdisciplinary 4	3.1.F: Interdisciplinary 7	4.1.F: Interdisciplinary 10	5.1.F: Interdisciplinary 12
13:50-14:00	08:50-09:00	15:50-16:00	21:50-22:00	Break/Change Chair in zoom Rooms				
14:00-14:50 Parallel sessions (B/C/D/E/F)	09:00-09:50 Parallel sessions (B/C/D/E/F)	16:00-16:50 Parallel sessions (B/C/D/E/F)	22:00-22:50 Parallel sessions (B/C/D/E/F)	1.2.B: Mining 2	2.2.B - Poster	3.2.B: P-Conventional 8	4.2.B - Poster	5.2.B: DFNE
				1.2.C: Civil 2	2.2.C - Poster	3.2.C: Civil 5	4.2.C - Poster	5.2.C: P-Conventional 16
				1.2.D: P-Conventional 2	2.2.D - Poster	3.2.D: P-Conventional 9	4.2.D - Poster	5.2.D: P-Conventional 14
				1.2.E: P-Unconventional 2	2.2.E - Poster	3.2.E: P-Unconventional 7	4.2.E - Poster	5.2.E: P-Unconventional 15
				1.2.F: Interdisciplinary 2	2.2.F - Poster	3.2.F: Interdisciplinary 8	4.2.F - Poster	5.2.F: Interdisciplinary 13
14:50-15:50	09:50-10:50	16:50-17:50	22:50-23:50	1.3.A: Keynote Sara Wilson	2.3.A Keynote Ahmad Ghassemi	3.3.A Panel: Women in Rock Mechanics	4.3.A Keynote Matt Pierce	5.3.A Keynote Hiroki Sone
15:50-16:00	10:50-11:00	17:50-18:00	23:50-00:00	Break/Change Chair in zoom Rooms				
16:00-16:50 Parallel sessions (B/C/D/E/F)	11:00-11:50 Parallel sessions (B/C/D/E/F)	18:00-18:50 Parallel sessions (B/C/D/E/F)	00:00-00:50 Parallel sessions (B/C/D/E/F)	1.4.B: Geothermal 1	2.4.B: Geothermal 2	3.4.B: Geothermal 3	4.4.B: Geothermal 4	5.4.B: Geothermal 5
				1.4.C: P-Conventional 3	2.4.C: Interdisciplinary 5	3.4.C: P-Unconventional 8	4.4.C: P-Unconventional 11	5.4.C: P-Latin America
				1.4.D: P-Conventional 4	2.4.D: P-Conventional 6	3.4.D: P-Conventional 10	4.4.D: P-Conventional 12	5.4.D: P-Conventional 15
				1.4.E: P-Unconventional 3	2.4.E: P-Unconventional 5	3.4.E: P-Unconventional 9	4.4.E: P-Unconventional 12	5.4.E: P-Unconventional 15
				1.4.F: Interdisciplinary 3	2.4.F: Interdisciplinary 6	3.4.F: Interdisciplinary 9	4.4.F: Interdisciplinary 11	5.4.F: Interdisciplinary 14
16:50-18:00	11:50-13:00	18:50-20:00	00:50-02:00	Hydrofrac Stress	Technical Committee	bur for U: Music Gala	Meet the Board	Meet Organizers

Santa Fe 2022

The 56th U.S. Rock Mechanics/Geomechanics Symposium was held in Santa Fe, New Mexico in June 2022.[38] This meeting was the first in-person symposium in three years and was also the first time the symposium returned to Santa Fe since the 33rd US Symposium on Rock Mechanics in 1992.

Covid-related travel restrictions resulted in remote presentations and registrations. Over 600 people registered with about 400 people attending in person. Technical tracks were offered in civil, mining, conventional and unconventional petroleum, geothermal, and interdisciplinary applications. Following the symposium, the 3rd International Discrete Fracture Network Engineering Conference was successfully conducted.

[38]This section is a reprint in part on an article by Blankenship, D. in ARMA Letters. Fall 2022 (Issue 35). Available on: https://armarocks.org/arma-letters/

Authors breakfast at the Santa Fe Community Convention Center.
Photo: H. Montague

Laura Pyrak-Nolte of Purdue University opened the symposium with a Keynote Address entitled *Fractures: Form & Function* that provided an intriguing look at the role of fracture geometry on the functional response of fractures to external stresses. Fred Dupriest, Texas A&M University, provided a Keynote Address on *How to Change Performance: Knowledge Deployment, Not Technology* describing the common gap between technology development and the deployment of knowledge to practitioners. The Early Career Keynote Address was provided by Ingrid Tomac from the University of California-San Diego on the topic of *Micromechanics of Rock Fracture Propagation under Coupled Processes.* Mark Zoback delivered the 3rd ARMA Distinguished Lecture where he examined the role of *Lithologically-Controlled Variations of the Least Principal Stress with Depth and Its Effect on Multi-Stage Hydraulic Fracturing and Earthquake Propagation.* Doug Blankenship chaired the symposium and cited the symposium model established in 1992 by ARMA Fellow Wolfgang Wawersik.

Somebody's Got to Do It

One of more enjoyable tasks of an executive director of ARMA is to visit potential sites for upcoming symposia. Besides viewing specific venues and tasting chefs' offerings, it is a chance to see the local attractions such as Niagara Falls, NY that Mark Holland, Katharine and I visited in the summer of 2023 as a potential venue for a future symposium. -P. Smeallie

Over Niagara Falls in a barrel. Mark Holland, Katharine and Peter Smeallie and Melissa Gearhart from the Convention Center in the summer of 2023 checking out a potential venue for the ARMA symposium.

Doug Blankenship and hotel staff check out veranda at the El Dorado Hotel in Santa Fe for the 2022 symposium. Photo: P. Smeallie

Atlanta 2023

The 57th US Rock Mechanics/Geomechanics Symposium was held in Atlanta, Georgia in June 2023. Six hundred seventy-nine people registered (in person and virtual) from 35 countries. As in past symposia, technical tracks covering areas of civil, mining, conventional and unconventional petroleum, geothermal, and interdisciplinary applications were offered through presentation of 525 papers.

Authors' breakfasts were held on the 72nd floor of the Westin Peachtree Plaza Atlanta Hotel. Photo: P. Smeallie

Four workshops were held before and after the symposium: 1) Distributed Fiber Optic Sensing in Geomechanical Applications; 2) Drilling Geomechanics for Oil & Gas, New Energies, and Energy Transition; 3) Educational Session: Fundamentals of Experimental Rock Mechanics; and 4) Workshop on Underground Hydrogen Storage. Two short courses were held: 1) 2D and 3D Modeling of Rock Fracturing Processes in Geomechanics; and 2) Introduction to Machine Learning in Geomechanics.

Haiying Huang from Georgia Tech. and Mengsu Hu from Lawrence Berkeley Laboratory were in charge of the event.

Networking is an important part of the symposium. Photo: H. Montague

Golden 2024

ARMA returned to the Colorado School of Mines in Golden, Colorado, in June 2024. The number of symposium attendees set a new record—794 people in person. A renewed emphasis on mining rock mechanics, a new industry format event—Showcase Sessions—and the charming attraction of the Rocky Mountains all contributed to the success of the event. Mines Professor Gabe Walton chaired the symposium.

In ARMA's July 2024 issue of Monthly News, ARMA President Andy Bunger wrote thoughtful observations reprinted here:

> [I] asked another participant for his Showcase Session highlights and he just kept listing speakers until he had named nearly all twelve he had attended. He finally gave up and just said they were all so, so good, it is impossible to decide.
>
> It is unusual for ARMA to experiment with the format that has served us so well for decades. It was a big swing at it to introduce six Showcase Sessions, inviting 24 speakers that represent the best of rock mechanics, and juggling the impact of this change on the schedule of the technical program. But our Organizing Committee embraced something new, our speakers hit it out of the park, and the feedback on this experiment was overwhelmingly positive. So, by embodying the technical highlight expressed by the quote about a much-anticipated talk delivering on expectations, this quote was hard to beat.

Another quote…“Everyone is just staying, talking, hanging out. It’s amazing in there.”

It was after the banquet on Tuesday evening. I had jumped over to the overflow room, had been caught in the lobby by a few first-time symposium participants who were expressing what a great experience they had, and then I stopped to chat with a colleague and recent Board member. She was coming from the main hall, and when I returned to the main hall I saw what she was talking about. By now it was nearly half an hour after the official close of the banquet, and the hall was still the place to be. People everywhere, laughing, sharing, embracing this moment that comes once per year. And I thought, “This is ARMA being ARMA.”

After the evening finally quieted, I couldn’t help but feel like ARMA is an absolute gem. I’ve seen so many banquet halls clear out like a fire broke out at the close of the program. But ARMA is different. Somehow it is special. It is a place where we grow into a family. Not rushing out after the holiday dinner ends and after the metaphorical presents have been opened, but rather staying, being, enjoying.

An outdoor tent was needed to accommodate the various meal functions at the School of Mines.

ARMA's Staff Transition

On 1 August 2024, Peter Smeallie stepped down as executive director after 30 years of managing ARMA. Eric Gustafson was selected by the board to succeed Mr. Smeallie.

Later in August, Mr. Smeallie was perched in his favorite summer place to be: his clubhouse box at Saratoga Horse Race Track with some of his family: wife Katharine, son Peter, daughter Eleanor Janszky and two of his grandchildren: Alice Katharine and Peter Charles Janszky.

APPENDIX ONE: ARMA BOARD MEMBERS 1994-2024

ARMA Presidents in Bold
**Deceased*

Ahmed Abou-Sayed
Joe Agapito*
Zach Agioutantis
Bernard Amadei
Kate Baker
Don Banks*
Douglas Blankenship
Mark Board
Antonio Bobet
Chris Breeds
Stephen Brown
Gabriel S. Esterhuizen
Russell Ewy
Charles Fairhurst
Steven Glaser
Sidney Green
Gang Han
Michael Hardy
Keith Heasley
Francois Heuze*
John Hill
Mengsu Hu
Haiying Huang
Anthony Iannacchione
Anthony Ingraffea
Violeta Ivanova
Kathy Kalenchuk
John Kemeny
Francis Kendorski*
Kunsoo Kim*
Robert Kranz
Joseph Labuz
Paul La Pointe
Herbert Wang
Wolfgang Wawersik
Erik Westman
Sarah Holtz Wilson
Andrew Bunger
Jami Girard Dwyer
Judy Ehlen
Herbert Einstein
Derek Elsworth
Tryana Garza-Cruz
John Curran
Jaak Daemen
Bill Dershowitz
Thomas Doe
Charles Dowding
Jane Long
Loren Lorig
Mary MacLaughlin
John McLennan
Shawn Maxwell
James Monsees*
Joseph P. Morris
Priscilla Nelson
Maria Nikolinakou
William Pariseau
Romain Prioul
Laura Pyrak-Nolte
Gangerico Ramos
Jean Claude Roegiers*
Reuben Samuels*
Richard Schultz
Gregg Scott
Rita Sousa
John Tinucci
Ron Steiger*
Azra Tutuncu*
Gabriel Walton
David Yale
R. Paul Young
Karl Zipf
Mark Zoback

APPENDIX TWO: ARMA FELLOWS 2008-2024

Chair of ARMA Fellows in Bold
**Deceased*

Ahmed Abou-Sayed
Bernard Amadei
Kate Baker
Don Banks*
William F. Bawden
Zdenek P Bazant
Mark Board
Antonio Bobet
Edward J. Cording
John Curran
Bill Dershowitz
Emmanuel Detournay
Mark Diederichs
Charles Dowding
Maurice B. Dusseault
Herbert Einstein
Derek Elsworth
Charles Fairhurst
Steven Glaser
Richard Goodman*
Sidney Green
Bezalel C. Haimson
Michael Hardy
John Hudson*
Francois Heuze*
Joseph Labuz
John McLennan
Priscilla Nelson
William Pariseau
Laura Pyrak-Nolte
Jean-Claude Roegiers*
John Rudnicki
Wolfgang Wawersik
R. Paul Young
Mark Zoback

A Fellows appreciation dinner was hosted in October 2024 for Peter and Katharine Smeallie at the Washington DC Cosmos Club by the Fellows shown in the photo. Seated Charles Fairhurst, Kathy Board, Mark Board, Susan Wheeler and standing Catherine Fairhurst (Charles' daughter), Sid Green, Peter and Katharine Smeallie, Derek Elsworth. Photo: Cosmos Club Staff

APPENDIX THREE: ARMA FUTURE LEADERS 2012-2024

**Deceased*

Alvin W. Chan
Chandong Chang
Brian Crawford
Murali Gadde
Gang Han
Amie L. Hows
Haiying Huang
Ellen Mallman
Samrat Mohanty
Michael Murphy
Azadeh Riahi
Lance A. Roberts
Marisela Sanchez-Nagel
Sherif Akl
Chloé Arson
Ivan Gil
Gang Li
Maria-Katerina Nikolinakou
Chi Hyun Park
Matt Pierce
Yanhui Han
Eunhye Kim
Brijes Mishra
Samrat Mohanty
Josh Taron
Nicholas Thompson
Shugang Wang
Liangyang Zhang
Houman Bedayat
Ahmadreza Hedayat
Mathew Ingraham
Ghazal Izadi
Kathy Kalenchuk
Fiona Kwok
Qing Lin
Varun
Fengshou (Frank) Zhang
Jesse Hampton
Mahdi Heidari
Xiaochun Jin
Andrea Lisjak
Andrew Rathbun
Hiroki Sone
Ingrid Tomac
Kan Wu
Bryan Tatone
Gabe Walton
Chia Weng Boon
Arash Dahi
Cheng Zhu
Bisheng Wu
Botao Lin
Jeffrey Oke
Nicolas Espinoza
Qianbing Zhang
Qinghua Lei
Reza Safari
Rob Bewick
Xiaodong Ma
Yi Fang
Yongcun Fen
Anahita Modiriasari
Eva Ieronymaki
Bruno Goncalves da Silva*
Farrukh Hamza
Haiyan Zhu
Hamid Roshan
Jennifer Day
Jian Huang
Luke Frash
Mahdi Haddad
M. Pordel Shahri
Seunghee Kim
Sevda Dehkhoda
Shengli Chen
Tianshou Ma
Tryana Garza-Cruz
Anita Ai
Carlos (Lei) He
Ehsan Ghazvinian

Fatemeh Rassouli
Junlong Shang
Mengsu Hu
Miguel Fuenzalida
S. Roshankhah
Sheng Mao
Bing Li
Wenzhuo Cao
Qi Zhao
Wei Fu
Xiaorong Li
Biao Li
Yida Zhang
Haitao Yu
Wencheng Jin
Hui Wu
Mengsu Meng
Sun Zhuan
Jiehao Wang
Wei Li
Oladoyin Kolawole
Bing Hou
Jeff Burghardt
D. De Melo Moura
Zohei Khademian
Marwah Alsinan
Qiquan Xiong
Xiaofeng Li
Radhika de Silva
Masoud Rahjoo
Yiqun Zhang
Qi Zhang
T. Kadeethum
Andreas Michael
Eric Edelman
Elsa Maalouf
Mostafa Mobasher
M.A.Q. Siddiqui
Yi Liu
Yao Huang
Aly Abdelaziz
Isabella West
Taghi Sherizadeh
P. Wanniarachchige
Yongzan Liu
Kai Liu

APPENDIX FOUR: EXHIBITORS & SPONSORS FOR SYMPOSIA 2005-2024

3G Software & Measurement GmbH
ADAM Technology
Advanced Terra Testing, Inc.
Advantek International,
Agapito Associates
Altair Engineering
ALWAG
Applied Geodynamics, Inc.
Applied Seismology Consultants
Aramco
Assn Environ & Engin Geologists (AEG)
Baker Hughes
Beck Arndt Engineering Pty. Ltd.
BGC Engineering
Calpine Corporation
Carl Zeiss Microscopy, LLC
Caroni
Chevron
Chinese Academy of Sciences
ConocoPhillips
Controls Group USA
Core Laboratories
Crazy Horse Memorial Foundation
CRC Press
Dassault Systemes SIMULIA
DCI Corporation
Elasto Plastic Concrete
DS SIMULIA
Engineering Seismology Group
ESG Solutions
floXlab
FracGeo
FracTech Laboratories
GCTS Testing Systems
GDS Instruments
Geocomp Corporation/GeoTesting Express, Inc.
Geo-Institute of ASCE
Geokon, Inc.
Geomechanica Inc.
GeoMechanics Technologies
GeoSlope International Ltd.
Golder Associates / WSP
Hess Corporation

IDS GeoRadar
Inflatable Packers International
Intelligent Resources Inc.
IPI Packers
Itasca Consulting Group Inc.
Jennmar
Knight Piesold
Lawrence Livermore National Lab
Maccaferri
MALA GeoScience USA, Inc.
Maptek
MetaRock Laboratories
Mirarco Mining Innovation
Motion Metrics International Corp.
MTS Systems Corporation
MWH Americas
Natl Inst for Occup Safety & Health
OMNI Laboratories, Inc.
OptiRock Group, LLC.
Petrolern
PLAXIS Americas
PoroMechanics Institute
RESPEC
Rockfield
RockMass Technologies Inc.
Rocscience
Ruen Drilling, Inc.
Sandia National Laboratories
Saudi Aramco
Schlumberger
Serata Geomechanics Corp.
Seequent / Bentley
Shell
Simpleware Inc.
Softrock Solutions
SOLDATA INC.
Split Engineering LLC
Suzhou Nenggong Foundation
Terralog Technologies USA
TerraTek

The Academy of Geo-Professionals
The University of Texas at Austin
TNO DIANA BV
TRE ALTAMIRA Inc.
UTD Incorporated
Weatherford Laboratories
Wille Geotechnik®
YieldPoint, Inc.

APPENDIX FIVE: CORPORATE MEMBERS 2010-2024

Agapito Associates, Inc.
Aramco Services Company
Baker-Hughes, Inc.
Barrick Goldstake
Chevron
ConocoPhillips
ExxonMobil
Geobrugg
Geomechanica, Inc.
Golder Associates / WSP
Hecla Mining Company
Itasca Consulting Group, Inc.
Metarock Laboratories
MTS Systems Corp.
Pioneer Natural Resources
RockEng Inc.
Rocscience
Schlumberger
Shell International Exploration & Production, Inc.
Southwest Research Institute
TerraTek