



AAPG

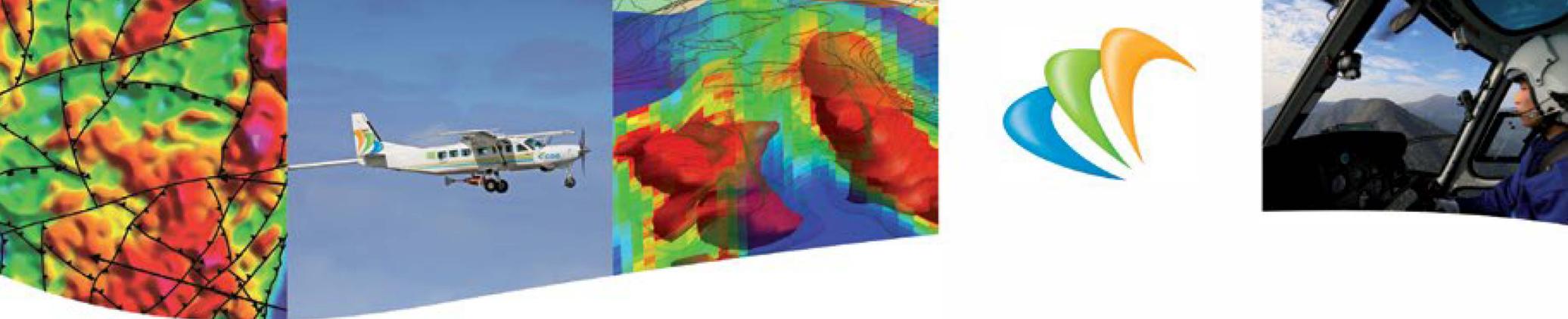
# EXPLORER

March 2018

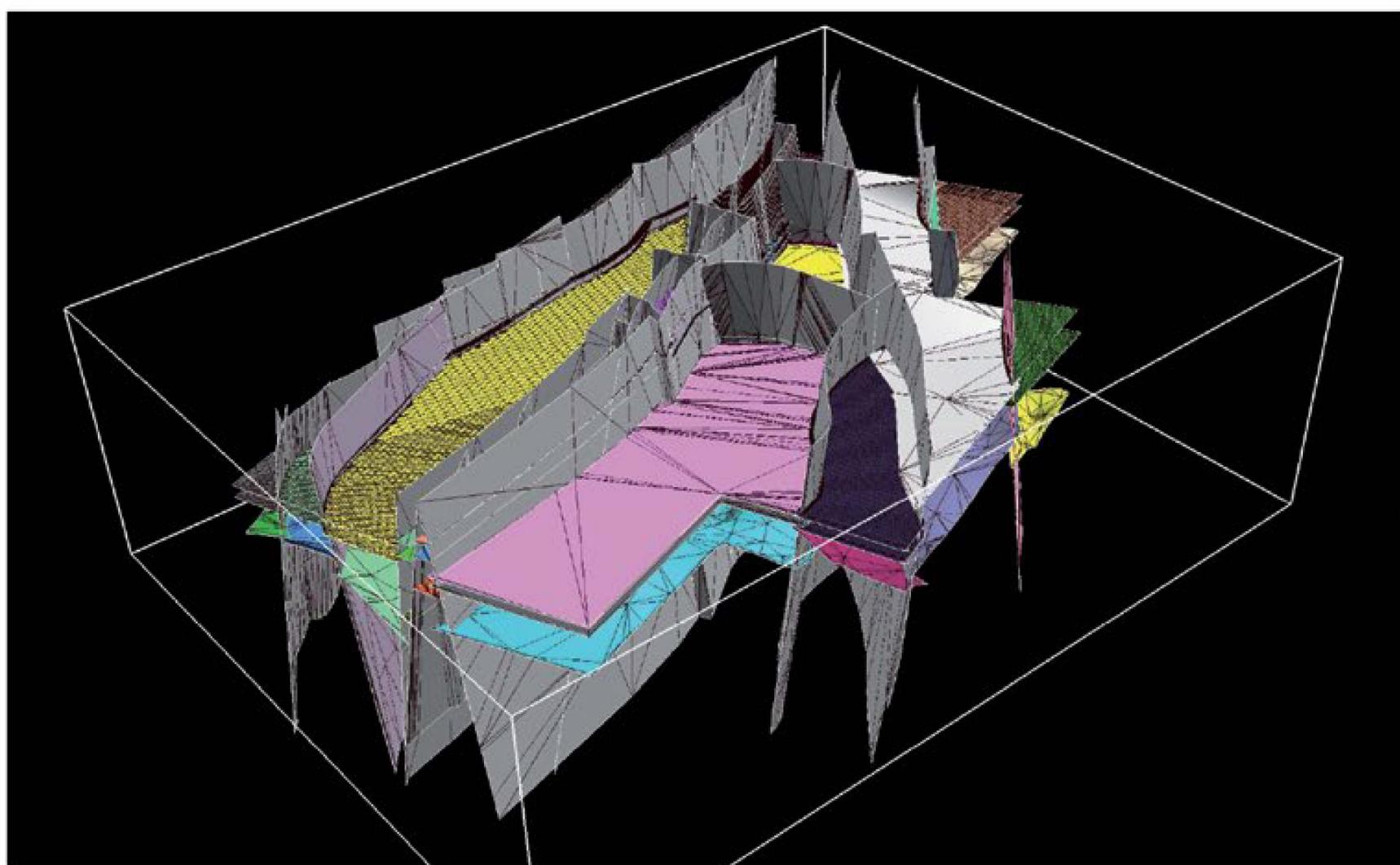
## Mystic River

Geological magic at work

See page 20



# Multi-Physics Boosts Seismic Value



CGG Multi-Physics provides a better understanding of subsurface geology. From adding gravity to your marine seismic to define basement architecture, to using airborne electromagnetics to map aquifers and shallow hazards in unconventional resource plays, we help you:

- Improve your subsurface models with cost-effective complementary data
- Gain rapid access to remote locations and rugged terrain
- Increase spatial resolution by infilling between 2D seismic and sparse wells

Achieve a greater return on your seismic investment, and reduce exploration risk with CGG Multi-Physics.



These are the speakers for the upcoming Global Super Basins Leadership Conference.



## Super Basins from page 3

Party and Mike Canich (both of whom are candidates for AAPG president-elect) and about 140 presenters. Houston is up for a "three-peat" on April 26 with talks on the Haynesville and Gulf Coast revitalized plays (see the article in the February Explorer). We estimate 2,500 total attendees.

To see previous Playmaker talks, visit [AAPG.to/PlaymakerVideos](http://AAPG.to/PlaymakerVideos).

► Super Basins, 2018: This initiative includes the Super Basin event on March 4 at CERA WEEK, the March 27-29 AAPG Global Super Basin Leadership Conference in Houston (visit [SuperBasins.AAPG.org/2018](http://SuperBasins.AAPG.org/2018)), a super basin forum on May 21

at ACE in Salt Lake City, and a multiyear initiative to publish super basin-related articles in the AAPG Bulletin starting in this month (March, 2018).

Multimedia presentations will extend our mission to deliver science and professionalism. It is possible that future super basins conferences can spotlight AAPG Sections and Regions.

Providing energy to the world is a heroic journey. In my preface to the 2017 DPA publication "Heritage of the Petroleum Geoscientist," I wrote that the philosopher Joseph Campbell described that the world has a few stories, and many storytellers. The "Hero's Journey" starts with a call to adventure, overcoming trials (think of the Greek character Odysseus), and returning to tell the story.

Here are those who have returned to tell the story – the speakers for the upcoming Global Super Basin Leadership Conference:

### Worth a Million Words

Back in 2012, the Petroleum History Institute (PHI) recognized me with their "Keeper of the Flame" Award. I was deeply touched and liked the poetic sound. If you are interested, the Petroleum History Institute is holding their 2018 conference in conjunction with the AAPG Annual Convention in Salt Lake City (see [PetroleumHistory.org](http://PetroleumHistory.org)). The award was for publications and efforts to recognize great men and women geoscientists for their oil and gas discoveries. The title of the talk was "If a Picture is Worth a Thousand Words, a Video is Worth a Million." Using innovative video broadcasting now on the AAPG website, we helped creative explorers reach tens of thousands of people with an important scientific message, "in their own words." I would like to thank Linda Sternbach for her tireless efforts to create and share nearly 200 videos and for being alongside me in this journey.

### Visiting Mr. Halbouty

Many AAPG members will remember former AAPG President Michel T. Halbouty.

To me, wisdom is about learning from experience – personal or that of others. Exploration experiences during productive lifetimes are cumulative, valuable and to be cherished. For ten years I asked for advice, listened deeply and got to know Mike Halbouty. Fourteen years ago, I was visiting Halbouty, gravely ill at the time, in the Methodist Hospital, in downtown Houston. As during our previous visits, we talked about exploration, professional societies and what is important in life. In the middle of a visit, he looked me in the eye and firmly grabbed my hand, saying "I want you to speak at my funeral." He made me promise, and yes, I kept that promise and spoke at his funeral in 2004. That was a difficult moment. I am not sure why he chose me, but I will never forget that he did.

"A keeper of the flame" has a sufficient desire and passion to continue to keep focused no matter what occurs. They continually bring the attention of the individual or organization back to what they need to be doing to create what is desired. We all have a duty to be keepers of the flame. The flame is service to others, pursuit of useful science and professionalism, and a duty to pass on to others a geoscience heritage better than we found it. Let us continue to dedicate ourselves to this mission.

*Charles A. Sternbach*

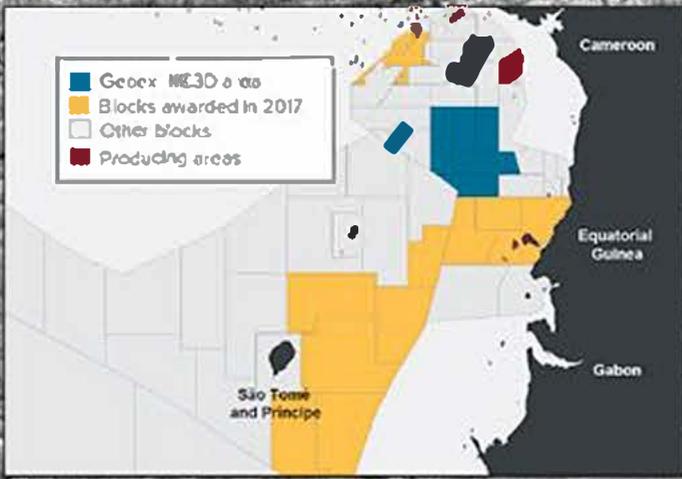
**Searcher**  
Seismic

**Searcher in ARGENTINA**  
Malvinas Basin 2D PSTM Reprocessing  
Offshore Argentina Seismic & Well Database  
Argentina Basin Analysis Report

searcherseismic.com  
sales@searcherseismic.com

[in](#) [Twitter](#) [A](#) [Google](#)

PSTM DATA  
NOW AVAILABLE



# EQUATORIAL GUINEA

HIGH QUALITY PSTM DATA AVAILABLE

Geox has available 8,400 km<sup>2</sup> of MC3D seismic data offshore Equatorial Guinea. Acquired over the EG-02, EG-05, EG-16, EG-17, EG-18 and EG-22 blocks, the datasets provide significant coverage in the highly prospective deep-water West African region.

Book your data room visit today via email [enquiry@geoexltd.com](mailto:enquiry@geoexltd.com) or call +44 (0) 1372 742 170.



Learn more at [www.geoexltd.com](http://www.geoexltd.com) & [www.mcg.no](http://www.mcg.no)

# Seismic Anisotropy and Unconventionals



Xiang-Yang Li (center, front) with fellow members of the Edinburgh Anisotropy Project.

reservoirs tend to be very anisotropic.

Shale reservoirs, especially, are anisotropic as all get-out.

"What we're finding is that the variation (in velocity) can be quite surprisingly large, as much as 30 percent," said Doug Schmitt. "That has a lot of implications in respect to how you explore, how you produce."

Schmitt has been involved in seismic anisotropy research as a professor of geophysics and physics at the University of Alberta in Edmonton.

He's currently on leave and serving as Karen and Stephen Brand professor of unconventional resources in the Department of Earth, Atmospheric and Planetary Sciences at Purdue University in West Lafayette, Ind.

### The Perils of Ignoring Anisotropy

By now, most geoscientists have seen one of those microseismic frac-monitoring maps with the clusters of little circles or two-dimensional spheres, Schmitt noted. If anisotropy isn't taken into consideration, those little spheres might not be where the operators think they are, he said.

"If you're doing seismic imaging and you're ignoring anisotropy, things can be in the wrong place," Schmitt said. "You have all these guys doing microseismic and they have no idea that these rocks are so anisotropic."

Making the picture even murkier is natural fracturing in unconventional reservoirs, which can "complicate the anisotropy with more anisotropy," Schmitt observed.

**H**ere's an important point about unconventional reservoirs: They're UNCONVENTIONAL. So when it comes to identifying and characterizing those reservoirs, conventional geophysics has bumped up against some locked doors.

Research into seismic anisotropy offers an important key. To understand why, think about the nature of anisotropy and unconventional.

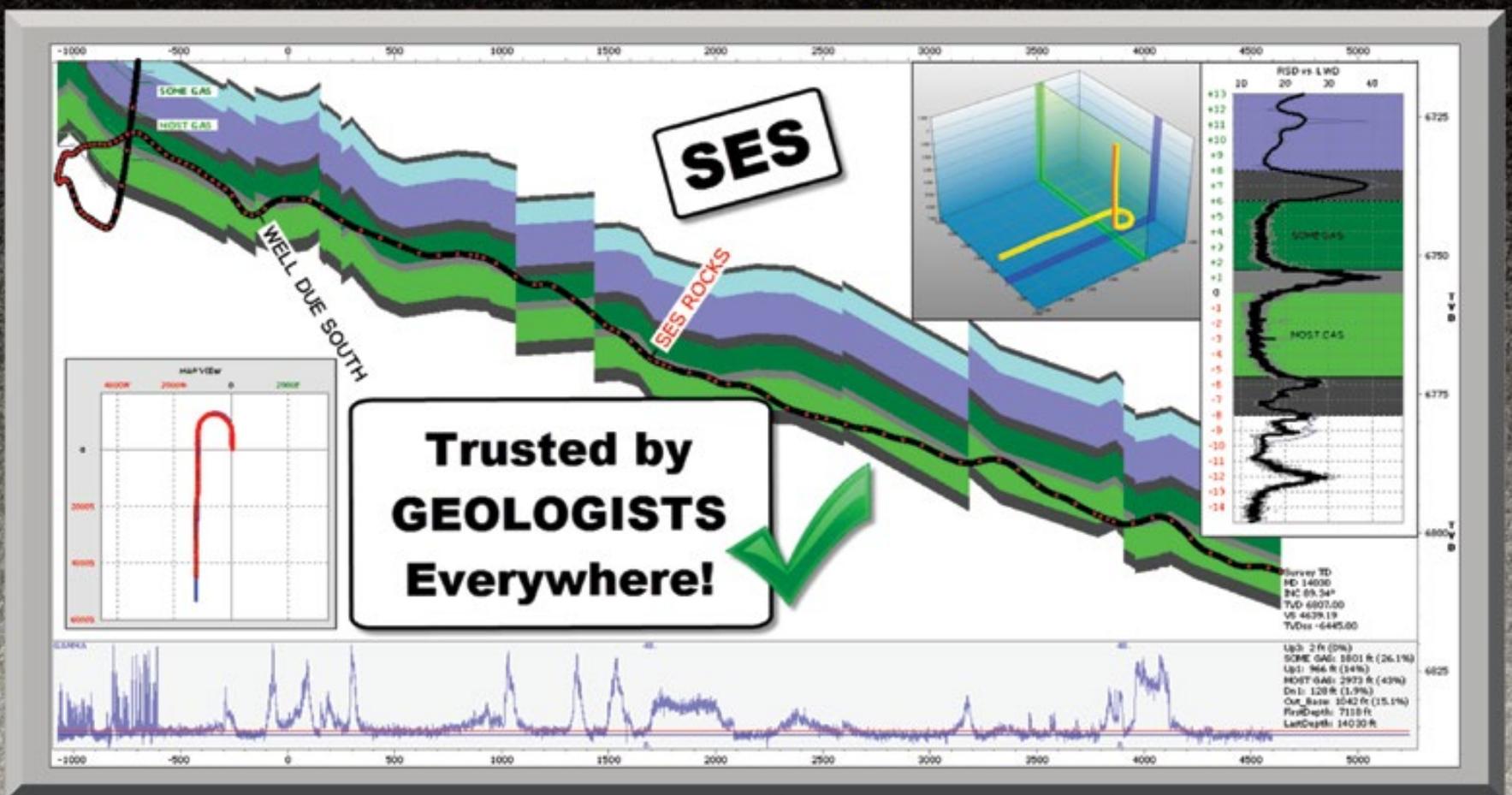
Anisotropy is directionally dependent variation, so anisotropic reservoirs have different properties in different directions.

When the variations are large, that can have a significant effect on seismic velocity.

According to a definition from Schlumberger, "in rocks, variation in seismic velocity measured parallel or perpendicular to bedding surfaces is a form of anisotropy." And unconventional

See Interpretation, page 8 ▶

## Steer & Study Horizontals, with *Confidence!*



**SES** is for geologists who are dissatisfied with drafting or gridding-tool methods of geosteering horizontal wellbores. **SES** is 3D technical geosteering software that makes wellbore stratigraphic tracking quick-n-easy, accurate, and easily shared. Unlike any other geosteering software, **SES** provides a complete suite of software features to handle your horizontal drilling needs.

To learn more and get a free trial, please contact us at: [www.makinhole.com](http://www.makinhole.com) Phone 720-279-0182 [support@makinhole.com](mailto:support@makinhole.com)



# explore our opportunities

أرامكو السعودية  
saudi aramco



No two reservoirs are the same, and no two geoscientists are alike.

At Saudi Aramco, you'll grow a career as diverse and unique as the skills you'll contribute and the assets you'll explore.

In addition to solving the day-to-day challenges of exploring and developing unconventional reservoirs, you'll carry out groundbreaking research with leading scientists, work with a multidisciplinary team, and develop over 1.2 million square kilometers of frontier basins.

Your next opportunity begins now.

[www.aramco.jobs/aapg](http://www.aramco.jobs/aapg)

where energy is opportunity™

## Interpretation

from page 6

Bottom-line, geoscientists need to be aware of the potential effects of anisotropy on seismic when assessing all reservoirs, not only unconventional shales.

That's especially important in seismic interpretation, said Xiang-Yang Li, director of the Edinburgh Anisotropy Project (EAP), a research team working under the Seismology and Geomagnetism Programme at the British Geological Survey.

"Shale is anisotropic, the earth's crust is anisotropic. In the presence of anisotropy, mis-positioning of faults, sand channels, is common if ignored. Therefore, these (geoscientists) should be made aware



SCHMITT

**"The processing algorithms are getting better and better. Seismic processing is now going into an evolution."**

when interpreting seismic data," Li said.

"In the presence of anisotropy, if ignored, seismic inversion results would also suffer and therefore, again, care should be taken when integrating seismic inversion during interpretation and reserve evaluation," he added.

The EAP, based at the University of Edinburgh in Scotland, investigates the

application of seismic anisotropy to the needs of the oil and gas industry. A consortium of oil companies, service-and-supply companies and software firms funds the project.

Anisotropy research in shale gas and other unconventional reservoirs comprises one of EAP's principal areas of investigation, along with converted wave analysis for improved seismic imaging,

amplitude-versus-direction technology for fracture characterization, and rock physics for frequency-dependent anisotropy.

"For unconventional reservoirs, such as shale gas and tight gas, shale is the rock with perhaps the strongest anisotropy, and velocity anisotropy can be up to 30-40 percent," Li noted.

"Therefore, any seismic techniques for predicting shale gas sweet spots has to consider the effects of anisotropy, both in processing and inversion," he said.

Schmitt said his own interest in seismic anisotropy includes multiple areas, from earth stresses to geomechanical processes to "fluid flow and how the fluid moves through the rock, which would be affected by anisotropy," he said.

At this point, Schmitt thinks, "It would be good somehow to take a step back and ask, 'How much error is involved in the location of things if you don't get the anisotropy into it?'"

Researchers already have made advances in "seismic imaging in the presence of anisotropy, widely acknowledged by the industry, including vertical transverse isotropy (VTI) for shales, tilted transverse isotropy, etc.," Li said.

Organic-rich shales normally exhibit strong VTI, also known as polar anisotropy, where bedding-perpendicular/vertical seismic velocities are slower than bedding-parallel/horizontal velocities.

### Future Research

The industry's ability to understand the effects of anisotropy in rock physics models has also been advanced by ongoing research, and work in seismic anisotropy can help in the characterization of fracture systems, Li observed.

That includes research into azimuthal velocity analysis to correct for anisotropy, important to understanding fracture density and distribution and to defining unconventional reservoir properties.

Generally speaking," Li said, anisotropy studies benefit the oil and gas industry by "improving seismic imaging, help in fracture characterization or in reservoir characterization." He sees quantitative seismic interpretation based on anisotropy rock physics as an important future area for research.

One of the problems in analyzing anisotropy is a lack of multi-directional seismic data sets, with more than just a down-and-up bounce. Horizontal, orthogonal, azimuthal data would help researchers when reservoir properties differ in multiple directions.

"We don't get a lot of angles," Schmitt lamented.

That could mean a bigger role for borehole geophysics, for cross-well seismic tomography and other forms of non-vertical signal capture in future anisotropy research.

With advanced seismic helping so much in offshore exploration and production, and also in characterizing onshore conventional reservoirs, why hasn't geophysics been able to contribute more to the exploration and development of shales and other unconventional resources?

Seismic anisotropy research could hold one key to a breakthrough. Other advances in geophysics are already pointing the way to a better understanding, according to Schmitt.

"The processing algorithms are getting better and better. Seismic processing is now going into an evolution," he said.

But with all the recent improvements in data collection and manipulation, there's still that devil-in-details hurdle for seismic interpretation: You have to understand what the data is telling you.

"They get the numbers out, but what do the numbers mean?" Schmitt said. "Anisotropy has to do with that." 

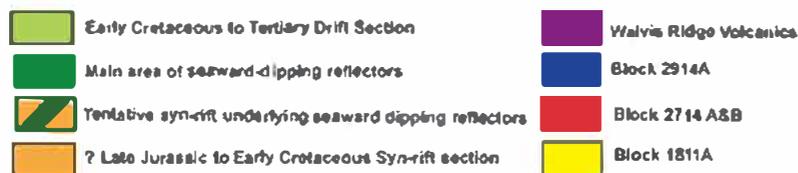
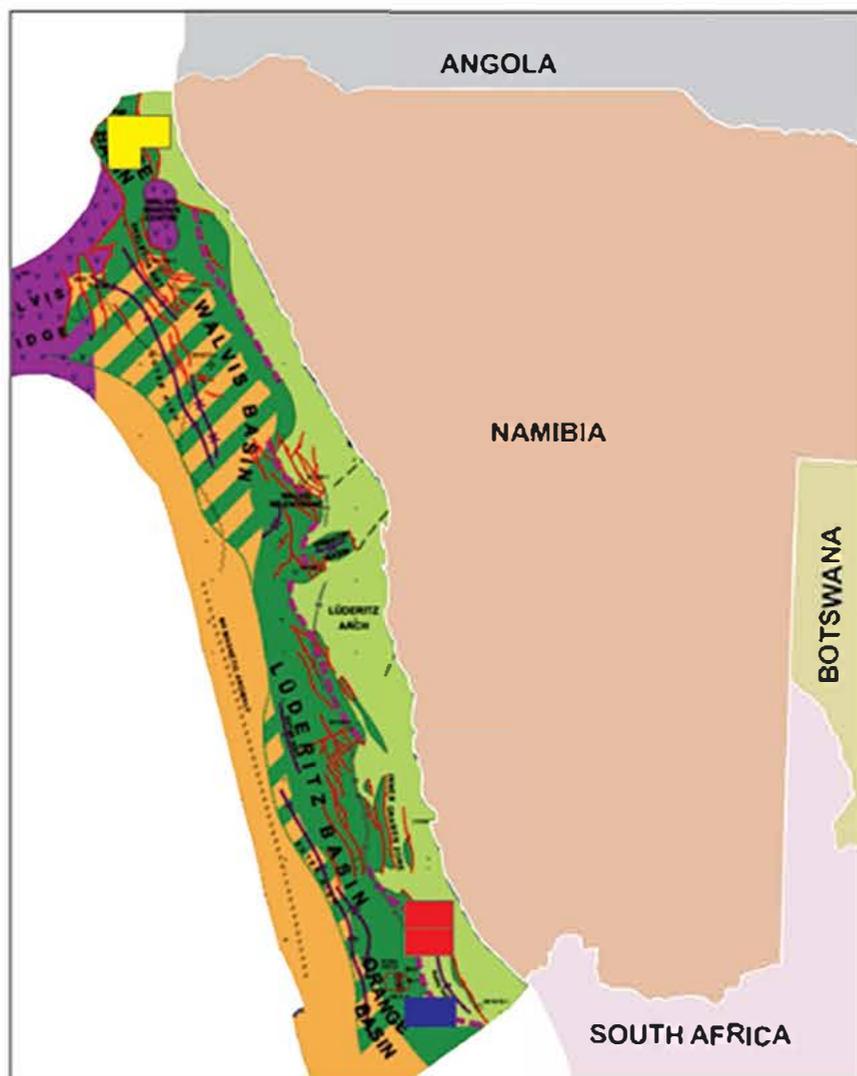
**Searcher Seismic**

**Searcher in MEXICO**  
 Buscador Near-Shore 2D  
 South Campeche 3D Ultracube  
 Mexico Basin Analysis Report

searcherseismic.com  
 sales@searcherseismic.com

# Investment Opportunities Offshore Namibia



## Petroleum Systems Overview

### Source Rocks

- Syn-rift (proven by the AJ-1 well in the Orange Basin, South Africa)
- Aptian (proven by the Kudu wells a and Moosehead-1 wells.
- Cenomanian/Turonian (proven by Moosehead-1 and Kabeljou-1 wells.

### Reservoirs

#### Clastic Reservoirs

- Clastic reservoirs ( Cretaceous and Tertiary Turbidites,)
- Aeolian sandstones (kudu wells),
- shallow marine sandstones, fluvial sandstones and deltaic sandstones.

#### Carbonate Reservoirs

- Barremian age carbonates (Moosehead-1)

### Traps

- Stratigraphic (mostly clastics)
- Structural (mostly carbonates)

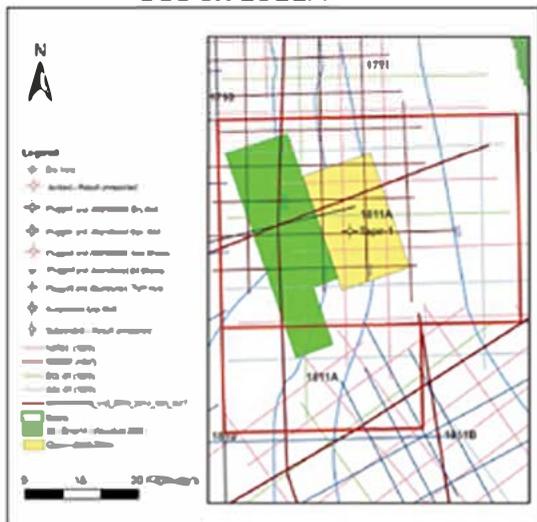
### Migration

- Lateral and vertical migration through the syn-rift faults
- Lateral and vertical migration through the gravity driven faults of the Late Cretaceous play

### Seal

- Barremian to Late Cretaceous shales

### BLOCK 1811A

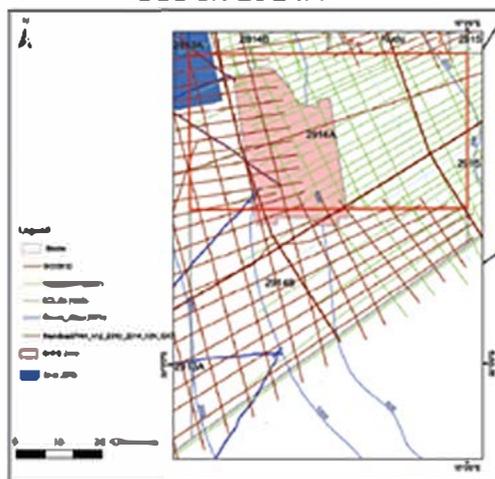


Location: Namibe Basin, Offshore Namibia  
Operator: NAMCOR

Working interest:  
NAMCOR: 100%

Block Area: 5 865 sq.km  
Exploration stage: Initial exploration phase

### BLOCK 2914A

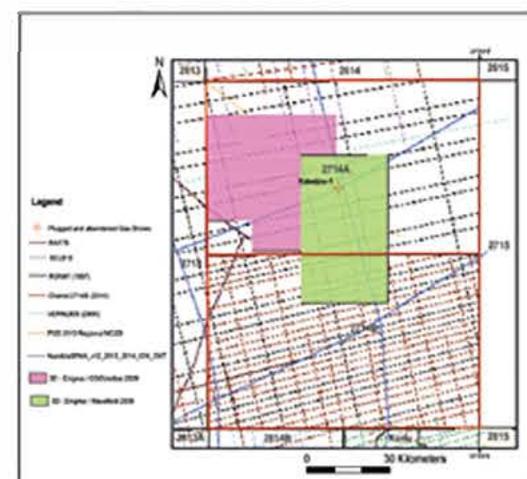


Location: Orange Basin, offshore Namibia  
Operator: Rhino Resources

Working interest:  
Rhino Resources Namibia: 55%  
NAMCOR: 20% (10% carried)  
Korres Investments: 15%

Block Area: 5 385 sq.km  
Exploration stage: Initial exploration phase

### BLOCK 2714A&B



Location: Orange Basin, Offshore Namibia  
Operator: NAMCOR

Working interest:  
NAMCOR: 67%, Quiver: 33%

Block Area: 10, 963.8 sq.km  
Exploration stage: 1st renewal phase



For all interested companies/investors a data room can be organized at the NAMCOR head office in Windhoek at agreed dates.

Should you require further information, please contact:

The Exploration & Production Department  
Email: [enpinfo@namcor.com.na](mailto:enpinfo@namcor.com.na)  
Phone: +264 204 5000

# Panama Sees First Modern Seismic Exploration

With oil prices slow to climb back to profitable levels, some operators have begun looking for opportunities that are less dependent on the industry's recovery cycle, taking them to new frontiers.

Panama, a country that has lacked legislation for international exploration until it unveiled a 35-year energy plan in 2015, has generated enough industry interest to prompt the first modern-day collection and processing of seismic data. The effort, spearheaded by ION with financial support from the industry, is currently under way.

"Recent exploration success in offshore Colombia, adjacent to Panama's Caribbean coast, has created interest among E&P companies," said Brian Hanson, president and CEO of ION, which has collected 5,840 linear miles of 2-D seismic data from Colombia to Costa Rica. The data was collected near recent gas discoveries from the Kronos-1, Purple Angel-1 and Gorgon-1 deep-water wells – the latter being the largest gas find in Colombia in 28 years and approximately 12 miles from Panama.

"Companies are interested in Panama because they want to get ahead of the



BLISS

**"This is groundbreaking. Panama stands out. It's been off the map for so long. Now is a great time for the country to present itself to the world."**

curve," said Andy Bliss, an AAPG Member and director of business development, Latin America for ION.

"Client interest has exceeded our expectations," he said.

It has been roughly 50 years since seismic lines have been shot in the waters of northern Panama, and only one well, dating back to 1978, has been drilled on the Caribbean side.

Despite the limited data that exists, the Colombian discoveries and new seismic data are pointing to a very diverse range of possible plays, said Antara Goswami, an AAPG Member and geologist at ION.

"We've learned so much in such a short period of time," Bliss said of the preliminary results of the new seismic. "This is groundbreaking. Panama stands out. It's

been off the map for so long. Now is a great time for the country to present itself to the world."

## Getting in the Game

When Panama's energy secretary announced at the 2015 Offshore Technology Conference that it would be opening its offshore acreage in a January 2018 lease round, the country attracted immediate attention.

"The discoveries of natural gas in the Colombian Caribbean Sea bordering Panama reinforce the existence of conditions in the region to generate hydrocarbons," said David Munoz, Panama's director of hydrocarbons, in an email. "With the necessary investment, the country's oil potential could be

determined."

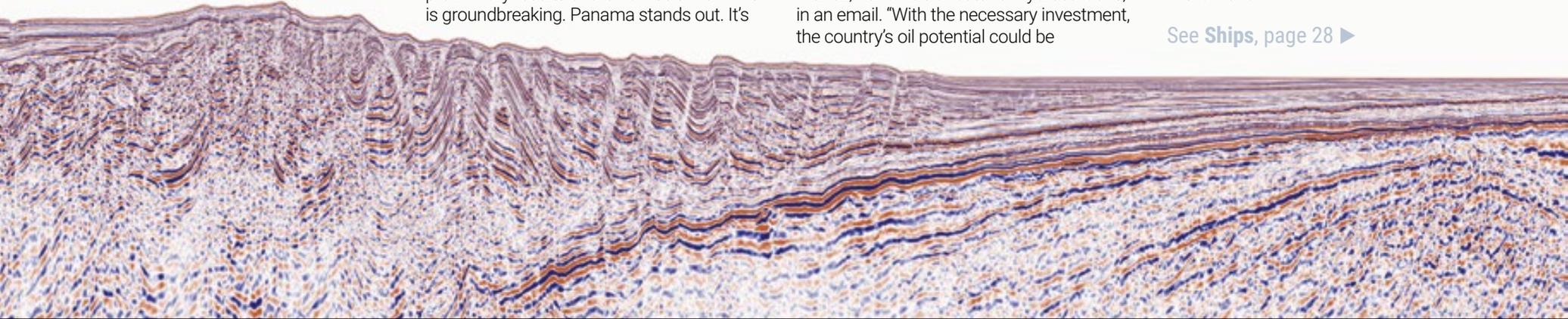
Of all the countries in Latin America, Panama has the fastest-growing economy, according to the World Bank, and contains infrastructure vital to the oil and gas industry. In addition to the Panama Canal and its recent expansion that accommodates LNG tankers, an 80-mile pipeline that transports crude oil provides a crucial connection from the Caribbean Sea to the Pacific Ocean.

On both banks of the Panama Canal there is infrastructure for fuel storage of up to 29 million barrels, Munoz said. Furthermore, the first terminal for the receipt and storage of LNG is being built and is expected to begin operating in mid-2018.

## A Sea of Ships

Unlike most areas of the world, Panama poses quite a challenge for collecting seismic data. Not only must a tailored survey be designed to image a complex geologic isthmus, but the seismic vessel, which carries roughly six miles of cable behind it, needs to collect data without interference from other ships in the second busiest canal in the world.

See [Ships](#), page 28 ▶

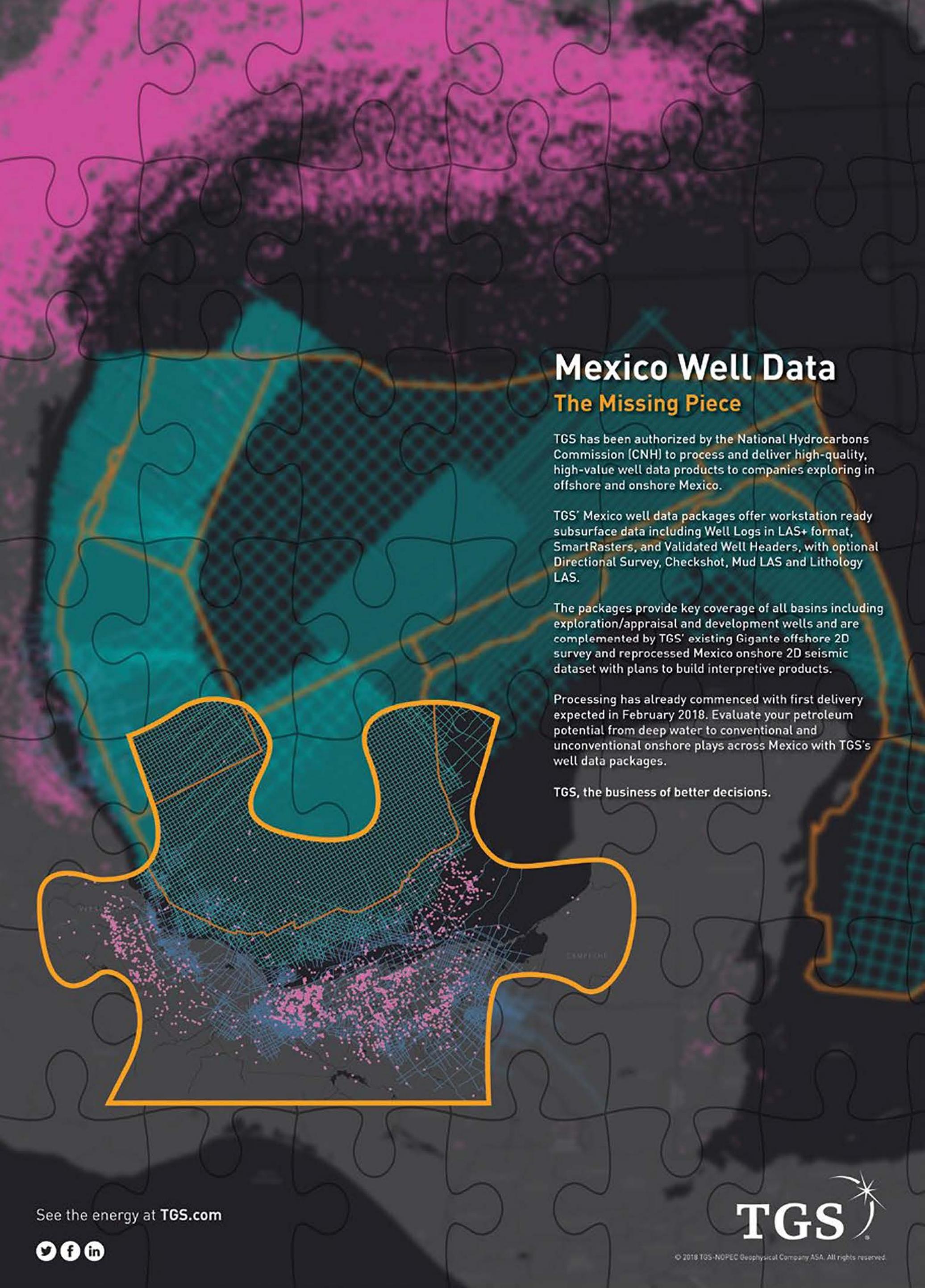


please  
~~Don't~~  
 Touch.

NeuraSection is the platform that lets you connect with your data. With **new touchscreen** capabilities and **SmartRibbons™**, you'll be almost as close to geology onscreen as you are in the field. Call us today to get your **hands-on demo** and quote.

**Neuralog**

Houston, TX | p. +1.281.240.2525 | [neuralog.com](http://neuralog.com)



## Mexico Well Data

### The Missing Piece

TGS has been authorized by the National Hydrocarbons Commission (CNH) to process and deliver high-quality, high-value well data products to companies exploring in offshore and onshore Mexico.

TGS' Mexico well data packages offer workstation ready subsurface data including Well Logs in LAS+ format, SmartRasters, and Validated Well Headers, with optional Directional Survey, Checkshot, Mud LAS and Lithology LAS.

The packages provide key coverage of all basins including exploration/appraisal and development wells and are complemented by TGS' existing Gigante offshore 2D survey and reprocessed Mexico onshore 2D seismic dataset with plans to build interpretive products.

Processing has already commenced with first delivery expected in February 2018. Evaluate your petroleum potential from deep water to conventional and unconventional onshore plays across Mexico with TGS's well data packages.

TGS, the business of better decisions.

See the energy at [TGS.com](http://TGS.com)



**TGS** 

© 2018 TGS-NOPEC Geophysical Company ASA. All rights reserved.

# Stinson Well Could Be Key to Alaska's ANWR

Angular unconformity between tightly folded and steeply dipping pre-Mississippian strata and near-horizontal Mississippian Kekiktuk Conglomerate, northeast Brooks Range, Arctic Alaska. Photo courtesy of USGS.

**W**ith the U.S. Department of the Interior calling for updated assessments of the oil and gas resources on Alaska's North Slope, most surprisingly (and, perhaps, controversially) the tightly regulated 1002 Area of the Arctic National Wildlife Refuge (ANWR), geologists are preparing for the possibility of exploring a frontier believed to be rich in hydrocarbon resources.

Congress and the president must first agree to open ANWR's coastal plain, which has remained essentially closed to the industry since 1980, and that hurdle might be difficult to clear even with a Republican-controlled administration. But if the president has his way, operators will get their first glimpse into the largest, unexplored and potentially productive geologic onshore basin in the United States.

That is why the Stinson No. 1 well, drilled in 1990 by ARCO (now ConocoPhillips), is beginning to draw interest. One of the closest wells to the 1002 Area at roughly 3 miles from its northwestern border, the well's core samples and associated 2-D seismic data suggest it could be a major gateway to understanding

and developing part of the 1002 Area.

"The Stinson No. 1 well is undoubtedly our key to understanding what the basement looks like near the northwestern border in the 1002 Area of ANWR," said Robert B. Blodgett, AAPG Member and geological and paleontological consultant with Blodgett & Associates LLC. "It should be highly significant in light of the Trump administration's push to develop the area for petroleum exploration."

### The Oldest Play in Alaska

Blodgett and Steve Sutherlin, a petroleum strategist with Strategic Action Associates, both based in Anchorage, began looking at the Stinson No. 1 well almost a year.

For nearly two decades, the well's data was granted extended confidentiality because of its proximity to unleased acreage in the 1002 Area, but some of its core samples were made publicly available in 2008.

After carefully examining the data, Blodgett said it suggests two potential plays from reservoir rocks of the Eocene and Cambrian ages. If the Cambrian play is viable, this base-

ment play would be from the oldest reservoir rock in Alaska.

"It is commonly believed that older rocks of Cambrian and Proterozoic ages have little potential for petroleum. However, this is not true," Blodgett said. "Cambrian rocks in eastern Siberia, China and North Africa are good producers of hydrocarbons."

Better understanding the lithostratigraphy of the rocks in the Stinson No. 1 well is key to understanding the basement rocks in the northwestern margin of ANWR and the possible Cambrian play there. Unlike the more weakly lithified sandstone reservoirs of the overlying early Eocene strata that hold oil in the rocks themselves, the Cambrian basement reservoirs are brittle and fractured and hold oil in their cracks.

The northwestern part of the 1002 Area near the Stinson No. 1 well is an "undeformed" zone where the U.S. Geological Survey believes that anywhere from 3.4 to 10.2 billion barrels of technically recoverable oil may be stratigraphically trapped in rocks younger than the basement, according to its most recent 1998 assessment.

While it has commonly been accepted that the oldest reservoir rock in Alaska is of early Mississippian age, identifying reservoir rocks from the Cambrian age could be a game changer if a discovery is made, Blodgett said.

Blodgett explained that the basement rock of ANWR sits on top of the Barrow Arch and Mikkelsen High – geologically likely places to find oil, hence the drilling of the Stinson No. 1 well nearly 30 years ago. While ARCO made oil and gas discoveries in that well, bringing oil to market at the time was cost-prohibitive, as nearby infrastructure was not in place, Sutherlin explained.

In 2016, ExxonMobil brought the neighboring Point Thompson unit into production and constructed processing facilities and pipeline access to the northern terminus of the Trans-Alaska Pipeline System.

"This infrastructure has transformed the economics of the Stinson well by reducing costs and significantly reducing the time it will take to get oil to market," Sutherlin said.

Blodgett believes that if a discovery were to

See **Cambrian**, page 14 ►

## 2018 PSAAPG-PSSEPM-PCSSEG Annual Meeting

Marriott Hotel, Bakersfield, CA

April 22-25, 2018

Registration is now OPEN!

**SUBMISSION DEADLINE:**  
MARCH 1st, 2018

For additional information contact:  
Plamen Ganev  
PSAAPG Technical Program Chair  
(661) 665-5459  
[pnganev@aeraenergy.com](mailto:pnganev@aeraenergy.com)  
[www.psaapg2018.org](http://www.psaapg2018.org)



**FOR PREFERRED RATES:**  
Make your accommodation reservations now!

### EMBRACING GEOLOGIC FUNDAMENTALS- FUELING YOUR PASSION

**ABSTRACTS ARE BEING ACCEPTED**

**General Themes:**

- ✓ California Geological Breakthroughs: Past, Present, and Future
- ✓ Pacific Exploration: Mature Basins and Prolific Reservoirs
- ✓ PS-SEPM Sedimentology and Stratigraphy: From Lacustrine to Deep-water Reservoirs
- ✓ Structure and Tectonics: Micro-fractures to Plate Boundary Faults
- ✓ PCS-SEG Petrophysics and Geophysics: From Borehole to Basin
- ✓ Geology and Data: Leveraging old data, new data, smart data, and big data
- ✓ Geologic Insights Learned from Regulatory Project Collaborations
- ✓ Geologic Applications in a Changing Regulatory Environment
- ✓ DEG – Oil and the Environment: Environmental and Regulatory Topics Associated with Oil and Gas Production

*Additional Themes will be considered based on submissions! (250-word abstract limit)*



# Registration Now Open!



Tinker Assa'adan Gee Yeilding Szabo Sheffield

## Actionable intelligence to profit from the world's most lucrative basins.

Whether you are an energy executive, investor, geoscientist, or consultant, this conference will give you the information you need to be successful in the world's most significant basins.

- **Big Thinking and Big Data**  
Use Big Data to identify the acreage that is cost effective and high producing with today's technology.
- **Technologies and Techniques**  
Learn about the technologies and techniques that will maximize output from every well.
- **Reinvent How You Think About Basins**  
Practice 3-D thinking to envision source rocks, traps, and stacks...not just planes.
- **Join the Community**  
Join your super basin community and pool basin specific knowledge to make everyone more profitable.
- **Find Solutions in Existing Science**  
Discover global analogues from the world's most petroliferous basins.

### Mix with the Experts

Super Basins is a great place to meet and mix with the presenters and attendees who know the globe's great basins the best. Numerous meals and mixers are provided to ensure you have the one-on-one time you need to ask your questions, develop new relationships, and discuss new opportunities.

### Basins From All Over the World!

- **Super Basins**, Bob Fryklund, Pete Stark, IHS Markit
- **Permian Basin**, Scott Sheffield, Pioneer
- **Overview of the Greater Super Basin Concept and How it Might Evolve**, Scott W. Tinker, Tinker Energy Associates, LLC
- **Appalachian Basin**, William A. Zagorski, Range Resources
- **Anadarko Basin**, Rick Fritz, Council Oak
- **Going Beyond the North American Mudrock Super Basin Plays: The Unconventional Development of Conventional Reservoirs**, Richard K. Stoneburner, Pine Brook Partners
- **Williston Basin**, Mark Williams, Whiting Petroleum Corporation
- **The Western Canada Basin, A Confluence of Science, Technology, and Ideas**, Paul MacKay, Shale Petroleum Ltd.
- **California, San Joaquin**, Kurt Neher, Berry Petroleum Company, LLC
- **Alaska – North Slope**, David Houseknecht, USGS
- **Gulf of Mexico Offshore Evolution of Past, Present, and Future Plays**, Cindy Yeilding, BP America
- **America's Unconventional Energy Opportunity – An Update**, David Gee, The Boston Consulting Group
- **Mexico, Tampico-Misantla Basin and Sur Este Basin**, Mark Shann, Sierra Oil and Gas
- **Neuquén Basin**, Carlos Macellari, Tecpetrol
- **North Sea**, John Underhill, Heriot-Watt University
- **The Arabian Basins: Prolific Producers with Bright Futures**, Ibraheem Assa'adan, Saudi Aramco
- **North Africa – a rejuvenated Super Basin**, Jonathan Craig, Andrea Cozzi, ENI
- **Brazil Pre Salt, Santos Basin**, Mario Carminatti, Petrobras
- **Western Siberia**, Alexei V. Milkov, Colorado School of Mines, Vladimir Vyssotsky, BP Russia, Andrei S. Bochkov, GazpromNeft
- **COP Operator Stimulated Rock Volume**, Greg Leveille, ConocoPhillips
- **Super Basins, Super Data, Super Results**, Shandell Szabo, Anadarko
- **Big Picture Geophysics and Reservoir Packages**, Brian Horn, ION

### General Chair:

Charles Sternbach, President, AAPG

## SuperBasins.aapg.org

Use promo code **SB18EXP** for best available pricing

Diamond  
Sponsor

أرامكو السعودية  
saudi aramco



## Cambrian from page 12

be made, the oil would be economically viable at the current price of oil.

A drill stem test from the Stinson No. 1 well determined that a Cambrian play could produce as many as 800 barrels a day, and an Eocene play could produce as many as 700 barrels a day.

### What We Know from Stinson

So far, data from the Stinson No. 1 well make Eocene and Cambrian plays in the 1002 Area look hopeful.

"There is beautiful oil staining present in the fractures in the older Cambrian play, which consists of fractured, pure orthoquartzite,"

Blodgett said. "No analog to the Cambrian orthoquartzite is known elsewhere in northeastern Alaska, suggesting that the source area is to the north, farther offshore."

Conventional wisdom suggests that the oil should source from the Paleocene and Cretaceous age strata. However, the presence of common bitumen at great depths in the basement rocks, well below the oil migration pathway that may have been provided by an existing early Eocene unconformity, suggest that another older petroleum system is present, Blodgett said. Oil in analogous strata in eastern Siberia is sourced to the Cambrian and the late Proterozoic age strata.

A 2-D seismic analysis by the late geophysicist Robert Klipping suggests that the Cambrian basement at the Stinson site is quite large, roughly 18 miles from east to west, located on the Barrow Arch and plunging to the southeast.

"A bounding high angle reverse fault near the south edge of the acreage alone would provide closure for the entire anticlinal trend," said Sutherlin, who obtained the some of the seismic data from Donkel Oil and Gas, which currently holds the lease position on the Stinson well site. In other words, the play could extend into the northwestern part of the 1000 Area.

According to Klipping's analysis, the Stinson No. 1 well also had very good oil shows in the base Eocene sand at the site of the unconformity, which is present in the vast majority of the acreage, Sutherlin added. Klipping suggested that an Eocene play extends into the 1002 Area.

### A Second Opinion

While he agrees there is evidence of multiple oil charges into the Barrow Arch trap, David Houseknecht said Stinson is not the only well to offer clues into the basement of the 1002 Area, including its northwest corner.

Houseknecht is an AAPG Member and USGS senior research geologist who is overseeing the current North Slope assessments.

Roughly 20 wells have been drilled in the nearby Point Thompson field reservoir, offering more data to those looking to understand the basement of the 1002 Area, he said. From these wells, multiple phases of hydrocarbons have been encountered and thoroughly documented.

In fact, the oil leg found in the basement rocks at Point Thomson has API gravity as light as 18 degrees – which is among the lighter "heavy oil" accumulations on the North Slope, meaning it might be producible under the right conditions, Houseknecht said.

However, information provided by wells at both Point Thompson and Stinson might not paint the most accurate picture of any of the 1002 Area, simply because of the unique nature of its basement.

"The basement rocks have been badly beaten tectonically, Houseknecht said. "They are severely deformed."

He explained that during the Devonian period, a tectonic event cracked the rocks to the point where, if they held oil, the oil likely seeped out. Furthermore, the rocks were heated to temperatures that exceeded 125 degrees Celsius, likely breaking the hydrocarbon chains and reducing the oil to pyrobitumen and gas.

Hypothesizing aside, however, additional oil and gas samples are needed for geochemical analysis in order to have a better understanding of a possible oil charge in the basement rocks of the 1002 Area.

### What's Next?

Blodgett and Sutherlin are continuing to analyze core samples from the Stinson No. 1 well and the data from five neighboring wells to the west: Alaska State A No. 1, Alaska State D No. 1, Alaska State F No. 1, Alaska Island No. 1 and Challenge Island No. 1 – all of which have Cambrian basement rocks that might have fractured reservoir potential. All are located along the coastline of the Beaufort Sea.

They are currently examining the ages and environments of the basement rocks of these wells to get an idea of how far they might extend along the northern fringe of the 1002 Area. Confirmation wells need to be drilled in the offshore state waters with guidance from 3-D seismic data. 3-D seismic data also is needed inside the 1002 Area to help confirm either the Cambrian or Eocene play, or both.

According to Blodgett, operators are beginning to express interest in the area. The chance to explore ANWR's coastal plain would be a once-in-a-lifetime opportunity for many geologists.

"The most enticing, unleased acreage near Stinson is the 1.5 million-acre 1002 Area," Sutherlin said. "We feel we have taken the first step to understanding its northwest corner, and we are looking forward to further exploration." 

Cambrian age orthoquartzite core from the Stinson No. 1 well showing highly fractured character and oil staining. Photo by Robert Blodgett.

## Interpretation® upcoming submission deadlines

### AUGUST 2018

#### ► Multiphysics imaging for exploration and reservoir monitoring

**Submission deadline: 1 December 2017**

Special-section editors: Yunsong Huang, Aria Abubakar, Daniele Colombo, Kai Gao, Jungho Kim, Marco Mantovani, Maxwell Azuka Meju, Changsoo Shin, Aldo Vesnaver, Rui Yan, Min Yang, Peng Yu, and Luolei Zhang

#### ► Geoscience follow-up papers from URTEC 2015-2017

**Submission deadline: 1 December 2017**

Special-section editors: Oswaldo Davogusto Cataldo, Alfredo Fernandez, Richard Brito, Ali Tura, Scott Taylor, Ulrich Zimmer, Stephen Wilson, Dustin Dewett, Bruce Hart, and Marianne Rauch-Davies

#### ► Foothills Exploration

**Submission deadline: 1 December 2017**

Special-section editors: Gerard Schuster, Xianhui Zhu, Mingqiu Luo, Sandro Serra, Gladys Gonzalez, Alfred Liaw, Christof Stork, and Yuefeng Sun

#### ► Argentina, several possibilities beyond the Vaca Muerta Fm.

**Submission deadline: 1 December 2017**

Special section editors: Luis Vernengo, Teresa Santana, Maximiliano García Torrejón, Eduardo Trincherro, Felipe Alberto Lozano García, Oskar Vidal Royo, Juan Carlos Soldo, Oswaldo Davogusto, Hernán Reijenstein, Marcilio Matos, and Felipe A. Lozano

### NOVEMBER 2018

#### ► Recent advances in geology and geophysics of deepwater reservoirs

**Submission deadline: 1 February 2018**

Special-section editors: Shu Jiang, Hongliu Zeng, Lorena Moscardelli, Grant Wach, Flávio J. Feijó, Michael Gardosh, Tao Jiang, Hongtao Zhu, Sverre Henriksen, and Sudeep Kanungo

#### ► Shale oil and gas enrichment mechanisms and effective development: Concepts, methodologies, and case studies

**Submission deadline: 1 February 2018**

Special-section editors: Dengliang Gao, Zhijun Jin, Taizhong Duan, Hongliu Zeng, Satinder Chopra, Tim Carr, Kurt Marfurt, and Jamie Rich

#### ► Interpretation pitfalls

**Submission deadline: 1 March 2018**

Special-section editors: Don Herron, Bill Abriel, Eric Ekstrand, and Bob Wegner



### FEBRUARY 2019

#### ► Distributed acoustic sensing and its oilfield potential

**Submission deadline: 1 May 2018**

Special section editors: Ge Zhan, Yingping Li, Ali Tura, Mark Willis, and Eileen Martin

#### ► Permian Basin challenges and opportunities

**Submission deadline: 1 June 2018**

Special-section editors: Sumit Verma, Olga Nedorub, Ron Bianco, Richard Pagel, Fangyu Li, Tao Zhao, Mohamed Zobaa, Robert Trentham, and Joon Heo

### MAY 2019

#### ► Seismic geometric attributes

**Submission deadline: 1 October 2018**

Special section editors: Xinming Wu, Hongliu Zeng, Haibin Di, Dengliang Gao, Jinghui Gao, Kurt Marfurt, and Saleh al Dossary

\*E-mail [interpretation@seg.org](mailto:interpretation@seg.org) to inquire about submitting manuscripts past the submission deadline. Some sections may have increased flexibility regarding submission and review dates.

To submit a paper, visit <https://mc.manuscriptcentral.com/interpretation> and select the appropriate topic from the manuscript type options. For submissions not associated with a special section, select "Technical Paper." To suggest a topic for future special sections, e-mail [interpretation@seg.org](mailto:interpretation@seg.org) or contact one of the editors.

SCHEDULED TOPICS

Visit <http://library.seg.org/page/interpretation-special-sections> for more details about these sections.

A joint publication of SEG and AAPG  
**Interpretation®**  
A journal of subsurface characterization



Interpretation, copublished by SEG and AAPG, aims to advance the practice of subsurface interpretation.



Candidates for AAPG office have been given the opportunity to respond briefly to the subject: "Why I Accepted the Invitation to be a Candidate for an AAPG Office."

Their responses and biographical information were provided by each candidate and edited only for grammar, spelling and format.

This information is on the AAPG website through the election period. Online balloting began March 29, 2018. Voting deadline is May 15, 2018.

Candidates were asked to limit their biographies to 350 words and responses to 500 words.

## PRESIDENT-ELECT

### MICHAEL R. CANICH

Independent Consultant  
State College, Pa., USA



#### Academic Degrees

1977 – M.S., Geology, Penn State University, State College, Pa., USA  
1970 – B.S., Electrical Engineering, Penn State University, State College, Pa., USA

#### Experience

2013-15 – President, Trimont Energy LLC, Pittsburgh, Pa., USA  
2009-13 – President and COO, Sylvan Energy LLC, Pittsburgh, Pa., USA  
2000-09 – Director and Vice President Geosciences, EQT Corporation, Pittsburgh, Pa., USA  
1997-2000 – Director, Business Development, Statoil Energy Inc., Alexandria, Va., USA  
1990-97 – Director, Development Drilling, Eastern States Exploration Company, Snowshoe, Pa., USA  
1978-89 – Senior Geologist, Cabot Oil and Gas Company, Pittsburgh, Pa., USA  
1976-78 – Geologist, The Superior Oil Company, Houston, Texas, USA

#### AAPG Activities

Joined AAPG 1976  
Member DPA  
2017-20 – Chair, Board of Certification, DPA  
2016 – Past President, DPA  
2016 – Co-Chair, Pittsburgh Playmakers Forum  
2015 – AAPG Advisory Council, DPA President  
2015 – President, DPA  
2015 – Board of Certification, DPA

2014 – President-Elect, DPA  
2014 – Bylaws Committee, DPA  
2014 – Conventions Committee, DPA  
2013 – Chair, AAPG Annual Convention and Exhibition, Pittsburgh, Pa., USA  
2009 – Vice President, DPA  
2007-13 – Chair, Honors and Awards Committee, AAPG Eastern Section  
2006-08 – Treasurer, DPA  
2004 – President, Pittsburgh Association of Petroleum Geologists (PAPG)  
2003-06 – Eastern Section Advisor, DPA  
1994 – President, PAPG  
1993-95 – Secretary, DPA  
1984 – Co-founder and President, PAPG

#### AAPG Honors and Awards

2017 – AAPG Division of Professional Affairs Past Presidents Award  
2014 – AAPG Distinguished Service Award  
2014 – AAPG Division of Professional Affairs Distinguished Service Award  
2013 – AAPG Certificate of Merit, ACE General Chair

#### Publications

2001 – Petroleum Geology and Geochemistry of the Council Run Gas Field, North Central Pennsylvania  
1977 – Study of Fractures Along the Western Segment of the Tyrone-Mount Union Lineament

#### Why I Accepted the Invitation to be a Candidate for an AAPG Office By Michael R. Canich

I accepted the invitation to stand for office of AAPG president-elect because AAPG has been such a big part of my career. It is hard to imagine what my career would have been like without the education, networking and friendship opportunities provided by AAPG. Early in my career AAPG was there to provide an inexperienced geologist with the scientific publications and educational courses needed to succeed as a petroleum geologist. There always seemed to be a supervisor or an associate who was an AAPG member and was very willing to mentor a young geologist who did not grow up in the oil patch. It was this scientific and moral support that was so instrumental in helping me to succeed in the early years of my career.

As my career progressed I began volunteering on a local level in an AAPG affiliated society, the Pittsburgh Association of Petroleum Geologists, learning leadership skills and making many lasting friendships. I then, simultaneously became involved on a Section and national level when I became the Eastern Section councilor for the Division of Professional Affairs (DPA). This opportunity led to a long and satisfying affiliation with the DPA which continues to this day. By serving in each position of the DPA Executive Committee, I was able to hone my leadership skills and learn the details of how a volunteer-based organization operates. As DPA president, I traveled to many Section meetings as well as the Annual Convention and Exhibition in Calgary and the International Convention and Exhibition in Melbourne, Australia. At each of these meetings I saw the unique characteristics of each area, but found that everyone everywhere had two common attributes: These attributes are a love of geology and a desire to be the best they could be in their position, whether in academia or industry, and they knew how much AAPG helped them do so.

In mid-career, when I served in leadership positions for various companies, I began mentoring young geoscientists in my company as well as in our local society. I became a dedicated participant in the career fairs hosted annually with the Eastern Section meetings, and it was very rewarding to

### J. MICHAEL PARTY

President, Beryl Oil and Gas  
Midland, Texas, USA



#### Academic Degrees

1978 – B.Sc. Geology/Geophysicist, University of Missouri-Rolla (Now Missouri University of Science and Technology), Rolla, Mo., USA  
1994 – Honorary Professional Degree, Missouri University of Science and Technology, Rolla, Mo., USA

#### Experience

2016-Present – President, Beryl Oil and Gas LP, Midland, Texas, USA  
2009-16 – Vice President Exploration, Reliance Energy, Midland, Texas, USA  
2000-09 – Exploration Manager, Wagner and Brown Ltd., Midland, Texas, USA  
1981-2000 – Senior Geologist, Wagner and Brown Ltd., Midland, Texas, USA  
1981 – Senior Geologist, Aminoil USA, Midland, Texas, USA  
1978-81 – Senior Geophysicist, Cities Services, Midland, Texas, USA

#### AAPG Activities

Joined AAPG 1979  
Member DPA  
2017-20 – SWS Advisor, DPA  
2017 – Co-Chair Delaware Basin Playmaker Forum, DPA  
2015 – Co-Chair Permian Basin Playmaker Forum, DPA  
2012-Present – Board of Certification, DPA  
2010-12 – Chair, Honors and Awards Committee, DPA  
2007-11 – SWS Advisor, EMD  
2007-10 – SWS Advisor, DPA  
2007-08 – Co-Chair, Membership Planning Committee  
2005-07 – Secretary, AAPG Executive Committee  
2005-06 – Chair, Nominating Committee, DPA  
2005-06 – Chair, Honors and Awards Committee, DPA  
2005-06 – Vice Chair, SWS Convention  
2004-05 – AAPG Advisory Council, President, DPA  
2004-05 – President, DPA  
2004-05 – General Chair, SWS Convention, Fredericksburg, Texas, USA  
2004-05 – SWS Advisor, DPA  
2003-04 – President-Elect, DPA  
2003-04 – Delegates Voice Committee, House of Delegates (HoD)  
2003-04 – Fundraising Chair, SWS Convention, El Paso, Texas, USA  
2002-Present – Foundation Member  
2002-05 – History of Petroleum Committee  
2002-05 – Student Chapter Committee  
2002-05 – Committee on Committees

2001-06 – Visiting Geologist Program  
2001-04 – SWS Advisor, DPA  
2001-02 – Chair, Rules and Procedures Committee, HoD  
2000-01 – Rules and Procedures Committee, HoD  
2000-01 – Vice President, DPA  
1999-2000 – President, Southwest Section (SWS)  
1999-2000 – Vice Chair, SWS Convention  
1998-2000 – Chair, Bylaws Committee, SWS  
1998-99 – Chair, Membership Committee, DPA  
1998-99 – President-Elect, SWS  
1996-99 – SWS Advisor, DPA  
1996-97 – Chair, Rules and Procedures Committee, HoD  
1995-96 – Chair, WTGS Delegate, HoD  
1995-96 – Chair, Rules and Procedures Committee, HoD  
1994-96 – Continuing Education Committee  
1994-96 – Chair, Bylaws Committee, SWS  
1994-95 – President, West Texas Geological Society (WTGS)  
1993-94 – Vice President, SWS  
1993-94 – Bylaws Committee, SWS  
1993-94 – President-Elect, WTGS  
1992-94 – Bylaws Committee, HoD  
1991-92 – Chair, SWS Convention  
1991-92 – First Vice President, WTGS  
1990-91 – Second Vice President, WTGS

#### AAPG Honors and Awards

2013 – DPA Life Member  
2010 – DPA Distinguished Service  
2009 – AAPG Honorary Member  
2006 – SWS John Emory Adams Distinguished Service  
2005-06 – HoD Long Service  
2005-06 – DPA Past President  
2000-01 – HoD Distinguished Member of the House  
1999-2000 – AAPG Distinguished Service  
1999 – WTGS Honorary Life Membership  
1995-96 – WTGS Dedicated Service

#### Publications

1998 Geology, Facies, and Stratigraphy of the Kingdom and Kingdom North (Abo) Fields, Terry and Hockley Counties, Texas. J. Michael Party, Anthony E. D'Agostino, J. P. F. (Pat) Welch and Robert F. Lindsay  
Have given several talks for WTGS, Permian Basin Section SEPM, Southwest Section AAPG, and a paper for the DPA Midland Basin Playmakers. Wrote an article for the Explorer in May 2012, "Permian: A Basin Full of Stories," and as president of DPA wrote articles promoting the DPA for the Explorer

## VICE PRESIDENT-SECTIONS

### JEFF ALDRICH

MHA Petroleum Consultants, LLC  
Denver, Co., USA



#### Academic Degrees

**1977** – B.Sc. Geology, Vanderbilt University, Nashville, Tenn., USA  
**1983** – M.Sc. Geology, Texas A&M University, College Station, Texas, USA

#### Experience

**2013-Present** – Vice-President/Partner, MHA Petroleum Consultants, Denver, Colo., USA  
**2011-13** – Portfolio Manager; Head of Exploration, Dart Energy, Singapore  
**2008-11** – Vice President Exploration, Greenpark Energy, Chesterfield, UK  
**2005-08** – Chief Geologist, PetroSA, Cape Town, Republic of South Africa  
**2004-08** – President, Energy Resource Advisors, Denver, Colo., USA  
**1998-2004** – Chief Geologist, Forest Oil International, Houston, Texas; Denver, Colo., USA  
**1993-98** – Exploration/Exploitation Geology and Geophysics, Maxus SES, Jakarta, Indonesia  
**1990-1993** – Geologist/Geophysicist. Maxus, Dallas, Texas, USA  
**1979-90** – Geologist/Geophysicist, Pennzoil, Houston, Texas, USA

#### AAPG Activities

Joined AAPG 1979  
Member DEG, DPA, EMD  
**2014-Present** – PROWESS, International Concerns Committee  
**2015-16** – DEG Vice Chair, Annual Conference and Exhibition (ACE) Organizing Committee  
**2015-16** – President, DEG  
**2015-16** – Advisory Council, DEG President  
**2014-15** – President-Elect, DEG  
**2014-15** – EMD Chair, ACE Organizing Committee  
**2014** – Africa Region Alternate Delegate, House of Delegates (HoD)  
**2009-16** – Energy Economics and Technology Committee, EMD  
**2010-11** – EMD Chair, International Conference and Exhibition, (ICE) Organizing Committee, Singapore  
**2011-14** – Advisory Board, DEG  
**2010-11** – Europe Region Alternate Delegate, HoD  
**2009-11** – Commodities Observer, Oil Shale, Shale Gas and CBM Committees, EMD  
**2008-09** – Africa Region Advisor, EMD  
**2006-09** – ICE Committee  
**2006-08** – General Vice Chair, ICE Committee, Cape Town  
**2004-07** – Africa Region Alternate Delegate, HoD  
**2000-05** – Mentorship Committee  
**2000-01** – Vice Chair, Membership Committee  
**1999-2000** – Membership Committee  
**1992-93** – Headquarters Management Committee  
**1990-93** – Dallas Geological Society Alternate Delegate, HoD  
**1990-91** – Twenty-First Century Committee

**1989-91** – Geological Computing Committee  
**1989-96** – International Regions Committee  
**1988-90** – Houston Geological Society Delegate, HoD  
**1987-88** – India Alternate Delegate, Asia Pacific Region, HoD

#### AAPG Honors and Awards

**2018** – AAPG Honorary Member Award  
**2016** – AAPG EMD Certificate of Merit  
**2008** – AAPG Certificate of Merit  
**2002** – AAPG Distinguished Service Award  
**2000** – AAPG Certificate of Merit

#### Publications

- "Fluvial-Deltaic Architecture of the Orange River Delta, Examples from Block 2A, AK 3D Seismic Survey." Aldrich, J.B. and Berge, T.B. 2000, in proceedings from the 6th Annual 3-D Symposium, RMAG and DGS, 15 pages.
- "A Win-Win Commercialization of Marginal fields in Indonesia by Pertamina, Migas, and YPF-Maxus Energy." 2000 Herucokro, T., Girgis, J., Aldrich, J., Thomas, B., Sambas, M. in G. Kronman, D. Felio, T.O'Connor, eds, International Oil and Gas Ventures: a Business Perspective; AAPG, pp 385-398.
- "Petroleum Systems of the Asri Basin, Java Sea, Indonesia." In the I.P.A. Proceedings of the Twenty – Sixth Annual Convention, 1998, in print; Sukanto, J., Nunuk, F., Aldrich, J. B., Rinehart, G. P., Mitchell, J.
- "Paleogene Basin Architecture of the Sunda and Asri Basins and Associated Non-Marine Sequence Stratigraphy." In the I.P.A. Proceedings of the International Symposium on Sequence Stratigraphy in S.E. Asia; Jakarta; Aldrich, J. B., Rinehart, G. P., Ridwan, S. and Schuepbach, M. A. May 1995
- "The Stratigraphy of the Hi-Lo #1 Exploration Well, Tikaboo Valley, Nevada: Proof of Thrust Tectonics." Nevada Petroleum Society; Aldrich, J. B., and Herring, D, Annual Field Trip. 1992
- "Alteration of Remnant Arc Debris, Site 448, Palau-Kyushu Ridge, Philippine Sea, Deep Sea Drilling Project Leg 59." Aldrich, J., Tieh, T., and Scott, R. doi: 10.2973/dsdp.proc.59.135. 1981.

In addition to the published papers I have presented 12 oral or poster presentations at AAPG ACE, ICE or GTW meetings. The subjects of these presentations have ranged from basin evaluation to reserves to economic evaluations. In addition I have prepared and presented talks aimed at the AAPG students and Young Professionals on ethics and how to prepare your career. I have also presented at SPE meetings on unconventional plays and the use of the SPE\ AAPG PRMS system in evaluating those plays. I have a poster that has been accepted for the 2018 ACE in Salt Lake City on quantification of "Sweet Spots" in Unconventional Reservoirs.

#### Why I Accepted the Invitation to be a Candidate for an AAPG Office By Jeff Aldrich

I am honored to be considered and I thank both the Nomination Committee and the AAPG Advisory Committee for considering me. When I was first encouraged to stand for the office of vice president of Sections I reflected first on whether or not I would be a suitable candidate. One of my responsibilities in my industry positions over the past decade has been to evaluate people as to their suitability for roles in teams; so I did some self-evaluation for my potential suitability for this role. I determined that I possess three fundamental, and unique set of skills or experiences to bring to the role of Section vice president.

See ALDRICH pg 4



### DON CLARKE

Consulting Geologist  
Lakewood, Calif., USA

#### Academic Degrees

**1972-74** – Joint Master's Program, California State Universities, Northridge, Los Angeles and Long Beach, Calif., USA. Completed 35 units  
**1972** – B.Sc. Geology, California State University, Northridge, Calif., USA

#### Experience

**2004-Present** – Consulting Geologist, Lakewood, Calif., USA  
**2003-13** – Teach Petroleum Geology in the Viterbi School of Engineering, University of Southern Calif., USA  
**1990-2004** – Geology Instructor, Compton Community College, Calif., USA  
**1981-2004** – Division Engineer, Department of Oil Properties, City of Long Beach, Calif., USA  
**1974-81** – Senior Geologist, California State Lands Commission, Long Beach, Calif., USA

#### AAPG Activities

Joined AAPG 1986  
Member DEG, EMD  
**2017-18** – Nomination and Election Committee, House of Delegates (HoD)  
**2017** – Co-Leader, AAPG Field Conference on Astrogeology, Casper, Wyo., USA (Part of three AAPG delegations to Washington, D.C.)  
**2016-Present** – Foundation Trustee Associate  
**2014-15** – Distinguished Lecturer on Ethics  
**2013-14** – Newsletter Committee, HoD  
**2010-12** – Board of Directors, Petroleum Technology Transfer Council  
**2006-Present** – Member at Large, HoD  
**2009-11** – Constitution and Bylaws Committee, HoD  
**2011** – National Research Council Committee on Induced Seismicity Potential in Energy Technologies (Published a book on Induced Seismicity)  
**2009-10** – Nominations and Election Committee, HoD  
**2008-09** – President, Pacific Section  
**2006-07** – Advisory Council, Past HoD Chair  
**2005-Present** – Astrogeology Committee  
**2005-16** – Professional Women in Geosciences Committee (PROWESS)  
**2005-08** – Executive Committee Liaison, Committee Manager for many committees  
**2005-06** – HoD Chair, AAPG Executive Committee  
**2005-06** – Newsletter Committee, HoD  
**2005-06** – Vice Chair, Graduated Dues Committee  
**2004-05** – HoD Chair-Elect  
**2004-05** – Nominations Committee, HoD  
**2004-05** – Chair, Domestic Sections Committee  
**2003-Present** – Membership / Recruitment / Enhancement / Career Services Committee  
**2002-04** – Resolutions Committee, HoD  
**2002-04** – Chair, Geotours Committee  
**2001-13** – Chair, Public Outreach Committee  
**2001-08** – Preservation of Geoscience Data Committee

**2001-04** – Advisory Council, DEG President  
**2001-03** – Advisory Council, Pacific Section  
**2001** – National Research Council Committee on Geoscience Data and Collections (Published a book on data preservation)  
**1999-2001** – Honors and Awards Committee, HoD  
**1998-2004** – Vice Chair, Reservoir Development Committee  
**1996-2002** – President, Los Angeles Basin Geologic Society  
**1996** – Charter Member, DEG  
**1992-95** – Constitution and Bylaws Committee, HoD  
**1988-2006** – Los Angeles Basin Geologic Society Delegate, HoD

#### AAPG Honors and Awards

California Registered Geologist #3583  
Licensed Texas Professional Geoscientist #4860  
**2016** – HoD House Long Service Award  
**2015** – HoD Honorary Member of the House  
**2014** – AAPG Honorary Member Award  
**2010** – HoD 15-Year Certificate of Service  
**2010** – HoD Distinguished Member of the House  
**2009** – AAPG Certificate of Merit, Membership Recruitment Committee  
**2009** – AAPG Certificate of Merit, Pacific Section  
**2008** – AAPG Certificate of Merit, 2007 AAPG Annual Meeting, DEG Vice Chair  
**2006** – House Recognition of Service Award  
**2005** – AAPG Certificate of Merit, Domestic Sections Committee  
**2005-06** – HoD Award of Excellence  
**2004** – AAPG Certificate of Merit for GeoTours Committee  
**2004** – DEG Public Outreach Award  
**2002** – AAPG Distinguished Service Award

#### Publications

- Over 60 published papers and abstracts on the Los Angeles Basin geology, computer mapping techniques, data preservation and induced seismicity,
- Three geologic guidebooks on geology and oil development in the Los Angeles Basin,
- One movie appearance on the Swiss documentary, "A Crude Awakening,"
- Several television appearances including the National Geographic series "Man Made," episode "Gallon of Gas"; The History Channel Series "Trashopolis," episode 9; VBS Television "LA's Hidden Wells"; A Russian Documentary on oil development (expected release 2018); BBC episode "Great American Railroad Journeys" (Chicago to San Diego, expected release 2018).
- Numerous television and radio interviews (NPR, NBC, CBC, Spiegel)

#### Why I Accepted the Invitation to be a Candidate for an AAPG Office By Donald D. Clarke

They caught me at a weak moment. Actually, I've volunteered for AAPG since the early 1980s, and that has allowed me to meet and work with many geologists around the world. As a young professional, I did not participate in professional societies. One day my boss came into my office and asked why I was not a member of AAPG. I didn't have a reason. He told me to forget that nonsense and to join right away. I joined. To this day I give the same advice to geoscientists who work with me.

At the time I was working in the giant Wilmington Oil field in Long Beach, California. We

See CLARKE pg 4

## RICHARD W. BALL

Detring Energy Advisors  
Houston, Texas, USA



### Academic Degrees

**2007** – M.S., Geology, University of Louisiana at Lafayette, La., USA  
**2005** – B.S., Geology, Stephen F. Austin State University, Austin, Texas, USA

### Experience

**2016-Present** – Vice President, Detring Energy Advisors, Houston, Texas, USA  
**2012-16** – Development Geologist-Angola Block 0; Chevron, Houston, Texas, USA  
**2010-12** – Exploration Geologist-Gulf of Mexico; Chevron, Houston, Texas, USA  
**2007-10** – Development Geologist-San Juan Basin; Chevron, Houston, Texas, USA  
**2006** – Contract Geologist-Gulf of Mexico Shelf; ToppKnotch, Lafayette, La., USA  
**2005-06** – Geotech-Onshore Louisiana; Rainier Minerals; Lafayette, La., USA  
**2004-2012** – Founder, Importation; T-ingo Importers, Dallas, Texas, USA

### AAPG Activities

Joined AAPG 2002  
Member EMD  
**2017-Present** – Visiting Geoscientist Special Interest Group  
**2017-18** – Credentials Committee, House of Delegates (HoD)  
**2016-17** – General Vice Chair, ACE Organizing Committee  
**2015-18** – Houston Geological Society Delegate, HoD  
**2014-16** – Ad Hoc Committee on Governance  
**2013-15** – HoD  
**2013-15** – Member, Astrogeology  
**2013-15** – Secretary, AAPG Executive Committee  
**2013-15** – Executive Committee Liaison; Preservation of Geoscience Data; Public Outreach; Youth Educational Activities; History of Petroleum Geology; Professional Women in Earth Sciences  
**2010-13** – Chair, Student Chapters Committee  
**2007-12** – Director, Student Chapter Leadership Summit

**2008-10** – Vice Chair, Young Professionals Committee  
**2007-10** – Vice Chair, Student Chapters Committee  
**2005-08** – Education Committee

### AAPG Honors and Awards

**2018** – AAPG Distinguished Service Award  
**2017** – AAPG Certificate of Merit, ACE 2017 General Vice Chair  
**2016** – James A. Hartman Service to Students Award  
**2013** – AAPG Certificate of Merit, Student Chapters Committee Chair

### Publications

- 2010, The Highs and Lows of Subsalt Exploration in Southeastern Green Canyon, Deepwater Gulf of Mexico - A World-Class Petroleum System
- 2009, LIDAR Imaging Technology Used to Reduce Cycle time, and Costs while Increasing Safety and Stakeholder Alignment
- 2009, Digital Regional Investigation of the Wilcox Group of Northern Louisiana: Application to Coalbed Natural Gas Evaluation
- 2007, Regional Subsurface Investigation: Coal Accumulation in the Wilcox Group, Northern Louisiana
- 2006, Ore Petrographic Aspects of Recent Basaltic Andesite from Arenal Volcano, Costa Rica
- 2005, Geochemical and Petrographic Aspects of Basaltic Andesites from Arenal Volcano, Costa Rica

Presentations and publications I have been a part of concentrated on lessons learned from work projects that focused on geo-modeling, geosteering, lean sigma application, and offshore exploration. Some publications are not listed as they were deemed company confidential.

### Why I Accepted the Invitation to be a Candidate for an AAPG Office By Richard W. Ball

I am grateful and proud to be a candidate for the office of treasurer. My experience in the AAPG has instilled in me the importance of professionalism, volunteerism and service. My concentrated record of escalating service reflects personal initiative and commitment to an organization that I believe has been vital to my professional development and success to date.

Like most active Members today, I joined the AAPG as a Student member while working on my bachelor of science degree in geology. After attending my first AAPG annual convention, I knew that I wanted to be more deeply involved in the association, which is filled with individuals who are passionate about their science, fellowship and organization.

I believe my position as vice president of Geology at Detring Energy Advisors, an acquisitions and divestiture advisory firm that focuses on mid-cap (\$25-200MM USD) space, has provided additional finance and business skill set that will help me better serve the organization. While I have served the AAPG in many capacities, I feel that my term of service as EC secretary proved both seminal and formative in my understanding of the AAPG. I gained new insight into business, procedures, responsibilities, protocol and strategic goals for the Association, which allowed me to consider alternatives that may alleviate current and future challenges (regardless of commodity prices). Above all else, I was able to directly observe hard-working, passionate and thoughtful volunteers-the same volunteers that will ensure OUR organization will continue to flourish for the next 100 years.

I find that the more time that I dedicate to the organization, the more I am indebted. Ultimately, this ensures that I will always be a part of AAPG, and for that I am grateful. Each position I have held within AAPG has enhanced my professional development, amplified my skill sets and proved to be another great adventure. I will never be able to fully repay the AAPG for the opportunities it has afforded me, but through my continued volunteering to the organization, I will not stop trying to pay my service forward.

If elected to the position of treasurer, I will continue the work of previous ECs and focus on capital stewardship and the integration of systems that make our finances more transparent.



## WILLIAM J. HASKETT

Haskett Consulting International, LLC  
Houston, Texas, USA

### Academic Degrees

**1989** – MBA, Finance and Organizational Development, University of Calgary, Calgary, Alberta, Canada  
**1994** – B.Sc., Geology, McMaster University, Hamilton, Ontario, Canada

### Experience

**2016-Present** – Managing Director, Haskett Consulting International, LLC, Houston, Texas, USA  
**2000-16** – Senior Principal - Energy Strategy, Decision Strategies Inc., Houston, Texas, USA  
**1980-2000** – Senior Exploration Advisor, Unocal Corp., Sugar Land, Texas, USA

### AAPG Activities

Joined AAPG 1980  
Member DPA EMD  
**2017-19** – Chair, Reserves Committee  
**2017-18** – Chair, DPA Reserves Committee  
**2015** – Conventions Committee, DPA  
**2016-17** – Vice Chair, DPA  
**2015-16** – 2016 Annual Conference and Exhibition (ACE) Calgary  
**2010-15** – Canada Region Advisor, DPA  
**2016** – Bylaws Committee, DPA  
**2006-15** – AAPG Continuing Education Instructor (domestic and international)  
**2014** – Organizing Committee, Playmaker Canada, DPA  
**2011-16, 1990-91** – Canada Region Alternate Delegate, House of Delegates (HoD)  
**2006-Present** – Publications "Bulletin" peer reviewer  
**2004-05** – Chair, Resolutions Committee, HoD  
**2003-05** – Resolutions Committee, HoD  
**2002-11, 1991-94; 1987-90** – Canada Region Delegate, HoD  
**2002-03** – Strategy Committee, HoD  
**2002-Present** – Education Committee  
**1998-2000** – Budget Review and Finance Profile Committee  
**1987-90** – Chair, Canada Region, Membership Committee  
**1986-91** – Membership Committee  
**Ongoing** – Numerous Convention Committees, Field Trip Coordination, and Session Chair positions at local and international levels

### AAPG Honors and Awards

**2011** – House of Delegates, 15-Year Certificate of Service  
**1998-99** – AAPG Certificate of Merit, Facilitator Budget Review Committee

### Publications

- Evaluation, Entry, Efficiency and Materiality Strategies for Energy and Infrastructure Projects, WJ Haskett, Canadian Operations Research Society, June 2016
- The Myth of Sweet Spot Exploration, W.J. Haskett, SPE 170960, Oct. 2014
- The Materiality Question, W.J. Haskett, Decision Strategies white paper, March 2012
- Unconventional Type Curves: Useful, or Sirens of Destruction?, W.J. Haskett, SPE-147059, Nov. 2011
- Pitfalls in the Evaluation of Unconventional Resources, W.J. Haskett and P.J. Brown, SPE-135208, Sept. 2010.
- Pain and Regret, W.J. Haskett, SPE 116773, October 2008
- Decision-Making for Unconventional Resources, P. J. Brown, W. J. Haskett and P.E. Leach, 2007, American Oil and Gas Investor, January, p. 22-25
- Exploitation and Management of Risk and Uncertainty, Drilling Magazine, ~March 2006
- Evaluation of Unconventional Resource Plays, W. J. Haskett and P. J. Brown, SPE 96879, October 2005
- Practical Optimization: Working with the Realities of Decision Management, W.J. Haskett, M. Better and J. April (OptTek Systems Inc.), SPE 90947, October 2004
- Optimal Appraisal Well Location Through Efficient Uncertainty Reduction and Value of Information Techniques, W.J. Haskett, SPE 84241, October 2003.
- Real-Time Negotiation Based Decision Analysis, W.J. Haskett, Decision Analysis Affinity Group annual meeting, Feb., 2002, Las Vegas

Over 20 publications focused primarily on the business aspects of the energy industry, including benchmark papers on the economic evaluation of unconventional resources, decision support linking technical assessment to business action, and the use of risk and uncertainty in the evaluation of resource and reserve potential.

### Why I Accepted the Invitation to be a Candidate for an AAPG Office By William J. Haskett

Simply put, I believe in doing what I can to promote and advance AAPG.

I have been a member since my undergraduate years, and an active volunteer in diverse capacities since 1982. For me, AAPG has always been the pre-eminent international earth science professional organization. My extensive volunteer and committee activity has been a rewarding part of my career. AAPG is my home and I am both pleased and honoured to have been selected by the nominating committee as a candidate for treasurer.

I believe that the treasurer position is a particularly good fit for me. I have striven to maintain a diverse practice throughout my career, including obtaining an MBA with concentrations in Finance and Organizational Development. After spending the first 20 years of my career exploring, developing and managing the worldwide new ventures portfolio for a large independent, I have spent the last 18 years coaching individuals, teams, companies and countries around the globe on the integration of business principles and strategy into their technical, business, and energy policy decisions. In doing so, I have developed new methods and won major industry awards. I have helped entities bridge the gap between sound geo-technical work and sound business decision making. I see my strategy development/execution and decision support skills as a critical contribution to the Executive Committee.

## **CANICH** from page 1

provide career guidance to students looking for employment.

I have found that in every volunteer position that I have held, the satisfaction and benefits that I received always outweighed the time and work required to fulfill the duties of the office.

As we all know, the oil and gas industry is cyclic and has been through many booms and busts. AAPG has always been there in the good and bad times to provide support via educational

opportunities and career development guidance. The network of geologists that I developed through AAPG helped to get me through the down times.

AAPG has been an integral part of my career and I want to do my part to ensure it is available to future generations of petroleum geologists. That is why I accepted the invitation to stand for the office of AAPG president-elect.

## **PARTY** from page 1

### **Why I Accepted the Invitation to be a Candidate for an AAPG Office**

**By J. Michael Party**

I am honored to be selected as a candidate for AAPG president-elect. I have been a member of AAPG for 39 years and started my involvement in the AAPG in the House of Delegates as a Delegate from the West Texas Geological Society and worked on committees for the Southwest Section AAPG. I also am a member of SEG, Permian Basin Section SEG, SIPES and the Geological Society of London, a Certified Petroleum Geologist and Geophysicist within DPA and a Texas Certified Geologist. I have been an AAPG Foundation Trustee Associate since 2001.

I believe one of the main responsibilities of AAPG's leadership is to make the organization indispensable to its members. Scientific and geological concepts are ever changing. The AAPG needs to continue assisting its members in keeping current on all new developments. The AAPG achieves this through several programs, most notably the Discovery Forum and the DPA Playmaker Forum.

Since my early involvement within the West Texas Geological Society and the Permian Basin Section of SEPM, my main focus has been on educational events. In the mid-1980s I organized symposiums held in Midland that became the very successful annual WTGS Fall Symposium. I also helped implement a free short course at the Southwest Section Convention. More recently, I co-chaired the Midland Basin Playmaker Forum and the Delaware Basin Playmaker Forum events in Midland. With the help of a great team of volunteers, these events were both very successful.

To me, the greatest strength of the AAPG is the people. Members of AAPG share a common love - "the rocks." I have been fortunate that while serving within the AAPG, whether on committees or in leadership roles, including secretary of AAPG, president and vice president of DPA and president of the Southwest Section of AAPG, I have had the pleasure of working with many of these great people.

After earning my B.Sc. degree in Geology/Geophysics from the University of Missouri-Rolla (now Missouri University of Science and Technology) in 1978, I was offered a position in Midland, Texas, with Cities Services as a staff geophysicist. In the early '80s I was offered a job with Wagner and Brown LTD, where I had the opportunity to work throughout the United States and internationally. In my career I have worked for a major (Cities Services, four years), a large independent (Wagner and Brown Ltd, 28 years), where I was exploration manager for nine years, and a small independent (Reliance Energy Inc., seven years) where I served as vice president of Exploration. At Reliance, I was part of the team that created an extremely successful company that sold its major assets to Concho in 2016. After Reliance, I started my own company, Beryl Oil and Gas LP, which is currently drilling projects in the Permian Basin.

The last 10 years have been transformational within the oil and gas industry. Many companies today are designed to move properties more than develop a geologist's career. It is the responsibility of the AAPG leadership to continue, and make a priority of, assisting geologists in career development and continuing education.

## **ALDRICH** from page 2

First, I have the geographic experience. I was born in West Virginia and educated in the Eastern Section, where I grew up in Florida and received my B.S. degree at Vanderbilt University in Tennessee; before moving west and getting my Master's degree from Texas A & M. I have lived and resided a good amount of my professional experience in three other Sections: the Gulf Coast (in Houston) the Southwest (in Dallas), and now the Rocky Mountain (in Denver). I have worked basins in every Section; from Alaska to Florida, from Georges Bank to Southern California, from the Gulf of Mexico and the Gulf Coast to the Rocky Mountains and almost every basin in between.

Second, I have worked in large independents (Pennzoil and Maxus), small start-up ventures (Greenpark and Dart Energy), had my own company (ERA), and now work for a consulting company based in Denver with an office in Bakersfield, Cali. Thus I believe I can listen to, and understand the needs of, professionals in any type of company, in any area of any Section in AAPG.

Finally, I have extensive experience having held many different roles in AAPG, including president of the DEG; being very active in the EMD; being DPA certified; having served on many committees and as a delegate in the House of Delegates. Additionally, I have lived and worked overseas for

14 years in four different countries. This has given me a global perspective of our industry and Association that should allow me, if elected, to better understand issues of our entire constituency.

I believe that the first step to meaningful communication is establishing better understanding of the drivers of individuals. I further believe that I can use my experience to help strengthen both the communication and AAPG services between the national organization and the six Sections. In order to better serve, and thus encourage membership in, the newest generation we know we must update our business practices while continuing to deliver the excellent technical content that we are known for. Each division, TIG, and SIG has remarkable people providing excellent content that AAPG, as a professional organization, pulls together to help elevate us all.

AAPG has provided me much of my training, contacts, professional education, and friends over the past 38 years. When asked if I would be willing to serve the answer is not "if I am willing to serve" but always "how can I best serve?" This time, after reflection, I can honestly answer that in this case, if elected, I can best serve to help advance the professionalism of the AAPG members as vice president, Sections.

## **CLARKE** from page 3

were working on an equity determination and trying to put all of our data into the computer. We purchased DEC computers, built a huge database and purchased Z-Map to make the geologic maps. It was exciting. Consequently, the 1986 AAPG annual meeting was held in Los Angeles and I was asked to conduct a short course on computer mapping and lead a field trip to the oil fields in the L.A. Basin. I grabbed some help from my fellow AAPG geologists and completed both. The result was amazing. I found mentors, new friends and have conducted many field trips and short courses since.

I was elected to the House of Delegates. I chaired a Pacific Section AAPG (PSAAPG) convention and co-chaired a joint PSAAPG and WRSPE meeting and a Cordilleran Section, GSA meeting. I served as president of the PSAAPG, chairman of the House of Delegates (HoD) and served on the AAPG Executive Committee. I was a member of the Advisory Council for four years and participated on many AAPG and HoD committees. I served on the board of directors of the Petroleum Technology Transfer Council, vice president of the Dibblee Foundation, member for AAPG on the AGI Critical Issues Committee and I was a member of two National Research Council committees.

I served as the AAPG Distinguished Lecturer on Ethics, which allowed me to interact with social groups, students and professors at Universities around the United States. I have also spoken to many service organizations about petroleum and geology.

I am trying to improve AAPG as a professional society. I feel that AAPG is not exactly aligned with our profession both domestically and internationally. When I was chair of the House I pushed to have a VP of Sections and a VP of Regions, which would represent two voices for membership on the Executive Committee. My goal as VP Sections will be to focus on the members' needs. Specifically, we need to keep the talent that the oil companies shed so quickly. The geologists need to band together under some capable mentors and continue to work. Small oil operators still have work to do and need geologists. Today's tools of the trade are expensive and most geologists have trouble getting the software due to cost. Let's come together and work with these geologists and provide opportunity to expand our working talent. AAPG's strength is in connecting with these people so that we can supply the world's energy needs.

## **HASKETT** from page 3

I accepted the nomination because I believe I am a good candidate. It comes down to three elements: training/knowledge, experience, and desire. I am excited for the opportunity to serve the AAPG and its membership. I believe my past industry experience, at both a technical and strategic level, will serve the organization well. As treasurer, I will be committed to building an AAPG that is

as meaningful to our current membership as it is to the next generation of geoscientists and has been to me.

I would be honored to have the opportunity to contribute to the AAPG's stability and growth as your Association's treasurer for the next two years.



# AAPG

1444 S. Boulder  
Tulsa, OK 74119 : USA  
Phone: 1.918.584.2555  
Toll Free US & Canada: 1.800.364.2274  
Fax 1.918.560.2665  
[www.AAPG.org](http://www.AAPG.org)

AAPG

20-23 May 2018 • Salt Lake City, Utah

# ACE 2018

ANNUAL CONVENTION & EXHIBITION

**Last Chance to Save Up to \$210**  
Pricing Increases 22 March (Use promo code **ACE18EXP**  
for best available pricing)

**Science** That is Changing Our Profession

**Technology** You Can Apply at Work the Next Day

**Friends** for Reminiscing, Networking, and Painting the Town

**Rocks!** Field Trips, Core, Fossils, Dinosaurs...ROCKS!

In conjunction with:



**ACE.AAPG.org**

## Historical Highlights

*According to local tradition, the Boiling River is a place of tremendous spiritual power, where the steam creates a magic atmosphere. Here, Maestro Juan, an Asháninka healer and shaman, plays the flute atop an outcrop of Agua Caliente sandstone. Photo by Sofía Ruzo of the Boiling River Project.*

# The Agua Caliente Oilfield and the Boiling River of the Peruvian Amazon

The presence of petroleum in Peru has been known for several centuries from the numerous oil seeps and outcrops of heavy black asphalt located in the Talara coastal region. Ages before the Spanish presence, the natives prepared the pitch for mummifying their dead, for waterproofing boats and as fuel for light. The earliest Spanish explorers used the pitch from these seeps to caulk their boats and tar their ropes. As Spanish shipping increased, the importance of the tar pits increased and they were soon systematically exploited, becoming the site of South America's oldest petroleum production. Finally, in 1869, the La Brea-Pariñas oilfield was discovered by cable-tool drilling, making it one of the first oil production fields in the world.

During the mid-19th and early 20th century, most of the exploration and production effort in Peru was focused in the Talara coastal region. It was not until after World War I, when the petroleum possibilities of the remote Peruvian Amazon region started to interest some U.S. companies. Field geological mapping for exploration purposes started in the early 1920s, but the absence of an encouraging Peruvian petroleum law to overcome the difficulties and high exploration costs in the Amazon region made most of the companies stop such work.

### A Surprising Prospect from the Air

In the late 1920s, Peru was seeking to expand its Amazonian development and better connect cities like Pucallpa with the rest of the country. In 1929, American geologist Robert B. Moran conducted an aerial survey from a plane over the Ucayali region for a railroad construction project across the Andes, to connect the Pacific coast with the Peruvian Amazon. About 60 kilometers southwest of Pucallpa, adjacent to the meandering Pachitea River near its junction with the Ucayali, a major tributary of the Amazon River, he spotted a large, elliptical-shaped landform rising out of the jungle, with a different type and shade of vegetation, standing above the surrounding swampy low land.

Moran was one of the first geologists to take advantage of air flights and aerial

photos for geological reconnaissance and mapping, and thus had a practiced eye. He immediately identified this protruding structure as an anticline and a potential oil prospect. He had the pilot fly over the area in several directions in order that he might study the feature further.

In later years, a reporter asked Moran how he recognized an anticline. His laconic and arrogant reply was, "How do you recognize a cow?"

Moran immediately took steps to obtain an exploration license covering the dome and the adjoining terrain and in 1930 convinced the Selden Breck Construction Co. to apply for a license to explore in the Pachitea region – not an easy matter after the Wall Street Crash of 1929.

### Geological Fieldwork Under Difficult Conditions

In the early 1930s, in collaboration with the geologist Douglas Fyfe and engineer Glenn M. Earl, and on behalf of the Selden Breck Construction Co., Moran organized several field reconnaissance expeditions to the Agua Caliente dome.

In a 1933 paper, Moran and Fyfe released the results of the geological fieldwork, also

describing the access routes, topography, weather, sanitation and the local population. They mentioned that, due to the mosquitoes – especially those locally known as "mantablanca" – the riverbanks were poorly inhabited. There were "not 50 people living in the Agua Caliente district," and most of these were "descendants of the people who came into the district during the rubber boom." Their paper also describes "a few wild Indians living back from the main rivers" that are "seldom seen and their numbers are practically negligible."

The Agua Caliente dome was covered by thick vegetation, but the streambeds, the clearing of trails and the rugged topography allowed observation and measurement of stratigraphic sections and strike and dip readings in good rock exposures. It was an admirable example of detailed fieldwork by canoe and on foot under hazardous conditions, exposed to high temperatures coupled with humidity and sporadic heavy rains, the annoying mosquitoes being the greatest inconvenience. Finally, the dome was confirmed as an anticline, 8 kilometers long and 5 kilometers wide, with the major axis trending northwest to southeast, covering some 35 square kilometers. The fold is asymmetrical with the northeast flank

rather steep (20 to 35 degrees) dip, whereas the southwest flank was gently dipping (10 degrees). The oldest rocks were sandstones of Early Cretaceous age found outcropping at the core of the anticline.

Moran and Fyfe named these the Agua Caliente Formation, which became a generally accepted term in the Peruvian Amazon stratigraphy. These sandstones were surrounded concentrically by the marine calcareous shales of the Chonta Formation (Late Cretaceous), overlaid by the Vivian sandstones (also named "Sugar sandstones"), which provide a prominent and continuous ridge. On top of the Vivian lie the Cachiayacu shales that represent the end of the Cretaceous sequence.

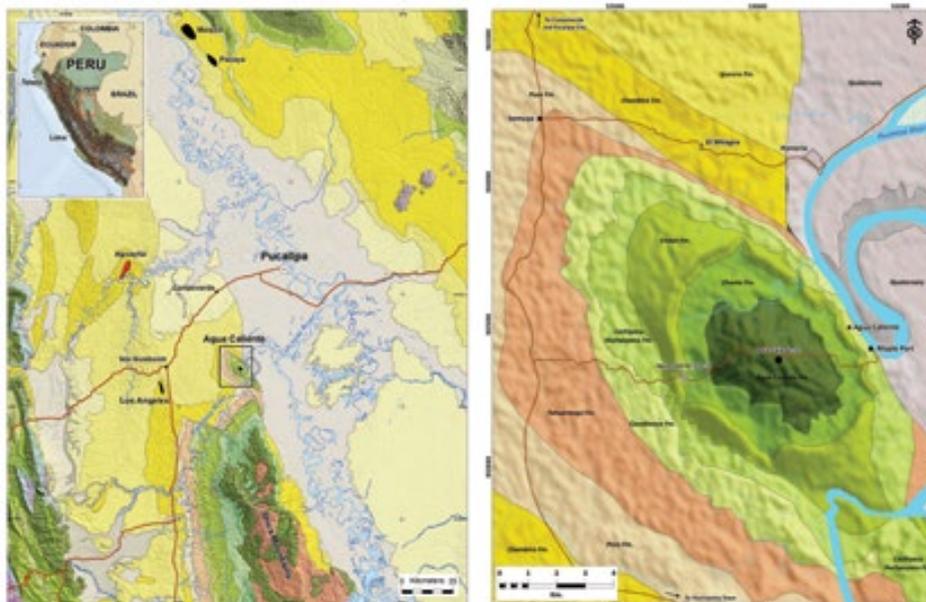
Hot water springs ("agua caliente" in Spanish) were found in the core of the anticline and geologists became concerned about the dome being a volcanic rather than a sedimentary structure, as hydrothermal volcanic fluids can overcook hydrocarbon source rocks and destroy oil reservoirs.

No igneous rocks were found nearby and Moran and his colleagues finally concluded the hot water springs were non-volcanic in origin and they opportunely found several natural live oil seeps ("chapapoterías" in Spanish) in outcrops of Cretaceous rocks in the Shira Mountains, a prominent uplifted tectonic unit located some 35 kilometers south of the Agua Caliente dome, which clearly indicated favorable conditions for the existence in the region of what we know today as a working petroleum system.

### First Exploration Well in the Amazon

During the 1930s, the Great Depression was in full swing and these were times of insurmountable difficulty. It took several years before a group could be found to finance the drilling venture.

In 1937, Moran and a group of friends organized the "Compañía de Petróleo Ganso Azul Limitada," which then negotiated the Agua Caliente license and a cost-plus contract with a California drilling company. After all kinds of problems with the initial shipment of drilling equipment from California to Pucallpa and then by river to



Left: Map showing the location of the Agua Caliente dome. Right: Agua Caliente dome geological map. The Agua Caliente sandstones are found outcropping at the core of the anticline.

Continued on next page ►

**Jorge Navarro Comet** is currently vice president of the AAPG-affiliated Association of Spanish Petroleum Geologists and Geophysicists (AGGEP). He is geology manager in CEPESA where he is responsible for coordination, management and supervision of the petroleum geology studies and works in regions where CEPESA is currently active: South America, North/East Africa, Middle East, South East Asia and Spain. He is also an active member of different professional associations of petroleum geoscientists such as AAPG, EAGE, PESGB and AGGEP.



Navarro Comet next to the Pachitea River in the NE flank of the Agua Caliente anticline.



Above: The Agua Caliente-1 well drilled in 1939 is still on production. Left: Robert B. Moran (1879-1961)

◀ Continued from previous page

Agua Caliente, the well was finally spudded on July 4, 1938. It was the first well ever drilled in the Amazon region.

The Agua Caliente-1 well was located in the center of the anticline, on top of a steep and small hill about 600 feet (180 meters) above the Pachitea River. The well was drilled to a depth of 3,130 feet (954 meters), recording oil shows in sandstone cores of Lower Cretaceous age taken from 1,100 to 1,260 feet (340 to 390 meters), but the well was not completed and was temporarily abandoned on Feb. 11, 1939. The rig was immediately skidded 24 feet (7 meters) to drill a second well (Agua Caliente-1A), spudded on Feb. 14, drilled to a total depth of 1,175 feet (358 meters) and open-hole completed on Feb. 26 as the Agua Caliente oil discovery, which was also known as the Ganso Azul (Blue Goose) oilfield.

The stratigraphy drilled by the discovery well was a sequence of Early Cretaceous age, composed of the Agua Caliente sandstones,

outcropping at surface, then the Raya marine shales interbedded with minor siltstones and sandstones and below, the massive sandstones of the Cushabatay Formation, lying unconformably over Paleozoic rocks. Oil was tested in the sandstone beds of the Upper Cushabatay to Lower Raya formations, with reservoir porosities ranging from 17 to 25 percent. The initial production rate was up to 700 barrels per day of 45-degree API oil on natural flow with no water, and gas practically absent.

The first exploration well drilled in the Amazon region resulted in an oil discovery and attracted considerable attention to the eastward region of the Andean Cordillera as a petroleum province, offering an area of enormous size for those interested in exploration in South America.

Since 1938, a total of 35 wells have been drilled in the Agua Caliente Field, of which 31 were completed and four abandoned. Subsurface maps were obtained from well data only, clearly showing the four-way dip closure with minor normal faulting detected

by the well penetrations. Seismic coverage is quite poor, limited to a few 2-D good quality seismic lines that clearly reflect the structural configuration of an anticlinal fold associated with high-angle reverse faulting sub-parallel to the Andean tectonic thrust front.

Initially the oil was shipped downriver by barges and refined in Brazil. In 1956, a pipeline was completed from the field to the small Pucallpa refinery and production from the field rose steadily up to 2,350 barrels of oil per day, enough to satisfy local demand. During the early 1970s, the field production started to decline and Petroperu – the Peruvian national company – acquired the exploitation rights after the field had produced a total of almost 13 million barrels of oil. In 1994 the company Maple was awarded a 30-year concession to further develop the field.

At the end of 2017 the field was being operated by Petr leos de la Selva, producing an average of 80 barrels of oil per day of 43-degree API with 90 percent water cut from 10 active wells, including

the Agua Caliente-1 discovery well. Oil is transported to Pucallpa by trucks since the old pipeline had been dismantled. After nearly 80 years of production, the field is now close to its ultimate recovery level of 15 million barrels of oil.

During the years following the Agua Caliente discovery, the exploration in the northern Ucayali Basin was based on photogeology and field surveys, aimed at locating anticlines where Cretaceous rocks were exposed. The next success, however, was not until 1957 with the discovery of the Maquia oilfield by a joint Peruvian-German venture. One year later, the small Pacaya field was discovered based on additional seismic survey. In 1961, Mobil made a gas condensate discovery at Aguaytia within the Cushabatay sandstones, in an anticline that had been seismic surveyed in the northwest part of the Ucayali Basin. Through most of the remainder of the '60s and into the early '70s, exploration was virtually non-existent in

See Geothermal, page 25 ▶

# SAVE THE DATE

## The East Texas Geological Society

Presents

### East Texas Geological Society

### 2018 EXPO

### March 27, 2018

### Harvey Hall Convention Center

2000 W. Front St.  
Tyler, Texas 75702

**Vendor Booths - \$350**  
**Prospect Booths - \$250**

**Guest Speakers**

**DR. THOMAS E. EWING, TEXAS BUREAU OF ECONOMIC GEOLOGY**

- Research geologist for four years at the Texas Bureau of Economic Geology in Austin.
- Served as Vice-President for Sections of AAPG (2012-14)
- Completed service as President of the GCAGS (2016-2017)
- Completed "Texas Through Time", an illustrated book and website on the geologic history and earth resources of Texas published by the Bureau of Economic Geology

**HONORABLE LOUIE GOHMERT UNITED STATES REPRESENTATIVE**

Serving his seventh term in the United States House of Representatives, Congressman Louie Gohmert was first sworn in on January 4, 2005. He proudly represents the First District of Texas.

Congressman Gohmert is an ardent member of the House Judiciary Committee and serves as Vice Chairman of the Judiciary Subcommittee on Crime, Terrorism and Homeland Security.

Barbara Cade [bacade@suddenlinkmail.com](mailto:bacade@suddenlinkmail.com)

or

Matt Bailey [matt@bhlboresight.com](mailto:matt@bhlboresight.com)

Register at [www.easttexasgeo.com](http://www.easttexasgeo.com)

**SECOND OFFERING OF THE HIGHLY ACCLAIMED  
PETROLEUM SYSTEMS OF CUBA  
& SE GULF OF MEXICO**

GUASSA FM

JAGUA FM

Laguna de Piedra

MANACAS FM

**April 8 – 14, 2018**

**A scientific field excursion to examine the geology and petroleum systems in outcrop of Western and Central Cuba and the relationships to the adjacent offshore tectonic, structural and depositional systems of the SE Gulf of Mexico and Proto-Caribbean**

**Highlights**

- 7 day excursion across Western & Central Cuba viewing classic outcrops and selected subsurface data displaying the following:
- Record of the Proto Caribbean rifting, Mesozoic source rocks, plate convergence and imbricate thrust structures,
- Middle-Upper Jurassic to Cretaceous clastic and carbonate reservoir analogs to the prolific fields of southern Mexico and the US GoM,
- Tertiary carbonate and deep-water synorogenic clastic strata, and
- K-T boundary catastrophic mega-event deposits.

**Field Trip Leaders: Drs. Manuel Iturralde, Paul Crevello and James Pindell**

**Endorsements** Dr. James Lowell, renowned structural geologist "One of the best field trips I've ever attended, incredible thrust complexes".  
Dr. John Decker, global exploration sedimentologist "Excellent trip, opens up new thinking for opportunities in the Caribbean-GoM region".

**Sponsoring Organization** GeoExplorers a US Nonprofit Corporation  
**To register for this field trip or for further details:**  
**Contact Paul Crevello** [excursions@GeoExplorers.org](mailto:excursions@GeoExplorers.org)

This seminar conforms to the Department of the Treasury OFAC update of 11/10/2017, 31 CFR part 515.565 (b) 1-6, p.23; <https://federalregister.gov/d/2017-24447>

# The Fabric, or Internal Structure, of Rocks: Part 2

Continuation of 'The Patterns of Anisotropy'

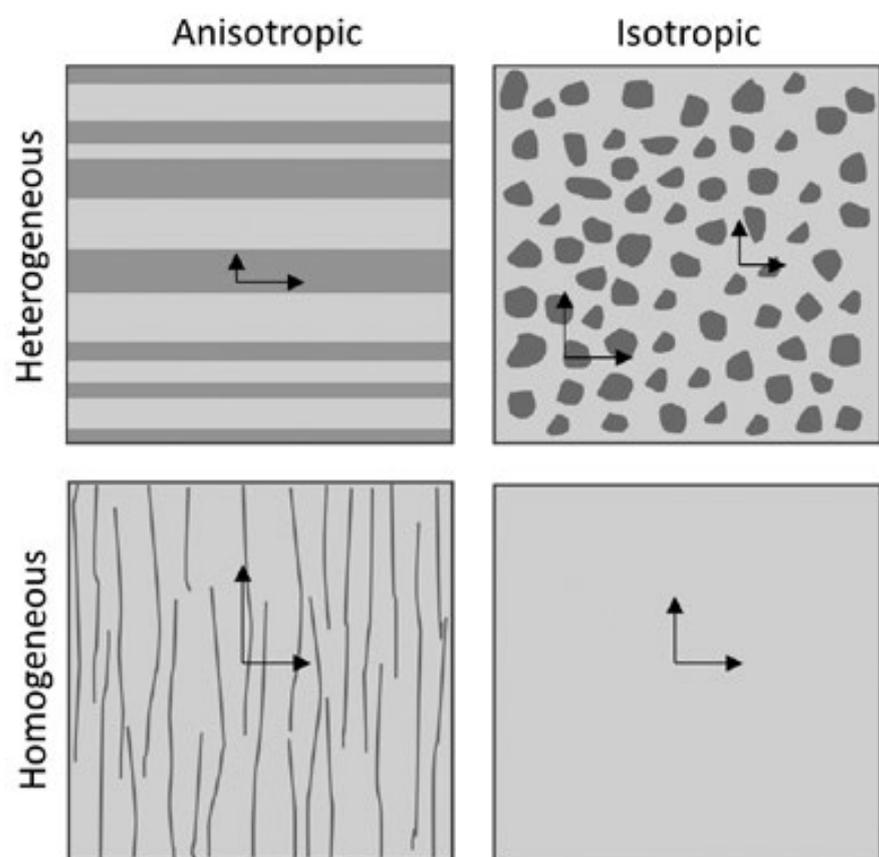


Figure 1. Sketches of possible scenarios to illustrate the four terms. Length of black arrow is proportional to velocity (as measured in direction arrow is pointing). Figure courtesy of Satinder Chopra.

Part 1 of this series explained that the wave acquires the symmetry of the rock: by examining azimuthal travel times and amplitudes, we document the symmetry of the wave and learn of the symmetry of the rock ("symmetry" is the fabric or order in the heterogeneities). I introduced the terms "homogeneous," "heterogeneous," "isotropic" and "anisotropic," schematically reviewed in figure 1.

In the anisotropic category, TI (transverse isotropy) is used to indicate that a plane of isotropy exists.

Its normal can be vertical (VTI, for the layer anisotropy) or horizontal (HTI, for the fracture or azimuthal anisotropy). Orthorhombic (ORT) is VTI + HTI, or flat layers plus one set of vertical fractures. Flat layers plus two sets of orthogonal vertical fractures can also give rise to ORT symmetry.

The words "orthorhombic," "monoclinic" and "triclinic" are like a family: they are related because now we are talking about how many right angles are there among the three axes (or principal planes of the anisotropy). If there are three right angles, we have orthorhombic: flat layers plus one set of vertical fractures. If there are two right angles, we have monoclinic: for example, dipping layers plus one set of vertical aligned fractures or vertical faults; or flat layers plus one set of dipping fractures or dipping faults. If there are no right angles, we have triclinic: for example, dipping layers plus two different non-orthogonal sets of fractures (possibly the stress-aligned microfractures from the unequal horizontal stresses, and the dipping faults or macro-fractures that flow fluids), wherein all these planes are non-orthogonal to each other.

Geologists: which of these symmetries is likely

present in the dataset your team is working?

Our industry state-of-the-art processing is 3-D P-P full azimuth full offset migration in the orthorhombic or tilted orthorhombic symmetry. To build the correct velocity model, the data can be 5-D interpolated into four, six or eight azimuth-sectors (more is better), and the TTI model is used to build the velocity field for that azimuth. Then, an algorithm takes the azimuth-dependent velocities and builds the ORT velocity field from the observed travel times. There are other methods for preserving azimuth and offset during the migration step, but lack of space precludes me from digressing to there. If you haven't reprocessed your data within the last five years, it is now time to reprocess to obtain the uplift, new gathers and additional attribute volumes.

### 360 Degrees

Geophysicists map the travel times (structure,  $V_{INT}$ ) and the amplitudes – the wave acquires the symmetry of the medium through which it travels. If the rocks contain the symmetry that the processing algorithm requires (i.e., expects), then all is fine. If the rocks are more complicated than the processing algorithm's expectation, poorer images can result.

Figure 2 (c and d) compare the images obtained with two different assumptions about the symmetry of the rocks. This area of offshore Vietnam is fairly complex structure, and so the ORT assumptions are being "pushed" (that is, I would not argue that these rocks are ORT). Dipping reflectors and dipping faults are clearly

Continued on next page ►

**AAPG** | EDUCATION WEEK 2018  
Latin America & Caribbean Region



Join us for world-class short courses provided by AAPG and the Argentine Association of Petroleum Geologists and Geophysicists (AAGGP).



### Natural Fractures Characterization and Modeling

René Manceda, YPF Tecnología;  
Ramiro Lopez and Damián Hryb, YPF

16-18 April 2018

The third day includes a trip to the core laboratory in La Plata.

US \$895; US \$795 (AAPG/AAGGP members)

Fee includes course materials, lunch, snacks, and transportation to and from the laboratory on 18 April.



### Fluvial Stratigraphy

John Holbrook, Texas Christian University

18-20 April 2018

YPF, Buenos Aires, Argentina

US \$895; US \$795 (AAPG/AAGGP members)

Fee includes course materials, lunch, and snacks.

Sponsored by:

**YPF**

Contact [latinamerica@aapg.org](mailto:latinamerica@aapg.org) for more information.

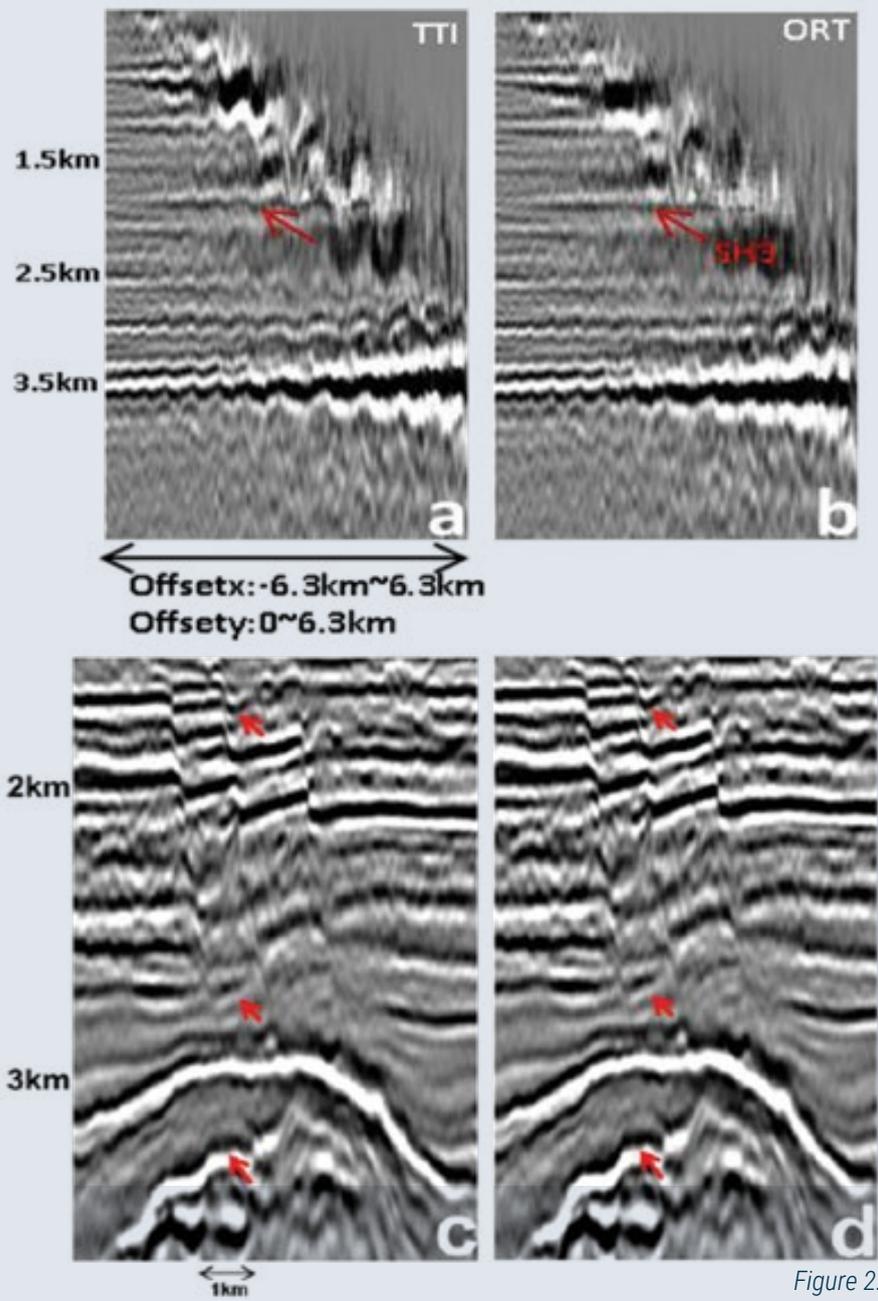


Figure 2.

◀ Continued from previous page

visible. Perhaps this explains why the deeper reflectors on the gather (2b) appear to have some remnant azimuthal time wobble present. Note especially the time wobble on the near offsets of the deep reflectors. Possibly, further subsequent processing did remove those azimuthal travel time variations.

Risking arguments, I assert that for monoclinic and triclinic symmetries, we would do well to process P-P reflection data 0-360, and not 0-180. How can we know what is going on in the field data unless we look at it? My whole career has been one long series of arguments, starting in 1980 at Amoco, when I was asked to process two SH-SH reflection lines that tied at Devil's Elbow, Pa. These two SH-SH reflection lines happened to lie in the principal planes of the anisotropy and exhibited a time-variant (dynamic) mis-tie at the tie point. This was the first published evidence of shear-wave splitting in oil company reflection seismic data. This field dataset sparked Rusty Alford's (of Amoco) interest in split shear waves, so he went to Dilley, Texas, and acquired 2-D four-component shear wave reflection profiles (SH and SV sources recorded by the inline and crossline horizontal geophones). The shear wave splitting contained in Alford's data were published at the 1986 Society of Exploration Geophysicists' Annual Meeting "Anisotropy" session; Alford was subsequently presented with the Kaufmann Gold Medal for his important contribution to the industry.

Rocks that are folded or curved can exhibit various regions of aligned fractures, curved layers being held in extension or in compression. A neutral plane can separate

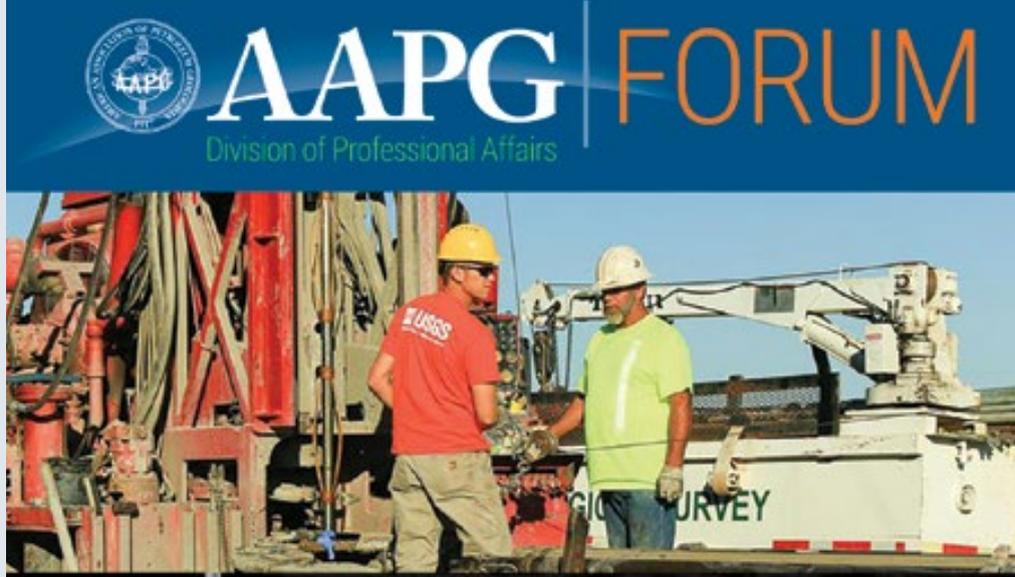
layers held in extension from layers held in compression. We often observe the azimuth of  $V_{INTfast}$  to change by 90 degrees when comparing one layer held in extension to a (lower) layer held in compression, for example, as in a mild anticline. For a mild syncline, the upper layer is held in compression, but the lower layer is held in extension. In 1994, Bruno and Winterstein published an important study into the relationship of stress variations within folds (using shear-wave data and modeling).

**Conclusion**

The internal structure of the rock, its fabric, can be studied by examining the anisotropy exhibited by the layer. Geophysicists routinely measure the interval velocity azimuthal anisotropy to compare to support data showing in situ stress (e.g. borehole breakout) and macrofractures; and the azimuthal amplitude anisotropy is compared to support data for macrofractures and in situ stress. To understand the AVO gradient change with azimuth (the industry standard), the azimuthal variation of the far offset amplitudes is quantified and mapped; as well as the azimuthal variation of the near offset amplitudes (see Lynn, SEG Expanded Abstracts, 2014, 2015, 2016). HTI amplitude modeling, through the CREWES website TI Explorer programs, is also employed to document "what we expect." Azimuth-dependent prestack elastic inversions are also important for obtaining the azimuthal variation in P-impedance, S-impedance and density (third term). All these measurements are tied to the local calibration data to assure management that "our interpretation is consistent with all the observations."



**Heloise Lynn** started her career with Texaco in 1975 and completed her doctorate in geophysics from Stanford University in 1980. She has consulted in anisotropy, multi-component and multi-azimuth seismic data, and in 2015 was presented with the Fessenden Award of the Society of Exploration Geophysicists for her contributions to the industry.



## Haynesville and Re-Emerging Resource Plays of the Gulf Coast

*DPA Playmaker Forum  
26 April 2018  
Marathon Oil Conference Facility  
Houston, Texas*

Join us to uncover the technological innovations that have spurred a spike in production in the Haynesville shale. New completions, refracking, imaging, and analytics are helping the Eagle Ford, Austin Chalk, Tuscaloosa Marine Shale, and more to bigger and better production and recoverable reserves. Are you a geoscientist, manager, or investment house interested in learning about this new technology and how it can revitalize basins or plays? **Space is Limited!**

Registration Now Open!

[aapg.to/AAPGForumApr2018](http://aapg.to/AAPGForumApr2018)

## AAPG Geosciences Technology Workshops 2018

Asia Pacific Region

### Back to the Future - the Past and Future of Oil and Gas Production in the Asia Pacific Region

27-28 September 2018 • Bangkok, Thailand

The upstream oil and gas business has two primary functions; the front-end loaded exploration phase and the development-focused harvest-mode which results in actual hydrocarbon production and revenue generation. Both of these processes require extensive geoscience input but the scope, techniques, and time involved are quite different. This two-day workshop will focus on these two siblings; the first day will focus on mature field development and the second day will highlight exploration potential within the Asia Pacific region.

The first day of the conference, the "Back to..." theme will focus on maximizing value from existing assets. Stranded gas, horizontal drilling, down-spacing drilling, fracture stimulation, waterflooding, EOR, deeper targets within existing fields, reservoir geometry, and characterization are all potential topics for the first day. Significant value is delivered through optimizing the development phase and this day will provide the attendees fruitful insights into what others have done in their areas to maximize value.

Second-day topics "...to the Future" include frontier exploration, unconventional resource exploration and deep water exploration. While the Asia Pacific region is relatively mature in the onshore and shallow-water conventional plays, deep water exploration and unconventional exploration are both still in their early stages. Encouraging results from various deep water basins around the world and the dynamic growth of the onshore unconventional plays in North America provide the impetus for operators to extend these plays into the Asia Pacific.

Abstracts are invited before 15 April 2018.

For more information please visit:  
[aapg.to/aprbangkok18](http://aapg.to/aprbangkok18)

# 'Rock Stars: Women in Petroleum Geology' Finds New Audiences

The AAPG and AAPG Foundation-produced documentary, "Rock Stars: Pioneering Women in Petroleum Geology," enjoyed an enthusiastic embrace when it debuted almost a year ago at the 2017 AAPG Annual Convention and Exhibition (ACE) in Houston – but since that premiere, only a handful of people had access for an encore viewing.

About 600 people attended the ticketed ACE event, which was sponsored by the Professional Women in the Earth Sciences (PROWESS) Special Interest Group and, in addition to the movie's premiere, featured panel discussions about the challenges women faced and the historic contributions they've made since the birth of the profession, followed by Q&A sessions and a costume contest that celebrated the working styles of women in the petroleum industry for the past 100 years.

The documentary itself was written for and presented specifically in conjunction with AAPG's centennial celebration.

When it was over, almost as soon as the lights came on, the question was asked: When can we see it again?

Good news: The movie is now gaining a wider audience of AAPG and PROWESS members via a link on the AAPG website. And it's about to gain an even wider audience of non-AAPG viewers, thanks to an upcoming special screening open to the public April 17 at the Permian Basin Petroleum Museum in Midland, Texas.

Appropriately, the film's screening is a complementary event for a second special night at the museum: One week later, on



April 24, past AAPG President and Honorary Member Robbie Gries, the force behind the project, will be the speaker for the museum's Arlen Edgar Distinguished Lecture Series.

"The fact is, without Robbie there would be no documentary at all," said Vern Stefanic, longtime AAPG staffer who wrote and served as the film's producer. "Her passion to shine a spotlight on a largely unknown part of the profession's history, and then her amazing and tireless research in gathering hundreds of fantastic stories that honor and extol the accomplishments are at the heart of every second of this film.

"She is the genius behind the content and creation of 'Rock Stars,'" he added. "It was thrilling to be able to work with her and bring the stories to the screen."

The documentary was inspired by Gries' book, "Anomalies – Pioneering Women in Petroleum Geology: 1917-2017," which also was released at the Houston ACE. She was well into the project in 2015 when she and Stefanic discussed the possibility of telling the story through additional media.

"Robbie's creative spark came as AAPG approached its centennial, and it started with a question," Stefanic said. "As she considered the stories of how petroleum geology began and evolved over AAPG's first 100 years, she wondered ... how many women were part of that story?"

"I'm not sure anyone at that time realized the answer would be, 'a lot of women, and their contributions to the profession and the industry were huge,'" he said. "Robbie made

that discovery. She was the first to realize the vision, and the more she researched, the more exciting and extensive the story became."

Stefanic and Gries concluded that a video would be a perfect complement to her book. The AAPG Foundation agreed, citing specifically the film's intent to further the Foundation's mission of disseminating science, preserving important data and enhancing the future of geoscience. Trustees approved a grant in late 2015, tied directly to the proposal's modest budget, and production began.

## Telling the Story

"Rock Stars" presents the history of women working in petroleum geology – from the first woman hired in 1917, to modern-day women who are present "from the wellsite to the board room." Their journey was not always an easy one – women working in the industry have had to overcome societal, cultural, financial, physical and professional challenges in their quest to become "rock stars," a story vividly examined by the documentary.

"A lot of thought went into how to combine the past with the present to project the future potential," Gries said. "That way the audience could be led back and forth between the earliest era to the Affirmative Action era when things opened up."

The documentary was structured in five parts, each about 20 minutes in length, covering the first century of petroleum geology from a woman's perspective.

See **Recognition**, page 29 ►

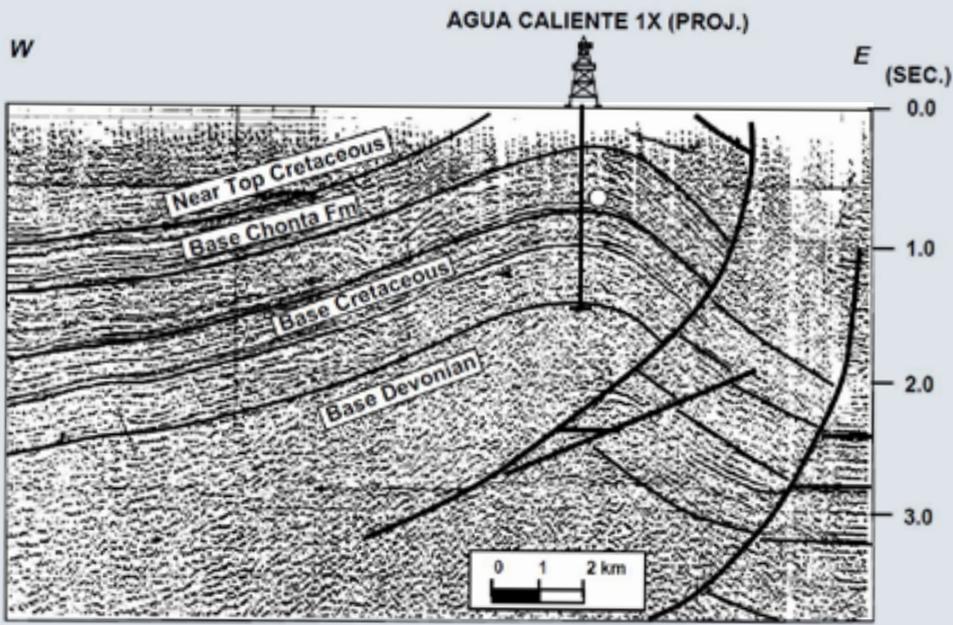
AAPG 4-7 November  
South Africa  
Cape Town International Convention Centre

**ICE 2018**  
International Conference & Exhibition

**Don't Wait  
Submit Today!**  
Call for Abstracts Deadline:  
**31 MARCH**

Shaping the future in a  
changing energy landscape

**ICEevent.org**



A 2-D seismic line showing the structural configuration of the Agua Caliente anticlinal fold associated with high-angle reverse fault sub-parallel to the Andean tectonic thrust front. Image from AAPG Memoir 62.

## Geothermal from page 21

this region.

During the late years of the 20th century, Ucayali saw a renewed interest. Different 2-D seismic vintages were acquired, but all exploration wells were dry holes although oil and gas shows were commonly recorded. It was not until 2013 when the Spanish company CEPSA discovered the Los Angeles oilfield, located some 40 kilometers west of Agua Caliente, reopening the prospectivity of the northern Ucayali Basin. An average of 3,500 barrels per day of 45-degree API oil are currently being produced from the prolific Cushabatay Formation in the Los Angeles

active wells, oil being trucked to the Pucallpa port and then exported by barges down the Ucayali River.

### The Boiling River and Its Geothermal Origin

The local name Agua Caliente ("hot water" in English) clearly reflects the presence of thermal springs in the area, surely well known by the local people since ancient times. According to the 1933 paper by Moran and Fyfe: "An interesting feature in the Agua Caliente sandstone is that there are numerous springs of boiling water," adding that "within the Agua Caliente concession there are some important hot springs warming a tributary river of the Pachitea, where hot water may run even

after flowing several kilometers."

The hot springs are located at the core of the Agua Caliente anticline, roughly 2 kilometers north of the oilfield discovery well. The hot water flows into the river at different places, bubbling up and heating the running water to temperatures as high as 90 degrees Celsius. The water gets so hot that it can cause severe burns, and small animals that fall in get cooked to death.

Generally, hot water springs around the world are associated with volcanic terrain, but springs in Agua Caliente do not have any relation with it since the area is far from any volcanic center. Andrés Ruza, a Peruvian geothermal geologist has investigated this curious natural phenomenon, later popularized by his TED talk and a book he authored entitled "The Boiling River."

The steam released into the air by the hot springs results in a spiritual and magic aura, which caused the river to be considered sacred by the locals and referred to as "Shanay-timpishka" in the indigenous language, which translates to "boiled with the heat of the sun." The Agua Caliente creek holds two shamanic centers, which have become a place of pilgrimage that has attracted a large number of visitors, chiefly Europeans and North Americans interested in the hot springs and the traditional natural medicines of the Peruvian Amazon and the local shamans.

The Ucayali region is a foreland basin formed by the Andes thrust-sheet loading to the west. Many of the structures present in the Ucayali have surface expression, such as the Agua Caliente anticline, which were mainly developed during the latest Andean orogeny in the Pliocene-Pleistocene, which, from a geological point of view, is more like just yesterday. The rapid and recent uplift to near surface from deeper zones where temperatures were greater than 100 degrees Celsius did not give enough time for rocks to cool enough and to equilibrate at

a shallower depth. This makes present-day temperatures, as measured in the wells from the Agua Caliente field, reach as high as 100 degrees Celsius at only 300 meters depth! This abnormally high temperature at such shallow depths is simply due to the recent, rapid tectonic uplift and exhumation of the anticlinal crest.

The Cretaceous sandstones show excellent reservoir properties with a good regional hydraulic continuity, being excellent carrier beds for fresh water recharge from the Shira Mountains. There, the high elevation in outcropping Cretaceous sandstones provides the drive for active recharge into the basin of fresh water, as proven by the low salinity (2,000 parts per million sodium chloride) in the oilfield formation waters. No pressure data are available for the Agua Caliente field, however the production history suggests the presence of an active and large aquifer. Meteoric waters produce a hydraulic head, as demonstrated by the increase in water production in the Agua Caliente wells during the rainy season. The meteoric water percolating downward into the sandstones flows laterally and is heated at relatively shallow depths, rising buoyantly upward along faults and fractures, leading to the hot springs that heat and originate the high temperature of the boiling river.

Regrettably, deforestation by locals and settlers has turned a great extension of jungle not protected by the Agua Caliente oilfield or by the shamanic centers into scrubland, showing how the oil production operation is serving as a protector of the jungle, saving it from poachers, illegal loggers and especially the clear burners – one of the greatest threats facing the Peruvian Amazon. Geologist Andrés Ruza is working with some major conservation groups, both in Peru and internationally, to preserve this special area, not only because of the geologic and geothermal aspects, but also its cultural relevance. [E](#)

Rice University, Houston, Texas

**Pan-American Current Research On Fluid Inclusions**

**PACROFI 14**

June 11-16, 2018

**Add Fluid Inclusions to Your Exploration and Production Tool Boxes!!!**

**Pre-PACROFI Short Course: Use of Fluid Inclusions in the Petroleum Industry**  
Monday, June 11, 7:30-3:30

**Day 1 of PACROFI: Petroleum and Sedimentary Fluid Inclusions**  
Tuesday, June 12

**Post-PACROFI Eagle Ford Shale Field Trip. Led by Barry Wawak of Core Lab**  
June 14-16

Rice University, Houston, Texas  
[PACROFI.COM](http://PACROFI.COM)

- Short Course Program:**
- "Constraining the history of fluid events using the fluid inclusion assemblage (FIA) method for collecting, displaying and interpreting micro thermometric data"  
**Andras Fall, PhD, Bureau of Economic Geology, University of Texas**
  - "Fluid inclusion applications to understanding diagenetic systems"  
**Bob Goldstein, PhD & Zhaoqi Li, PhD, University of Kansas**
  - "Application of fluid inclusions in petroleum exploration"  
**Stephen Becker, PhD, ExxonMobil Upstream Research Company**
  - "Fluid Inclusion applications in unconventional petroleum systems"  
**Gordon Macleod, PhD, Chesapeake Energy**
  - "Automated Cuttings Analysis: Key to Risk Evaluation and Exploration Success"  
**Don Hall, PhD & Dr. Mike Sterner, PhD, Schlumberger**
  - "Mapping and Evaluating: Production; Nearby Economic Pay; and Paleo Pay Zones. Rock Volatiles Stratigraphy of New and Old PDC Cuttings"  
**Mike Smith, PhD & Bill Murphy, MSc, Advanced Hydrocarbon Stratigraphy**
- Petroleum Inclusion Keynote Address (Day 1 PACROFI):**  
"Raman Spectroscopy and PVTX of hydrocarbon fluid inclusions: Analyzing P and T of oil and gas migration." **Bob Burruss, PhD, USGS (retired)**

**HEDBERG** Geology of Middle America  
The Gulf of Mexico, Yucatan, Caribbean, Grenada and Tobago Basins and Their Margins

2-5 July 2018 • Sigüenza, Spain

Join us in Sigüenza, Spain, to learn about the new structural, geochemical, and geological findings, as well as enormous hydrocarbon potential of the complex region that covers Guyana, the Caribbean, Gulf of Mexico, Yucatan, and more. Abstracts due by 30 March 2018.

**Call for Abstracts Now Open!**

for more information please visit:  
[aapg.to/Hedberg2018](http://aapg.to/Hedberg2018)

## Foundation Update

# Paul H. Dudley Jr. Receives Chairman's Award

Longtime AAPG Foundation supporter and promoter Paul H. Dudley Jr. has been named recipient of this year's Chairman's Award, presented annually to honor extraordinary contributions to the AAPG Foundation.

Dudley, a Foundation Trustee Emeritus, has had a long relationship with AAPG and the AAPG Foundation, which follows what he refers to as his "wandering career searching for oil."

"My days in geology have been wonderful," Dudley said recently. "Supporting the geological science, AAPG and AAPG Foundation have all led to a delightful life, with which all of my 'geofriends' certainly agree."

Dudley, now retired save for "a bit of consulting from time to time," has been an important part of the Foundation Trustee Associates for more than three decades, and his support for the Foundation remains strong.

Dudley credits his interest in petroleum geology to his father, who was an oil geologist on the West Coast. Dudley attended the University of California, Los Angeles, and after receiving his master's there in 1954 he joined Humble Oil, where he spent the next 25 years in various management positions.

It was during this time he became acquainted with geology giants L.T. Barrow, Morgan Davis and Wallace Pratt, all of whom played important roles in the development and early days of the AAPG Foundation.

Dudley's career took with took him to Midland, Houston and New Orleans, where he became friends with famed AAPG geologists Bob Megill and Mike Halbouty,

Halbouty, then-president of AAPG, developed the concept for the Foundation and took steps to bring it to existence; Megill was one of the Foundation's early contributors.

In the late 1970s the AAPG Foundation was just over a decade old, and leaders wanted a way to build its donor base and recognize those who provided financial support for the Foundation. The Trustee Associates group was formed, and this distinguished group of donors became, and remains, the backbone of contributions to the AAPG Foundation.

Dudley's friends approached him about joining the group – and with Halbouty prompting him to "hurry up," he did, providing strong financial support for



DUDLEY

such important projects as the Treatise of Petroleum Geology and North American Tectonic Map project.

Not only did he quickly see the value of the Foundation and what it had to offer to the geoscience world, he began asking his friends and colleagues to join the effort.

Dudley and his wife became active participants in Trustee Associates' events, with him chairing the group in 1992-93.

When the AAPG Foundation was changed from an Oklahoma Trust to an Oklahoma non-profit corporation in 1986, Dudley was appointed as one of the original Members of the Corporation.

In 1995 he was elected as a Trustee on the Foundations Board of Trustees, where his leadership skills help guides the Foundation through the next decade.

He continues to serve on the Members of the Corporation as a Trustee Emeritus, calling attention to the role and value of the Foundation. 



The GWB team in Java, Indonesia.

### Foundation Contributions for January 2018

#### General Fund

Bill and Louise Barrett  
Encana Cares (USA) Foundation  
*Matching gifts given by Adam Jackson; given through Benevity Community Impact Fund*  
Gretchen M. Gillis  
Philip and Janet Heppard  
John Hickenlooper  
Gary Laing  
John Nikolai Louie

David Martineau  
Sally M. Murray  
*In memory of Charles R. Burnette*  
Matthew John Sladic  
Robert Gerard Slyker, Jr.

**Distinguished Lecture Fund**  
J. Ben Carsey Distinguished Lecture Fund  
Paul H. Dudley, Jr.  
*In memory of Thomas Fitzgerald*

#### Education Fund

Mark Yanoski & Patricia Sterbini

**Grants-in-Aid Fund**  
Richard Joseph Gentile, PhD

**Robert K. Goldhammer Memorial Grant**  
Mark David Sonnenfeld  
*In memory of Bob Goldhammer*

David G. Campbell  
*In memory of Marlan Downey*

**Military Veterans Scholarship Fund**  
Donald C. Gifford  
Charles and Janet Rubins  
Richard Howard Vaughan

**L. Austin Weeks Undergraduate Fund**  
Andrew L. Brill

## Recognize outstanding leadership

*Give back to the profession that has given you so much.*

We make it easy! Give to your favorite geoscience fund when you pay your AAPG dues.

ANNUAL STATEMENT – DUES BILLING FOR THE 2018-19 FISCAL YEAR  
P.O. Box 879 • Tulsa, OK 74101-0879 USA • Phone – Toll Free U.S. & Canada (800) 364-2274 • International: +1 (918) 504-2535

 **AAPG**  
Advancing the World of Petroleum Geosciences

AAPG dues may be deducted as a business expense, but not as a charitable contribution. One percent of the dues are not deductible in accordance with IRC Sec. 6033.

**PAYMENT IS DUE BEFORE JULY 1, 2018**

NEW MEMBER CARD AND PAYMENT RECEIPT MAY BE ACCESSED ONLINE AFTER POSTING - OR CHECK THIS BOX TO RECEIVE VIA MAIL.

**Suggested AAPG FOUNDATION contribution (optional):** Contributions received with this statement will be designated to the General Fund. Contributions to the Foundation are deductible according to the U.S. 501 (c)(3) guidelines.

**PLEASE WRITE TOTAL AMOUNT OF PAYMENT HERE:** (Include dues and any applicable contributions/donations)

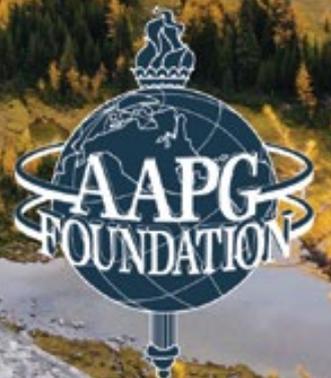
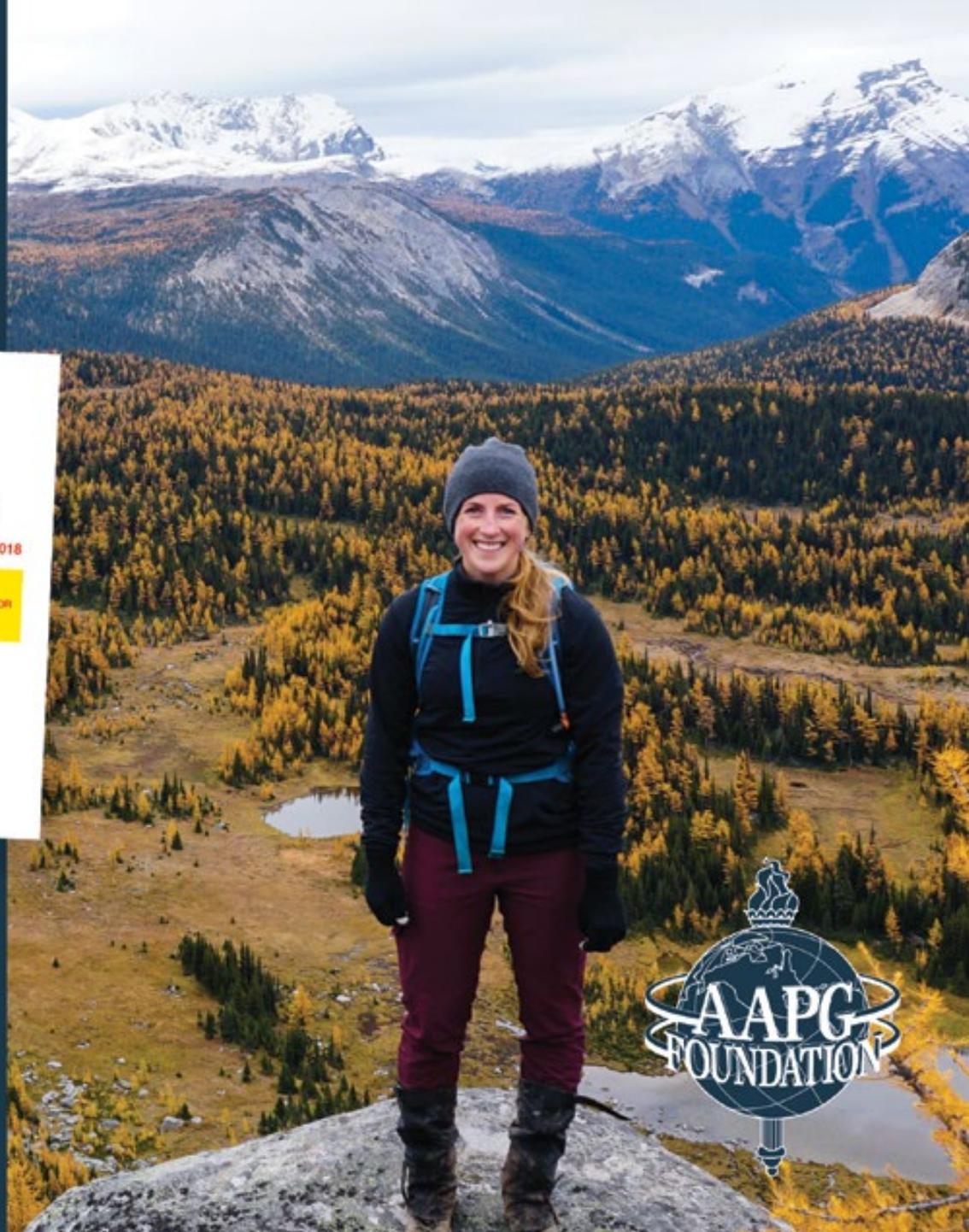
SEE BACK OF FORM FOR PAYMENT OPTIONS AND ADDITIONAL INFORMATION.

Simply locate the AAPG Foundation contribution box and add your donation.

Learn how your contributions to AAPG Foundation help promote the geosciences by visiting

**foundation.aapg.org**

\*Contributions to the AAPG Foundation are tax deductible according to U.S. 501 (c)3 guidelines.





# Geoscientists Without Borders Continues Global Outreach

The AAPG Foundation is in its fourth year as a partner of Geoscientists Without Borders, an outreach program that provides humanitarian applications of geoscience around the world. This program allows geoscientists to share their knowledge and skills with universities or other non-profits to help communities facing environmental hardships or natural hazards like severe water shortages and threats of earthquakes or tsunamis.

Through this unique program, university students are engaged to develop solutions to these challenges using geoscience applications.

Three project completion reports were received in 2017:

- ▶ Landslide monitoring in Peru by ISTerre, INGEMMET, CONDIDA, mayor of Maca and project team, school director of Maca and selected students.

- ▶ Assessment of flood-damaged infrastructures in Bosnia-Herzegovina and Serbia by the Association of Geophysicists and Environmentalists of Serbia, Terra Australis Geophysica Pty. Ltd, Curtin University, OGS, Uppsala University, Technical Faculty European University BD Brcko Brcko District, CTU IPKIN Bijeljina Republic of Srpska, University of Tuzla.

- ▶ Building local capacities for monitoring eruptive and catastrophic landslide activity at Pacaya volcano (Guatemala), through international partnership and collaboration with Michigan Tech, INSIVUMEH, Pacaya Volcano National Park, San Carlos University, Instituto Geografico Nacional, Coordinadora Nacional Para la Reduccion de Desastres, U.S. Geological Survey Volcano Disaster Assistance Program, International Volcano Monitoring Fund.

Four progress reports of multi-year projects also were received:

- ▶ Development of fresh groundwater use in Douala, Cameroon, by the University of Missouri, Research Institute for Development (IRD), France, University of Ngaoundere,

Cameroon and University of Maiduguri, Nigeria.

- ▶ "Bridge Over Troubled Waters: Building resiliency to tsunami hazards by training Indonesian geoscientists and local communities, by Brigham Young University, Utah Valley University, Universitas Pembangunan Nasional, APMD Indonesian Institute of Community Development, BPBD – Indonesian Government Disaster Mitigation Agency, Lembaga Ilmu Pengetahuan Indonesia Indonesian Institute of Science.

- ▶ Geophysical mapping of aquifers in the Challapampa aquifer and the Punata aquifer by Lund University, Aarhus University, Universidad Mayor de San Andres, Universidad Mayor de San Simon, Universidad Tecnica de Oruro.

- ▶ GPS training and application to seismic hazard in southern Haiti, by URGeo/FDS/UEH, Haiti, Ecole normale supérieure, France, Seismology Technical Unit of the Bureau of Mines and Energy (UTS/BME) and National Center for Geospatial Information (CNIGS). [E](#)

*(Editor's note: This update is from the 2018 Activity of the Geoscientists Without Borders report, by Robert Merrill.)*



A GWB team testing a village water source.



## Deana and Paul Strunk Military Veterans Scholarship Program

Deadline: May 1, 2018

The Military Veterans Scholarship Program (MVSP) is designed to support veterans pursuing geoscience education programs at a four-year college or university. Grants range from \$2,000 to \$4,000 each and are intended to provide financial assistance to veterans who are studying undergraduate level geoscience.

*"I would like to thank all those involved for the creation of programs such as this, and for the donors who support them. Though many of us take advantage of our military educational benefits, those alone are not enough to accomplish what we wish. Without scholarship opportunities made available to veterans, reaching our post-military goals would be increasingly more difficult."*

–Matthew Brice, 2017 recipient

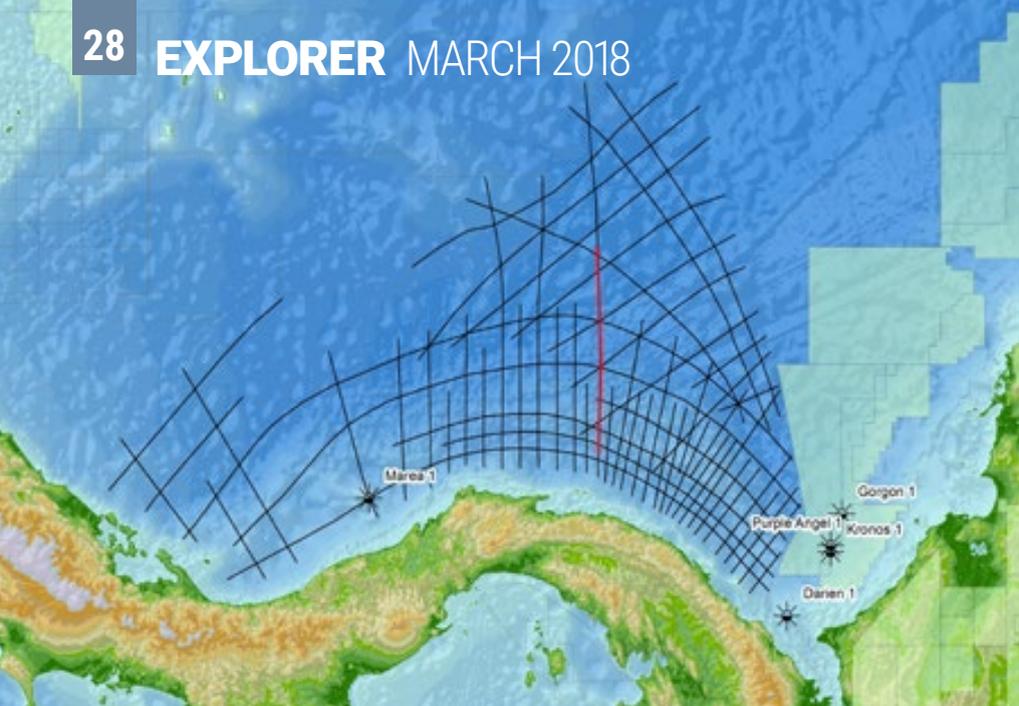


Learn more. Visit [foundation.aapg.org](http://foundation.aapg.org)



For more information on our past recipients, check out the AAPG Foundation's Yellow Ribbon Blog Series at [aapg.to/fdnblog](http://aapg.to/fdnblog).





## Ships from page 10

ION put its Marlin software to use on the project to efficiently guide the seismic vessel around the 35-40 ships that pass through the canal every 24 hours.

"Similar to modern air-traffic control systems, Marlin integrates a variety of real-time data sources that enables multiple stakeholders to share vessel route plans, foresee and avoid conflicts between vessels and fixed assets and adjust their schedules accordingly," Bliss explained. "About 50 percent of the vessels we came into contact with veered their course to avoid potential issues."

The long-offset 2-D seismic data collected with an 18-second record length enabled imaging of both shallow and

deep features, including the dense North Panama Deformed Belt, a wide belt of folds and thrusts that originated from the convergence between the Caribbean plate and the Panama block, Goswami explained.

Using technology that is five decades more progressed than the last seismic shoot in Panama, ION is putting together the area's first regional framework using images taken up to 25 miles in depth.

"This data is helping us to fully understand the nuances of the basin before moving in to take a closer look," Bliss said. "It will help companies choose which areas of the basin they want to high grade."

### Preliminary Panama

While ION does not expect to complete its seismic processing until mid-2018, preliminary data delivered to the industry suggests there is promise.

First, the geology of northern offshore Panama varies greatly from the west, near Costa Rica, to the east, near Colombia. The western reaches of the basin reveal relatively undeformed, thick stratigraphic intervals that extend in the deep water, Goswami said. In contrast, the eastern reaches include a highly deformed accretionary prism above the NPDB's subduction zone, and the relatively undisturbed sediments of an adjacent forearc basin.

"The subduction zone creates a highly structured environment," said Kyle Reuber, an AAPG Member and geologist at ION, explaining that the seismic imaging will examine its various crustal domains and the overlying sediment packages. "When you have faults and more structurally complex segments, then you have more exploration targets where hydrocarbons may accumulate."

Early observations of the accretionary prism indicate the possible presence of gas hydrates and a petroleum system either thermogenic or biogenic in nature, Reuber said.

"This is a pioneering dataset, and it is intended to tie into available legacy datasets in the Caribbean region, creating a high-quality regional dataset that allows for contiguous interpretation across basins and geologic zones," Goswami said. "Proven petroleum systems in nearby basins can be analogous to systems in Panama and can be de-risked with regional interpretation."

### Colombian Connection?

Acknowledging that the geology in the Caribbean margin is complex, Chris Schenk, an AAPG Member and Denver-based geologist who has overseen the U.S. Geological Survey's South American and Caribbean assessments for nearly 20 years, said a discovery in northern offshore Panama could be favorable if the geology in Colombia's productive Guarija Basin extends into Panamanian waters.

"No one really knows yet," he said.

In the USGS's 2012 assessment of undiscovered conventional resources in the region, it found that Colombia's Guarija Basin contains a mean of 6 million barrels of oil and a mean of 3 trillion cubic feet of gas. The assessment did not include the recent discoveries in offshore Colombia.

The USGS plans to update its assessment of the area next year, Schenk said.

"Panama is one of the few basins in the world that is underexplored or has limited exploration," Reuber said. "One of our objectives is to test the continuity of the sedimentary intervals between Colombia and Panama. If they are continuous and if they have relatively coeval units, Panama could very well be prospective. From what we have seen so far, a door to Panama may be opening." 

23-25 July 2018 • Houston, Texas

# UNCONVENTIONAL<sup>®</sup>

## RESOURCES TECHNOLOGY CONFERENCE

FUELED BY SPE • AAPG • SEG



The integrated event for  
unconventional resource teams

Registration  
Now Open!

For more information please visit:  
**URTeC.org**



Endorsing Organizations:

Sponsoring Organizations:



## Recognition from page 24

"It's a chronological approach," Stefanie said, "and each segment captures the dynamics and challenges that women faced in specific decades, as well as recognizing the specific women who led the way."

Important women were remembered – or, in some cases, officially recognized for the first time. Stories range from those of Helen Plummer (the first woman hired as a petroleum geologist), Reba Masterson, Fanny Carter Edson (as colorful and flamboyant as any male wildcatter ever dreamed of being), Dollie Radler Hall, three discovery micropaleontologists (Esther Applin, Alva Ellison and Hedwig Kniker), Doris Curtis, Julia Gardner (Sidney Powers' hero and muse), Anny Courey, Anne Robbins Frank (the first woman to lead a seismic crew) and dozens of others.

To tell the story on film, Gries enlisted women of high position and achievement currently working – plus some distinguished veterans of the profession – to appear on camera. That list included, in addition to Gries, Cindy Yeilding, Susan Morrice (this year's AAPG Explorer of the Year awardee), Michelle Judson, Sherilyn Williams-Stroud, lone Taylor, Annell Bay, Randi Martinsen (past AAPG president), Marie Gramman, Susan Cunningham, Anne Robbins Frank and Anny Coury.

Gries matched each woman with a historic figure or subject that best matched their own expertise and experience. Since Gries had collected the research, she "knew the material, through and through" and was able to "coach each one during their presentations" to help them prepare.

Each woman typically had a two-session shoot. First, Gries would ask questions that allowed the women to tell the stories of the pioneering women who opened the door for women to succeed in the profession. Next, Stefanie asked about the interviewee's own personal experience in the profession.

Interviews were grouped and filmed in a handful of multi-day sessions, taking place in Houston, Denver, Tulsa, Louisville and Carson City, Nev.

The actual writing of the script came together quickly over a two-month stretch, which Stefanie survived thanks to "seemingly non-stop bursts of weekend adrenalin." (The longtime editor of the EXPLORER, Stefanie's regular duties now are as AAPG's director of administration and programs.)

Contributing to the film's look and quality

was an impressive team: AAPG graphic artist Matt Randolph was the director of photography; Claire Edwards, a veteran of Ree Drummond's "The Pioneer Woman" production team, was the editor; composer Elizabeth Smith Curtis provided the film's original score; and Tulsa actress Dionne White, whose voice has been heard for several years at ACE opening sessions, was the narrator.

### Yesterday, Today ... and Tomorrow

As an historical document, "Rock Stars" aspires – like Gries' book, "Anomalies" – to place into the archives the story of how women were able to find their place in the profession. It provides a new perspective in what might be a familiar context – adding some new chapters to a familiar story.

The fact that it does so via intriguing and often entertaining stories about amazing women makes it compelling for today's audiences. Some will see it as a reflection of their own experience; younger viewers may see it as inspiration.

"I hope Robbie and I have brought some awareness and appreciation to ongoing conversation of women in the profession," Stefanie said, "and I hope there are young women who dream of a career in the geosciences, who will watch and better understand why they have the opportunity to do what they love."

Indeed, the film's final part is written as a montage of observations, advice and encouragement to tomorrow's geoscientists.

"Hearing our interviewees talk with enthusiasm and passion about tomorrow's energy opportunities was inspiring," Stefanie said. "In fact, the entire last montage wasn't part of the original script, but their words and performances were too good to ignore.

"I mean, they inspired me."

For Gries, "getting to know my cohorts and so many details and experiences from their careers" and "sharing my knowledge of both the pioneers and the sociology of those earlier eras" were parts of the experience she'll never forget.

And, like the circles that form and ripple outward when a pebble is thrown into water, Gries hopes that the next generation of petroleum geologists learn from their predecessors.

"I just hope that we can bring them to appreciate our rich and long history and be able to imagine the circumstances that the earlier women worked in," she said. "And, with this appreciation, maybe there will be times in their careers where challenges require more courage and strength ... they can use this as a resource to buttress their efforts." 

distinguishing good data from bad data.

I am a stout supporter of increasing funding for research to address climate change issues and concerns regardless of which way the pendulum swings. As I continue to reminisce about my night out (at least what I could recollect about my night out), and as I watch the two-inch ice cube in my Old Fashioned slowly melt, I think about where I can go to validate data – I am not ready to conclude whether man-induced climate change is occurring or not. As I listen to certain celebrities, politicians, scientists, reporters (I am being gracious not to name names) ... where do I go to enhance my understanding of climate change? I continue to work toward trying to differentiate between good data and bad data – good data versus fake data – and ponder what actually is going on with climate change. But in the meantime, I spend more time trying to validate the data and separate good data from bad. I am still in the data validation stage.

I am not sure where we go from here, but I think a good place to start is talking more about the data and less about the urgency and using inflammatory rhetoric. We as environmental scientists have a long way to go in educating ourselves as scientists and the public at large. 

## Cloth from page 30

To be of high quality, data needs to fit its intended uses in operations, decision making and planning. In other words, it needs to be useful, consistent and unambiguous. Issues with data quality often arise when a database from one line of research is merged with another. In such cases, the databases may not be compatible, and thus require what is called "data cleansing." Yes, one has to cleanse the data to improve its quality (like with a cloth!).

### A Good Place to Start

Our ability to get cozy and sieve through large databases and distinguish good data from bad data is imperative to any scientific discussion and determines whether we will be successful in our ultimate scientific pursuits. Unfortunately, although I believe the general public loves science and is enthralled by it, the public's views and perceptions vary greatly. I believe it is a reflection of the level of understanding and appreciation of the scientific method, education, political party (this sounds so good that it deserves repeating - political party) and professional pressures, among other factors, including



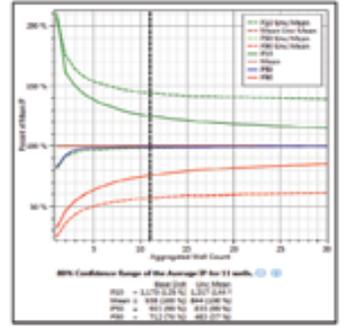
# ProjectRA

Project Resource Analysis & Cash Flow Tool

LSI, the software company of  
Rose & Associates

Software for the Integrated Probabilistic Economic Modeling of Unconventional Projects to Address the Challenges of:

- Multiple play segment characterization
- Forecasting from limited data sets
- Pilot-sizing and confidence of achieving the mean
- Modeling type well decline variability
- Full-cycle economics
- Modeling in either scoping or detailed development mode



Contact us at [www.roseassoc.com](http://www.roseassoc.com) or 713-528-8422

## GEOLOGICAL GLOBE OF THE EARTH

AVAILABLE IN  
18" AND 30" SIZES



[WWW.REALWORLDGLOBES.COM](http://WWW.REALWORLDGLOBES.COM)

## Classified Ads

### SAMPLES TO RENT

International Sample Library @ Midland – Formerly Midland Sample Library. Established in 1947. Have 164,000 wells with 1,183,000,000 well samples and cores stored in 17 buildings from 26 states, Mexico, Canada and offshore Australia. We also have a geological supply inventory.

Phone: (432) 682-2682  
Fax: (432) 682-2718

Looking For Prospects 7000 feet or Shallower in TX and OK. Please Contact Matthew Rydell @ 214-448-4526

[www.makinhole.com](http://www.makinhole.com)  
Stoner Engineering LLC

### Dry Erase Geological Globes of the Earth

Beautiful handmade globes for gifts, office or lab. Pangea globes now available. See explanatory notes online at

[www.realworldglobes.com](http://www.realworldglobes.com)

**Unique Petroleum Geology** focused field trips on shelf to basin sedimentary transitions, source rock sequence stratigraphy, extensional and compressional tectonics. Courses are designed for multi-disciplinary resource exploration teams with special emphasis to tie subsurface data to outcrop. Small class size with jeep transportation. For more information contact [riograndegeologyfieldtrips@gmail.com](mailto:riograndegeologyfieldtrips@gmail.com)

\*\*\*\*\*

### Reynolds & Associates

**Exclusive & Unique Course on:** Identification of natural fractures, faults and structures for determining optimum drillable prospects.

**Consulting:** Assist in selecting acreage and generating prospects. Mapping sweet spots or clusters of intersections of two or more natural fractures.

AIPG #2827, CPGS #4890, CPG #6059  
Questions: 832-279-2076 [Santiagoreynolds7271@comcast.net](mailto:Santiagoreynolds7271@comcast.net)

\*\*\*\*\*

### Geologist or Petroleum Engineer wanted

Texas Comptroller of Public Accounts (in Austin). Link to CPA - Program Specialist IV posted 11/15/2017 at <https://comptroller.texas.gov/about/careers/opportunities.php>. Job description at <https://capps.taleo.net/careersection/ex/jobdetail.ftl?job=00001283&tz=GMT-06%3A00>

\*\*\*\*\*

**Paisano Energy Advisors** is looking for a Geologist in Dallas, TX. Req: Masters degree or foreign equivalent in Geology, or closely related field. Position requires 15% travel in the following regions: Texas; Oklahoma; and the Rocky Mountain region. 3 yrs exp in providing geological analysis within U.S. oil/gas/water/mineral basins. 3 yrs exp in utilizing each of the following technological tools: Drillinginfo; IHS Software; Petra; PHDwin. 3 yrs exp in providing each of the following aspects of analysis for exploration prospects: Analysis of all well-log types; Mineralogy analysis and reports; geological models of the earth's subsurface to recreate in electronic model form the geological structure, rock characteristics, and likely distribution of oil/gas/minerals-bearing strata. Education and experience may be gained concurrently Any suitable combination of education, experience and training will be accepted.

Interested applicants should forward resumes to Grant Eidson, Paisano Energy Advisors, 4441 Buena Vista Street, Dallas, TX 75205.

## Director's Corner

## AAPG Keeps You Connected, Informed, Engaged

Being a member means belonging to something larger than yourself. You're a member of a family, a community, a nation.

And for most readers, you're also a member of AAPG.

Reasons for joining AAPG are many and varied.

If you are seasoned by years of experience, you were probably told by your supervisor or mentor to join AAPG as a young professional. It's what you did, and there was no need for protracted analysis or evaluation. You can't expect to be a successful petroleum geologist without being a member of the largest professional association of petroleum geologists. Sign up already!

Others join AAPG because they like a good deal. I'll confess – this was my motivation for joining early in my career. Email was becoming mainstream, the World Wide Web was in its infancy, but if you wanted to know something and didn't have easy access to a library, you needed to build and maintain a professional reference library of your own. AAPG members get discounts on all AAPG titles as well as on meeting registrations. This doesn't require higher math: it makes perfect sense to join.

Still others are attracted to AAPG because they like a good time. Getting together with others who share your interests is a strong reason to join an organization, and – let's be honest – an established culture of celebrating when we're gathered does make it an enjoyable experience.

No matter your reason for joining – and the reasons listed above are neither exhaustive nor mutually exclusive – what makes AAPG such a unique organization is



CURTISS

**Being a petroleum geologist is a noble profession. Supporting you in this endeavor is why AAPG exists.**

that we're focused on connecting science, specifically the geosciences, to the business of finding and producing hydrocarbons.

It's a unique business, where titans of industry in Houston and London watch carefully the outcome of meetings in Vienna. And those gathered in Vienna are closely monitoring the actions of large, medium and small companies in Midland, and making decisions accordingly.

It's a business where fortunes can still be made or lost in the service of providing the planet with the energy resources it so desperately needs.

Being a petroleum geologist is a noble profession.

#### How AAPG Helps

Supporting you in this endeavor is why AAPG exists. And at each stage of your career we're seeking to provide you with opportunities and experiences that help you succeed.

As a student geoscientist we want to help you build your network and connections in the industry, provide you with services to find that first job, and offer you opportunities to learn alongside your fellow geoscientists as

well as showcase your work and abilities by presenting at conferences and workshops. You're beginning to build a personal professional brand and AAPG can help you do that.

Early career geoscientists are looking to accelerate their professional development and learn to identify and create opportunities for themselves and their employers. It's time to focus on building and expanding your network, hone your theoretical knowledge with practical experience, and teach others what you know. And if you're looking to develop your leadership skills to position yourself for career growth, there are few opportunities better than working as an AAPG volunteer leader. Leading peers who themselves are volunteers, rather than employees, requires true leadership.

In our cyclical business it's important to build a resilient career. And AAPG can help you do that by helping you stay current as our science evolves, technology improves and old and emerging plays develop. You're connected to your business and science by attending events, networking and engaging.

One of the distinguishing characteristics of our profession is how few of our members actually retire. While they may slow down

their level of professional activity, they're still connected, they're still engaged, and our legacy members are still learning. At this stage of your career, AAPG helps you stay connected to your professional network as your peers also leave full-time employment, provides updates on how the industry is evolving and offers opportunity to share your wisdom and knowledge.

#### Next Generation AAPG

And just as our industry and profession is constantly changing, evolving in response to new realities and new opportunities, so too must AAPG evolve and become more dynamic to ensure that what we're providing you is, in fact, relevant. So, we're innovating, trying some new things.

As this arrives in your mailbox, AAPG Europe is conducting a brand new "Next Generation Deal Making" workshop, designed by and for early career professionals, in conjunction with APPEX Global 2018 in London. And President Sternbach highlighted at the beginning of this issue the purpose and promise of our new super basins conference to be held later this month.

New events, new opportunities to deliver value to you and be ever more relevant to your career.

Throughout your career, at every stage, AAPG is a professional node that keeps you connected, keeps you informed, keeps you engaged.

It's something special. It's AAPG.

By STEPHEN M. TESTA, DEG President

## Divisions Report: DEG

# Oh What a Night!

*On the importance of sifting good data from bad*

In the words of the falsetto frontman of The Four Seasons' Frankie Valli, Oh what a night! I flew in to Las Vegas a day before the commencement of a conference on climate change, with a whole evening to be irresponsible and unaccountable. However, morning came early – it was 6 a.m. and I needed to get going in order to hear the early morning talks from such environmental celebrities as the founder of Greenpeace and the Weather Channel, meteorologists, space scientists, government and academic scientists and researchers, among others. I stumbled into the conference room and, not feeling very chatty, chose an empty table. I was sitting, quietly sipping my cappuccino, until a distinguished gentlemen sat down next to me – I guess I looked like I needed to talk to someone.

I offered a good morning greeting and he told me his name – which I should have known since I had just purchased his book a couple of weeks ago, though it was gathering dust on a side table until I could find time to read it. He was a NASA astronaut and would be speaking later in the day, and I just happened to be staring at his portrait in the brochure in front of me. Oh what a night! Anyway, I verbally fumbled around and got to the question of what inspired him to be an astronaut and what, in his view, was his particular skillset that made him successful. I have to paraphrase but essentially he was an engineer and



TESTA

**One cannot overemphasize the importance of understanding the data – how it was generated, where it came from, how it was manipulated and massaged, and whether the conclusions drawn are supported by the data or if is there overreach.**

specialized in distinguishing good data from bad data – or, in other words, what data can one rely on and what data one cannot. Slowly feeling more in the present than I did a little while ago, I found this response to be profound.

#### Follow the Data

I was attending this climate change conference to enhance my knowledge base as to what we know and what we do not know, and I am a glutton for a good and robust debate. Climate change science is a complicated topic and certainly no one would argue that it isn't complex and multi-disciplinary in nature. As a geologist, I recognize the obvious fact that climate changes – that is what it does and when it stops changing, I think we really will have something to debate about. It is so multi-faceted that I simply have not been convinced that the data is clear enough to

draw a conclusion as to what the climate is actually changing to and whether there is a man-induced component to climate change – I put my unconscious bias aside and I remain open-minded.

That being said, how does one determine what good data is and what bad data is when the science is multidisciplinary, multifaceted and complex? One cannot overemphasize the importance of understanding the data – how it was generated, where it came from, how it was (for lack of a better phrase) manipulated and massaged, and whether the conclusions drawn are supported by the data or if is there overreach.

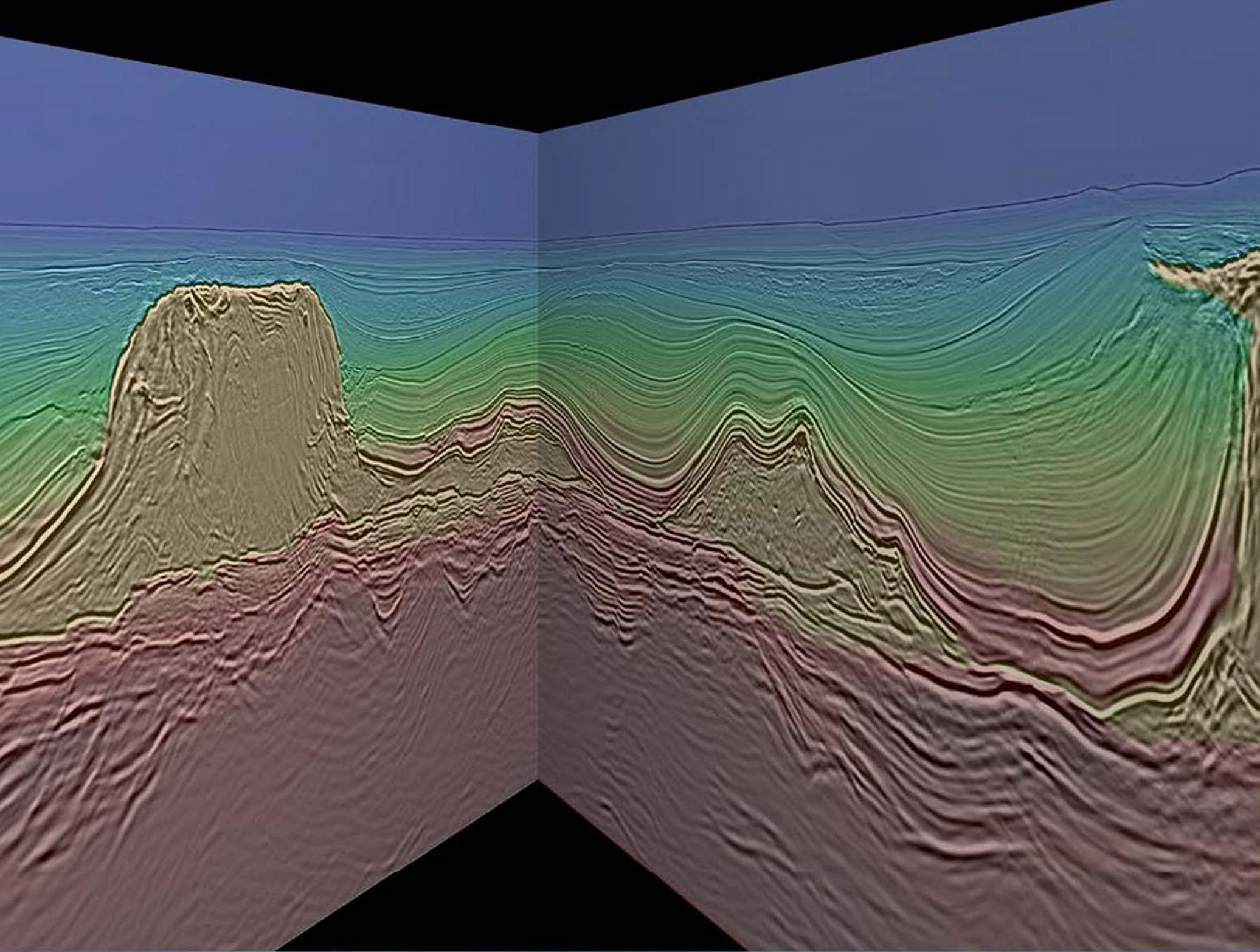
I like the climate debate because it exemplifies how we as a society and science community evaluate good data from bad. It is a challenging effort to get one's arms around the data, albeit, this particular skillset applies to all scientific endeavours.

#### 'Climategate'

My interest started to emerge in November 2009 with what was referred to as "Climategate." Emails were hacked and claims of data manipulation were exchanged. Climategate was not helpful to the overall discussion and caused doubt about what was good data versus bad. It was also not helpful that everything under the sun, and everything under the sun for years to come, is also a result of man-induced climate change. In a recent issue of a prestigious science journal I came across an article that grabbed my attention: one on yellow warblers' adaptation to climate change which started out "Human-induced climate change is causing rapidly changing global temperatures and extreme fluctuations in precipitation." What a beginning to a paper on yellow warblers. With all the published information on climate change, a reference or two would have been nice. Statements like this, in my view are not helpful, and exemplifies unconscious bias and does a great disservice to both the author who, as I read on, seemed to be quite the expert on yellow warblers, but was not convincing in understanding the nuances of the climate change debate.

Data quality recognition skills are essential in the geosciences as they are in any science, and certainly in the climate change debate.

See Cloth, page 29 ►



## Santos Basin

### Brazil – Santos Vision Area 1

PGS announces the availability of Area 1 from its Santos Vision project within the pre-salt play in the Santos Basin, offshore Brazil. The total project will cover 34 000 sq.km. Exploration plays in Area 1 include: a rift/pre-rift fault-trap play in the west-central part of the area, with prospective siliciclastic reservoirs in the Paleozoic pre-rift through Lower Cretaceous rift succession; a sag/rift limestone edge play (Sagitário trend), involving subsalt structural or paleo-topographic traps in microbial platform limestone; and the Carcará North/Uirapuru sag-rift limestone play, which includes the Carcará discovery in BMS-8 and several significant closures at the base of salt.

Santos Vision Area 1 deliverables will be available for the upcoming license rounds.

Please contact: [brazilinfo@pgs.com](mailto:brazilinfo@pgs.com)

# The art of seismic



LIBRARY • ACQUISITION • PROCESSING

Visit us at [seitel.com](http://seitel.com) and subscribe to win a seismic painting.



[seitel.com](http://seitel.com)