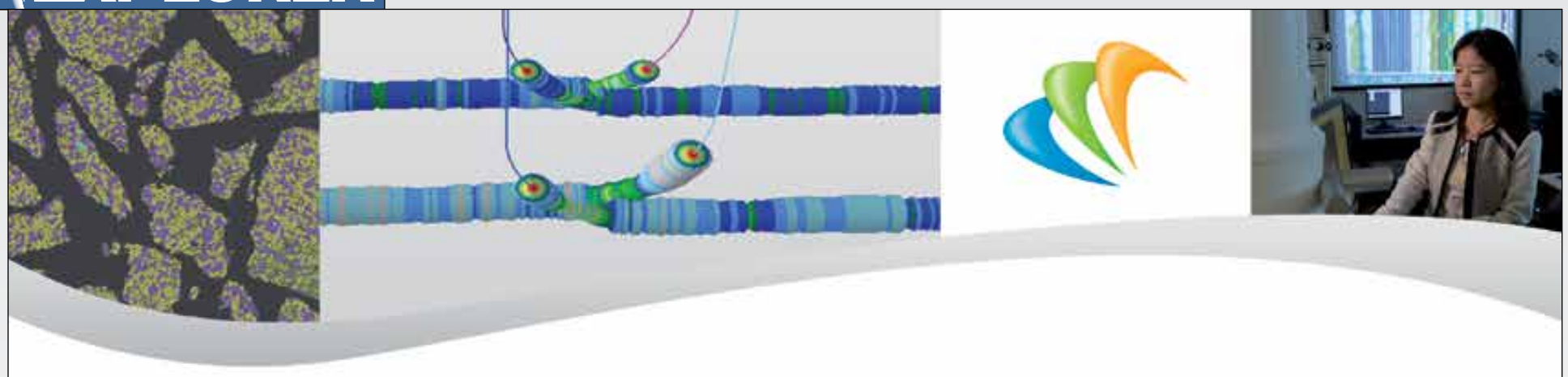
AAPG EXPLORER

DECEMBER 2015

The Beguiling Burgess

Spectacular fossil site is a geologic treasure

See page 3



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Vol. 36, No. 12
December 2015

AAPG EXPLORER

PRESIDENT'S COLUMN

Embodying 'Community' in AAPG

BY STEVE BRACHMAN

(From AAPG President John Hogg: Once again I'm offering my column space to a member of the AAPG Executive Committee for a report on activities and trends in their respective area. This month we turn the spotlight on our Sections, with a message from our vice president-Sections, Steve Brachman.)


BRACHMAN

Expanding on the concept of "community," the creation of SIGs now give us the ability to form groups to pursue shared interests beyond science.

Community.

Traditionally, "community" referred to where you lived: A town, a village or a neighborhood. It was a term that implied geography.

Now, however, the word "community" has taken on additional meaning: Common culture, common history and shared heritage.

AAPG, as an organization, is dedicated to science and community. In the October President's Column you'll recall that Elected Editor Mike Sweet discussed science and our challenges in the technical arena.

As vice president-Sections, I deal mostly with "community."

* * *

AAPG is a "member-led" society, and in the United States our community is the Section – and some of the parameters of Sections' structures are tricky.

Like the traditional use of "community," members are grouped into Sections based on geography. You either tell us where you want to belong, based on your membership in a local geologic society, or you are placed in an area based on where you live.

But unlike other entities such as Regions or Divisions, Sections really are not part of AAPG. Each Section is an independent corporation and runs its own business.

For example, when the Southwest Section holds its convention next year in Abilene, Texas, it will take all of the financial risks and, in turn, garner all of the reward (if any). There is no AAPG safety net if anything goes wrong.

While some Sections have thrived and grown over the past several years under this model, others have struggled.

I have attended great conventions in all of the Sections during my term as vice president, but each Section is faced by the same challenges as AAPG as a whole: changing member demographics, diminishing sponsorships and declining attendance. These issues are exacerbated by near-critical problems in the smaller affiliated societies, located far from major population centers.

Those additional challenges put a great deal of stress on each Section's business structure, they skew representation within the Sections and they limit potential convention sites.

* * *

I work mostly with engineers. While they are some of the smartest people I know, I occasionally am struck by the unwillingness of some to think "outside-the-box."

On the other hand, creative thinking seems to come naturally to geologists.

So leave it to some very creative geologists to put forward interesting solutions to address our issues. What all of these solutions have in common is expanding the concept of "community."

The Mid-Continent Section, faced with the prospect of only three cities able to host Section conventions, generated the brilliant idea of the "Field Conference." In every even-numbered year, a field conference is hosted by one of the smaller affiliated societies, and on every odd-numbered year the Mid-Continent Section hosts a regular convention in one of its "big three" cities.

The field conferences, incidentally, have been great successes. They regenerated interest in local areas throughout the Mid-Continent – and of equal importance, have been successful financially and in terms of attendance.

They embody the concept of "community."

* * *

Other creative solutions were generated during a joint Sections/Regions workshop held at the recent AAPG Business Meetings event in Houston. At the meeting – co-chaired by Peter Lloyd, vice president-Regions, and aided by AAPG staff Section and Regions manager Carol McGowen, leaders of the Sections and Regions agreed that there were issues that could more easily be resolved with better cooperation and sharing of "best practices."

We have set-out to make this cooperation a reality.

We also created a new SIG (Special Interest Group) called "Local Group Support," whose purpose is to gather a group of experienced members, worldwide, who could help support a convention, conference or workshop.

Support could range from finding content experts for a struggling technical committee to supplying expertise on hotel bookings, social events or sponsorships.

Victor Vega stepped forward to lead this new SIG and is looking for members to join him from both Sections and Regions. Contact me if you have experience in these areas and are interested in joining the Local Support Group (sbrachman@wapitienergy.com).

Finally, expanding on the concept of "community," the creation of SIGs now give us the ability to form groups to pursue shared interests beyond science. We have all attended networking events. But in my experience, the best events for getting to know other geologists are social events. We now can form SIGs at the local level for those of us who like to shoot skeet, go rock-climbing, run marathons, have wine tastings, or even enjoy hockey.

Other initiatives in the discussion stage involve ways of more closely linking goals and objectives of affiliated societies and Sections with those of AAPG.

What do these groups have in common?

See **Sections**, page 4

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REGULAR DEPARTMENTS

Scan this for the mobile version of the current web Explorer.

ON THE COVER:

The famed Burgess Shale in the Canadian Rockies is just one of the areas that will be offered in this year's set of field trips that are being planned before and after the AAPG Annual Convention and Exhibition (ACE) in Calgary, Canada. This year's ACE announcement will be included with the January EXPLORER – or you can start planning your trip by visiting ACE.aapg.org. Photo by Mark A. Wilson, Department of Geology, College of Wooster.

Left: A site you'll see while at the Burgess Shale – Emerald Lake in Yoho National Park, British Columbia, Canada.

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Executive Committee Candidates Announced for 2016-17


RIESE


STERNBACH


O'HARE


SCHWARTZ


AL-BEAIJI


HEWITT


BARTOLINI


KATZ

Officer candidates for the 2016-17 AAPG Executive Committee have been announced, and videos that allow the membership to become more familiar with them, their careers and their thoughts will be available online Dec. 14.

This year's slate includes contests for four offices. The person elected president-elect will serve in that capacity for one year and will then be AAPG president for 2017-18. The terms for the vice president-Sections and treasurer posts are 2016-18, and the term for elected editor is 2016-19.

As with last year's election process, all candidates will be presented to the AAPG membership via two brief videos:

- One video, a "mini-bio" featuring personal photos, provides a quick look at the candidate's professional career as well as their involvement with AAPG.
- The second video features a Q&A format, allowing the candidates a chance to share their thoughts, priorities and visions for AAPG.

The videos will be published on the AAPG website in mid-December.

Also, printed material will be inserted in the January EXPLORER that provides biographical information for all candidates, as well as their responses to the statement, "Why I accepted the invitation to be a candidate for an AAPG office."

(Associate and student members are not eligible to vote – but to upgrade your membership status, contact your delegate or an AAPG member services representative.)

Ballots will be mailed in the spring. The candidates are:

President-Elect

❒ **W.C. "Rusty" Riese**, retired, adjunct professor and lecturer, Houston.

❒ **Charles A. Sternbach**, Star Creek Energy Co., Houston.

Vice President-Sections

❒ **Terence G. "Terry" O'Hare**, Emerald Energy, Dallas.

❒ **Daniel E. Schwartz**, Aera Energy, Bakersfield, Calif.

Treasurer

❒ **Anwar M. Al-Beaiji**, Saudi Aramco, Houston.

❒ **Martin D. Hewitt**, retired, Calgary, Canada.

Editor

❒ **Claudio Bartolini**, Repsol USA, Tomball, Texas.

❒ **Barry J. Katz**, Chevron, Houston.

Sections
from page 3

Membership challenges? Support for unemployed and under-employed members? Running profitable events?

These discussions are continuing in the Executive Committee and in the Section leadership teleconferences.

* * *

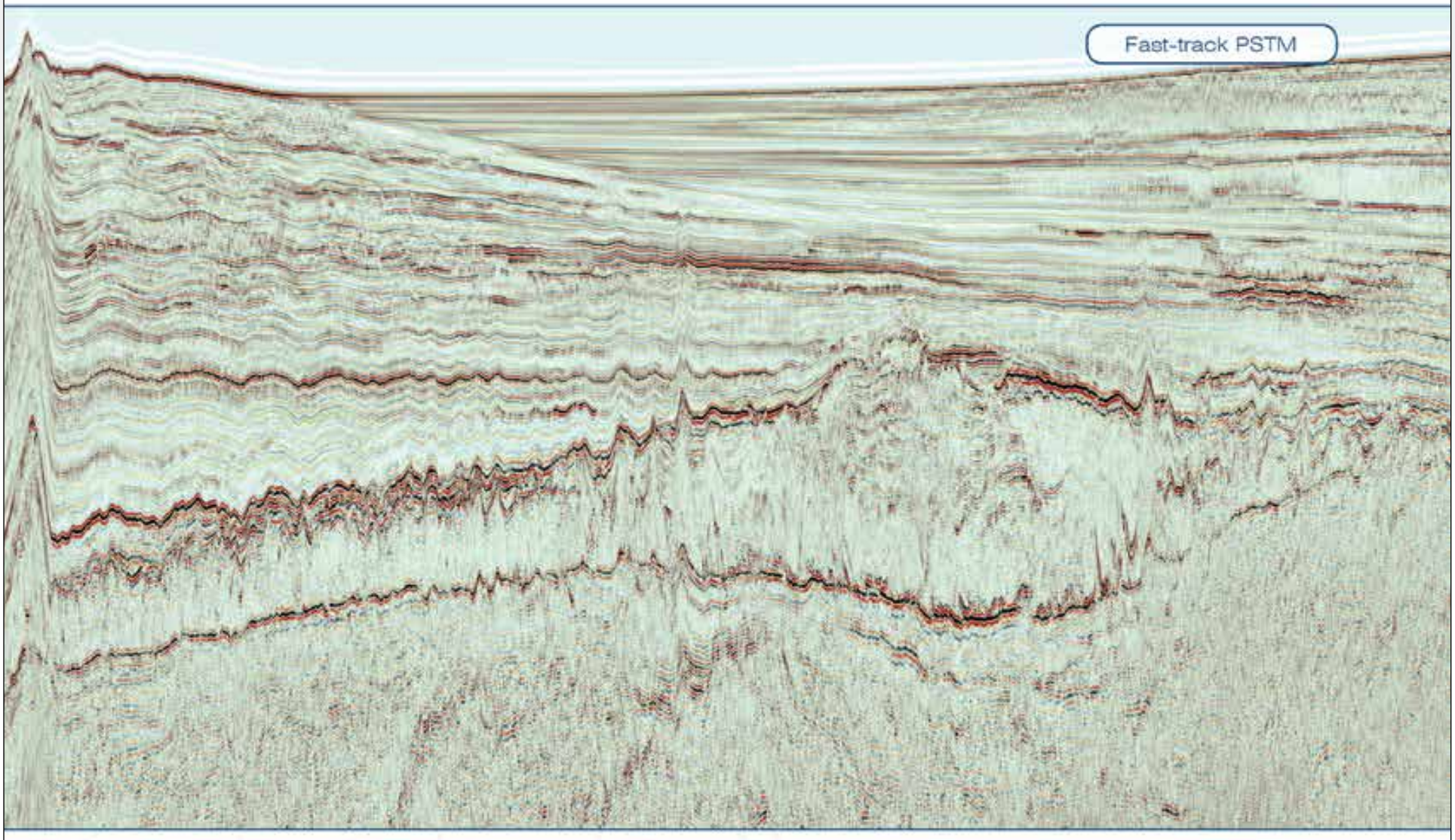
The structure of AAPG may seem to adhere to rigid, geographic borders, but nothing could be further from the truth. Our inherent strength as a member-led organization gives us incredible flexibility.

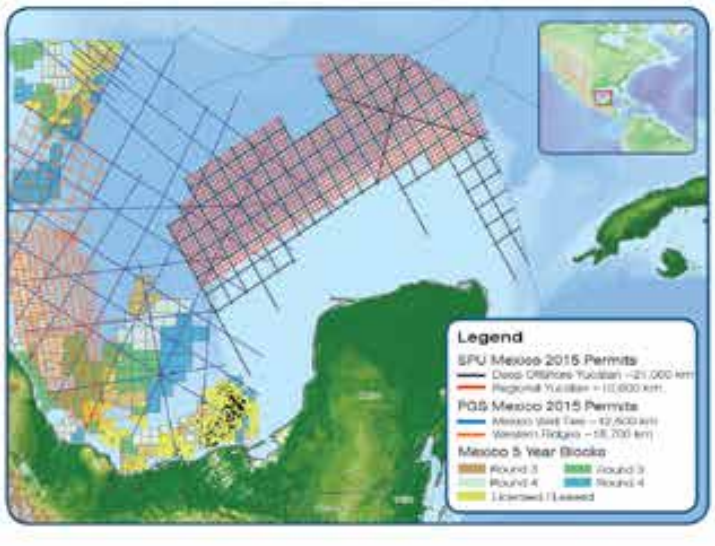
- We now have the ability, through SIGs and TIGs (Technical Interest Groups) to form groups with a veritable smorgasbord of offerings and link them directly to AAPG.
- We now have a vehicle, "Local Group Support," to bring worldwide experts to bear on local problems.
- We now have concepts to help generate regional interest in local societies, such as the Mid-Continent accomplished with field conferences.

I look forward to hearing more new ideas to help us become a better community.

Mexico GoM

Newly Acquired Multi-Client 2D Seismic





Spectrum's latest long-offset 2D seismic survey offshore Mexico is a collaborative effort with PGS and Schlumberger, spanning approximately 60,000 km. The survey provides seamless broadband seismic coverage across the Gulf of Mexico from the Yucatan Platform in the southeast, to the Perdido Fold Belt in the northwest, tying key wells in producing hydrocarbon basins and sampling emerging pre-salt plays. These strategically placed surveys will help provide greater insight to clients preparing for subsequent licensing rounds.

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SCHULZ


STONEBURNER


LEWAN


PASSEY


AFIFI


AL-HAJRI


ENGLISH


HENNINGS


A. JOHNSON


LAUBACH


LUNDE


OLSON


OSBORNE


KIRKLAND

AAPG Announces This Year's Best of the Best

By VERN STEFANIC, EXPLORER Managing Editor

Paul E. Potter, an award-winning geology professor, researcher and best-selling author with more than 60 years of experience and distinguished accomplishments, has been named the recipient of the AAPG Sidney Powers Memorial Award – the Association's highest honor.

Potter, professor emeritus at the University of Cincinnati, is widely celebrated as an expert on the Midwestern U.S. Paleozoic – he performed groundbreaking research on paleocurrent analysis and basin analysis – and is the author of "Sedimentology of Shale (1980)," one of the first textbooks on the subject.

Joining him at the top of this year's awardees list is **Scott W. Tinker**, an AAPG Honorary member, past president and multiple award winner, who has been named recipient of the Michel T. Halbouty Outstanding Leadership Award.

Tinker, acclaimed for his role as Texas state geologist and head of the influential Bureau of Economic Geology at the University of Texas at Austin, also is known worldwide as the co-creator and onscreen presence of the award-winning documentary film, "Switch."

As AAPG president, Tinker played a pivotal role in promoting the growth of AAPG's international Regions, as well as advancing interdisciplinary cooperation with other geoscience societies, including SEG, SPE, SEPM, GSC and EAGE.

Potter and Tinker head the list, but they are just two of the 56 award winners who have been announced by AAPG and who will be recognized at the opening session of the 2016 AAPG Annual Convention and Exhibition, set June 19-22 in Calgary, Canada.

AAPG awards, approved by the Executive Committee, are presented annually to recognize individuals for service to the profession, the science, the Association and the public.

Biographies and citations of all award winners will be included in a future AAPG BULLETIN.

Joining Potter and Tinker as this year's AAPG awardees are:

Honorary Member Award

Presented to members who have distinguished themselves by their accomplishments and through their service to the profession of petroleum geology and to AAPG.

❒ **Hussain M. Al-Otaibi**, Saudi Aramco, Dhahran, Saudi Arabia.

❒ **Rebecca L. Dodge**, Midwestern State University, Wichita Falls, Texas.

❒ **Michael C. Forrest**, consultant, Duncanville, Texas.

❒ **Lawrence D. Meckel**, L.D. Meckel and Company, Denver.

❒ **Valary L. Schulz**, consultant, Dallas.

Norman H. Foster Outstanding Explorer Award

Presented to members in recognition of distinguished and outstanding achievement in exploration for petroleum or mineral resources, with an intended emphasis on recent discovery.

❒ **Richard K. Stoneburner**, retired, Houston, honored for his significant role in the discoveries and developments of both the Eagle Ford and Haynesville shale plays.

Robert R. Berg Outstanding Research Award

Presented to honor a singular achievement in petroleum geoscience research.

❒ **Michael D. Lewan**, U.S. Geological Survey, Golden, Colo., honored for his pioneering role and expertise in petroleum geochemistry.

❒ **Quinn R. Passey**, retired (ExxonMobil), Kingwood, Texas, honored for his contributions in well-log geochemistry and the petrophysics of unconventional reservoirs.

Distinguished Service Award

Presented to those who have distinguished themselves in singular and beneficial long-term service to AAPG.

This year there are nine recipients of the honor:

❒ **Abdulkader M. Afifi**, Saudi Aramco, Dhahran, Saudi Arabia.

❒ **Sa'id A. Al-Hajri**, Saudi Aramco, Dhahran, Saudi Arabia.

❒ **Paul English**, Nexen Energy, Calgary, Canada.

❒ **Peter H. Hennings**, ConocoPhillips, Houston.

❒ **Arthur H. Johnson**, Hydrate Energy International, Kenner, La.

❒ **Stephen E. Laubach**, Bureau of Economic Geology, the University of Texas at Austin.

❒ **Geir Lunde**, Concedo ASA, Gjettum, Norway.

❒ **Terrilyn M. Olson**, EOG Resources, Denver.

❒ **Debra P. Osborne**, COG Operating Co., Midland, Texas.

Grover E. Murray Distinguished Educator Award

Presented for distinguished and outstanding contributions to geological education, both at the university level and toward education of the general public.

❒ **Brenda L. Kirkland**, Department of Geosciences, Mississippi State University, Starkville, Miss.

❒ **Xiaomin Zhu**, deputy director, Academic Committee, China University of Petroleum-Beijing, China.

Potter, Tinker Honored for Continuing Excellence

When celebrated educator and researcher Paul E. Potter receives his award in Calgary in June he will become the 69th winner of the AAPG Sidney Powers Memorial Award.

The Powers Award is given annually in recognition of distinguished and outstanding contributions to, or achievements in, petroleum geology.

Sidney Powers himself was a founding member and 14th president of the Association. He died in 1932 at the age of 42.

Frank R. Clark, in his memorial to Powers, said, "Sidney Powers will be known by future generations for his able contributions to pure and applied geology, but, important as are his scientific achievements, his character was greater, because it typified service to others."

In Potter's 60-plus-year career, he has had a significant influence on geologists in their formative years, which is a big reason why his peers saw him as an ideal recipient for the honor.

It's not the first time Potter has had the spotlight on him and his work. He also has won:

- AAPGs Jules Braunstein Award for presenting the best poster at the 1990 annual meeting in San Francisco.


POTTER


TINKER

- SEPM's Francis J. Pettijohn Award for Excellence in Sedimentology (1992).
- The Eastern Section's Outstanding Educator Award (2000) and John T. Galey Memorial Award (2007).
- AAPG's Grover E. Murray Distinguished Educator Award (2002).

He received his undergraduate, master's and doctor's degrees from the University of Chicago – plus a master's degree in statistics from the University of Illinois in 1959 – and started his career in 1952 as a geologist with the Illinois Geological Survey.

He was named an associate professor of geology at Indiana University in 1963, and from 1966-71 was a full professor.

He began his long career as a professor at the University of Cincinnati in 1971, also during that time serving five stints as a visiting professor at universities in Brazil.

In addition, he has authored or co-authored more than 130 articles and maps, and seven books – including the seminal "Exploring the Geology of the Cincinnati/Northern Kentucky Region."

Scott Tinker, who is director of the Texas Bureau of Economic Geology, is the 10th recipient of the Halbouty Outstanding Leadership Award, given in recognition of outstanding and exceptional leadership in the petroleum geosciences.

One of the Association's more high-profile figures, Tinker was AAPG president in 2008-09, where he played an active role in advancing AAPG's international expansion, and has been the Texas state geologist since 2000.

He also has served as president of the Austin Geological Society, Association of American State Geologists and the Gulf Coast Association of Geological Societies.

He's been involved with dozens of AAPG committees, has served as the Distinguished Ethics Lecturer, and has previously been awarded Honorary membership, the AAPG Distinguished Service Award, the J.C. "Cam" Sproule Memorial Award and the Geosciences in the Media Award.

Interviews with both Potter and Tinker will be published in a future EXPLORER.


ZHU


BARCHFELD


COBBAN


ANNA


MARTINEAU


McPEEK


GADD


K. JOHNSON


MILLER


JACKSON


CARRUTHERS


MAHLO


BRIGGS


MARLOW


KENDALL


YOSE


HELLER


VERMYLEN

Harrison Schmitt Award

Presented to recognize individuals who, for a variety of reasons, do not qualify for other Association honors or awards.

❒ Gary Barchfeld, Barchfeld Productions, Wimberley, Texas, honored for his work as the official photographer of AAPG events for more than 20 years.

❒ William A. Cobban, honored posthumously for a 75-career as a geologist, stratigrapher, biostratigrapher, paleontologist and mapmaker with the U.S. Geological Survey.

Public Service Award

Presented to recognize contributions of AAPG members to public affairs – and intended to encourage such activities.

❒ Lawrence "Larry" Anna, Anna GeoScience Inc., Littleton, Colo., honored for his activities in geosciences and public policy, and in geosciences outreach efforts.

❒ David Martineau, Pitts Oil Co., Dallas, honored for his activities (recent chairman) involving the Texas Independent Producers and Royalty Owners Association.

Pioneer Award

Presented to long-standing members who have contributed to the Association and who have made meaningful contributions to the science of geology.

❒ Lawrence A. McPeek, independent, Denver, honored for his discoveries and developments of several large oil and gas fields in the Rocky Mountain region, including the Cave Gulch Field in Wyoming's Wind River Basin.

Geosciences in the Media Award

Presented for notable journalistic achievement in any medium, which contributes to public understanding of geology, energy resources or the technology of oil and gas exploration.

❒ Ben Gadd, Canmore, Canada, honored for a long career as a naturalist, guide, teacher and author of the popular and influential book, "Handbook of the Canadian Rockies."

❒ Kirk Johnson and Ian Miller, honored for their work in publicizing the significant paleontological find of Ice Age fossils near Snowmass Village, Colo., especially the book "Digging Snowmastodon: Discovering an Ice Age World in the Colorado Rockies."

Johnson, who previously won AAPG's Geosciences in the Media Award in 2013, is director of the Smithsonian's National Museum of Natural History in Washington, D.C. Miller is department chair of earth sciences and curator of paleontology at the Denver Museum of Nature and Science.

Wallace E. Pratt Memorial Award

Presented to honor and reward the author(s) of the best AAPG BULLETIN article published each calendar year.

❒ Christopher A.L. Jackson, Daniel T. Carruthers, Seshane N. Mahlo and Omieari Briggs, for "Can Polygonal Faults Help Locate Deepwater Reservoirs?" (September 2014 AAPG Bulletin).

Jackson and Carruthers are with the Bureau of Economic Geology, University of Texas at Austin, and Mahlo and Briggs are with the department of earth science and engineering, Imperial College, London.

Robert H. Dott Sr. Memorial Award

Presented to honor and reward the author/editor of the best special publication dealing with geology published by the Association.

❒ Lisa Marlow, Christopher C.G. Kendall and Lyndon A. Yose, for AAPG Memoir 106: Petroleum Systems of the Tethyan Region.

Marlow is with Halcon Resources, Houston; Kendall is emeritus professor at the University of South Carolina, Columbia, S.C.; and Yose is with ExxonMobil, Houston.

J.C. "Cam" Sproule Memorial Award

Presented to recognize and reward younger authors of papers applicable to petroleum geology.

❒ Robert J. Heller and John Vermylen, for "Experimental Investigation of Matrix Permeability of Gas Shales" (AAPG BULLETIN, May 2014).

John W. Shelton Search and Discovery Award

Presented in recognition of the best contribution to the "Search and Discovery" website in the past year.

❒ Ronald C. Blakey, Colorado Plateau Geosystems, Phoenix, for "Paleogeography and Paleotectonics of the Western Interior Seaway, Jurassic-Cretaceous of North America."

George C. Matson Award

Presented to honor and reward the best oral presentation at the 2015 AAPG Annual Convention and Exhibition in Denver.

❒ Jeremy Jameson, ExxonMobil Research Qatar, Doha, Qatar, for "Textural Types of Evaporites in Holocene Sabkhas of Qatar and Their Geological Significance."

Jules Braunstein Memorial Award

Presented to honor and reward the best poster presentation at the 2015 AAPG Annual Convention and Exhibition in Denver.

❒ Xuejun Wang, Lirong Dou, Zhao Yuguang, Mao Demin, Qunwei Zhang and Wei Xiaodong, for "Fractured Granite Basement Reservoir Discoveries in the Bongor Basin of Chad."

Wang, Zhao, Mao, Zhang and Wei are all with the BGP Geophysical Research Institute, Zhuozhou, China. Dou is with the Chinese National Petroleum Co., N'djamena, Chad.

SEG/AAPG Best Paper In Interpretation Award

Presented in recognition of the best contribution to the new SEG/AAPG journal, "Interpretation."

❒ Dave Hale and Richard H. Groshong Jr., for "Conical Faults Apparent in a 3-D Seismic Image" (February 2014).

Hale is with the Colorado School of Mines, Golden, Colo., and Groshong is with the University of Alabama, Tuscaloosa, Ala.

Gabriel Dengo Memorial Award

Presented to honor and reward the best oral presentation at the 2015 AAPG International Conference and Exhibition in Melbourne, Australia.

❒ Charlie Smith, Halliburton, Oklahoma City, for "Nuclear Magnetic Resonance Response to Textural Reservoir Changes."

Ziad Beydoun Memorial Award

Presented to honor and reward the best poster presentation at the 2015 AAPG International Conference and Exhibition in Melbourne, Australia.

❒ Angela G. Griffin, Kyle J. Bland, Brad Field, Dominic P. Strogen, Gareth Crutchley, Mark J. Lawrence and Richard Kellett, for "Reservoir Characterization of the East Coast and Pegasus Basins, Eastern North Island, New Zealand."

All of the authors are with GNS Science, New Zealand.


BLAKEY


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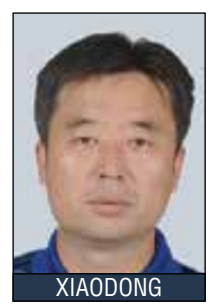
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Committee: 'More Mission Focus Needed'

By VERN STEFANIC, EXPLORER Managing Editor

The highly anticipated report of the AAPG Ad Hoc Committee on Governance – offering recommendations regarding all segments of association governance – was presented in its preliminary form and discussed at the recent AAPG Mid-Year Business Meetings in Houston.

Past AAPG president Lee Krystinik headed the committee and presented the findings of an effort that had been under way for more than a year by committee members representing each of the three AAPG governance bodies (Executive Committee, Advisory Council and the House of Delegates).

The presentation was the first step toward finalizing recommendations that will eventually be presented to the Executive Committee (EC) for its consideration.

The charge to the committee from Randi Martinsen's and John Hogg's Executive Committees was:

- Recommend the best options for governance of AAPG into its second century.
- Review AAPG governance and compare it to other learned societies.
- Recommend a structure and form of governance that is efficient, representative and flexible enough to adapt rapidly to a changing technical and business environment.
- Make recommendations for potential changes in governance and suggested implementation, if any.

An immediate and dominating conclusion of the report is that a significant amount of money – some estimates rise to the $2 million range – and efforts are being expended in support of AAPG governance.

Past AAPG president Lee Krystinik presents the recommendations of the Ad Hoc Committee on Governance at the recent AAPG Mid-Year Business Meetings in Houston.

"While the committee sees our present structure as perfectly adequate to achieve the tasks required of it, present AAPG governance does not presently provide adequate value to AAPG for the $2 million per year cost of governance," Krystinik said. "Each governance group should strive to more directly address issues that advance our mission and positively impact our members.

"The key observation regarding all segments (of governance) is, significant opportunity exists for much greater focus on advancing the mission of AAPG," he said.

The AAPG mission statement includes an emphasis on advancing the science of geology; promoting the technology of exploration; fostering a spirit of scientific research; disseminating geological information; inspiring a high standard of professional conduct; providing the public with means to recognize adequately trained and professionally responsible geologists; and advancing members' professional well-being.

The members of the AAPG Ad Hoc Committee on Governance included representatives from the three main branches of association leadership (selected in 2014).

The committee members are:

Executive Committee
- ❒ Richard Ball
- ❒ Steve Brachman
- ❒ John Kaldi

Advisory Council
- ❒ Lee Krystinik
- ❒ Peter MacKenzie
- ❒ Robert Webster

House of Delegates
- ❒ David Hawk
- ❒ Laura Mauro Johnson
- ❒ Ryan Lemiski

"We all work hard, but we're not working on advancing our mission," he said. "Instead, too often we're working on governance for governance's sake."

The Current Reality

The committee's report, from its formation in 2014, was slated to be unveiled at the inaugural AAPG Mid-Year Business Meetings event, which included leaders from the Executive Committee, Advisory

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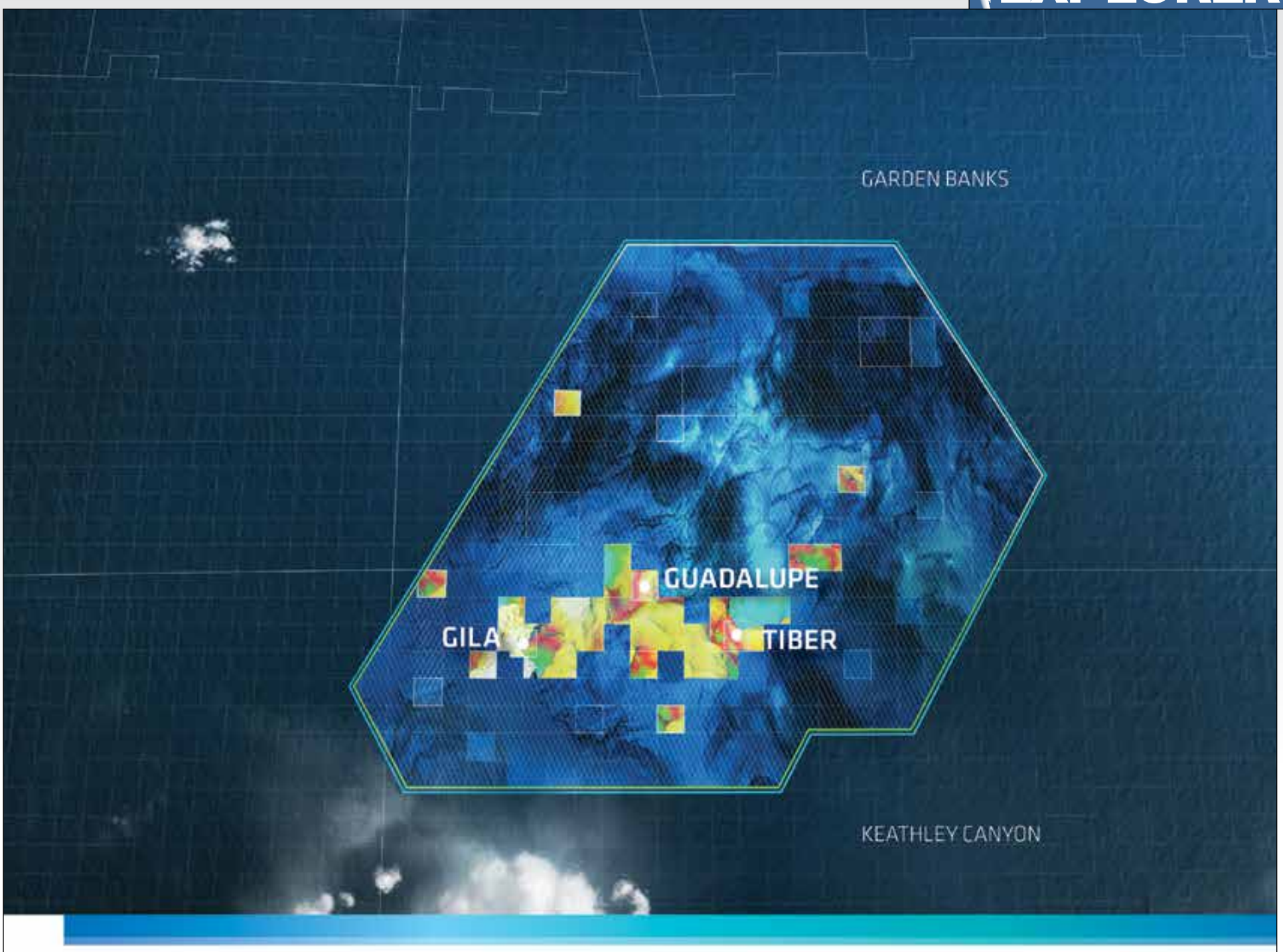


Enrollment Deadline for GeoCare

By VIRGINIA THAEMERT, Chief Operating Officer of Creekmore Livingston

AAPG's GeoCare Benefits Members' Private Medical Insurance Exchange offers major medical coverage to AAPG members and their staffs, if the staff consists of fewer than 50 employees.

The Exchange is a medical insurance marketplace for health insurance plans, which have been chosen to create a line of health insurance products to help members and their staffs meet the cost of medical care and offer a selection of types of coverage and deductibles.

AAPG membership is not required to enroll in major medical coverage through the Exchange.

Open enrollment for coverage that will go into effect on Jan. 1, 2016, began in November, so now is the time to review current coverage and look into any changes, such as a change in plan or deductible.

The enrollment deadline for changes effective Jan. 1, 2016, is Dec. 15.

Online information is available at geocare.saleslinkportal.com, where you can request, receive and review quotes to effectively evaluate costs, benefits and features from a variety of carriers.

Representatives also are available to help you by phone, at 877-739-7845.

If you have questions about this or any of the other coverages offered through AAPG's GeoCare Benefits Insurance Program, visit geocarebenefits.com/aapg, or contact Melissa Hughes or Virginia Thaemert at Creekmore Livingston Inc., at 1-941-639-3333.

Governance
from page 8

Council (AC), House of Delegates (HoD), Division of Professional Affairs (DPA), Energy Minerals Division (EMD), Division of Environmental Geosciences (DEG) and Young Professionals (YPs).

The committee's report first offered several observations of "the current reality":

- Much of what AAPG does is focused on managing governance of AAPG.
- Some boards may be highly efficient, but not representative of the membership.
- Governance is an intangible "product" that is important to a "small but vocal 1-2 percent of the membership."
- The Executive Committee has seven officers focused on governance and one focused on science.
- The House of Delegates has eight committees – seven for internal matters and one for AAPG legislation.
- Lack of strategic and business alignment between AAPG, Sections and affiliated societies is "costly and divisive."
- Volunteers and staff often envision different perspectives of AAPG priorities and functions.

"There were some simple financial observations that were a part of our study," Krystinik said. "They include, we can't continue to support and fund all the programs we have in the past, and we have to be careful in adding new projects. And when we do so, we must be certain we understand how they will be funded."

The committee's report included "radical options" that were discussed but discarded, including the idea of eliminating all AAPG governance bodies.

Although "radical" and challenging to implement, the committee considers the option of potentially running AAPG as a wholly owned business entity under a board answering to the Executive Committee to be worthy of further discussions.

The Discussions Begin

Presentation of the committee's findings and initial recommendations sparked an energetic and lengthy discussion – dominated by as many questions as responses to the recommendations.

Among the concerns was the potential for newly defined roles for the House of Delegates.

"The committee sees significant opportunity for the HoD to expand its role on several fronts while maintaining its legislative duties," Krystinik said, "including membership, mentoring of future AAPG leaders and providing market research and strategic input to the AC. All of these recommendations have been reviewed in consultationt with the HoD leadership team.'

Findings also expanded on the other areas of governance.

"The Committee recommends that the AC focus much more actively on the AAPG Strategic Plan, to be dovetailed into the three-year Business Plan," Krystinik added, "and the Committee recommends that the EC take a much more direct and active role in budgetary constraints during down years and that potential new positions be added to the EC to address key mission functions."

The committee will continue to work on the final recommendations for presentation to the EC in 2016.

Primary Recommendations

Executive Committee

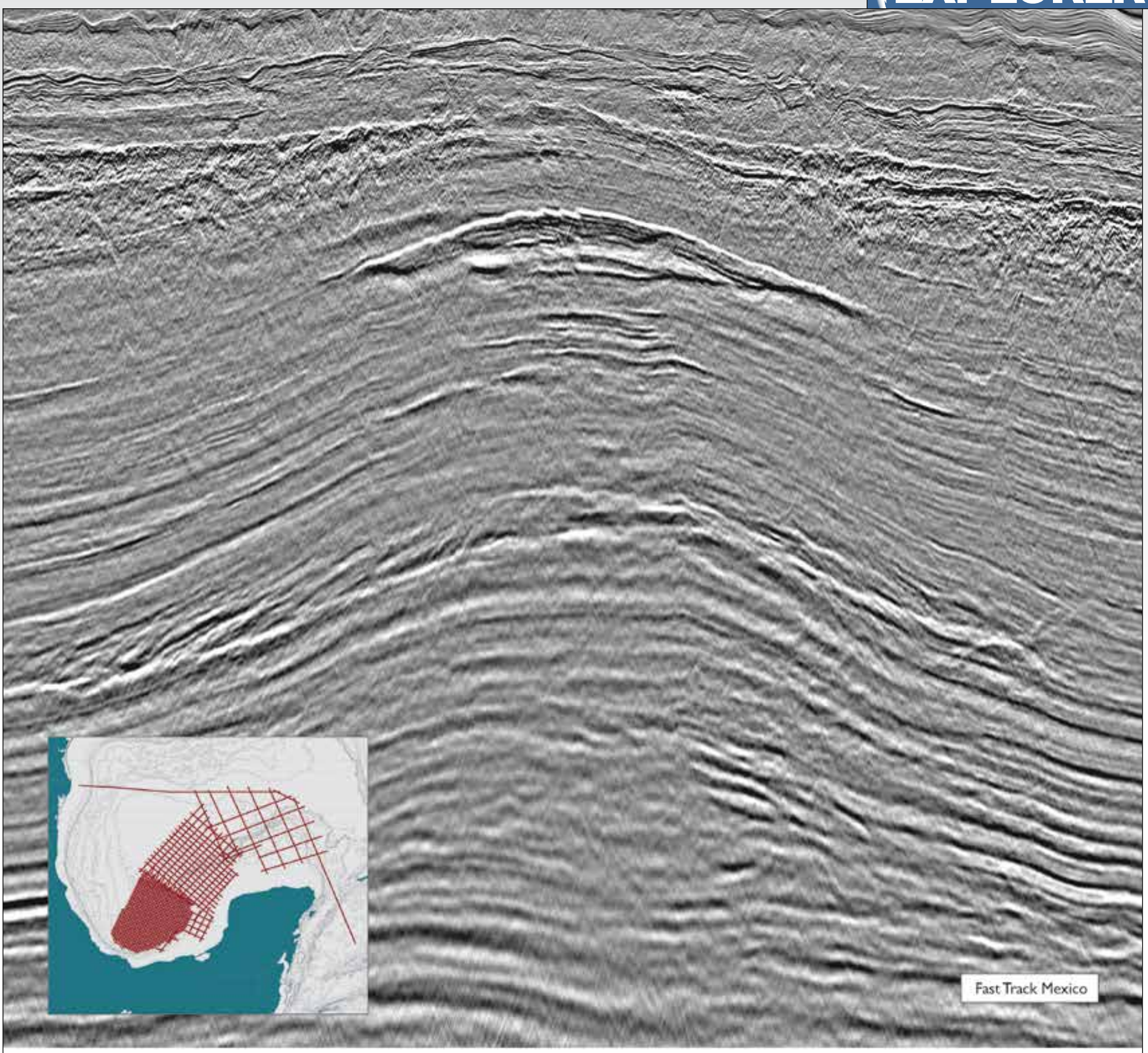
- Emphasize its strategic role and involvement in implementation.
- Better communication needed.
- Make the tough financial decisions during tough times.

Advisory Council

- More emphasis on systematic enhancement of strategic/long-range planning.
- Divest ethics issues to a special committee.
- Move review of the AAPG Constitution and Bylaws to the House of Delegates.

House of Delegates

- More focus on membership, leadership development and strategic direction.
- The body must "evolve in mindset and demographics" to achieve the added functions.



The new 3-D seismic?

New Tech Predicts Fracturing Performance

By HEATHER SAUCIER, EXPLORER Correspondent

A team of structural geologists and seismic processing geophysicists has developed what they believe is a potentially revolutionary technology that can help predict hydraulic fracturing performance before a well is ever drilled.


SICKING


VERMILYE

What the team cannot predict, however, is when the technology will rock the industry and become a pervasive, indispensable tool – much like 3-D seismic, which started its long journey toward acceptance in the 1980s.

As is the case with most new technology, Ambient Seismic – a product of Global Geophysical Services – is catching on in the industry, although not at breakneck speed.

"A good analogy is the 3-D printer. It's so new that no one knows what to do with it," said AAPG member Charles Sicking, vice president of research and development at Global, and one of the developers of the technology. "They can see the value but need time and experience to determine how to use it."

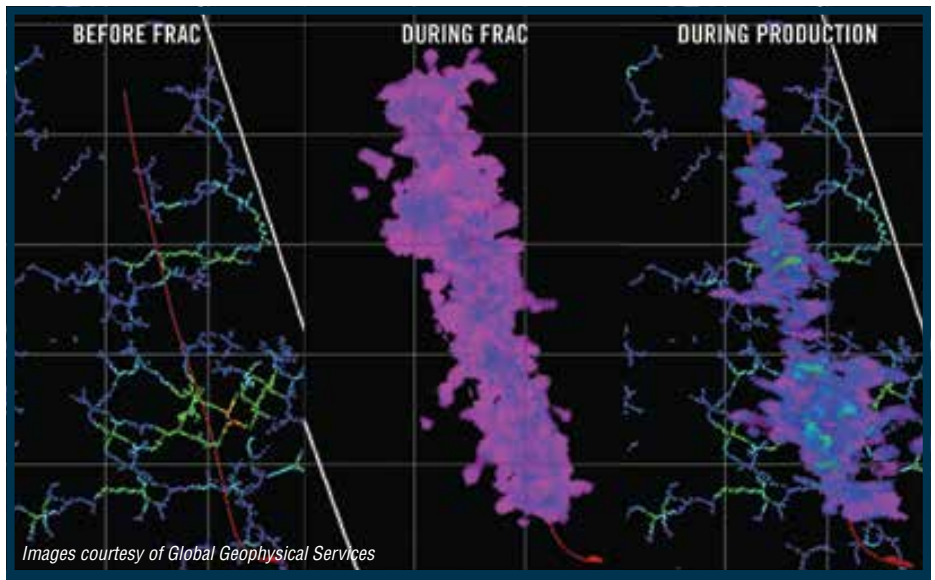


Figure 1 – A top-down view of one well. Ambient Seismic monitoring before the frac images natural fractures and faults; during a frac, Ambient Seismic reveals the total reservoir volume activated (SRV); and during production, Ambient Seismic reveals the active production volume (APV), which is shown overlain the natural fracture network.

So, like anyone who believes in his product, Sicking and his colleagues have been going door to door, so to speak, and demonstrating its unprecedented capabilities to potential clients.

"This technology can help you plan ahead. People are drilling less now. If you put in a well, you want and need it to be a successful well," said AAPG member Jan Vermilye, chief geologist for tomographic fracture imaging and manager of Ambient Seismic processing and interpretation at Global.

Natural Sounds

Ambient Seismic records the acoustic activity from natural fractures in the earth. Based on those acoustics, maps of fractures can be generated as predictive guides for hydraulic fracturing operations, explained Vermilye, who worked with Sicking on the development of the technology.

"We provide the roadmap before the trip begins," Vermilye said. "Before you drill, you look at the map and decide if it's a fracture network that should be avoided or should be used to help deliver oil or gas to the well."

Seismic emissions are released when rocks break naturally from various forces within the earth. A measurement of low emissions indicates the presence of low fracture density or small fractures, and a measurement of high emissions indicates the presence of high fracture density or large fractures.

"If you have a location with hydrocarbons and it is highly fractured, these fractures provide for storage and for transmission of the hydrocarbons to the wellbore," Vermilye explained.

Unlike microseismic events, which are small earthquakes, Ambient Seismic emissions are low amplitude signals that can be collected and stacked over an extended period of time – anywhere from one minute to several days, Vermilye said.

"We are not just picking one-time events," she said. "We are stacking all of the energy released."

And, unlike 3-D seismic surveys, which provide images of larger fractures and faults in the earth, Ambient Seismic captures smaller structures and shows active

See **Ambient Seismic**, page 14

Ambient Seismic

from page 12

deformation, Sicking added.

That is the key to the technology's predictive ability: Fractures that help produce oil are generally smaller than those typically detected by 3-D seismic, Sicking said, and they don't have large enough offsets across the fractures to be imaged with 3-D seismic.

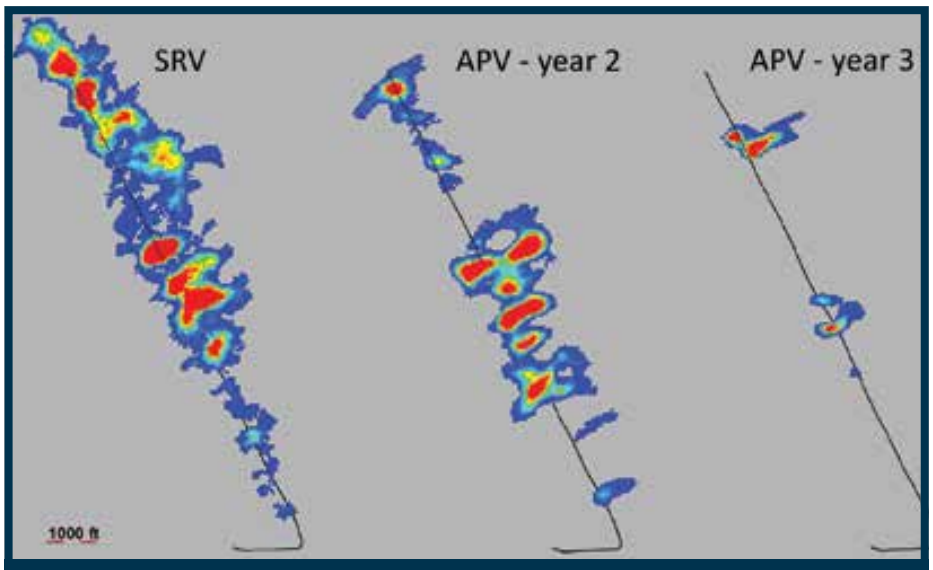


Figure 2 – A map view slice from one well showing acoustic activity imaged from Ambient Seismic collected from a buried array over three different time periods. Shown are a stimulated rock volume (SRV, left), an active production volume about two years into production (APV, center) and an APV about three years into production (APV, right).

Brainstorming

Long before the industry's downturn, the concept of Ambient Seismic was in the works to offer a more affordable way to drill and produce.

It began with Peter Geiser, a visiting seismologist at Columbia University who had the idea to map the natural energy released within the earth, recalled Vermilye, who worked with Geiser after he founded STRM LLC – a company that developed seismo-tectonic reservoir monitoring methods – in 1998.

Initially, STRM hired Global, which employed Sicking, to provide acquisition services for one of its projects. Impressed with STRM's fracture mapping technology, Global acquired the company in 2011 to incorporate STRM's reservoir monitoring methods into Global's budding microseismic division.

Sicking, who is a geophysicist, recalled early conversations with Vermilye, who is a structural geologist. Paired to help develop the frac prediction technology, "We sat down to begin discussions on how to merge the two technologies but had trouble communicating with each other in technical terms," Sicking said. "We didn't understand each other's language. She was a fracture expert and I knew about seismic waves."

After jumping the high hurdle to learn each other's language and expertise, technological magic began to happen, and Ambient Seismic's predictive abilities gave rise to additional applications.

Maps of natural fractures in rocks were produced specifically for frac monitoring operations. These maps showed what was happening in the reservoir rocks during the frac treatment. Later, technology was developed that allowed clients to map the induced fractures during the frac treatment. This evolved into Ambient Seismic production monitoring technology, which allows clients to map producing rock volumes and determine if infill wells or re-fracturing are needed.

"We can now make maps of producing volumes and determine which stages in wells are producing fluids," Sicking said. "If you have 40 stages but are only getting production from less than half of the stages, we can map the volumes from Ambient Seismic recordings and tell you which stages are producing without having to put a tool into the well."

Selling It

Sicking admits he was considering retirement before the Ambient Seismic project came along.

"It was an opportunity to work on something that is brand new and totally revolutionary," he said. "I've become more of a salesman."

Here is his pitch: "What if a geophysical service company came to a client and said, 'We have all of this great 3-D seismic survey technology, and we can make great attributes and tell you where the fracs are, but you have to pay us while we are doing the work and you can't look at the data until after you drill your wells.'

"That would get a laugh, but that's today's microseismic technology," Sicking said. "Companies drill a well based on 3-D seismic reflection surveys and design a frac treatment. They treat the well according to plan and lay out geophones to record data during treatment. Microseismic data is not recorded until the treatment plan is being executed.

"When using the current mainstream microseismic technology, you get data back that tells you what you did in the past," he said. "There is no predictive value."

On the other hand, the Ambient Seismic method records data before a well is drilled and predicts the locations that will yield the best production and performance based on the natural fracture system in the rocks.

"We map the fractures and show which produce the most acoustic activity and are the most transmissive" Sicking said. "This provides the predictive value."

Turning Heads

Sicking and Vermilye, like all innovators, have a vision: Every oil patch will one day use Ambient Seismic.

"We are at the very beginning of industry adoption," Sicking said. "We are not there yet. When we get there, everyone will

See **Real Time**, page 18

The Predictive Power of Porosity

By LOUISE S. DURHAM, EXPLORER Correspondent

Image courtesy of Kitty Milliken

X-ray map of a sample of silty Barnett Shale. Clay-minerals and mica are yellow; quartz is gray; albite is aqua; dolomite is purple; organic matter is orange.

Mention porosity, and it undoubtedly conjures up thoughts about holes, or pores, contained within rocks.

In turn, this tends to trigger visions of empty spaces, for the uninitiated.

Au contraire.

Pores, in fact, are never voids. They are always occupied.

This content varies and often includes desirable substances awaiting recovery, such as petroleum liquids, gas and water. They also can be filled with material for storage, such as porous rock accumulations that provide a repository for carbon dioxide.

It's fortunate, particularly for the petroleum industry, that this whole arena captivates the attention of skilled researchers like AAPG member Kitty Milliken, senior research scientist at the Bureau of Economic Geology, University of Texas at Austin.

Kitty Milliken discussed her work in porosity in her presentation "Compositional Classification for Fine-Grained Sediments and Sedimentary Rocks: Foundation of Porosity Prediction" at the AAPG Geosciences Technology Workshop (GTW) in Austin, Texas, last month.

Milliken, who received the AAPG Robert R. Berg Outstanding Research Award in 2015 has studied fine-grained rocks and the pores therein since the late 1970s.

"My focus is not on pores so much as it is fine-grained rocks, and pores are a part of the rock," Milliken said. "If I'm going to understand this class of rocks, then understanding pores is part of it."

Right Tool for the Right Pores

The variety of material that can fill the pores calls for measurement techniques that are sensitive to the particular fill.

These techniques entail putting material into pores, such as epoxy, mercury, nitrogen gas and argon gas. The ensuing measurements reflect the pores into which a certain material is able to go. There may be other pores in the rock that are detectable by a different technique.

"It's important to remember that the total pore system is something we only partially sense with any one technique," Milliken said. "My colleagues and I try various techniques on the same sample, working in a collaborative manner."

She noted that when measuring and viewing the pores in a subsurface sample, one is seeing only the final state, which is a consequence of a long process.

"If we're going to predict the outcome of that process, we need to understand the historical process by which we arrived at that final state," she emphasized.

Today, there are new methods that are transforming geoscientists' ability to make predictions.

One of these is a sample preparation technique called argon-ion milling, or Ar-ion cross section polishing, which has become the industry standard for imaging pores in fine grained rocks, according to Milliken. It allows the scientists to look at really tiny pores without some of the ambiguities created by mechanical polishing.

Another technique is X-ray mapping.

"This is really allowing us to look at the components of shale at sufficient resolution that we can begin to assess how they're impacting the porosity," Milliken said.

"Although fine-grained rocks have components that are really small compared to those in sandstone, you still see the same range of component parts to the rock that are subject to many of the same processes that cause pore evolution in sandstones," she noted.

"We can demonstrate that similar processes impact the pore evolution in these fine-grained rocks. In other words, things like compaction, cementation, development of secondary pores all happen in both sandstones and fine-grained sedimentary rocks," Milliken pointed out.

She regards X-ray mapping as a key to turning all of this into something predictive.

"It's wonderful to be able to see pores, describe them and classify them and understand what they look like," she said. "But ultimately, what we really want to do is predict them, and to do that we have to integrate our understanding of the pores with the material around the pores.

"We have to understand the origin of the pore walls, and to do that we have to look at imaging that allows us to see the composition of the rock – and x-ray mapping is key to that," Milliken declared.

See **Pore Prediction**, page 18

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Sequence Strat., Facies Architecture & Reservoir Characterization	April 30-May 7, 2016 Utah

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AAPG Education

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It's All About Prediction

When a team of petroleum geologists is assigned to a basin, they must decide where to drill. To do so, they need some sort of conceptual basis on which to determine where it's preferable to site the borehole.

Milliken weighed in on that.

"Trying to link our understanding of pores to understanding of the composition of the rock is geared toward giving people this kind of exploration model they can take and apply to make better drilling decisions, which are predictions," she noted. "That's the most important point.

"We're not there yet, but we've come a long way," she noted. "To get there it's this combo of being able to see not just the pores but the minerals around the pores and to understand their history.

"That's what's going to yield a predictive understanding of where you do and you don't get pores in rocks," Milliken emphasized.

It's a given that the operators recognize that unconventionals have "sweet spots" where the best production can be anticipated.

But there's no such thing as a divining rod to zero-in on them.

"The question is how one goes about predicting where those are going to be," Milliken noted. "I think the big element of gaining that predictive power depends on understanding how grain composition affects pore evolution."

Real Time
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want to apply the technology, clients will recognize its value, and they will see it as a standard method to use and they will no longer be worried about a fledgling development."

Today, many of Global's clients hire the company to reprocess existing data recorded for older frac monitoring methods but failed to yield enough useful information. Global provides added value that is extracted from the old data, helping to explain well and stage performance problems, identify locations for infill wells and determine how wells are performing.

"This technology is so new and so different from anything anyone has ever seen," Vermilye said. "People think it is really interesting but they are afraid to go out on a limb with something completely new."

In many cases, clients want to see if the maps generated by Global are consistent with their internal data before taking a risk. When they learn that this is the case, they return with additional projects.

"However, it is the engineers who are responsible for designing the fracs, and they have their way of looking at the world," Vermilye said. "It's important that we make the Ambient Seismic data relevant to their workflows and issues, and make it easier for them to incorporate data types and products that they are not accustomed to."

Once engineers open their minds to new ideas, "They're ours," Vermilye said. "They don't want to go anywhere else."

Despite the fact that Global has worked on scores of wells across the nation and around the globe – including the Permian, Eagle Ford, Marcellus and Haynesville formations, and shales in China and Colombia – many of their clients choose to keep their results confidential.

"Operators like to maintain their competitive advantage and are reluctant to share their information," Vermilye said. "We have some wonderful results that we would love to show as well as publish in papers, but most of our clients are not yet ready to share their results."

That reality leaves Global with few options with which to market its product. Today, they rely heavily on giving presentations, participating in industry events, pitching articles to trade publications and offering clients discounts if they allow their results to be shared.

Around the Bend

Confident their technology will catch on, Sicking and Vermilye are currently working on ways to improve it.

During a hydraulic fracturing operation, it currently takes approximately four weeks from frac completion to deliver the Ambient Seismic products.

"I would love to do it in real time or near real time," Vermilye said. "We have developed a workflow for this, but we have not yet had an opportunity to apply that workflow. We need a client who has a need for this and wants us to do it."

Sicking is ready to go even further and predict what will happen during hydraulic fracturing and production – ahead of time. If the predictive value of the Ambient Seismic method becomes well established, there will be less need for real-time monitoring during the frac treatments.

"We can do it," he said. "I have a plan!"

Engineering in the oilfields has experienced an evolution in the last four to five years, Sicking said, explaining that engineers now realize that not all rocks fracture in the same way.

He believes many engineers are coming around to the idea that hydraulic fracturing is a reservoir-wide operation that requires further study and innovative technology.

As operators begin to shift their focus from today's well-to-well approach and begin to use a predictive, reservoir-wide management approach, the industry will be forever changed.

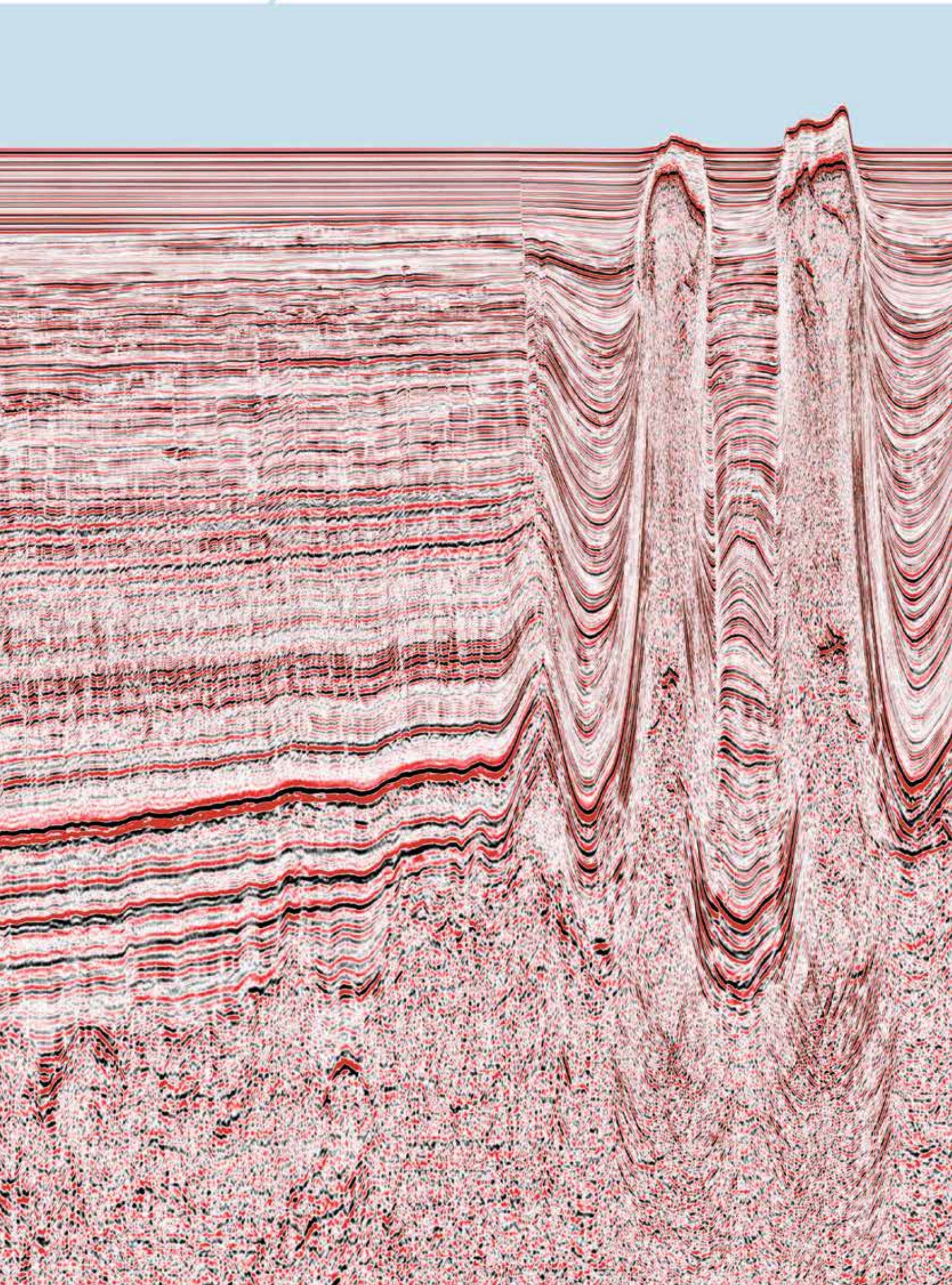
"It could save a huge amount of money," Sicking said. "You would have the same amount of oil production or even more, but significantly reduced production costs."

This would mean unconventional reservoirs could make a profit at a much lower oil price.

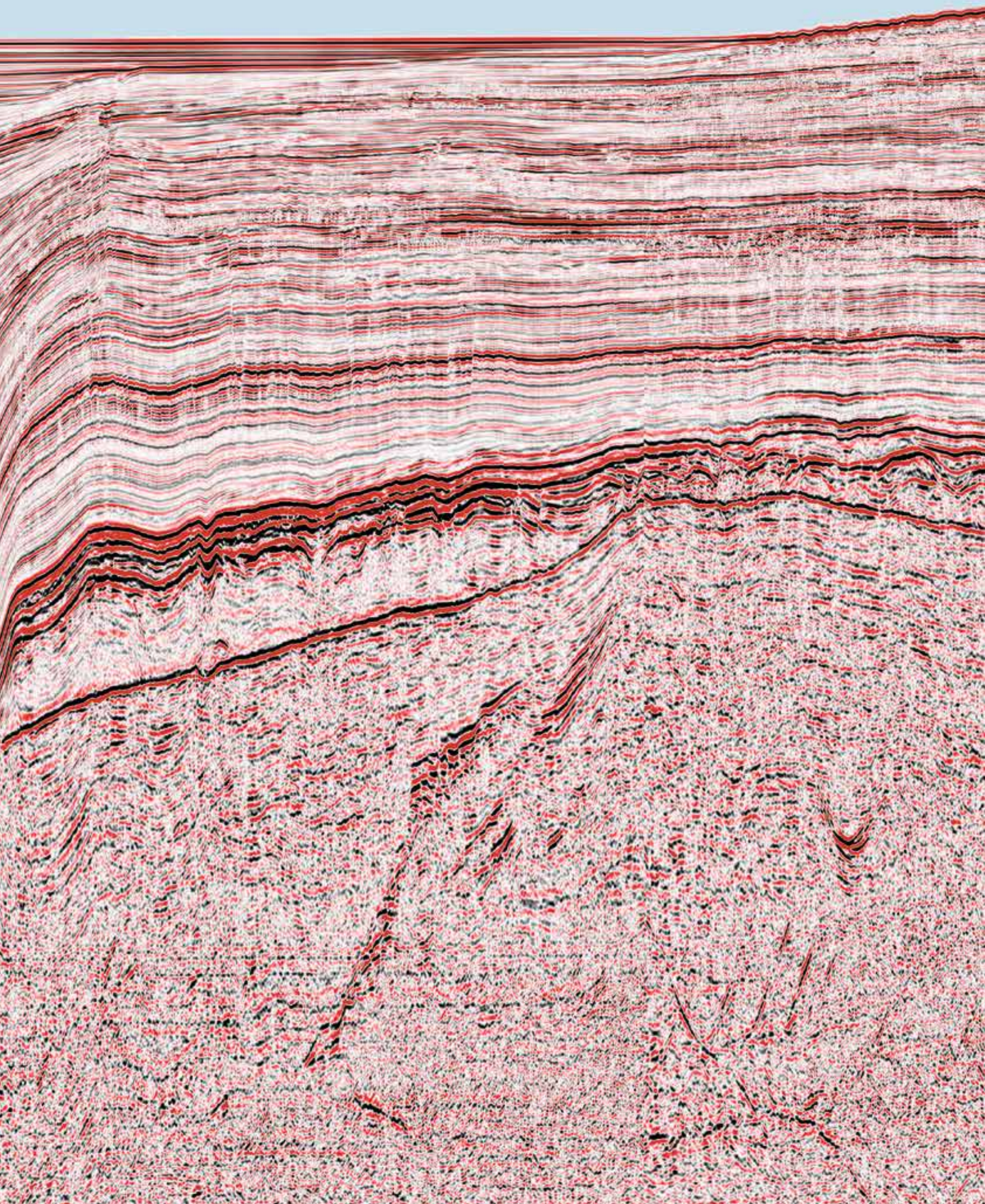
"I am past retirement age and still working," Sicking said. "This is one of the more chaotic and exciting times of my career. But I am here because I believe this is going to bring a paradigm shift to the industry."

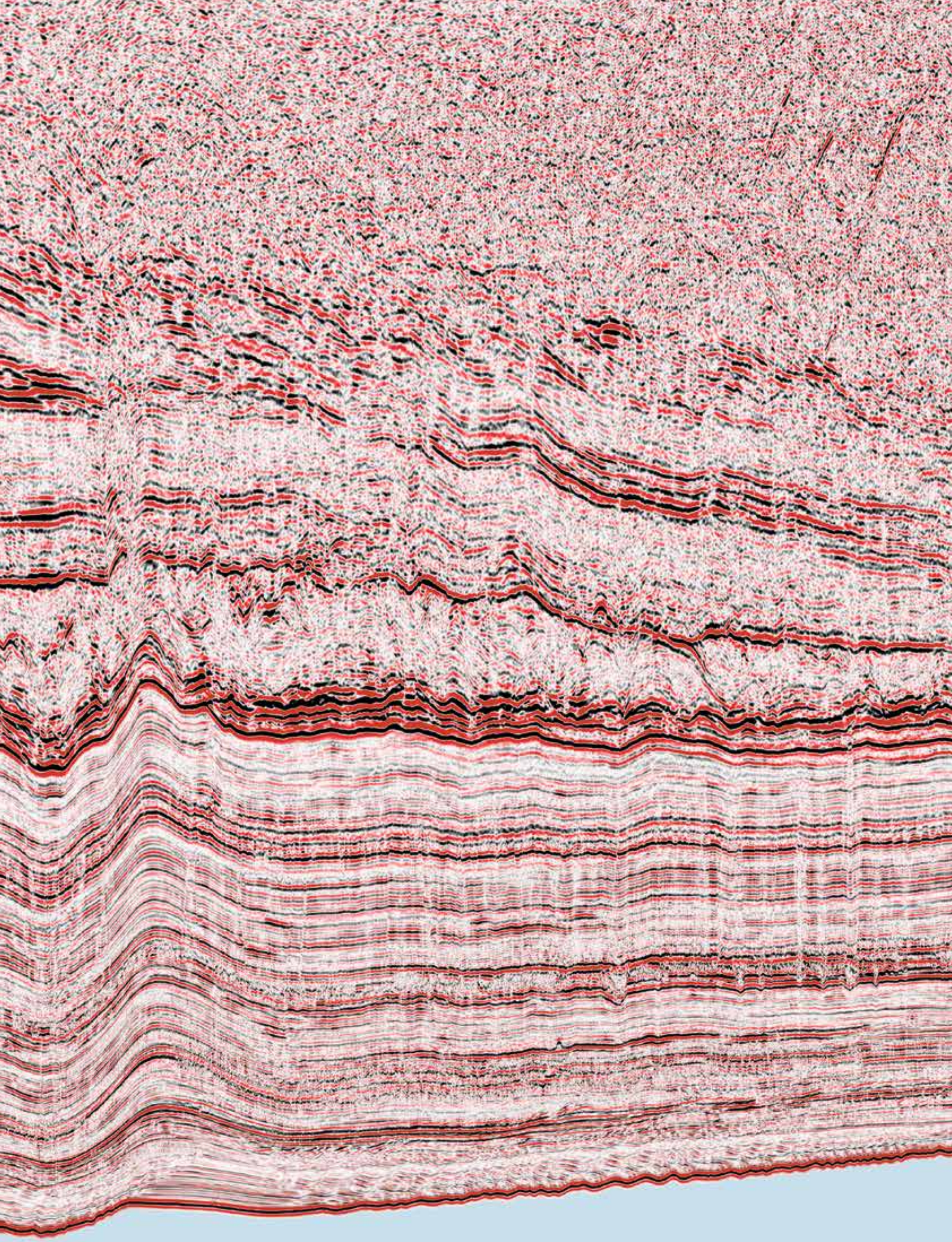
TGS

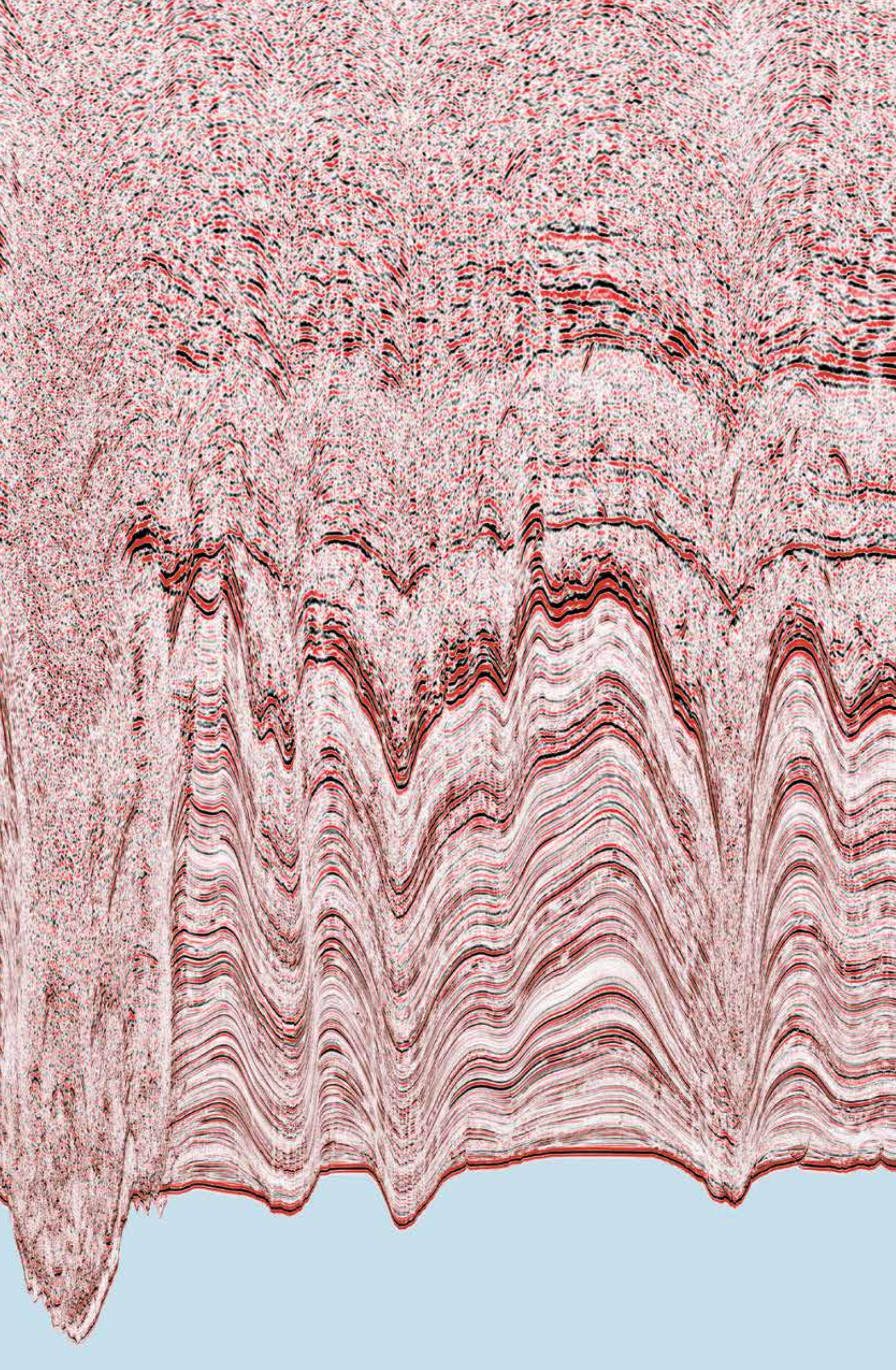
Gigante 2D - Offshore



Mexico







A science-based approach

U.S. Industry Offers Lessons in Earning Public Trust

By EMILY SMITH LLINÁS, EXPLORER Correspondent

The unconventional revolution in North America has provided lessons for industry throughout the world – from technology to geology, operators look to precedents set in the United States to decide best practices and procedures.

The trend holds true especially with regard to resistance from environmental and community groups.

The recent AAPG-SEG International Conference and Exhibition (ICE) in Melbourne, Australia, provided a unique opportunity to learn about that precedent in the sessions dedicated to environment, regulation and social license to operate.

Ian Duncan, a native of New South Wales, returned to his home country to share research from his work at the Bureau of Economic Geology at the University of Texas in Austin. He brought a poster and delivered a lecture on the scientific data intended to inform public debates over coalbed seam gas (CSG) extraction and hydraulic fracturing.

Duncan's poster, "Accuracy of Facts Supporting Justice-Based Social License-to-Operate Arguments for CSG Development: Information From Four Decades of CBM Production in North America," provided a review of environmental impact statements and models published before coalbed methane (CBM) extraction and compared them with case studies conducted by state agencies and consultant reports to see what actually happened.

Duncan, who presented the poster with Andrew Garnet, director of the Center for Coal Seam Gas at the University of Queensland, said his research helps address concerns that have risen in Australia surrounding CSG.

"Australia with CSG is where the United States was 20-25 years ago with stages of development," he said. "Australia can learn about getting gas out of coal by looking at the track record in the United States."

Prediction and Reality

Duncan's analysis in Melbourne addressed two primary concerns raised by CSG extraction: water table reduction and land subsidence.

"Because operators have to pump water out of coal beds in order for gas to come out, farmers and environmentalists are concerned that they will get all the water out of the area and it will be gone," he said.

Duncan noted that when CBM extraction first started in the United States, numerous hydrological and computer models predicted massive amounts of water would be extracted. After projects were completed, the total extraction was much less than predicted.

The difference between prediction and reality comes from challenges associated with geologic modeling and modeling consultants' hesitancy to underestimate the impact of CSG development.

"Modelers tend to be conservative," he said. "Extracting more water is bad; less water is good. No one wants to be seen as having a rosy scenario. The conservative choice is to have the highest permeability."

Duncan added that areas with coal seam gas tend to have low permeability rocks, which are very challenging to model.

Photo courtesy of Wikipedia user Unaipon

Coalbed methane production in Australia's Surat Basin has drawn criticism from environmentalists concerned about water pollution.


DUNCAN

He also noted that Australian land models are very similar to models used in the United States 20-25 years ago.

"The models tend to create a grid spacing of 10-15 square meters," he said. "That includes a number of different types of geology, so they have to average them and create rocks that don't actually exist."

Another question raised throughout the world is how much the land surface will sink as a result of CSG extraction.

"In Australia, there are suggestions in the Surat Basin, the land will sink up to two meters," Duncan said, noting that these claims do not fit with his subsidence studies following decades of CBM extraction in the Rattan Basin in New Mexico.

Analysis measured subsistence as small as a fraction of a millimeter, but in most cases measurements in the basin reached scales of one to two centimeters. The largest subsistence was six centimeters spread out over several kilometers.

"There's no evidence of large scale subsidence," he said, "Even if you had a house there, you wouldn't notice."

Duncan said he hopes his CSG presentation helped to inform geoscientists and encouraged them to respond to news coverage and discussions in which "exaggerated claims are made."

"We're trying to get the information out to geologists first," he said, "because geologists are the ones who tend to understand."

The Court of Public Opinion

Providing scientific answers in response to media reports was a primary focus of Duncan's second ICE lecture, "Evaluating the Veracity of Scientific Reports Used to Argue Against a Social License to Operate for CSG: The Curious Case of the Pavilion Wyoming Deep Monitoring Well Study."

The lecture featured an analysis of data collected following the 2009 Environmental Protection Agency (EPA) study in Pavilion, Wyo., a rural farming area located within the Wind River Indian Reservation.

The EPA conducted the study following resident complaints that local water wells had been polluted by natural gas drilling.

Duncan described Pavilion as "probably geologically the worst place to look for pollution of water wells and gas wells."

He pointed out that, in addition to the minimal environmental regulation on the Indian Reservation, there is almost no seal between the coalbed layer and the aquifer.

"People were drilling water wells in the gas surface," he said.

The EPA aimed to test pollution allegations by drilling two deep monitoring wells at 1,000 feet each. Duncan noted that the producing gas wells were located at 1,400 feet.


Photo courtesy of the EPA

An EPA employee takes a sample for the now withdrawn report on water contamination near Pavillion, Wyo.

The EPA collected samples and produced a large number of analyses, and the agency's preliminary report, published in 2011, showed the presence of hydraulic fracturing chemicals in wells that the EPA drilled.

International newspapers published articles claiming the EPA found definitive evidence that hydraulic fracturing has contaminated water wells, and frac'ing opponents like "Gas Land" director Josh Fox claimed victory.

Representatives from field operator Encana Corporation disputed EPA claims and hired consultants to show what the agency had done wrong while drilling. Allegations included drilling at depths not previously specified and having paint on well casings, which would skew the results.

The debate reached the U.S. Congress, and the U.S. Secretary of the Interior Ken Salazar directed the U.S. Geological Survey (USGS) to go to Pavilion and resample the wells that the EPA drilled.

In 2012, the USGS produced two reports full of data. The problem with the data, Duncan stated, was "there was no interpretation at all … not a sentence."

Shortly after the USGS data was published, the EPA withdrew its report – an action that, according to Duncan, caused both sides of the hydraulic fracturing debate to claim victory.

"One group says the EPA found frac water contamination and was forced out by political pressure. The other group says, 'No they weren't. The USGS data was contrary to the EPA data," Duncan said. "Frac'ing opponents say that the EPA wells were the best proof that contamination occurred. Supports say, 'No the well wasn't completed properly, so the study doesn't prove anything.'"

Following the debate, the geochemist and geologist decided to go back and see what actually happened. He restudied all of the EPA and USGS data and reviewed the original chemical analyses.

"I screened, plotted and analyzed. I've come up with a new interpretation of what happened that no one has heard," he said.

Duncan said he was intrigued by claims made by construction consultants hired by Encana to study the EPA wells.

"Consultants said that when the EPA grouted the well they put too much water in the cement, so the cement was watery. Seven hundred gallons of cement went out into the sand layer that the EPA later sampled," he said.

He noted that watery cement and incorrect plotting of hydrogen and oxygen isotope data caused misinterpretation of the findings.

"(The EPA) misplotted points in 2011, so it looked like there was no pattern," he said. "If plotted correctly the isotopes pointed to a meteoric water line."

Duncan noted that the local reservoir displayed isotopes matching those present in the river water used to source the city's water supply. This same city water was mixed with the cement used to

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grout the EPA well.

The first sample taken out had 80 percent river water. The second had 60 percent river water. The third and fourth samples had 40 and 30 percent respectively. As the amount of river water decreased, the amount of contaminants decreased as well.

"(The EPA) flushed watery cement into low permeability aquifer," Duncan said. "Pollution goes down as there is less and less river water and more surface water present."

Duncan also noted that several contaminants present in EPA samples, glycols, 2BE and phenols, are found in frac fluids, but they also are added to cement to improve grindability.

An isotope of hydrogen tridium, produced during atomic testing in the 1950s, was also found in the city water supply.

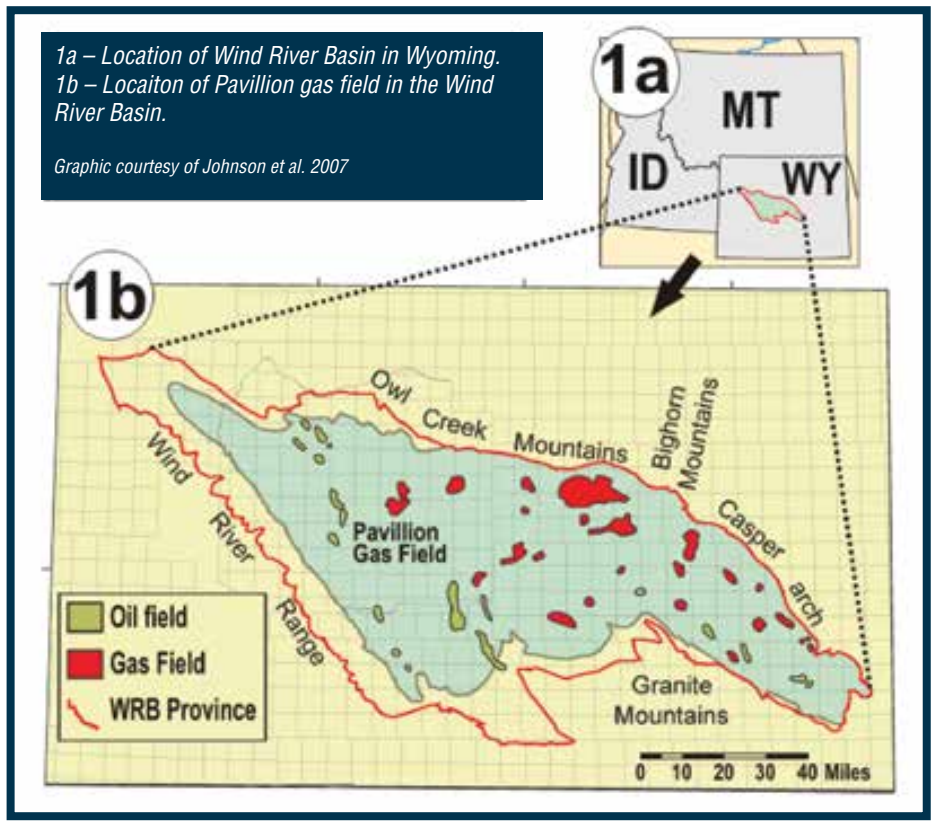
Hydrogen tridium levels, like the other contaminants, decreased when there was less city water and more surface water present.

Duncan compiled his findings into a report, which he submitted to the journal Science and is awaiting word on publication.

"I was out to show that most of the chemicals that the EPA claimed were contaminants from frac'ing actually were contaminants from the watery cement they introduced into the aquifer," he said.

Duncan has not yet heard from the EPA, but he expects some kind of communication when the article is published.

"There were good scientific reasons for them to drop the study based on my work," he said, "and I'm imagining that they might have been thinking the same thing."



1a – Location of Wind River Basin in Wyoming. 1b – Locaiton of Pavillion gas field in the Wind River Basin.

Graphic courtesy of Johnson et al. 2007

Why He's Talking

Duncan said he hopes his Pavilion study will provide insight to organizations involved with the hydraulic fracturing and water contamination debate in Australia.

"Earlier this year, one of the farmers from Pavilion went to Queensland to talk about how polluted their water was. There's a direct connection," he said.

"With the Internet and social media, everything is connected. If some paper gets published in the United States, people in Australia are on to it straight away," he said.

Duncan said he hopes his findings will help other geoscientists understand the hydraulic fracturing debate is not as simple as some industry representatives, environmentalists or community groups imply.

"The general public gets info chemicals found in water wells caused by frac'ing. Often it's because someone found a water sample and found something," he said.

"In the Pavilion case, there were thousands of samples gathered, two federal agencies and hundreds of millions of dollars involved. It's very difficult to find out what these data mean, and sometimes they don't mean anything."

Other Causes of Contamination

Duncan also noted that while advancing technology improves the ability to detect chemicals, it may also cause undue alarm.

"Sometimes you have to ask the question, 'What's the significance of finding one part in a trillion of something?" he said.

Duncan said it is also important to recognize other causes of contamination. He noted one of the items on EPA's contaminants list is 2BE, a chemical found in common household cleaning products.

"The average person probably has several bottles of 2BE sitting under their sink," he said. "In rural areas, if you wash your floor and have a bucket of water, what are you going to do with it? Are you going to take it to a toxic disposal facility or dump it outside?"

He also noted that nitriles found in water, including in the Pavilion water, often from the nitrile gloves people use while conducting testing.

Duncan said there are ways to do testing, using ultra distilled water and seal blanks. This testing is time consuming and expensive, and strict procedures are not always followed.

Ultimately, the issues are not as simple as newspaper headlines may imply, he said.

"We have to be really careful jumping to conclusions with water testing. People overreact," he said. "I am not saying not to test anything. But we're in a whole new era."

Historical Highlights is an ongoing EXPLORER series that celebrates the "eureka" moments of petroleum geology, the rise of key concepts, the discoveries that made a difference, the perseverance and ingenuity of our colleagues – and/or their luck! – through stories that emphasize the anecdotes, the good yarns and the human interest side of our E&P profession. If you have such a story – and who doesn't? – and you'd like to share it with your fellow AAPG members, contact Hans Krause at historical.highlights@yahoo.com.

Tempest at Teapot Dome:
The Greatest Political Scandal of the American Oil Industry

By MATT SILVERMAN

Warren G. Harding's presidential administration was arguably the most corrupt in American history, and the oil industry was right in the middle of the scandal. The 1920s affair surrounding Teapot Dome oil field was the most infamous presidential scandal to happen in the 100-year period between the Grant administration in the 1870s and the Nixon administration.

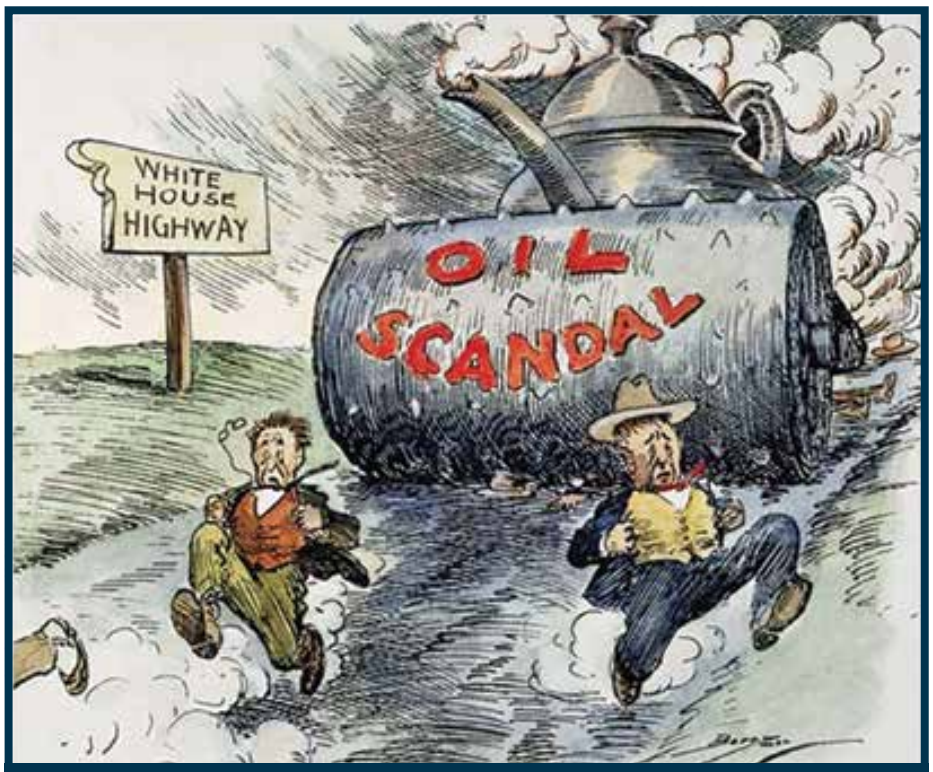

SILVERMAN

The story includes sex, bribes, scandal, oil barons, crooked politicians, bathtub gin, smoke-filled rooms, the Roaring Twenties, blackmail, suicide and murder.

In short, it's just like today – except gin is made in distilleries now and smoking is less popular than frac'ing.

A series of presidential orders between 1910 and 1923 created Naval Petroleum Reserves and Naval Oil Shale Reserves in California, Wyoming, Colorado, Utah and Alaska. For the United States and the United Kingdom, the advantages of petroleum over coal for naval fuel had proved irresistible, and the reserves were meant to provide a secure American wartime supply.

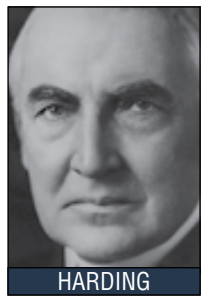
Leading the charge for Great Britain in this effort was First Lord of the Admiralty Winston Churchill, who was committed to meeting Germany's challenge to Britain's naval supremacy on the eve of the Great War.



Teapot was the greatest presidential scandal between the Grant and Nixon administrations. (Cartoon from The Granger Collection.)

"Mastery itself was the prize of the venture," he said later of the Royal Fleet's fuel conversion.

President Woodrow Wilson's Secretary of the Navy Josephus Daniels and the Assistant Secretary Franklin D. Roosevelt also embraced the promises of greater firepower, efficiency and speed that oil-burning ships offered.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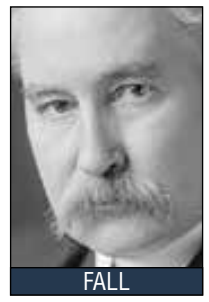
FALL

Teapot Dome

In 1911, C.H. Wegemann of the U.S. Geological Survey first described the Teapot Dome structure, southeast of the giant Salt Creek field, 30 miles north of Casper in Natrona County, Wyoming: "No drilling has yet been done in the Teapot Dome, but the structural conditions here are very favorable for the accumulation of oil."

One hundred years ago, in 1915, Naval Petroleum Reserve 3 was created by the Wilson administration at Teapot Dome. The prospective structure was exclusively set aside for U.S. naval supply in case of emergency.

(The field was named for Teapot Creek, which in turn had been named for Teapot Rock, an iconic landmark cropping out nearby. The "spout" and "handle" have since eroded away.)

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Wobbly Warren

Handsome and likeable, Ohio Sen. Warren G. Harding was elected easily as the U.S. president in 1920 after a protracted Republican nomination process that gave us the phrase "smoke-filled rooms."

Among the wealthy smokers who supported Harding's candidacy – generously, but not necessarily altruistically – were legendary oilmen Jake Hamon, "the Oil King of Oklahoma," and Harry Ford Sinclair, who had failed as a pharmacist but launched his fortune by selling timber for derricks in southeast Kansas.

Harding chose a poker and drinking buddy, New Mexico Sen. Albert B. Fall, to be secretary of the Interior.

Fall was said to resemble "the frontiersman, the rough and ready, two-fisted fighter … who looks like an old-time Texas sheriff … a Zane Grey hero," according to a description in a 1924 issue of The New Republic.

The president promised "normalcy" and made several excellent appointments, but Fall was not among them. He was a successful rancher, miner and lawyer, but one whose enthusiasm for the private exploitation of the nation's strategic resources led a contemporary to say, "It would have been possible to pick a worse man for secretary of Interior, but not altogether easy."

Harding was distracted in office by a collection of personal scandals; among them was a mistress with whom he had a daughter, and a former lover blackmailed him during his campaign for the presidency. He was a popular (and deeply mourned) president in his day, but is now a widely discredited chief executive.

Historians generally consider him one of the nation's worst presidents, though one recent biographer, John Dean (yes, Richard Nixon's White House counsel) offers a more sympathetic portrait.

Scandal and Aftermath

In 1921, the Navy Department estimated that Teapot, aka NPR-3, contained 30 million barrels of oil reserves. They went on to suggest "under the terms of the oil-land leasing act of Feb. 25, 1920 … the Navy's interests in these reserves can be considered very well protected."

The estimate proved to be realistic, but the protection was fleeting.

That same year, Fall wrangled NPR-3 away from the Navy Department, and then leased the field to independent oil titan Harry Sinclair in a secret, non-competitive deal.

A Wyoming operator spotted Sinclair operations on the reserve and informed his senator, who demanded an investigation.

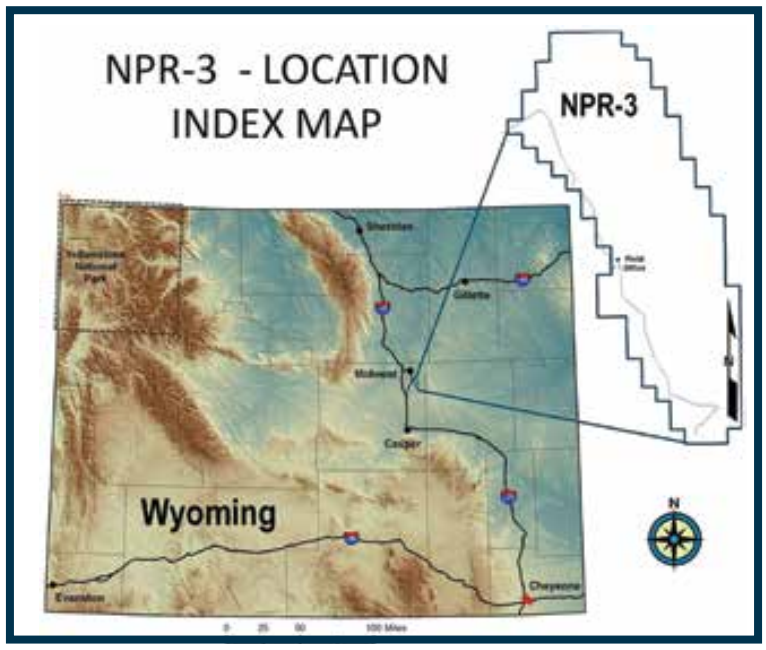
The Wall Street Journal broke a sensational story on the furtive deal and the scandal captured headlines across the country.

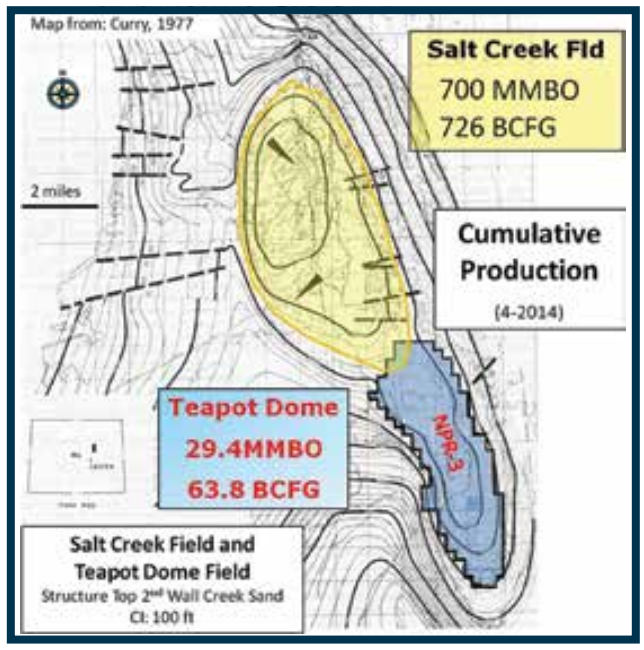
"Teapot Dome Lease To Sinclair Threatens Wyoming Oil Scandal," read a headline in the Denver Post. A picture of Teapot Rock in the New York Times was captioned, "The 'Teapot' Which Has Things Boiling in Washington."

Sinclair later made a payment to the colorful owners of the Post – and their coverage of him and the scandal took a much gentler tone.

Senate hearings followed, however, led by Thomas Walsh of Montana and Robert "Fighting Bob" La Follette of Wisconsin. After the scandal broke, Harding reportedly

See **Mammoth**, page 27





Edith Allison, director of AAPG's Geoscience and Energy Office in Washington, D.C., can be contacted at eallison@aapg.org; or by telephone at 1-202-643-6533.

LNG Exports Approved Amid Waning Interest

By EDITH ALLISON, Geoscience and Energy Policy Office Director

For over two years Congress has complained about delays in the government permitting process for liquefied natural gas (LNG) export-terminals, and several bills were introduced to accelerate the processing of natural gas export applications.

In mid-2014 the Department of Energy (DOE) made changes to expedite the approval process, and now low natural gas prices have slowed industry interest in LNG exports. Today Congress and industry are focused on increasing the volumes of crude oil that can be exported, although legislation is stalled in Congress.


ALLISON

The dream of selling U.S. natural gas into a global market in which prices are set in energy-output parity to crude oil selling at $100/barrel has vanished.

By late October DOE had approved five LNG export terminals that are under construction, located in:

- Sabine, La.
- Hackberry, La.
- Freeport, Texas.
- Cove Point, Md.
- Corpus Christi, Texas.

Another plant proposed for Sabine Pass, La., is approved but not under construction.

In the United States 22 export terminals have been proposed and are in various stages of the review process. In addition, dozens of export terminals are proposed for Canada.

With low natural gas prices, most people expect that the majority of the proposed export terminals will not be constructed.

However, a few plants probably will export gas, even in today's low-price regime: Cheniere Energy Inc., for example, announced it would ship LNG from its Sabine plant in January, becoming the first exporting plant in the lower 48; and the Kenai, Alaska, LNG export plant started exporting in 1969, was mothballed in 2013 and then restarted in mid-2015.

In another twist, the Trans-Pacific Partnership would eliminate the need for much of the procedure for approving LNG export terminals, because exports to countries that have trading agreements with the United States are automatically approved.

The dream of selling U.S. natural gas into a global market in which prices are set in energy-output parity to crude oil selling at $100/barrel has vanished. Parity with a Brent oil price of $50/barrel would put natural gas at under $9 per million BTUs (MMBTU), which may be less than the cost to liquefy, transport and regasify the product – and real prices may be even lower. The Energy Intelligence Group reported September spot prices of $7.10/MMBTU for Northeast Asia.

* * *

The distant future may be no brighter.

Bloomberg, FGE energy consultants and others expect the global LNG market to be oversupplied for the next decade. However, a Bloomberg Intelligence analyst observed that U.S. brownfield plants, built on existing LNG import facilities, would be least likely to suffer delays or cancellations in low-price markets.

Continuing low prices can be blamed on a large and enduring natural gas surplus that is propelled by:

- U.S. gas production, driven by shale gas, is projected to fall slightly in 2016, but can grow quickly if prices rise.

In fact, unconventional gas production has proven more cost-efficient than expected. U.S. Energy Information Administration (EIA) data show that U.S. dry gas production has continued to grow as prices have fallen. A year ago Henry Hub spot prices were around $4/MMBTU. In August they were $2.77.

EIA reports that in August, for the second consecutive month, dry gas production was the highest since they began reporting. In fact, August 2015 production was almost 7 percent above August 2014.

- Northern Alaska holds over 100 trillion cubic feet of discovered and undiscovered natural gas resources (U.S. Geological Survey) awaiting a decision to build a pipeline from Alaska's North Slope – a decision that would not be made until at

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least 2018-19.

Of course, there have been past proposals for natural gas pipelines from northern Alaska that have come to naught.

▸ Australia has over 100 TCF of economically demonstrated resources of conventional natural gas (Australian government).

Australia is projected to surpass Qatar as the world's largest gas exporter by about 2018. Australian LNG will be the major competitor to U.S. LNG for Asian markets.

▸ The European Union committed to reduce its dependence on Russian natural gas after the 2006 and 2009 supply disruptions.

As U.S. production expanded, producers hoped to export to what seemed like a potentially growing European market, and U.S. legislators pushed for accelerated permitting of LNG export terminals to support our European allies.

Russia, however, remains their main supplier; 42 percent of EU natural gas imports were from Russia in 2014, although this represents a 10 percent drop in import volume. The Ruble continues to lose value against the dollar, increasing profit margins for Russian producers allowing them to sell at below-market prices.

Russia is expected to undercut U.S. LNG prices for many years.

▸ On the other side of the supply-demand equation, European demand for natural gas is declining with increased energy efficiency and the shift to renewable energy. In addition, weak Asian economies and the return of nuclear power in Japan also push down demand.

* * *

Of the many bills to accelerate approval of export facilities introduced in Congress in 2014, none passed both houses of Congress. There is much less activity this year, probably reflecting progress in permitting export terminals and low gas prices.

H.R. 351, the LNG Permitting Certainty and Transparency Act, which has passed the House, is sponsored by Rep. Bill Johnson (R-Ohio). It would require accelerated review of export applications and disclosure of the specific destination(s) of the exports. A similar measure, S. 33, was introduced in the Senate by Sen. John Barrasso (R-Wyo.). Neither of these bills is likely to get to the president.

In fact, in the current natural gas price environment, analysts expect that the United States will not need all the export facilities that have already been approved.

Meanwhile, Congress – especially Republicans, but including some Democrats – has been especially interested in legislation to end the 40-year ban on crude oil exports, and the House voted in October to lift the ban. The president, however, announced his intention to veto the measure if it gets to his desk, and the Senate seems unlikely to pass a stand-along oil export bill.

One early-November tactic to force the end of the oil export ban was to make it an amendment to the highway transportation bill. That effort failed to get the necessary support of the House Rules Committee.

Additional efforts to pass a bill will continue.

Mammoth
from page 25

told an associate " ... if Albert Fall isn't an honest man, I'm not fit to be president of the United States."

Fall resigned in disgrace less than a year later, Walsh became a national icon of probity, and Harding died suddenly of a heart attack a few months later.

Harry Sinclair had made his first big oil strike in 1905 at the fabulous Glenn Pool in Oklahoma, and was said to be the richest man in Kansas by 1907. He organized a subsidiary, Mammoth Oil Co., to acquire and operate Teapot in 1922. Bullnecked and ambitious, by the mid-1920s Sinclair had built Sinclair Consolidated into the largest oil company in the Midwest and the seventh largest in the country.

Investigators determined that Sinclair had given "loans" to Fall of about $400,000 (more than $5 million in today's dollars). Fall was tried, convicted, fined and imprisoned for felonies (bribery) committed in office – the only cabinet officer ever to suffer such ignominy (so far!).

His health broken, he served nine months and died penniless in 1944.

Sinclair was acquitted of the bribery, ironically, but jailed for six months for contempt of court (jury tampering) and contempt of Congress. He returned to the helm at Sinclair Oil and prospered for another 30 years.

The leases were invalidated by the Supreme Court in 1927, however, and Teapot Dome was returned to the Navy.

Harding was succeeded by his Vice President Calvin Coolidge, famous for his conclusion, "The business of America is business."

Taciturn and proper, "Silent Cal" fired or forced the resignation of Harding's secretary of the Navy, attorney general and others to minimize the stain on his party. The GOP was vilified by the press as the "Grand Oil Party," but went on to a landslide win in 1924.

(La Follette ran as a Progressive but finished third, carrying only his home state.)

Teapot Dome Production

Sinclair had managed to buy out most of the existing claims at Teapot Dome before he got title to NPR-3 from Fall. However, a title dispute involving the Mutual Oil Co. resulted in the Navy Department sending in the Marines.

See **Teapot**, page 33

"ProTracks" is an ongoing feature of the EXPLORER, offering news and information pertinent to getting started or getting better in your career. Keep up-to-date with the YPs on Facebook, Instagram, Twitter and LinkedIn.

AAPG President John Hogg with Young Professionals at the AAPG Mid-Year Business Meetings.

PROTRACKS

Stemming the Loss of YPs

By JONATHAN ALLEN, Young Professionals Committee Co-Chair

ALLEN

The sixth annual Young Professionals Leadership Summit (YPLS) was held in Houston with the AAPG Mid-Year Business Meetings in October.

Nine attendees participated in the three-day event intended to give Young Professionals (YPs) a greater understanding of AAPG, the opportunity to discuss issues currently facing YPs within the Association, and the chance to network with the current leadership.

YPLS participants were joined by members of the Executive and Advisory committees as well as from AAPG Sections and Regions leadership, who provided constructive feedback and valuable insights on several key issues.

They covered a range of topics, including AAPG's value proposition, the effects of the current downturn on YPs and the future state of AAPG.

Why Are They Leaving?

One major challenge is that many YPs do not perceive the value in AAPG because they can receive many of the products and services AAPG offers from other sources.

Additionally, YPs in attendance expressed frustration that, while this and similar issues have been raised many times, the Association has yet to address the problem to their satisfaction, which directly affects the Association's membership: numbers are decreasing and the YPs are a large demographic within this decreasing population.

Young Professionals are leaving the Association in two major ways:

- The first and more significant loss in terms of numbers occurs during the student-to-YP transition. Approximately 80 percent of student members do not renew their membership after graduation. This issue has been recognized for several years, yet it continues despite several efforts, such as the Student-YP Bridge.

The reasons for the small retention of student members as they progress to YPs are varied. Some do not continue in the geologic sciences professionally. Some rely heavily on their company and other sources for training and development, while others have not recognized the powerful network that one can develop as an AAPG member.

A significant issue seen in the Regions, which was discussed at the YPLS, is that while AAPG has a robust and well-supported infrastructure for student members, it is extremely lacking for YPs.

As a result, YPs in many regions rely on local societies or their companies to provide training, career development and other resources.

- The second way YPs are leaving the Association is after progressing from student to YP. While numerically much smaller than the loss of members during the student to YP transition, this loss is much more alarming. This group feels that AAPG does not provide the resources and services that they need as early-career geoscientists.

More striking is that YPs who have been active in the Association as members and volunteers have expressed frustration that AAPG has not addressed the needs of this group nor made appropriate changes in a timely manner. The result is increasing apathy about the organization and decreased or no participation and are in danger of leaving the Association.

This loss needs to be prevented because the percentage of YP members who are active and engaged as volunteers is already small, yet these members are supposed to be the future leaders of AAPG. While some feel that this group needs to

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be patient as change occurs slowly, the danger is that when this change finally does occur, this group already will have left the Association for other alternatives.

These two issues – retaining and increasing membership, and the perceived lack of value in AAPG – were discussed at length during the first portion of the YPLS.

The implications are that AAPG is in danger of becoming irrelevant in the short term and nonexistent in the long term.

A Future Without YPs?

The most significant YPLS discussion centered on the newly formed YP Special Interest Group (SIG) and how it can be used as a vehicle to address the membership problem highlighted above.

Four major focus areas were identified in which the SIG could offer value to both YPs and the Association:

- Technical excellence.
- Membership recruitment and retention.
- Career development.
- External partnerships.

YPLS attendees proposed a number of methods within each focus area to address the current gaps identified during the Summit's issue-raising discussions.

Within the technical excellence focus area, there is a proposal for a suite of shorter half to full-day technical conferences, panels and workshops. Several participants have also started conceptualizing a YP magazine as a platform to showcase YP technical work.

A formal mentor program was proposed under the membership recruitment and retention focus area. This program could provide significant value, given the coming "Great Crew Change." Many senior geoscientists will be retiring in the coming years, which will create major knowledge gaps across the industry within companies both small and large.

While YPs may lose a large number of mentors within their own company, AAPG has the opportunity to fill this gap with a pool of mentors, both working and retired, with which no single company could compete.

The YPs also realize that we are not the only game in town. Stronger relationships with our YP counterparts within other organizations such as YPE, SEG, SPWLA and SPE will be necessary in order to attract members and ensure that YPs are at the forefront of improving AAPG for all its members.

Several of the solutions proposed at the YPLS already exist in some manner within the Association. However, these may not be well known or advertised, or are not fit for purpose.

The YPs intend to leverage pre-existing products and services by either incorporating or modifying these into the offerings of the YP SIG as well as partnering with other groups within the Association who are also working on similar programs. These include the Visiting Geoscientist Program, Student Chapters, Career Services and the Division of Professional Affairs.

At the conclusion of the YPLS, the participants felt energized and walked away with a clear set of actions for a large number of the proposed programs in each of the four focus areas. Despite identifying a significant problem, the attendees have offered innovative solutions to address the problem.

The YPs want the Association to thrive well past its 100th anniversary and are looking forward to making a lasting impact with the YP SIG.

The Geophysical Corner is a regular column in the EXPLORER, edited by Satinder Chopra, chief geophysicist for Arcis Seismic Solutions, Calgary, Canada, and a past AAPG-SEG Joint Distinguished Lecturer. This month's column deals with avoiding interpolation artifacts in displaying cyclical attributes on interpreted horizons.

Using Volumetric Calculators For Better Accuracy

By LENNON INFANTE PAEZ and KURT J. MARFURT

Interpreters routinely use horizon slices and stratal (or proportional) slices to interpret seismic attributes. While some attributes such as dip magnitude and dip azimuth can be computed from a picked surface, most attributes are computed volumetrically on a 3-D grid of voxels whose vertical size is defined by the time or depth sample increment.

In general, picked horizons occur at fractional sample increments, requiring subsequent interpolation.

- For attributes that vary smoothly, such as the original seismic amplitude, simple linear, quadratic and sine function interpolation provide excellent results.
- For attributes such as envelope and spectral magnitude components, the results are almost always acceptable, but can be less accurate as the values approach zero.
- For attributes that are cyclical, such as phase, azimuth and strike, such interpolation gives erroneous results.

We present a simple workflow that allows an interpreter to more accurately extract such attributes using the volumetric calculators available in most commercial interpretation software packages.

* * *

Many attributes of interest have a cyclical behavior, including instantaneous phase, spectral phase components, dip azimuth and strike of azimuthal anisotropy and curvature. While human interpreters perceive these attributes to be continuous, computer software does not, and injects a numerical discontinuity in phase and azimuth between -180 degrees and +180 degrees (or depending on the software package between 0 degrees and 360 degrees).

Similar discontinuities appear in strike between -90 degrees and +90 degrees.

Such discontinuities do not pose a problem if we only wish to look at the data at discrete voxels – but if the number of pixels used on the computer screen is larger than the number of voxels being displayed, the data need to be either replicated or interpolated.

The most common implementation is to interpolate the data, linearly, bilinearly or with a spline. Such interpolation between samples works very well for seismic amplitude and envelope, but fails for cyclic (to a computer, discontinuous) attributes like phase (figure 1a). Many commercial software packages use splines to interpolate along the vertical axis, which for phase results in erroneous values beyond ±180 degrees.

The simplest way to avoid such artifacts is to disable the interpolation. This can almost always be done when displaying vertical or horizontal slices through the data volume.

Examining figure 2, we note that the vertical slices through the seismic

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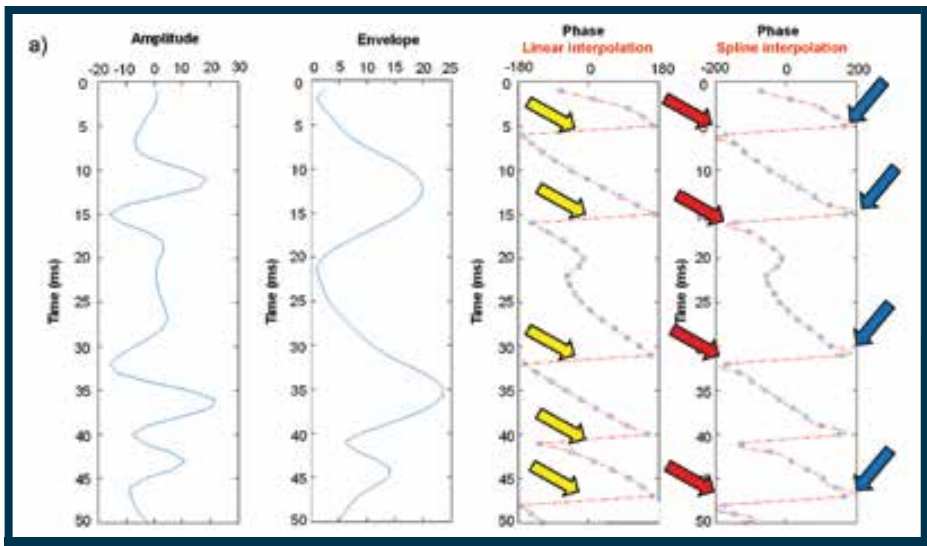

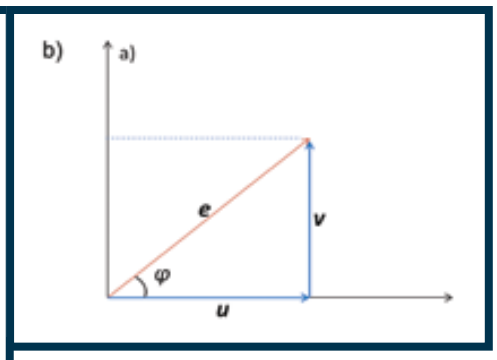

Figure 1 – (a) Seismic amplitude, and its corresponding instantaneous envelope and phase. The envelope is linearly interpolated and exhibits no strong intersample errors. In contrast, the linearly interpolated phase generates inaccurate estimates between samples (yellow arrows) when the phase "wraps" around the circle. The spline-interpolated phase (used in many commercial software implementations) exhibits the same artifacts, but also overshoots (blue arrows) and undershoots (red arrows) values beyond ±180 degrees. (b) A cartoon showing the relationship between the original amplitude, u, its quadrature component, v, instantaneous envelope, e, and instantaneous phase, ϕ. We will use this relationship to improve our interpolation.


PAEZ


MARFURT

Continued from previous page

amplitude and instantaneous envelope display nicely, but the same slice through the instantaneous phase in figure 2c looks "green." Using figure 1a as a guide, we realize that much of the green is an artifact of inaccurate interpolation wrapped around values of the phase. Disabling interpolation and instead replicating the nearest pixel provides the lower resolution but acceptable image in figure 2d.

This artifact becomes particularly ugly when we wish to extract cyclical attributes along a picked horizon. Horizon picks rarely fall on an integer sample value such that the data need to be interpolated.

In figure 3 we show a time-structure map and amplitude extraction where the base Oligocene corresponds to a trough. The initial phase extraction is totally erroneous (figure 3c). A more accurate means of interpolating the phase is to compute the original data and its quadrature (the "real" and "imaginary" components of a complex trace), using the envelope, as shown in figure 1a.

Be careful to compute the angle using "ATAN2" (the same one as in Excel) to obtain values of phase range between -180 degrees and +180 degrees. By doing so we obtain the geologically reasonable image (phase close to ±180 degrees, appearing as magenta), consistent with our picked trough.

Interpolation of other vector components, such as dip azimuth and dip magnitude, are similar to the technique used in equation 1.

In contrast, interpolation of attributes that are defined by a strike require a slight variation.

For azimuthal anisotropy, the "azimuth"

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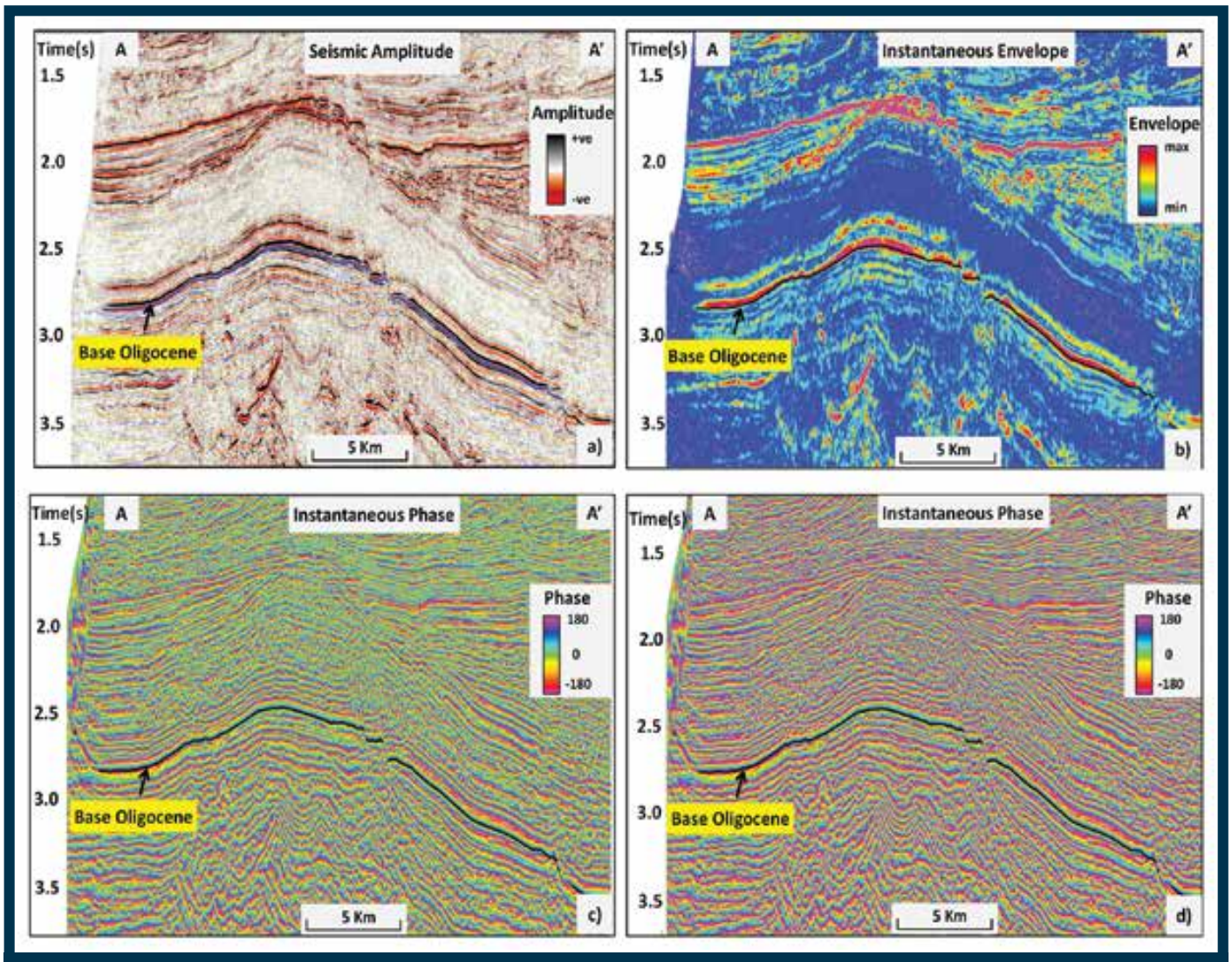

Figure 2 – A representative vertical time slices through (a) seismic amplitude, (b) instantaneous envelope, e, (c) instantaneous phase, ϕ, displayed with pixel interpolation turned on, and (d) instantaneous phase with pixel interpolation turned off. Since the software does not know that instantaneous phase is cyclical, it incorrectly linearly interpolates values that fall between purple values near -180 degrees and purple values near +180 degrees to generate green values near 0 degrees. Turning interpolation off removes these display artifacts. The blue pick indicates the base of the Oligocene section corresponding to a trough. (Data courtesy of NZPM)

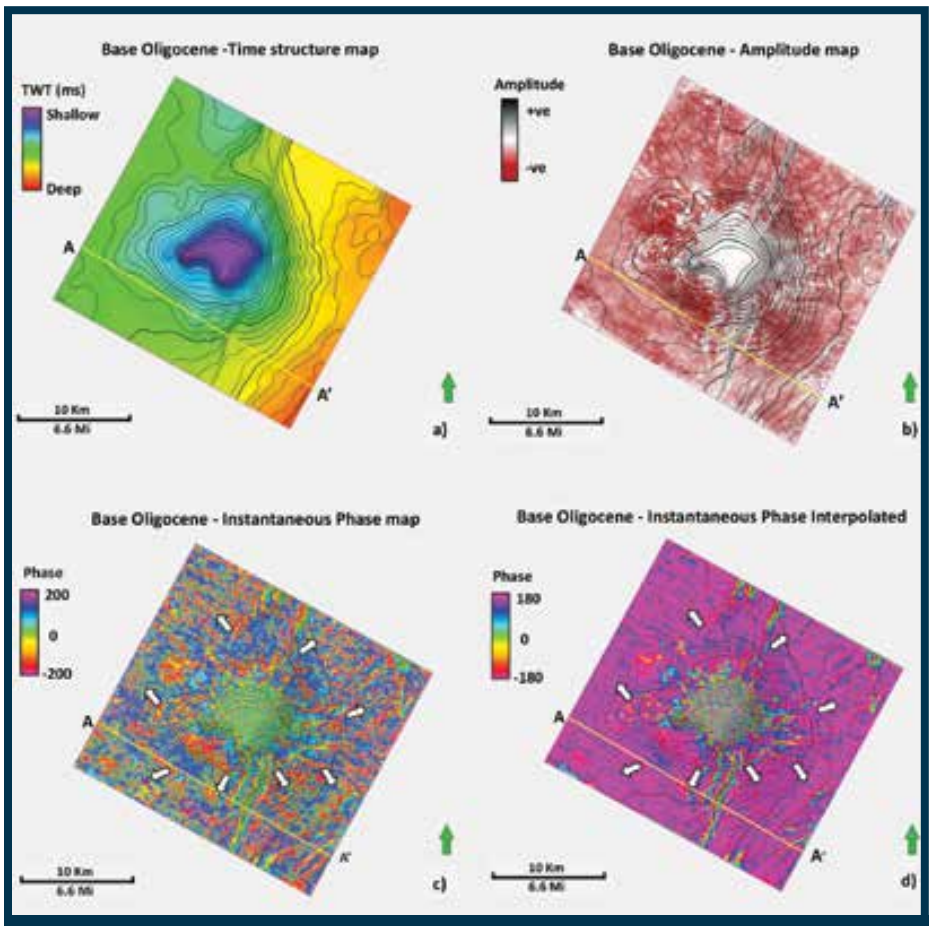

Figure 3 – (a) Time structure map of the base Oligocene corresponding to the blue pick in figure 2. These picks corresponded to a trough. (b) Horizon slice through seismic amplitude, where the values are mostly negative, consistent with the trough pick. (c) Horizon slice through instantaneous phase without vector interpolation. Since we picked a trough corresponding to ϕ = ±180 degrees, the interpolation is highly inaccurate, resulting in a useless image. Notice how the interpolation creates erroneous values beyond ±200 degrees. (d) Horizon slice through instantaneous phase using the vector interpolation algorithm described by equation 2. Here, the phase appears to be purple, corresponding to ϕ = ±180 degrees. The anomalous phase values correspond to radial faults associated with the volcanic plug. There are very few artifacts in linearly interpolating the phase about a peak. Note the white arrows show improvement of artifacts.

Continued from previous page

is really a strike and also varies between -90 degrees and +90 degrees, while the azimuthal intensity, ε, is a strictly positive number. Here, be careful to use "ATAN" rather than ATAN2 to obtain strikes between -90 degrees and +90 degrees.

* * *

This workflow works well in many, but not all software packages.

Figure 4, for example, illustrates a limitation faced in the one that we use.

We wish to extract and display volumetric dip azimuth along the same horizon shown in the previous image.

Using equation 1 eliminates some of the artifacts. However, while the software allows us to disable interpolation on vertical and horizontal slices, it does not allow us to disable it on horizon slices.

The result is the appearance of blue "rings" (corresponding to north, or 0 degrees) circling anomalies that wrap around between SSW and SSE (±180 degrees) azimuths.

Presented with such an image, the only recourse is to realize that they are artifacts and not geology!

(Editor's note: Lennon Infante Paez is a student member of AAPG, completing his doctorate in geophysics at the University of Oklahoma, studying under AAPG member Kurt Marfurt.)

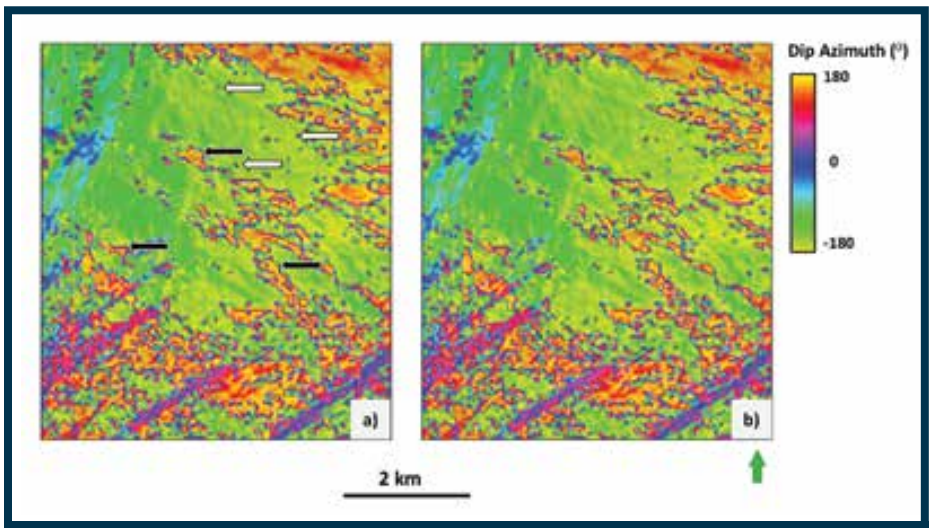

Figure 4 – A zoomed image of horizon slice through volumetric dip-azimuth along the picked horizon shown in the previous image about an area of predominantly south (ψ = 180 degrees) dip (a) without and (b) with vector interpolated defined in equation 1c. Careful examination of small artifacts indicated by the white arrows are eliminated when using vector interpolation. However, the major overprint here is the pixel interpolation artifacts introduced by the surface rendering software. In the software we use, there is no way to turn off pixel to pixel interpolation between seismic data points, giving rise to (typically blue, ψ~0 degrees) linear (vs. cyclical) interpolation between yellow values near -180 degrees and yellow values near +180 degrees. For this reason, the extra steps involved in vector interpolation is not worth the trouble.

Editor's note: AAPG member Matt Silverman is exploration manager for Robert L. Bayless, Producer in Denver, and he thanks Meagher Energy Advisors, Gustavson Associates, Stranded Oil Resources, Don Missey and AAPG members David Bickerstaff, Jeff Spencer and Cat Campbell for their help in making this paper possible. It is based on a presentation made to the History of Petroleum Geology session at the 2015 AAPG Annual Convention and Exhibition in Denver, and it represents the triple junction of Silverman's interests in petroleum exploration, American political history and bathtub gin.

Teapot

from page 27

One captain and four well-armed Marines (along with a contingent of Interior officials and the press) shut down Mutual's drilling operation on the Reserve with much fanfare but no bloodshed in August 1922.

Sinclair's Mammoth Oil Co. drilled 87 wells, 65 of which were producers. One was called the greatest gusher in Wyoming history, blowing in at 28,000 barrels of oil per day.

Mammoth produced about 3.5 million barrels of oil at Teapot from 1922 to 1927 – but from then until the early 1950s there was little activity at Teapot, and even during World War II no more wells were drilled.

During the late 1950s and '60s Navy contractors drilled about 150 wells inside the reserve, mostly Shannon Sandstone protection wells on the east flank of the field and Second Wall Creek wells adjacent to Salt Creek Field.

In 1977, Teapot Dome was transferred from the Navy to the Department of Energy, which drilled more than 1,100 wells there. Peak production was about 5,000 barrels of oil per day in 1979 and '80. Ultimately, NPR-3 was the last of the four Naval Petroleum Reserves. Under federal management it produced about 22 million barrels of oil and returned approximately $569 million to the Treasury since 1976.

In 1993, DOE created the Rocky Mountain Oilfield Testing Center (RMOTC) at Teapot, to be used in a public-private-academic partnership for real world testing of new oilfield technologies.

In all, about 1,500 wells have been drilled inside the NPR-3 boundaries.

Teapot Dome Geology

The field is an asymmetrical, Laramide anticline on the southwestern flank of the Powder River Basin.

Teapot includes basement-seated north-south thrust faults that offset Pre-Cambrian to Cretaceous units on its western boundary. There are many deep, complex, east-west faults throughout the field, as indicated by a 2001 3-D seismic survey.

Teapot has about 200 feet of structural closure. Cumulative production is about 29 million barrels of oil and 64 billion cubic feet of gas.

The key producing zones are Cretaceous sandstones and shales.

The Shannon Sandstone is the best pay, consisting of two zones at only 300 to 400 feet deep. It is a tight, compartmentalized reservoir with low pressure and a recovery factor of less than 10 percent.

The Steele and Niobrara shales are the second-best pays and include some of the most prolific wells in the field. These reservoirs are fractured and thick, characterized by high producing rates and rapid depletion.

The Second Wall Creek (or Frontier) Sandstone produces from two structurally distinct pools and consists of shaly offshore bars. One 1923 well flowed 8,000 barrels of oil per day from this zone. The Pennsylvanian Tensleep Formation has made about two million barrels of oil and untold million barrels of hot, fresh water from wells on the field's crest.

Teapot still produces several hundred BOPD and several thousand BWPD from about 400 wells. There is undeveloped potential for primary and enhanced oil recovery, as well as infill and horizontal drilling targets.

The Next Chapter

The scandal is over but the story continues.

In 2014, the DOE retained Meagher Energy Advisors to solicit offers for Teapot Dome, effective Jan. 30, 2015.

There were multiple bidders, and Stranded Oil Resources (a subsidiary of Alleghany Capital Corp.) purchased the field for $45.2 million via a competitive data room process.

Transfer of title this year to a new, private operator after 100 years as a Naval Petroleum Reserve represents another exciting chapter in the history of America's most notorious oil field.

The Petroleum History Institute will meet July 28-31 in Casper, Wyo. This meeting is open to the public and will include papers, posters and a tour of Teapot Dome and Salt Creek Fields. For more information visit www.petroleumhistory.org.

Foundation Aims to Double MSVP Fund

By JIM GIBBS, AAPG Foundation Chair

The AAPG Foundation was established in 1966 to support programs that benefit the geological profession and the general public. Its purpose is to encourage a better understanding and advancement of the geosciences – and to establish programs and fund projects that support the education, training and career enhancement of earth scientists.

From a modest gift of oil company stock, Foundation assets have increased through the years to today's value of almost $50 million.

With growth in assets has come an increased need to expand existing programs deemed to be in the public interest, as well as the opportunity to provide financial aid to additional projects suggested by AAPG members or others.

* * *

Each year generous donors make contributions that increase the Foundation's asset base and provide growth of earned income. However, requested funds to expand existing programs and initiate new ones always exceed revenue available from endowment earnings.

That's why every grant request is reviewed with the tests of supporting the Foundation's purposes and serving the public interest, and only a few new initiatives are sufficiently attractive to garner Foundation approval and member support.

Wesley Weisberg, a 2015 scholarship recipient through the MVSP.

One that has is the U.S. Military Veterans Scholarship Program, first proposed in 2012 and conditionally approved upon receipt of member contributions totaling at least $500,000.

Within months of approval, several major gifts led to the program's permanent establishment.

This year was the first in which grants were awarded.

Ten U.S. veterans each received a $2,000 scholarship to support enrollment in classes that could lead to a degree in the earth sciences.

According to Don O'Nesky, a retired U.S. Air Force lieutenant colonel and our MVSP Committee chairman, there are far more worthy and outstanding applicants than the Foundation has funds to support.

The Foundation's intermediate-term goal is to increase the number of awardee grants from 10 to 20 per year.

To accomplish this will require an increase in its asset base allocable to the program from $500,000 to $1 million.

For now, each gift of $50,000 will allow the Foundation to award a veteran $2,000 per year.

This is a program truly worthy of your interest and support.

* * *

As you consider your year-end tax-deductible contributions, please remember the AAPG Foundation. A gift that is not designated to the MVSP or other specific fund is available to support the many others the Foundation has traditionally supported.

Exhisting Funds are included in the contribution list in each EXPLORER (see page 35).Remember also that a gift to the Foundation of $25,000 or more can be designated as a "named gift" in honor of an individual or a family, or as a memorial tribute to a good friend, a valued partner or a respected mentor.

For more information about gifting to the Foundation, call 1-918-560-2664 or write to foundation@aapg.org.

Foundation Contributions for October 2015

General Fund

Sarah Allen
Mary L. Bateman
Janok P. Bhattacharya
William C. Boyers
BP Foundation
Matching gift/Hugh Nicholson
Janet Brister
William L. Buse
Michael H. Carter
Chevron Matching Employee Fund
Matching gifts/Joy Roth and Stanley Roe
Brian S. Cook
Robert T. Dickey
Gordon E. Duffy
Mirela Dumitrescu
Eastern Section AAPG 2015
Judit G. Garcia
William M. Hoag
Jenny Y. Hope
Curtis C. Humphris Jr.
Robert Hunsdale
Tarig I. Mohamed
Susan M. Landon
Alexander B. McInnis
James F. O'Connell
Andrew J. Pulham
Barbara J. Radovich
Sarah Springer and Rusty Riese
Lee R. Russell
Thomas J. Schull
Kim B. Shoemaker
John Smoot
Matthew J. Telfer
William G. and Patricia Watson
Justin Whitlow
Yu Ye

Digital Products Fund

W. Richard Moore
In memory of Robert R. Berg

Centenary College
Dianne B. Padgett

Stephen F. Austin State University
Dianne B. Padgett

University of Kentucky
Brian S. Cook

University of Tulsa
Dianne B. Padgett

Education Fund

Chevron Matching Employee Fund
Matching gift/Don Lewis
Sandy Meyer
Susan S. Nash

Grants-in-Aid Fund

Arthur A. Meyerhoff Memorial Grant
Dianne B. Padgett

Barrett Family Named Grant
Daniel Ramirez-Caro

Fred A. and Jean C. Dix Named Grant
James E. Briggs

Ike Crumbly Minorities in Energy Named Grant
Tricia G. Alvarez

John and Erika Lockridge Named Grant
Paul H. Dudley, Jr.
In memory of John Lockridge

Raymond C. Moore Memorial Grant
Teresa M. O'Neill

Roger W. Stoneburner Memorial Grant
Jean K. Funkhouser
In memory of Roger W. Stoneburner

James A. Hartman Student Leadership Summit Fund

Chevron Matching Employee Fund
Matching gift/Richard Ball

Military Veterans Scholarship Fund

William E. Gipson
In memory of John Lockridge
Paul M. Guerino
In memory of Vito Carnavalle
Dianne B. Padgett
Jack C. and Catherine I. Threet
Michael and Lynn Wisda

Named Public Service Fund

The Gibbs Family Endowment Fund
James A. Gibbs
In memory of John Lockridge and Jon Withrow

E.F. Reid Scouting Fund

Terri Duncan
Ronald L. Hart
Bryan Haws

The monthly list of AAPG Foundation contributions is based on information provided by the AAPG Foundation office.

INMEMORY

Bill St. John, an AAPG Honorary member who was a world-renowned international geologist and an expert on Africa and Antarctica geology, died Oct. 26. He was 83.


ST. JOHN

St. John's career started with American Overseas Petroleum and ExxonCorp., where he had a direct connection with the famous "Rover Boys" exploration team, before he was named president and CEO of Primary Fuels Inc.

Throughout his career he was active in Libya, Ethiopia, Niger, Morocco, Senegal, Cote d'Ivoire, Equatorial Guinea, Nambia and Madagascar, and authored the influential 12-volume "Hydrocarbon Potential of East Africa Offshore."

Other contributions included authoring the "Sedimentary Provinces of the World" map; his role as editor of AAPG's "Antarctica as an Exploration Frontier: Hydrocarbon Potential, Geology and Hazards;" author of "Geology and Hydrocarbon Potential of Antarctica;" and in providing expertise on a variety of global exploration publications and articles, including several for the EXPLORER.

* * *

John Schuyler Baldwin, 56
Houston, June 14, 2015
* Gerard Demaison, 87
Capitola, Calif., Aug. 10, 2015
Franklyn Engler, 86
Harlingen, Texas, Oct. 5, 2015
Carsten Geiger, 51
Vienna, Austria, May 15, 2015
Donn Gorsline, 88
Los Angeles, May 27, 2015
Roger Hammond, 61
Spring, Texas, July 12, 2015
John Evans Hankey, 63
Houston, May 28, 2015
Louis Eliphalet Harlan, 86
Dallas, Sept. 27, 2015
Peter West Hummel, 86
Reno, Nev., July 25, 2015
Steven Mark Murray, 67
Houston, Aug. 30, 2015
* Bill Eugene St. John, 83
Kerrville, Texas, Oct. 26, 2015
John Harold Scheufler, 86
Ocean Springs, Miss.
March 25, 2015
Richard Lawrence Stallings, 82
Littleton, Colo., Oct. 20, 2015
Jon Richard Withrow, 82
Oklahoma City, Oct. 19, 2015

(Editor's note: "In Memory" listings are based on information received from the AAPG membership department. Asterisk denotes AAPG Honorary member.)


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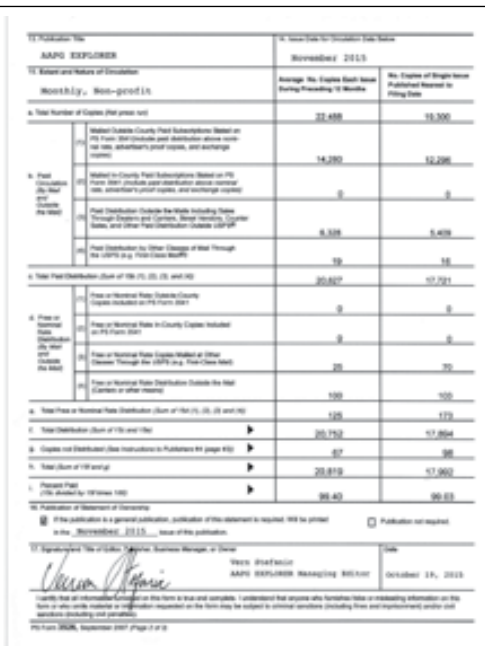

EXPLORER Editor Steps Down

By BRIAN ERVIN, Assistant Managing Editor


STEFANIC

The December EXPLORER, marks the end of an era.

Our final EXPLORER of the year is also the final issue for longtime managing editor Vern Stefanic.

After more than 32 years with AAPG at the helm of the EXPLORER – 394 editions – he'll be shifting his focus to Monarch Productions, where he'll be involved as a producer-writer-director of web-based broadcasts, documentaries and other film and media projects.

Stefanic joined AAPG after a 10-year career with the Tulsa World newspaper, where he covered a variety of subjects before being named the paper's entertainment editor and film critic.

He is a graduate of the University of Tulsa, where he had two college careers – the first in journalism, the second in playwriting.

In addition to his EXPLORER duties, Stefanic has been involved since 1998 in helping to create the opening sessions and other production events for the AAPG Annual Convention and Exhibition (ACE) and International Conference and Exhibition (ICE), and more recently in producing the IBA awards ceremony and the annual officer candidate videos.

Mostly, though, you know him for his leadership of the EXPLORER, for which I'll be succeeding him as managing editor.

I'd be lying if I said replacing Vern isn't a daunting prospect, but I couldn't have asked for a better mentor in the two years I've worked under him. His encyclopedic knowledge of AAPG and of the industry, his journalistic instinct and insight, his talent for effective communication and dynamic writing, but most of all, his genuine affection and respect for people – whether they're readers, members, sources or employees – have defined his impact on the EXPLORER and AAPG, and they'll be qualities I'll strive to emulate as I fill the role.

Godspeed, Vern. You'll be greatly missed.

INDUSTRY HIGHLIGHTS

Weatherford Introduces Production Optimization Consulting

Production optimization consulting (POC) services can be applied to a wide range of fields, including conventional, deepwater, unconventional shale and heavy oil. Whether the objective is to reduce costs through individual well optimization, to increase efficiencies by integrating field operations or to create a comprehensive digital oil field, Weatherford develops a custom plan to maximize oil production and reduce operational costs. For more information about this new service, visit www.weatherford.com/poc.

Baker Hughes and Shell Announce Release of First Software Application from Co-Development Agreement

The re-engineered JewelSuite 6 Subsurface Modeling software application improves decision making in field development planning. Baker Hughes and Shell recently announced the commercial release of the Baker Hughes JewelSuite 6 Subsurface Modeling software application for geological modeling and reservoir engineering. The companies' re-engineered application provides rapid, precise and powerful modeling of the subsurface and helps operators to make better decisions about well placement, reserves estimates and production planning.

Based on Shell's extensive experience as an oil industry operator and Baker Hughes' expertise in reservoir simulation and modeling, it is the first result of the joint software development between the two companies and is a core technology component of Shell's proprietary modeling software, PetroSigns. For more information, please go to: public.bakerhughes.com/jewelsuitesubsurface.

The Board of EMGS appoints Christiaan A. Vermeijden as new CEO

The Board of Directors of Electromagnetic Geoservices ASA (EMGS) has appointed Christiaan A. Vermeijden as new chief executive officer.

Vermeijden is 42 years old and comes from the position as global offshore geotechnical director of Fugro N.V., where he was part of the executive management team. Vermeijden has worked for Fugro since 2000 in several challenging management positions around the world, and brings with him extensive international experience and knowledge of the oil and gas service industry. He holds a master's in physical Ggeography from the University of Amsterdam and a Master in Business Administration (MBA) from the Rotterdam School of Management.

For more information, visit www.emgs.com

Schlumberger and Ikon Science Sign Joint Software Development Agreement.

Schlumberger and Ikon Science announced today an agreement to further develop the existing quantitative seismic interpretation capability in the Petrel* E&P software platform. The collaboration will make high-value seismic workflows fully available to customers and allow easy access to advanced reservoir characterization tools.

Bringing key capabilities of the RokDoc software platform, developed by Ikon Science, into the Petrel platform will enable geoscientists to derive enhanced geologic understanding from seismic data. The new workflows will democratize what was once considered only an undertaking for specialists, enabling all geoscientists and petroleum engineers to use the workflows for prospect or field development. For more information, visit www.slb.com.

DEG

from page 38

benefits) equal to that of the petroleum companies, because the environmental program is seen as a cost to be borne, not as a potential product to be delivered.

Today, as in the past, those who make the transition will find the work just as challenging and just as intellectually rewarding, but you'd better bone up on your chemistry, including partial pressures.

To those who transition, or set themselves up as consultants with an environmental tag, the DEG has been and continues to be here as a professional division of AAPG to assist you with excellent technical content, training and connections.

* * *

On a final note, and speaking of transitions: Last month, after decades of incredible service, Norma Briggs retired as AAPG's staff Divisions manager. Norma has kept the DEG, the Energy Minerals Division and the Division of Professional Affairs on track with meetings, budgets, reminders, gentle nudges, countless phone calls and billions of emails. Her duties are being re-assigned, but she can't be replaced.

Norma, you will be missed. I know I speak for all of the Divisions in wishing you the best in your transition to the next phase of your life.

CLASSIFIEDADS

POSITIONS WANTED

Assistant Professor – Quantitative Structural Geology or Geomechanics
Job Number: 00816

The Department of Geology and Geography at West Virginia University seeks to hire a full-time (9-month), tenure-track Assistant Professor specializing in quantitative structural geology with interests in the study of fractured reservoirs and geomechanics. The start date is August 16, 2016. The successful candidate will be expected to develop a vigorous externally-funded research program, teach undergraduate classes in structural geology or geomechanics, teach graduate courses in the area of his/her expertise, and mentor graduate and undergraduate students. Candidates should demonstrate potential to establish a strong externally-funded research program, publish in peer-reviewed journals, and excel in teaching at the undergraduate and graduate levels. Applicants should have a PhD or equivalent degree in geology, earth science or related field by the start date.

To apply, please visit jobs.wvu.edu and navigate to the position title listed above. Upload (1) a single PDF file containing a curriculum vitae, statement of research interests, statement of teaching philosophy, and names, titles, and full contact information for 3 references; and (2) PDF files of up to 3 publications. In addition, arrange for 3 letters of reference to be sent to Geomechanics@mail.wvu.edu. Review of applications will begin January 15, 2016 and continue until the position is filled. For additional information, please see or contact the search chair, Dengliang Gao, at Geomechanics@mail.wvu.edu or (304) 293-3310.

WVU is an EEO/Affirmative Action Employer and welcomes applications from all qualified individuals, including minorities, females, individuals with disabilities, and veterans.

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Endowed Chair (Associate/Full Professor) of Unconventional Energy

The Department of Earth, Atmospheric, and Planetary Sciences at Purdue University invite applications for the Steven and Karen Brand Chair in unconventional energy resources. Candidates with a core expertise in unconventional energy with a strong and consistent track record of applying this expertise to unconventional petroleum resources will be considered. Candidates with expertise including, but not limited to, unconventional exploration and production, tight reservoir characterization, geophysics and seismic data analysis, subsurface integration, hydraulic fracture mechanics, pore/fluid interactions, water and environmental issues, and enhanced oil and gas recovery are encouraged to apply. Excellence in and/or commitment to multi-disciplinary research and teaching is a requirement. It is expected that the candidate hired would significantly enhance Purdue's visibility and impact in this key area; increase opportunities for industry collaboration and grant funding; and inspire and train the next generation of leaders in the field.

This is an open-rank search; senior or mid-career scientists with academic, national laboratory, and industry background are all encouraged to apply. Applicant must hold a doctorate in an appropriate field; salary and rank are commensurate with qualifications and experience. The Department of Earth, Atmospheric, and Planetary Sciences, and the College of Science at Purdue embrace diversity and seek candidates who will create a climate that attracts students of all races, nationalities, and genders. We strongly encourage women and under-represented minorities to apply.

The department, in collaboration with other departments, has expertise in solid earth geophysics and crustal seismology, fracture mechanics, fluid flow in porous media, hydrogeology, clay mineralogy and surface chemistry, and basin analysis. The department has a long tradition of training students for careers in the petroleum industry and is part of a new multidisciplinary initiative at Purdue University aimed at addressing the energy needs of the country and is affiliated with the newly established Enhanced Oil Recovery Laboratory located in Discovery Park. Faculty members have a long history of working closely with and providing leadership to various Purdue University Discovery Park Centers (www.purdue.edu/DP). The successful applicant will conduct research, will advise graduate students, will teach undergraduate and graduate level courses, and will perform service. The successful applicant will be expected to work across these existing areas of Purdue expertise and build on them with a focus on unconventional resources. Applicants should have a vision for the design and execution of a cross-functional program that achieves the intended mission as described above.

Interested applicants should visit https://hiring.science.purdue.edu; submit a curriculum vitae, a research statement, a vision statement, a teaching statement, and complete contact information for at least 3 references. Review of applications will begin January 15, 2016, and continue until the position is filled. Questions related to this position should be sent to Drs. John Cushman or Ken Ridgway, Co-Chairs of the Search Committee (phone: 765-494-3258, email jcushman@purdue.edu or ridge@purdue.edu. Applications will be accepted until the position is filled.

Purdue University is a dynamic, growing university and a great place to work. Our inclusive community of scholars, students and staff impart an uncommon sense of larger purpose and contribute creative ideas to further the university's mission of teaching, discovery and engagement.

Purdue University is an EOE/AA employer. Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. All qualified applicants for employment will receive consideration without regard to race, religion, color, sex, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability or status as a veteran.

Two Tenure-Track Assistant Professor Positions in Basin-modeling/Solid Earth Geophysics and Sedimentology

* * * * * * * * * * * * * * * * *

The Department of Geology at Kansas State University invites applications for two tenure-track faculty positions at the assistant professor level beginning in August 2016 in the areas of: (1) sedimentology and/or stratigraphy, (2) basin-scale modeling or solid earth geophysics. A detailed advertisement for both positions is located at www.ksu.edu/geology. Screening of applications begins December 21, 2015 and continues until the position is filled. Full consideration will be given to applications received by December 1, 2015. Kansas State University is an EOE of individuals with disabilities and protected veterans. Kansas State University actively seeks diversity among its employees. Background check required.

MISCELLANEOUS

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DIRECTOR'S CORNER

Overcoming the Challenges of Change

By DAVID CURTISS

As I'm writing this column the price of oil hovers around $40 a barrel. It's been in decline all year. And the impact of this slide on our industry and our membership has been dramatic. It is directly affecting many of us, our colleagues and friends. For our business 2015 will go into the history books as a challenging year.

The challenges we're facing are creating a lot of change.

It's happening at the personal level as families work to make ends meet in the face of a layoff. It's happening at the corporate level as centuries of accumulated knowledge and wisdom leave companies as the Baby Boomer generation shifts into retirement. And it's happening at AAPG as we readjust to a new price environment that is directly affecting the business of the association.

Change is hard; particularly disruptive change. But it also can be a source of new thinking and new opportunities.

How do we best serve our members?

What do our stakeholders need from us to be successful?

How does AAPG shift its practices to more efficiently and effectively achieve its mission?

* * *

Reducing costs and how we manage the Association's financial resources during this downturn is a principal focus of both the Executive Committee and our staff here at headquarters.


CURTISS

> We don't do this in a vacuum. We do this in community with other geoscientists and engineers.

We're looking at our various activities from events and publications to programs and services, prioritizing those programs that will have the greatest benefit to members and seeking to reduce costs where possible.

Last month we had 14 staff members elect to leave AAPG through an incentivized voluntary opportunity. These folks have dedicated long portions of their careers – in some cases their entire careers – to AAPG and its members.

While our member volunteers are the lifeblood of this association, our staff is the hands and feet ensuring that AAPG successfully delivers the high quality products and programs you've come to expect.

They did this work cheerfully, with pride and with commitment to you, our members.

If you had the fortune to work with them, and many of you have, you know that we owe them a debt of gratitude.

So, on behalf of AAPG's more than 37,000 members worldwide, I'd like to say a public thank you to **Debbi Boonstra**, **Jim Briggs**, **Norma Briggs**, **Janet Brister**, **Linda Burris**, **Mary Kay Grosvald**, **Veta McCoy**, **Carol McGowen**, **Sandy Meyer**, **Anne Pinkey**, **Karen Piqune**, **Marge Roper**, **Vern Stefanic** and **Kim Van Delft** for your dedication and service.

This is a big change for AAPG, and as we adjust to these folks being gone it will lead to more changes in coming months.

First and foremost, we are looking to this transition to create focus on what AAPG does and to look for ways to eliminate complexity in our systems and operations.

* * *

As I explained to AAPG's leaders assembled in Houston in October for the Mid-Year Business Meetings, we are emphasizing science and community as we work to create focus.

As a scientific and professional association we are meeting our mission when we are providing you, our members, with the science tools and understanding you need to find and produce oil and natural gas. That's our reason for existing.

And we don't do this in a vacuum. We do this in community with other geoscientists and engineers.

It's the community – the network of your colleagues, mentors and peers – that will lead you to a new job if you've been laid off, or reveal an opportunity for promotion and advancement that will accelerate your career.

If you haven't started building your network yet, it's time to start. Getting involved in AAPG activities, serving on a committee or work group, attending and presenting at a workshop or conference are all ways that you can begin developing the relationships in this business that, if cultivated, will persist throughout your career.

As we ring out 2015, there is a lot of worry in our industry and profession. But together we will get through this downturn.

Here at AAPG we're focused on change that benefits you.

DIVISIONS REPORT: DEG

Once Again, Get Ready to Survive the Rollercoaster

By JEFFREY B. ALDRICH, DEG President

One of the very few benefits of reaching six decades of shuffling around this earth is the ability to have near perfect 20/20 hindsight. I have found that it still does not give me the clarity I wish for the next 50 years, or even the next 12 months.

Last year at about this time, I looked back and hoped we would be going through an oil price shock similar to 2008; instead it has become apparent that we are facing something different and much more akin to the 1980s.

There are forces that can keep oil prices low for the foreseeable future:

- The remarkable and innovative changes helping North American producers lower their break-even costs for unconventionals.
- The political will of several large national state exporters.
- Weak national economies.

On the other hand it is inevitable that the price will rise again to a very profitable level once the demand/supply curve comes back into balance.

Day of Reckoning?

During the 1980s crisis, the oil industry lost a generation of workers, and our industry is just now struggling with how to fill this huge personnel gap – "The Great Crew Change," as it's called.

With massive global layoffs, we as an industry are compounding the problem. In fact, there may no longer be a "Crew Change" but a "Reckoning Day" for some companies – I have heard of companies offering 100 percent voluntary severance, putting all assets on the sale block, as they have given up.


ALDRICH

> While we can understand the need to try to survive on a corporate level, these large redundancies will set the industry up for an unhealthy battle for talent when prices recover.

I once was part of a corporate strategy placing all corporate debt on the upstream company and spinning the downstream company off debt-free, expecting the upstream company to sink. We stayed alive for many years by innovation until we were purchased, mainly for our personnel. Many of those employees are still there at what became the eventual parent company.

While we can understand the need to try to survive on a corporate level, these large redundancies will set the industry up for an unhealthy battle for talent when prices recover.

To survive this will not be easy, now or later.

Those of my generation are being moved out; we are the higher-cost employees. Our expertise is and will be needed, but more and more as mentors and as temporary consultants.

For the younger generation, I advise taking or keeping any work you can. Many of my colleagues had to leave in the 1980s but successfully came back; the industry has a way of seeking forgiveness and forgetting the layoffs when they need talent.

The trouble and temptation I see ahead comes with the next boom, when experienced personnel will be scarce. In general, it seems that those who have been able to stay with single successful companies generally do better than people that jump and jump.

There will be large gaps of both tremendous people and skills in the coming years. We will manage it as we always do, in part by innovation, in part by technology and in part by either raiding the best people or by mergers and acquisitions.

After the '80s crisis came the recovery of the '90s, during which it was common to find managers in their 30s and 40s. We drilled a lot of dry holes and as an industry we lost much of our map-making skills, but we broke new ground: We moved from silo organizations to asset teams, we embraced workstations and computer modeling, we enabled (or created or discovered – choose your term) deepwater exploration/development and unconventionals.

It will, at times, be painful but exciting to see how the industry rises to the challenge over the next decade with the next generation at the helm.

Birth of the DEG

During the layoffs of the 1980s many (but not all) of those who left the petroleum side transitioned to environmental work, and it was those transitions that led AAPG to form the Division of Environmental Geosciences.

AAPG recognized that the work of the environmental geoscientist is much the same as the work of the petroleum geologist – though, at the time, at a shallower depth.

Today's environmental geologist is likely to be involved in CO_2 sequestration, induced seismicity, monitoring of stimulation and other deep underground geological investigations, as well as efforts related to protecting underground water resources.

Today, as in the past, we will see many of our petroleum colleagues transition to environmental and hydrologic careers and today, as in the past, we will see those companies in general do not offer compensation packages (salaries and

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noise reduction

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