



**West Side Story**  
A sweet 'Beast' in the Niobrara

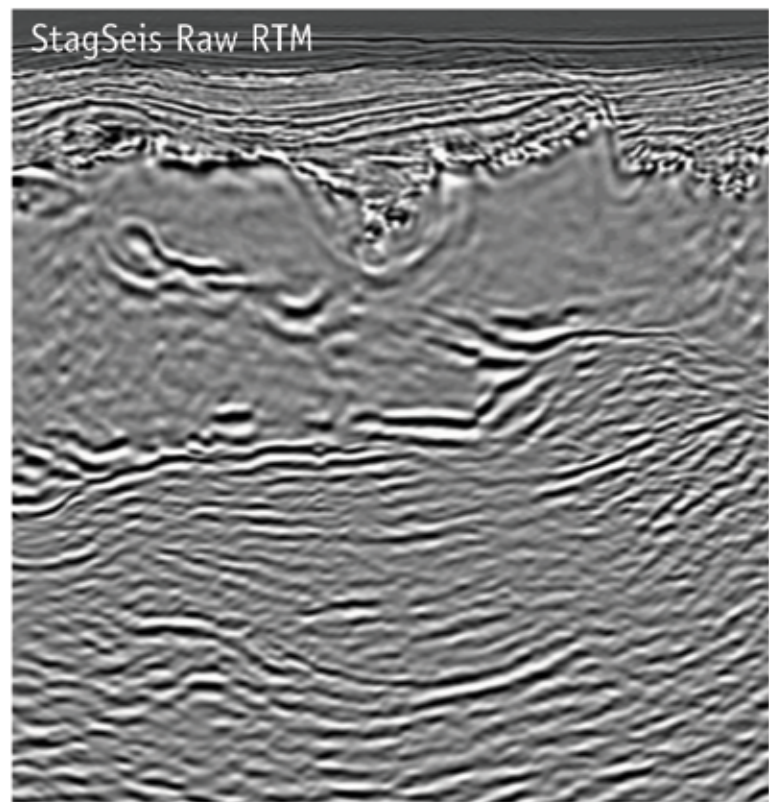
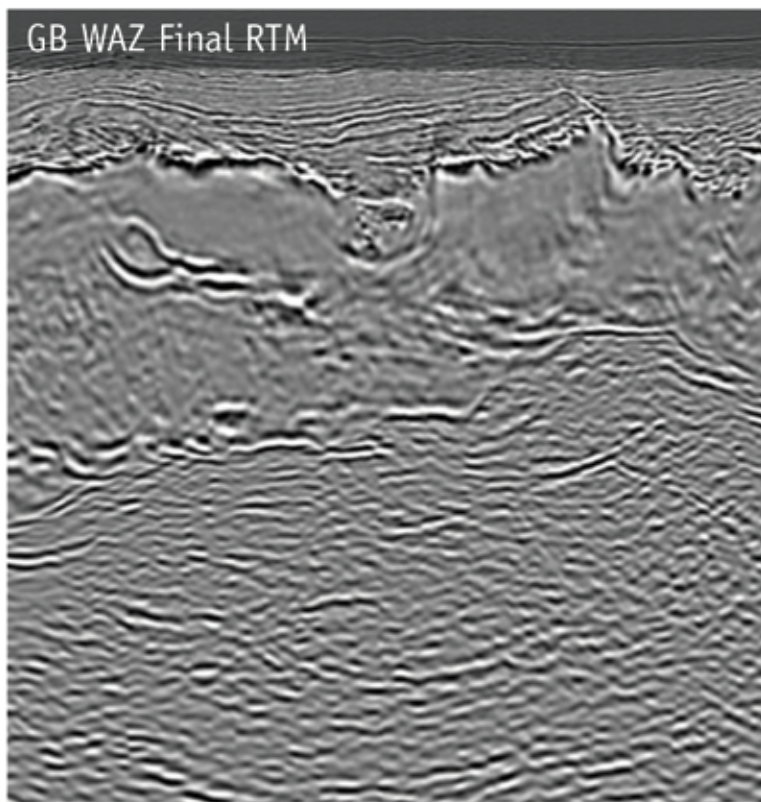
See page 6





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**PRESIDENT'S COLUMN**

# Realities Check: Moving Forward Through Change

By TED BEAUMONT

Just a few years ago, when most of us believed that peak oil had occurred or would very soon, I worried about how much longer AAPG would survive past its 100th anniversary, which comes up in just four years.

At that time we all were making assumptions about the future based on the current "realities." Now it seems safe to say that AAPG will be around for at least 25 more years, and the question becomes:

*Will there be a 200th anniversary?*

Indeed, the recent shale gas revolution caused petroleum geologists to rethink assumptions that we commonly held.

The result?

- ▶ New theories evolved that sought to explain how gas could be produced from shale.

- ▶ Papers were presented at AAPG meetings and symposiums, expounding those new theories.

- ▶ Many of those theories were published in the AAPG BULLETIN and in the online journal Search and Discovery.

Exploration for unconventional reservoirs requires petroleum geologists to learn more about things that we once considered esoteric. Now, for example, we must absorb concepts of rock mechanics, basin modeling and analytical geochemistry.

Petroleum geologists also need a better understanding of well drilling and completion, which until recently were the territory only of petroleum engineers.

\* \* \*

Over the past year, the AAPG Executive Committee made science a priority.

By delivering state-of-the-art geologic concepts to its members, AAPG helps make them more effective explorers and



BEAUMONT

developers of the world's petroleum resources – therefore anything we can do to strengthen AAPG's scientific efforts makes AAPG more valuable and indispensable to its members.

Shale gas and, more recently, tight

oil are some of the latest examples of the critical importance of sharing information – and AAPG has several vehicles for that purpose.

AAPG's flagship, the BULLETIN, has a long tradition (almost 96 years) of publishing high quality, peer-reviewed papers.

The EXPLORER provides news of the industry and its people.

AAPG's online, open-access journal, Search and Discovery publishes hundreds of papers (approximately 860 in 2012) each year that were presented at meetings and would never be published elsewhere.

Soon AAPG will publish memoirs and other science as e-books.

Clearly, AAPG is evolving to meet the new science needs of its members.

Along those same lines, the AAPG Executive Committee approved two important new changes during the past fiscal year:

- ▶ Beginning this fall the Society of Exploration Geophysicists (SEG) and the AAPG will publish a new journal called "Interpretation." It is intended to create a synergism between SEG's technological expertise and AAPG's geological proficiency.

- ▶ The other very critical new development approved by this year's Executive Committee is the creation of a new technical division to be called the Petroleum Structure and Geomechanics Division.

The Executive Committee envisions this new division as the first of many other technical divisions that will invigorate AAPG's science program – which is our heart and soul.

I believe that AAPG will celebrate its 200th anniversary. One thing is certain, though – it will not be the same

organization it is today.

Old assumptions will again and again be challenged, and then revised or discarded as we go forward – because in order for AAPG to last another 100 years it must evolve to stay true to its mission of advancing the science of petroleum geology by delivering high quality, timely scientific information to its members.

\* \* \*

It has been a privilege and an honor to serve as AAPG president for the past year. AAPG is blessed with a talented staff – they, under the leadership of AAPG Executive Director David Curtiss, make serving as an AAPG officer a real pleasure. My special thanks to them.

And my special thanks, too, to all members who generously donate their time, information and ideas to AAPG.

You make AAPG the special organization that it is.

## Martinsen Voted AAPG President-Elect

**R**andi Martinsen, senior lecturer-petroleum geology at the University of Wyoming, Laramie, Wyo., has been voted president-elect by the AAPG membership for the 2013-14 term and will serve as AAPG president in 2014-15.

Also elected were:

- Vice president-Regions – **John Kaldi**, Australian School of Petroleum, University of Adelaide, Adelaide, Australia.

- Secretary – **Richard W. Ball**, Chevron Upstream, Southern Africa

SBU, Houston.

- Elected editor – **Michael Sweet**, ExxonMobil Production, Houston.

Both the vice president-Regions and secretary will serve two-year terms. The elected editor serves a three-year term.

The newly elected officers will begin their duties July 1, serving on an Executive Committee headed by **Lee Krystinik**, principal with Fossil Creek Resources, Arlington, Texas, who assumes the AAPG presidency.

Others on the 2013-14 committee

– and serving their final year of their term of service – are vice president-Sections **Thomas E. Ewing**, geoscientist and partner, Yegua Energy Associates, and geoscientist, Frontera Exploration Consultants, San Antonio; and Treasurer **Deborah K. Sacrey**, owner, Auburn Energy, Houston.

Also on the new committee will be **Lawrence H. Wickstrom**, with Wickstrom Geoscience, Worthington, Ohio, who will assume the chair of the House of Delegates.

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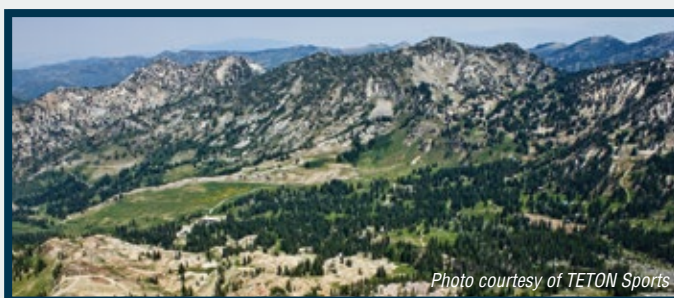


Photo courtesy of TETON Sports

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### ON THE COVER:

Most Rocky Mountain operators express cautious optimism when asked about the current state of affairs in their region, but at least one operation brings unbridled excitement: WPX Energy found a big Niobrara sweet spot in the Piceance Basin, where it drilled a whopper that came to life at 16 MMcf/d – choked back. It's shown on the cover, and it's called, affectionately, "The Beast." Story on page 6; photo by Jim Blecha, courtesy of WPX Energy.

On this page: A field trip exploring Utah's Little Cottonwood Canyon in the Wasatch Mountains is part of this year's Rocky Mountain Section annual meeting. See related story, page 8.



## University of Utah Takes IBA Top Prize

**G**eoscience students from the University of Utah took the top prize in this year's Imperial Barrel Award competition, beating out 10 other teams from geology and geophysical departments from around the world.

The finals were held in Pittsburgh right before the start of the AAPG Annual Convention and Exhibition.

For the second year, the awards ceremony was held immediately before the convention's opening session – emceed by IBA co-chairs David Cook and Chuck Caughey, and featuring swirling lights, rollicking music and a celebratory atmosphere – and was attended by a crowd estimated at more than 500.

The winning team, representing the Rocky Mountain Section, received individual medals and a \$20,000 prize for their school's geoscience department.

Finishing second (Selley Cup winners) was the team from the University of Oklahoma, representing the Mid-Continent Section, which earned individual medals and \$10,000 in scholarship funds for the department.

Finishing third (Stoneley Medal winners) was the team from Sultan Qaboos University in Oman, representing the Middle East Region, which earned individual medals and \$5,000 in scholarship funds for their department.

The remaining eight finalists each earned \$1,000 in scholarship funds for their schools plus individual medals for themselves as IBA finals participants.

The IBA program gives teams of students the chance to evaluate the petroleum potential of a sedimentary basin and to test their creative geological interpretations. Their work must be completed in a six-to-eight week period, with results presented to – and judged by – an independent panel of petroleum industry experts.

A total of 107 teams from 30 countries, involving at least 535 students, competed in this year's IBA program.

A full report will be included in the July EXPLORER.

*During ACE*

## Top Students, Six Chapters Are Honored In Pittsburgh

**T**hree geoscience students from the University of Houston and six AAPG Student Chapters were honored in Pittsburgh during the AAPG Annual Convention and Exhibition, as poster award winners and the Outstanding Student Chapter awards were announced.

The Student Chapter awards are sponsored by Schlumberger, which announced its contribution of five scholarships to the Outstanding Student Chapters Awards.

Two universities were selected as the 2013 AAPG Outstanding Student Chapter winners and four additional universities were awarded honorable mention student chapter scholarships.

The top Student Chapter awards went to:

- ▶ The Colorado School of Mines, Golden, Colo. (U.S.-based chapters) – \$1,500.

- ▶ The Universitas Indonesia, Jakarta (international chapter) – \$1,500.

Honorable mention awards were given to:

- ▶ The University of Utah, Salt Lake City (\$750).

- ▶ The Universitas Sriwijaya, Palembang, Indonesia (\$750)

- ▶ Wichita State University, Wichita, Kan. (\$250).

- ▶ Eotvos Lorand University, Budapest, Hungary (\$250).

Individual student awards for best poster presentation at the Pittsburgh ACE went to:

- ▶ First place: Bryan Ott, University of Houston (\$2,000).


- ▶ Second place: Luis Carlos Carvajal Arenas, University of Houston (\$1,500).

- ▶ Third place – Lucia Torrado, University of Houston (\$1,000).

- ▶ Fourth place – Oluwatobi Olobayo, University of Manchester, England (\$500).

AAPG has 277 chapters worldwide. Student chapter requirements for selection of awards are maintenance of student AAPG memberships, active AAPG faculty sponsor, participation in the Geosciences Institute's Earth Science Week or other scientific outreach programs, field trips, meetings and special community events, and the use of social media to promote their chapter.

"Schlumberger is committed to working with students and universities who continue to excel their geological programs," said Maurice Nessim, president, PetroTechnical Services, Schlumberger. "This is our sixteenth year to sponsor the scholarships for the AAPG Outstanding Student Chapter Awards, and we are honored to support AAPG with its development programs aimed to promote academic and professional opportunities, specifically engaging students in the geosciences."

For more information on AAPG student chapters, visit: <http://students.aapg.org/index.cfm>. 



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*Optimism trumps the blues*

# Rocky Operators Cautiously Move Ahead

By LOUISE S. DURHAM, EXPLORER Correspondent

Ask a Rocky Mountain operator how it's going, and the answer might well be a non-committal "it's going."

There's both oil and gas aplenty in this region, but as is the case elsewhere, gas prices here continue to languish in life support mode.

This can be a downer in the major gas-prone areas where deep horizontal wells requiring multi-stage fracturing have become the rule rather than the exception.

These big babies are expensive to drill and complete.

But optimism trumps pessimism, and the operators go about their business.

"Across the Rockies, people are having success if they're careful where they're drilling," said past AAPG president and Honorary member Steve Sonnenberg, professor and Boettcher Chair in petroleum geology at Colorado School of Mines, Denver.

"One of the exciting things going on is the development of the Niobrara in the Wattenberg field in the DJ Basin in Colorado," he said. "Operators are drilling horizontal laterals about 4,500 feet and using multi-stage hydraulic fracturing.

"The wells are coming on from 100 to 700 barrels of oil equivalent a day," he noted. "The total resource in Wattenberg



SONNENBERG



Photo by Jim Blecha/Courtesy WPX Energy

They call it *The Beast*: WPX Energy's Cyclone rig 17 on the GM 41-4 well and MV 7-4 pad production equipment – a big Niobrara sweet spot in the Piceance Basin.

may be four billion barrels equivalent, according to (a couple) operators.

"The Niobrara in the southern Powder River Basin is also doing very well," Sonnenberg added.

He emphasized that the good news about the Niobrara is the kerogen associated with it is Type II and will give both gas and oil.

### The Beast

The Cretaceous-age Niobrara is one of the few formation names used in just about every basin in the Rockies. It might be viewed as being a bit offbeat in the geological sense in that it's a shale, but also *not* a shale.

"The Niobrara petroleum system is a major petroleum system in the Rocky Mountain region," Sonnenberg noted. "It consists of really rich source rocks with total organic content between 3 and 8 percent in areas, and the reservoir rock primarily being limestone or chalk intervals."

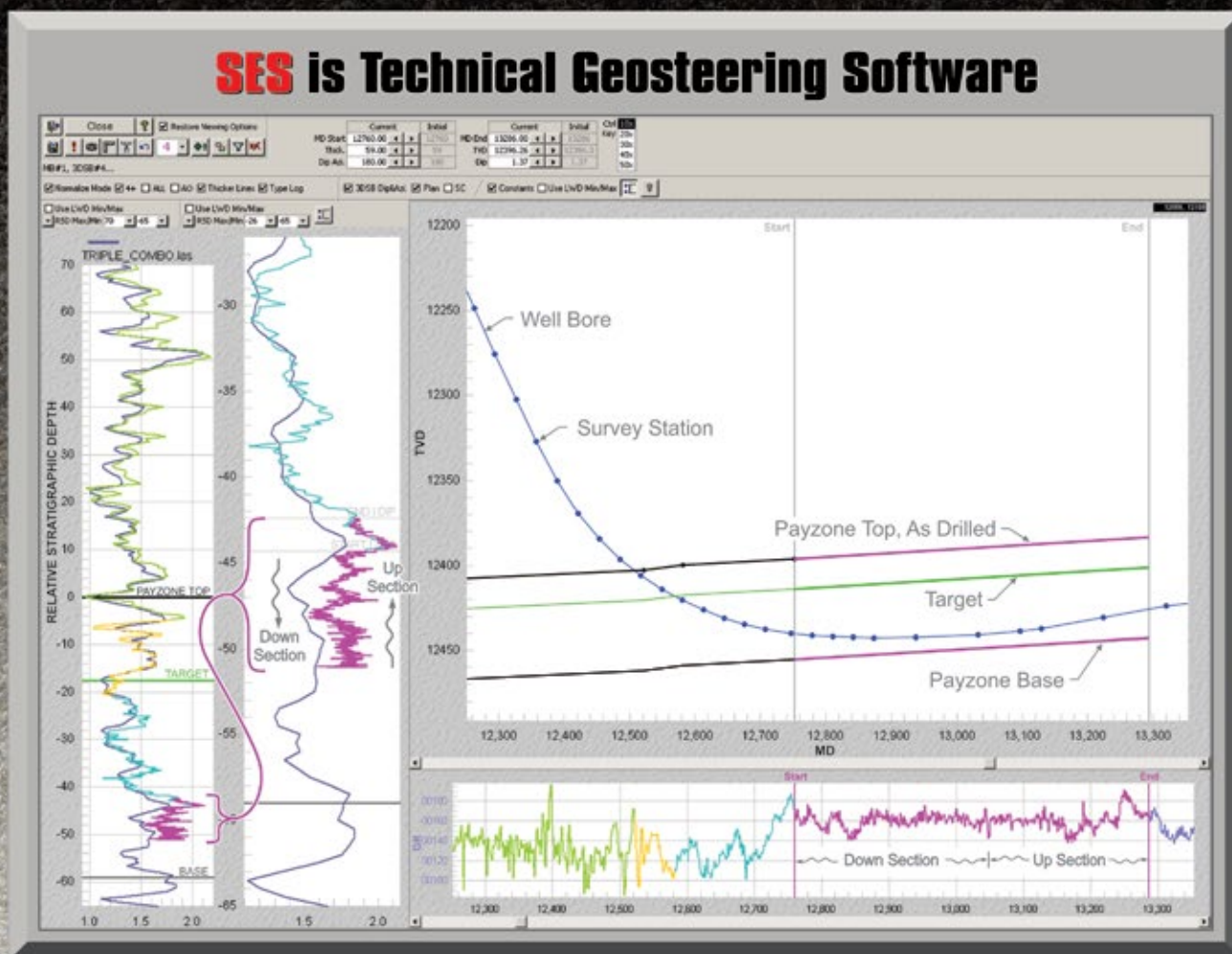
Nomenclature varies for the shale associated with the Niobrara, e.g. Mancos, Cody, Steele, Baxter.

Often targeted for oil production, the Niobrara has proved to be gas-rich in a number of areas. These include the well-known Piceance Basin, which is a major gas basin in western Colorado.

"The Niobrara shale play kicked off

See Rockies, page 8

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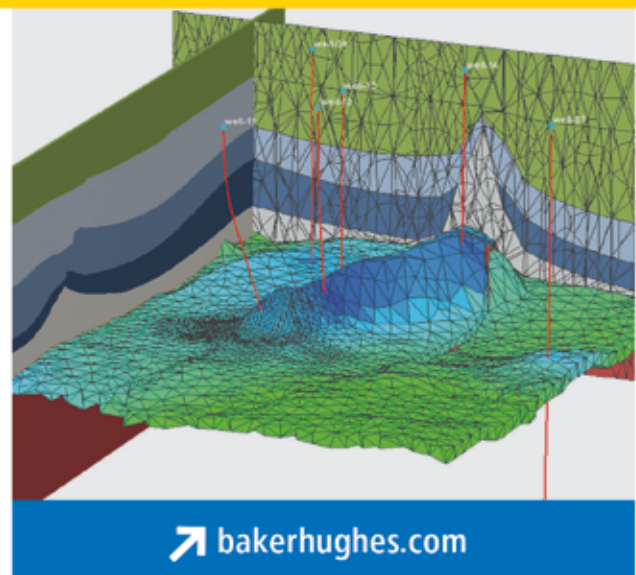
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## 'Energy Elevated' Theme for RMS Annual Meeting

**"E**nergy Elevated" is the theme for this year's Rocky Mountain Section annual meeting, which will be held Sept. 22-24 in Salt Lake City.

The technical program features more than 130 oral and poster presentations covering such diverse topics as:

- ▶ Unconventional resource plays (including specific talks on the Uteland Butte, Mancos Shale, Bakken Shale and the Niobrara Formation).

- ▶ New resource plays (including specific talks on the Mowry Shale, emerging central Utah thrust belt exploration and the Great Basin's "underappreciated" Middle Mississippian unconformity).

- ▶ Lacustrine basins and microbial carbonates.

- ▶ Tight oil and gas plays.
- ▶ Geothermal resources.
- ▶ Emerging plays and new discoveries.

The program also offers a special session that focuses on "old but still producing great oil and gas fields in the Rockies," eight core posters plus two forums – one dealing with gas marketing and another dealing with energy policy (see related story, page 42).

"These forums will afford the opportunity for attendees to interact with panels of leading policy and gas marketing experts," said Tom Chidsey, the technical program chair.

"The program offers something new, old, innovative and unique that can elevate everyone's understanding of

energy demands and challenges," he added.

Other meeting highlights include:

- ▶ Five field trips and four short courses.

- ▶ A "More! Rocks In Hour Head" workshop for teachers.

- ▶ Two luncheons: The All-Convention luncheon features Rebecca Williams, Planetary Science Institute, talking about "Roving the Red Planet: A Field Geologist Explores Gale Crater," and the DPA luncheon features Rick Allis, Utah state geologist and director of the Utah Geological Survey, talking about "Our Transforming Energy Sector – A Utah Perspective on Trends and Changes."

To register or for more information, go online to [rmsaapg2013.com](http://rmsaapg2013.com).

## Rockies from page 6

about three years ago," Sonnenberg noted. "It kicked off in a stealth manner because people were having such great success in the Bakken.

"A lot of acreage was picked off, and there are more land plays going on now," he said, emphasizing "there are sweet spots."

WPX Energy found a big Niobrara sweet spot in the Piceance Basin where it drilled a whopper in 2012 that came to life at 16 MMcf/d – choked back.

"It's probably one of the biggest wells seen in the Rockies," Sonnenberg exclaimed.

"It was nicknamed The Beast."

WPX announced the well produced more than one Bcf of natural gas in just over 100 days. It tallied an average production rate of almost 10 MMcf/d over the first 90 days, even while choked back substantially.

Ralph Hill, president and CEO at WPX, noted "the well is demonstrating tremendous strength, and we're very pleased with what we're seeing."

This might be called an understatement given the company expects that in the first four months the well will produce what a typical well in the shallower Williams Fork formation in the Piceance produces over its estimated life cycle of 25 to 30 years.

The 4,000-plus wells the company has drilled in the Piceance Basin have targeted the Williams Fork tight sands, for the most part.

### Plenty More to Come?

The Niobrara and Mancos shales in general are located at depths of 10,000 to 13,000 feet and the Williams Fork at 6,000 to 9,000 feet.

WPX plans to drill four horizontal Niobrara wells in 2013. The spud date for its second Niobrara well was April 3.

The Beast itself would be a company maker for many operators, but there apparently are a lot more molecules trapped in the neighborhood, awaiting release.

"Based on early indications from this discovery in the Piceance, we're talking about the potential to ultimately more than double our current 18 trillion cubic feet equivalent of 3P reserves," Hill said.

"We see hydrocarbon saturation across tremendous thickness in a highly over-pressured environment," he noted. "These shales are located directly underneath our current Williams Fork production in the Piceance."

The prediction is that much of this gas can eventually be produced economically owing to horizontal drilling advances and the company's completion engineers' finesse in applying multi-stage fracture technology, according to AAPG member Steve Natali, senior vice president of exploration at WPX.

When queried whether Rockies operators in general see the glass as half-empty or half-full given the current state of gas prices, WPX media spokesman Kelly Swan replied pragmatically.

"We believe a resurgence will take place in the Rockies in terms of opportunities out there in the right price environment," Swan said. "The resource is there; it will just take the right price to go after it a little bit more full bore.

"In the Piceance around 2007, 2008 we had 25 rigs running in western Colorado," he said, "and we've been running five rigs there in today's much more modest price environment.

"We're running everything very disciplined." ■

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Secondary target now in the spotlight

# Unconventional Uteland Butte Sparks New Utah Activity

By LOUISE S. DURHAM, EXPLORER Correspondent

**G**eologic intervals that may have looked a bit ho-hum when pierced by the drill bit on its way to the Real Target can, on second look, yield some pleasant surprises.

The Uteland Butte Member of the Eocene Green River Formation in the Uinta Basin in Utah is one of these.



VANDEN BERG

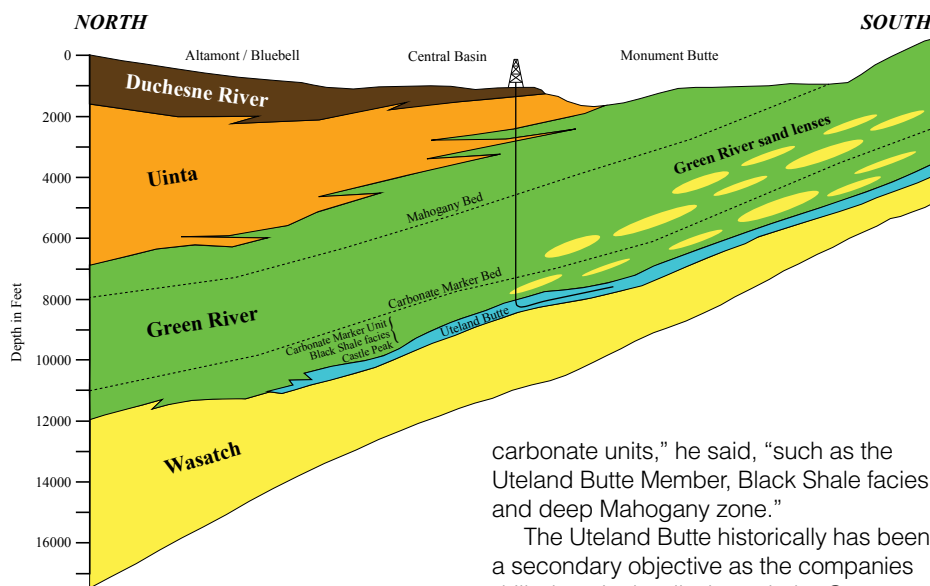
It's the basal member of the Green River, above the Upper Paleocene to Lower Eocene Wasatch Formation, which is predominantly a sandstone with red, green and gray shales deposited in a fluvial setting.

In contrast, the Uteland Butte is indicative of a lacustrine environment and is mainly limestone, dolomite, organic rich calcareous mudstone and siltstone, with some thin sandstones, according to AAPG member Michael Vanden Berg.

Vanden Berg is a research geologist in the Energy and Minerals Program at the Utah Geological Survey. He currently serves as president of the AAPG Rocky Mountain Section.

The unconventional Uteland Butte zone ranges in thickness from less than 60 feet to more than 200 feet.

"The Green River Formation in the Uinta Basin has been studied for over 50 years since the first hydrocarbon discoveries," Vanden Berg said. "But early



studies focused on the many conventional sandstone reservoirs currently producing large quantities of oil and gas.

"Little information exists on the more unconventional crude oil production potential of thinner, organic-rich shale/

carbonate units," he said, "such as the Uteland Butte Member, Black Shale facies, and deep Mahogany zone."

The Uteland Butte historically has been a secondary objective as the companies drilled vertical wells through the Green River and into the Wasatch, which was the main target.

"They would often perforate the Lower Green River along with the Wasatch," Vanden Berg said.

"However, there is a Uteland Butte field

in the central portion of the basin that is productive from localized sand beds," he noted, "but this is unusual."

### Pressure Points

Vanden Berg described an active scene today, noting that over the past few years, companies have been targeting the thinner carbonate beds in the Uteland Butte with horizontal drilling.

"In particular they're going after a single dolomite bed in the upper part of the unit, which has 20 to 30 percent porosity but very low permeability," Vanden Berg said. "That's where the horizontal drilling comes in – and the hydraulic fracturing."

He noted that production from these wells averages 500 to 1,500 Boe/d from horizontal legs up to 4,000 feet long.

"Overpressure seems to be key to the success of the Uteland Butte," Vanden Berg said. "Most of the production is within the overpressure zone."

"That's why Newfield (Exploration Co.) has taken the lead, because they have acreage in the overpressure area, whereas other companies are either further south, west, or east," he commented.

"Most companies are operating outside the reservoirs overpressured zone, which is hurting the economics of the Uteland Butte play," Vanden Berg said."



Photos, graphic courtesy of Michael Vanden Berg

See Uteland, page 12

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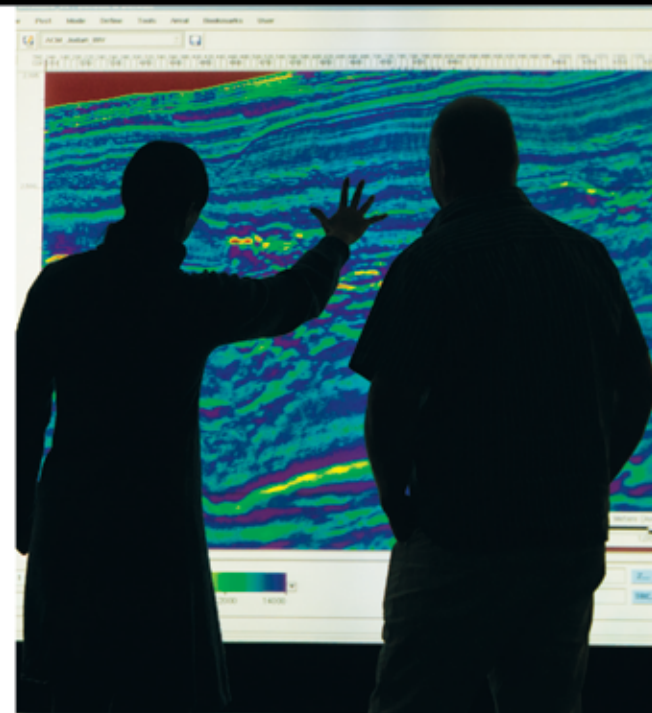
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Overlooked by past operators – and even some geologists – the Uteland Butte is indicative of a lacustrine environment and is mainly limestone, dolomite, organic rich calcareous mudstone and siltstone, with some thin sandstones. It also has become a hot target “with significant potential” in Utah, and the subject of intense research and investigation.

## Warning: Our data has gone mobile (You may never return to the office)



## Uteland from page 10

### Making It Better

Right now, the Utah Geological Survey is evaluating how to make these fringe areas of the Uteland Butte more productive.

“We see significant potential in the fringe area,” Vanden Berg noted. “The question we want to answer is what is the best way to complete these horizontal wells to unlock that potential.”

There’s a whole lotta research going on.

Vanden Berg is principle investigator for a newly launched three-year-long program funded by the National Energy Technology Laboratory – Liquid-Rich Shale Potential of Utah’s Uinta and Paradox Basins: Reservoir Characterization and Development Optimization.

The overall goal of the study is to provide reservoir-specific geological and engineering analyses of:

- ▶ Emerging Green River Formation tight oil plays, such as the Uteland Butte Member, Black Shale facies and others in the Uinta Basin.
- ▶ Established yet understudied Cane Creek shale (and possibly other shale units) of the Pennsylvanian-age Paradox Formation in the Paradox Basin.

### Hands-On Experience

If you were on the scene during the recent AAPG Annual Convention and Exhibition in Pittsburgh, you may have examined a Uteland Butte core that Vanden Berg transported in for a core poster session.

The core, which is from the productive carbonate zone in the Uteland Butte, was acquired from the Bill Barrett 14-3-45 BTR well in southwestern Altamont Field.

“The horizontal drilling objective, as analyzed in the core, is a five-foot interval of fractured dolomite, with porosities between 14 and 26 percent, interbedded with organic-rich limestone,” Vanden Berg noted.

“The TOC values for the 60 feet of recovered core range between 2 and 5 percent, while Ro (vitrinite reflectance) values range between 0.7 and 1.1, indicating these rocks are self-sourcing.”

Not to worry if you missed the Uteland Butte core-viewing opportunity in Pittsburgh. Word has it that you’ll have another chance during a session at the upcoming AAPG Rocky Mountain Section meeting in Salt Lake City in September.

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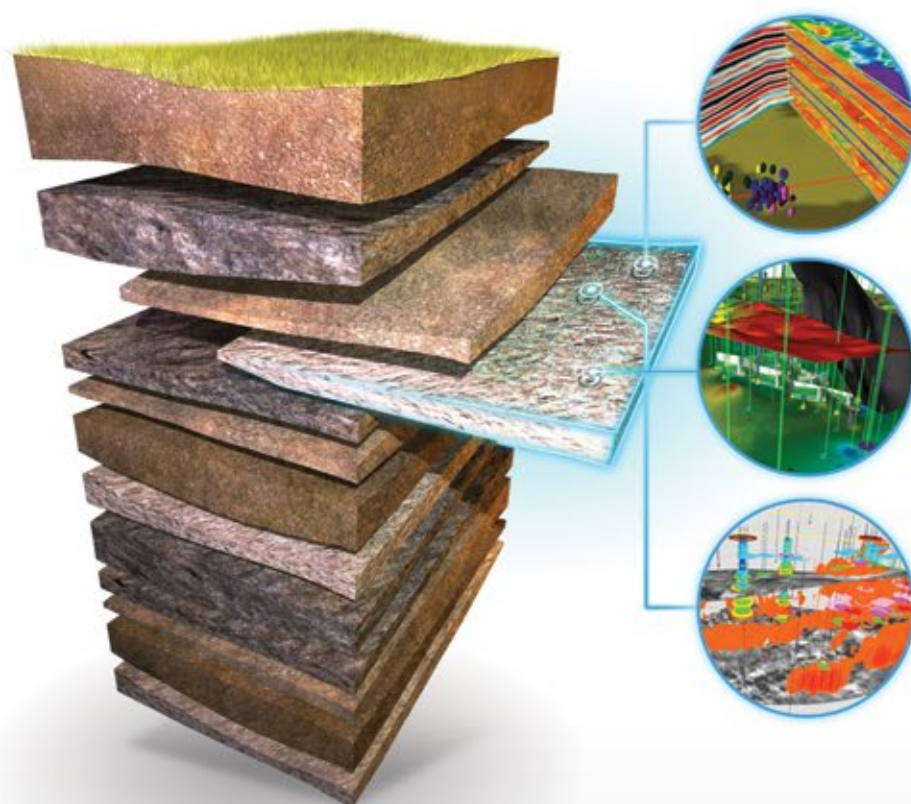
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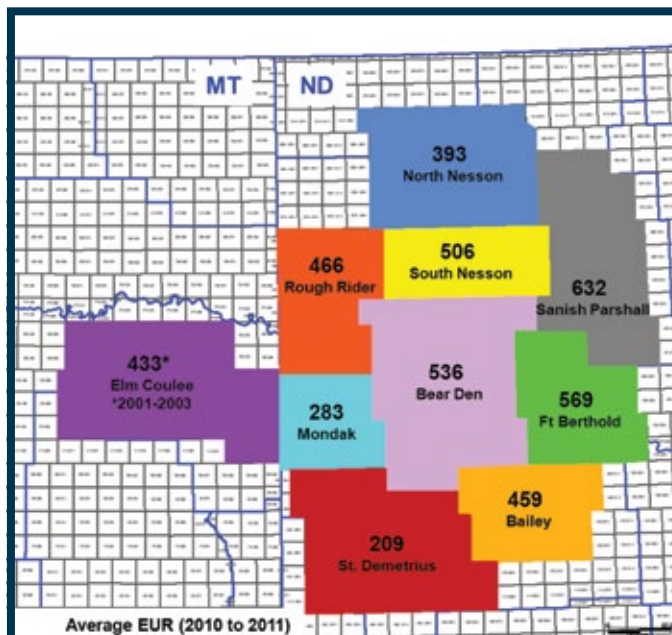
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Not all areas are created equal: Subdivision of the Bakken play into 10 areas across North Dakota and Montana, based on township boundaries, proves the point: There are diverse factors and significant differences in productivity across basin.

Graphics, photos courtesy of Cosima Theloy

## Diverse Dynamics Impact Bakken Productivity

By LOUISE S. DURHAM, EXPLORER Correspondent

The mere mention of the Bakken Formation conjures up thoughts of a seemingly unlimited oil supply. The now-famous upper Devonian-lower Mississippian Bakken shale oil play in Montana and North Dakota is indisputably a world class petroleum system.

The prolifically productive play no doubt is a long-term hydrocarbon supply source, given that the just-released 2013 U.S. Geological Survey resource assessment estimates a mean oil resource of 3.65 Bbo for the Bakken Formation, along with an additional 3.73 Bbo for the underlying Three Forks.

Reportedly, 450 million barrels have been produced in this area since 2008. Like any play, some wells are better than others, for any number of reasons.

Factors influencing productivity in the Bakken play are the focus of a doctoral dissertation being prepared by AAPG member Cosima Theloy, a doctorate candidate in geology at the Colorado School of Mines.

The Bakken is a technology-driven play showing a clear trend of increasing production rates over time, as drilling techniques and well completion designs have become more sophisticated.

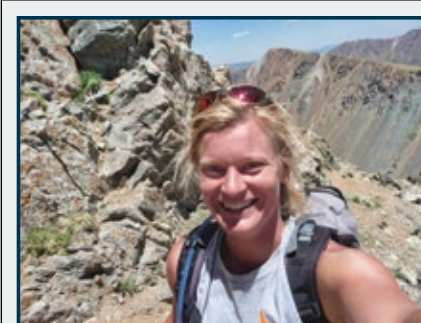
The formation is comprised of an upper and lower shale member and a mixed siliciclastic middle member, which is usually referred to as a dolomite sand or a sandy dolomite.

The shale zones source the hydrocarbons for the fractured dolomite and for the Three Forks formation below.

### Research Objectives

Theloy compiled a lengthy array of objectives to tackle for her research, including:

- ▶ Identify sweet spot and low productivity areas and analyze the cause.
- ▶ Evaluate the effect of improving technology.
- ▶ Develop a method to distinguish completion-related production enhancement versus geology-induced productivity variations.
- ▶ Study the relationship between hydrocarbon generation and observe pore-overpressure in both middle Bakken and Three Forks.
- ▶ Create pressure map for middle



AAPG member Cosima Theloy, a doctorate candidate in geology at the Colorado School of Mines, will present the paper "Factors Influencing Productivity in the Bakken Play, Williston Basin," at the inaugural Unconventional Resources Technology Conference, which will be held Aug. 12-14 in Denver.

Theloy's talk will be presented at 2:20 p.m. Tuesday, Aug. 13. Her co-author is past AAPG president and Honorary member Steve Sonnenberg.

The paper is part of a session on "Unconventional Tight Oil and Tight Gas-Carbonates."

Bakken without using older, unreliable DST data.

- ▶ Determine role of natural fractures in Bakken play.
- ▶ Impact of facies variations on rock mechanical properties and fracturing action.
- ▶ Whether hydrocarbon migration is significant in Bakken petroleum system.
- ▶ Importance of traps and their impact on presence or absence of hydrocarbons.

By her own account, she worked with a vast amount of data. These data included:

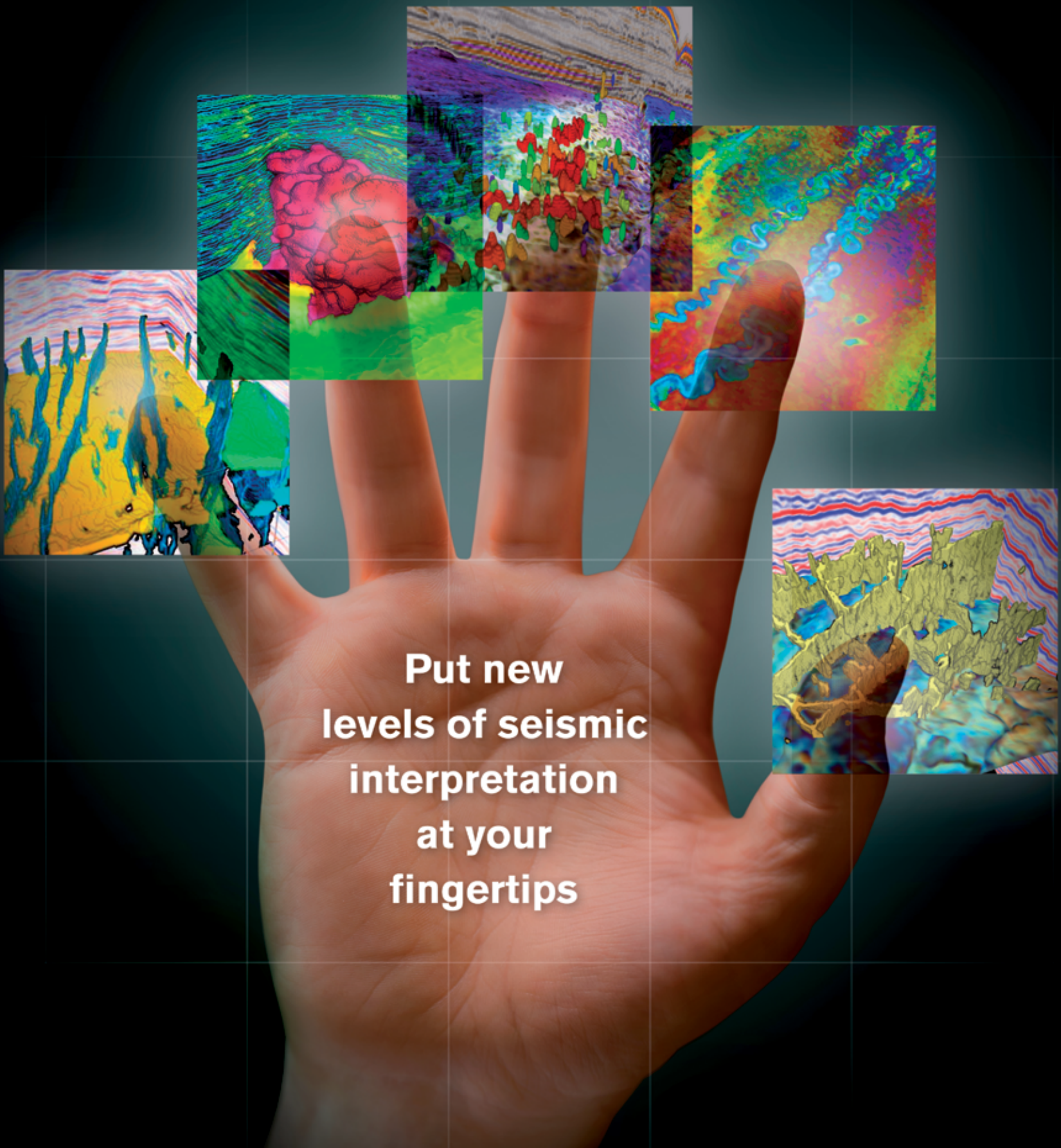
- ▶ Production and completion.
- ▶ EUR data.
- ▶ Pressure.
- ▶ Reservoir rock.
- ▶ Rock mechanic.
- ▶ Source rock.

When it comes to well completions, optimal completion design depends on the area and field maturity.

"Since 2010, the majority of operators have employed massive hydraulic fracturing treatments (in the Bakken) with up to 40 stages while pumping millions of pounds of

See Productivity, page 16





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## Register Now for Reduced ICE Fees

The first deadline for big savings on registration fees for the upcoming AAPG International Conference and Exhibition arrives this month.



for the meeting – including details of two plenary sessions that will be held Monday, Sept. 9. They are:

- ▶ National Oil Company Forum, featuring top level officers of Latin America's largest and most influential NOCs.

- ▶ Global Trends – Independent Oil Company (IOC) Perspective, will be a look at the dynamics and factors driving global energy trends.

The information also is online, at [www.aapg.org/cartagena2013](http://www.aapg.org/cartagena2013).

Most important: Register before June 20 to take advantage of the reduced fees.

Members can save up to \$295 if they register for the meeting by June 20.

This year's ICE will be held Sept. 8-11 in Cartagena, Colombia – the first time the event will be held in Colombia. The theme is "Energy for Integration and Prosperity."

The official ICE announcement was mailed to members in late May, offering information on the technical program, the special "country session" panels, luncheons and all activities planned

## Productivity from page 14

proppant," Theloy said.

"But numerous older wells outperform younger wells despite technological advancements," she noted, "suggesting that geological factors have a larger impact on production than the completion design."

Theloy pointed to such fields as the giant Elm Coulee and Parshall, where wells ordinarily underwent maybe five-stage fracturing early on. These wells are still out-performing new ones in fields such as Rough Rider, where high-end completions using 40-stage fracturing are the norm.

The Rough Rider field lies to the east of Elm Coulee field and west of Parshall.

"Rough Rider is not the best geological area, but the aggressive completions work," Theloy said. "But they produce a lot of water,

and a barrel of oil there probably costs a lot more than a barrel at Elm Coulee."

She did emphasize that Elm Coulee is a geological sweet spot with enhanced reservoir properties. This is most assuredly a big plus for productivity/economics.

### Factors for Productivity

Theloy summarized some of the geological factors that can influence productivity:

- ▶ Reservoir quality and thickness.
- ▶ Rock mechanical properties.
- ▶ Natural fractures.
- ▶ Pore-overpressure distribution.
- ▶ Organic geochemical parameters.

"The interplay of hydrocarbon generation potential and maturity results in tremendous over-pressuring and creation of fracture permeability and secondary porosity," she said.

"A combination of overpressure and buoyancy-driven migration of hydrocarbons into updip traps can result in large scale accumulations, such as Sanish-Parshall and Elm Coulee," she continued.

There's much ado about hydraulic fracturing these days – particularly the chemicals being used. The proppants used to hold the cracks open to allow for flow have escaped attention, in large part, during the conversations/confrontations.

They were on Theloy's radar screen.

"The main type (in the Bakken) is sand, but there's been more of a shift to ceramic," she said. "I looked at the effect of proppants on production and separated it into sub-areas, so the geology was fairly the same.

"In all three areas, it showed that a mixture of two-thirds sand and one-third ceramics works best."

Some of her other conclusions include:

- ▶ Natural fractures play a significant role for production but don't define sweet spots.
- ▶ There is good correlation between hydrocarbon generation, pore-overpressure, inferred oil saturations and productivity.
- ▶ Low productivity areas probably are a result of migration, e.g., flanks of Nesson anticline.

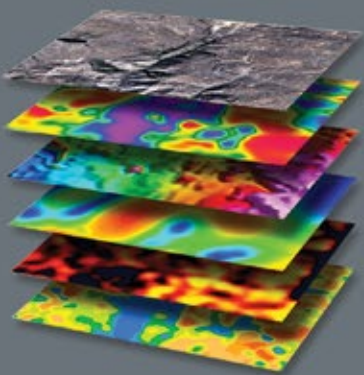
- ▶ Bakken and Three Forks pressures indicate an inverted continuous system with pressure leaking off at the top, apart from Parshall pressure cell.
- ▶ Parshall area has a mix of locally generated and migrated oils.

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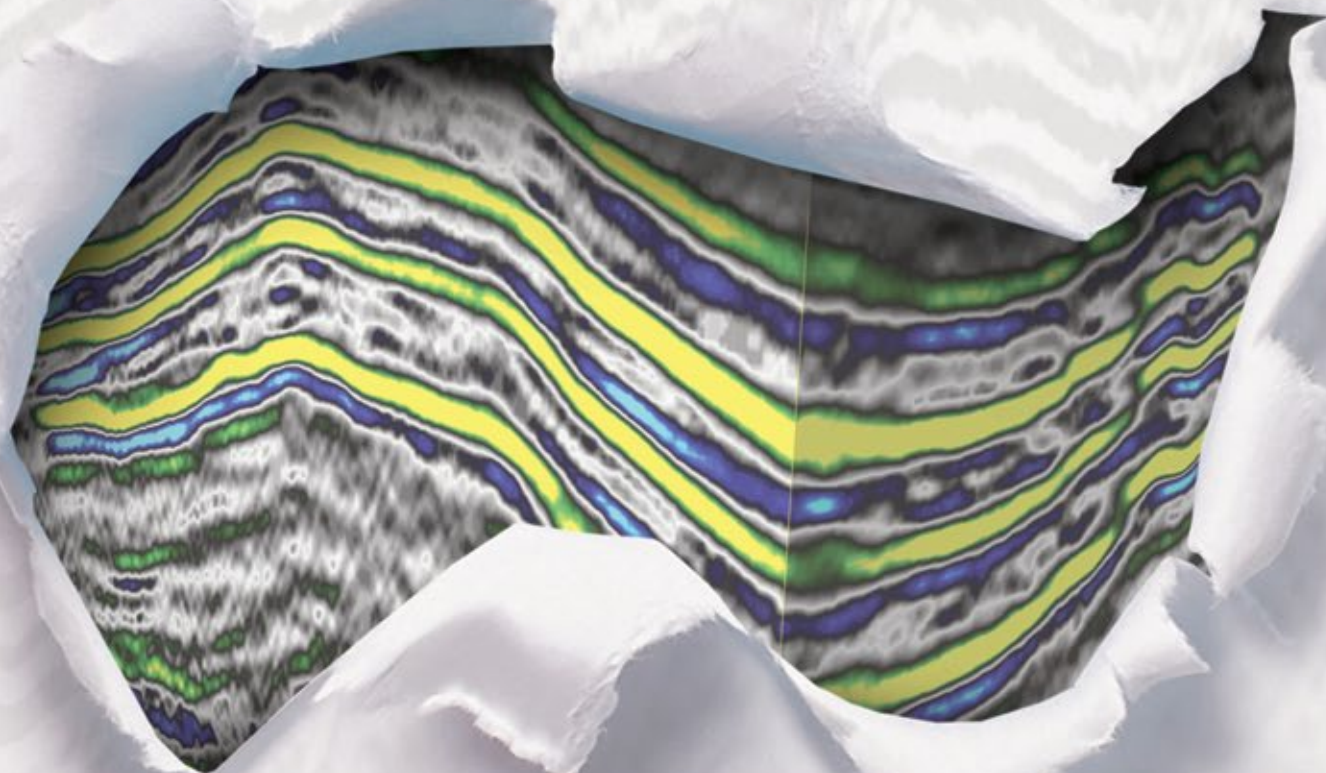


Examples of natural fractures found in the Bakken Formation.





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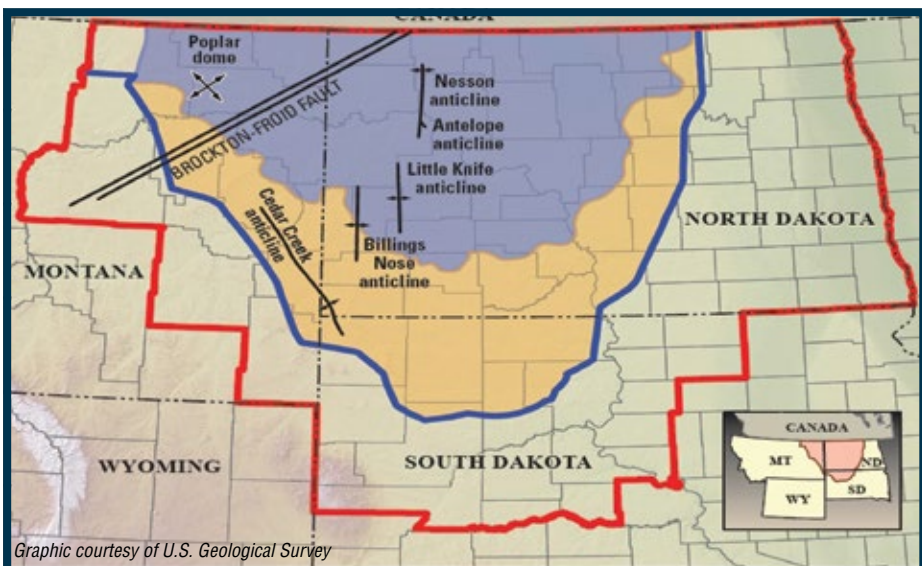
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Graphic courtesy of U.S. Geological Survey

Red line defines the Williston Basin boundary; the blue line defines the Bakken TPS; the peach area is the Three Forks Conventional AU; and purple shows Three Forks continuous oil AU.

# Bakken Reassessment Provides Reassurance

By LOUISE S. DURHAM, EXPLORER Correspondent

The much-anticipated updated numbers that all thought would reveal even more about an already prolific area are in – and the numbers are giving operators yet another reason to smile.

The bottom line: When you combine the mean oil resource of the Bakken Formation in North Dakota and Montana with the underlying Three Forks, you get a total estimated mean of 7.4 Bbo of undiscovered technically recoverable oil.

This is the number just released by the U.S. Geological Survey resulting from its

new reassessment of the Bakken shale play in the Williston Basin in North Dakota and Montana (April EXPLORER).

This area has produced about 450 million barrels of oil since 2008.

The initial USGS assessment of the Bakken in 2008 estimated a mean of 3.65 Bbo for unconventional oil resources (June 2008 EXPLORER). While that number remains steadfast, the reassessment allocates an estimated mean resource of 3.73 Bbo to the Three Forks, bringing the total to 7.3 Bbo, with a range of 4.42 (95 percent chance) to 11.43 Bbo (5 percent chance).

The Three Forks resource was not included in the 2008 program, as the play did not demonstrate significant momentum until early in 2012. Until then, the operators' principle focus had been on the overlying Bakken.

The Bakken has sometimes been tagged the "Saudi Arabia of the United States." The reassessment release essentially coincided with an international oil dignitary's statement reported in the mainstream media that the United States is naïve to contemplate the possibility of energy independence.

What the future might hold is a whole other story.

## Oil AND Gas

Commenting that such a quick reassessment is rare, the USGS emphasized the Bakken is an unusual reservoir. The agency noted that what is technically recoverable has changed during a short period of time.

More than 4,000 wells have been drilled in the Williston Basin since the 2008 assessment. These have provided a trove of additional data, including an enhanced understanding of the Three Forks and its resource potential.

Oil is not the only game in play here.

The Bakken and Three Forks reportedly are estimated by the USGS to contain a mean of 6.7 Tcf of undiscovered, technically recoverable natural gas and 0.53 billion barrels of undiscovered, technically recoverable natural gas liquids.

Gas estimates range from 3.43 (95 percent chance) to 11.25 (5 percent chance) Tcf and 0.23 (95 percent chance) to 0.95 (5 percent chance) billion barrels of natural gas liquids.

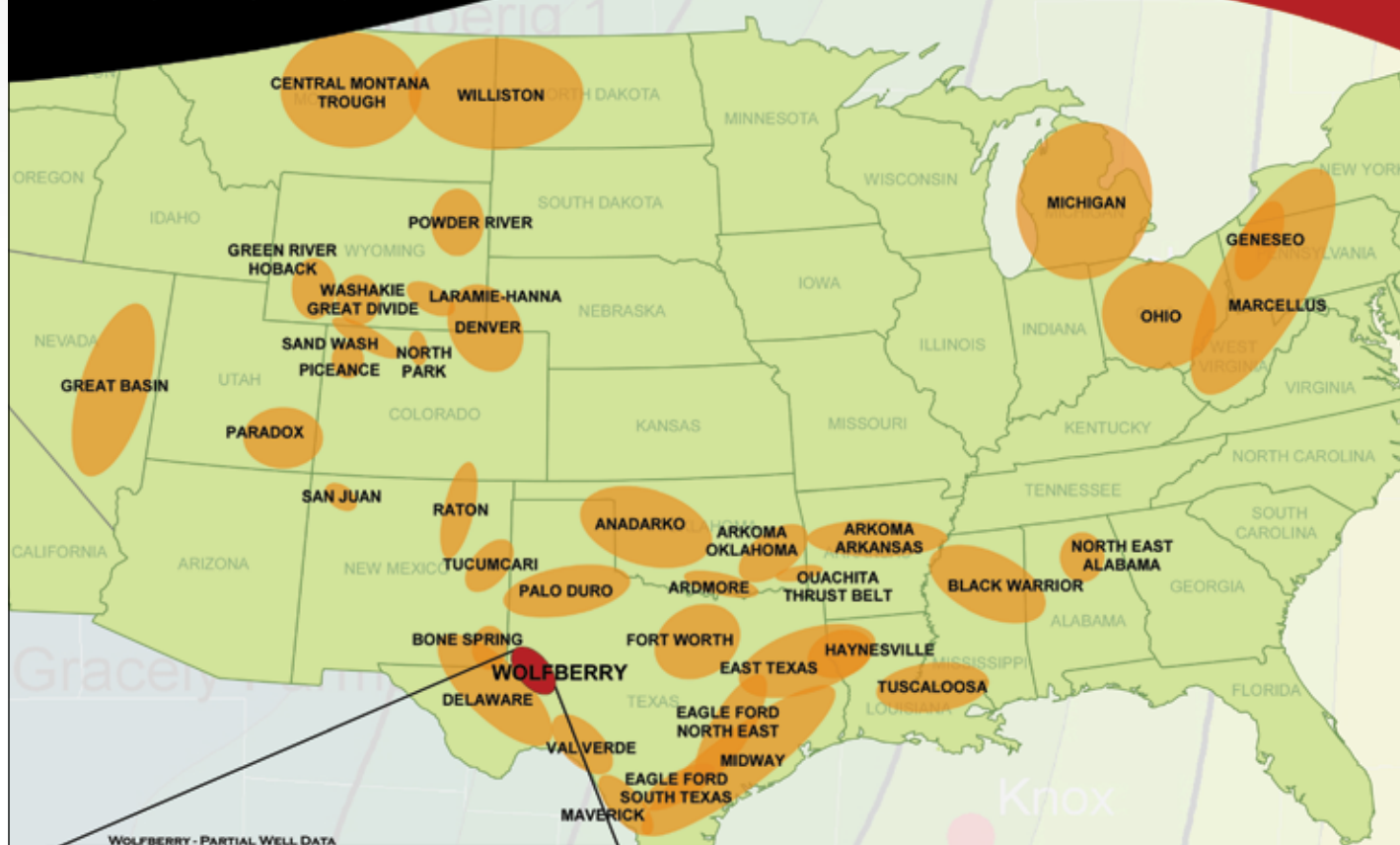
The agency reported this estimate is a nearly threefold increase in mean natural gas from the 2008 assessment and an almost threefold increase in mean natural gas liquids resources. These increases are attributed for the most part to the inclusion of the Three Forks formation.

The USGS effort is receiving kudos from some of the experts – including AAPG past president and Honorary member Steve Sonnenberg, professor and Boettcher Chair in petroleum geology in the Department of Geology and Geological Engineering at Colorado School of Mines, Denver – and head of the school's Bakken Research Consortium.

"I think the new assessment by the USGS is very good," Sonnenberg said, "and agrees with successes seen by the operators."

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4301330700000	American Quest Petroleum Co.	Good	2-51	Borden	TX	32.3790162	-101.5117282
4312900700000	Continental Oil Company	John 588	1	Cherokee	TX	30.9832788	-100.8799309
43137671407000	Beas Realty Oil Company	John M	1	Cherokee	TX	31.2921789	-101.4821784
4313000470000	Surf Oil Corp	Roberta Reeves Et Al	1	Cherokee	TX	32.6610275	-101.7824252
4313000520000	Merced Oil Co	Oil Queen #	1	Cherokee	TX	32.8180484	-101.8600889
4313000480000	Shell Oil Company	Schumacher	1	Cherokee	TX	32.0828074	-101.9413781
4313000570000	Evon Corp	Delaux Camille	1	Cherokee	TX	32.7812026	-101.3433978
4313760880000	YPL Oil	J.C. Clark	1	Cherokee	TX	31.8989967	-101.9340992
4313761030000	Janco Oil Co Of Calif	Edmond Ben	1	Cherokee	TX	32.3670348	-101.7291684
4312776120000	Midcon Drilling Company	Bullfinch Roscoe	1	Howard	TX	32.2892864	-101.3760079
4312776180000	Cynosa Oil Corp	Franklin	1	Howard	TX	32.4911344	-101.3929123
4312776190000	YPL Oil Corp	J.C. Clark	1	Howard	TX	32.4821048	-101.7201889
4312776200000	Merced Oil & Gas Co	Franklin 1	1	Howard	TX	32.4310282	-101.2821889
4312900400000	Shell Oil Corp	Schumacher 1	1	Jeff	TX	30.9832782	-101.8618829
4313000380000	Apache Corp	Agustin	1	Jeff	TX	31.3208811	-101.8981781
4313000390000	Woodward Oil	Wally W Crawford	1	Martin	TX	32.3208811	-101.2200934
4313738440000	Perm County Land Co	Kingfield	1	Martin	TX	32.4851134	-101.6811776
4313000470000	Great Western Drilling Company	J. DeLoe	1	Midland	TX	31.83861	-101.94480
4312900411000	Midcon Petroleum Co.	John Roy 207 No	24	Midland	TX	31.8413311	-101.2757292
4313000470000	Woodward Oil	J. DeLoe	1	Midland	TX	31.8413311	-101.94480

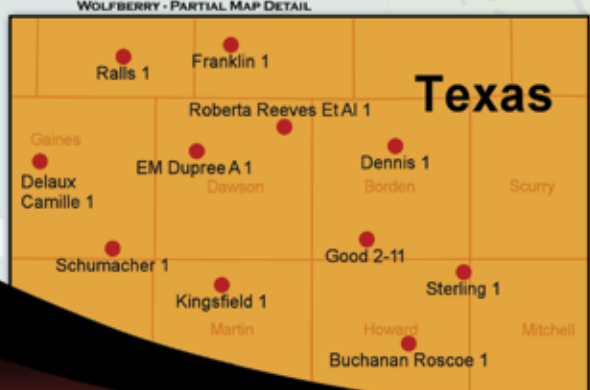
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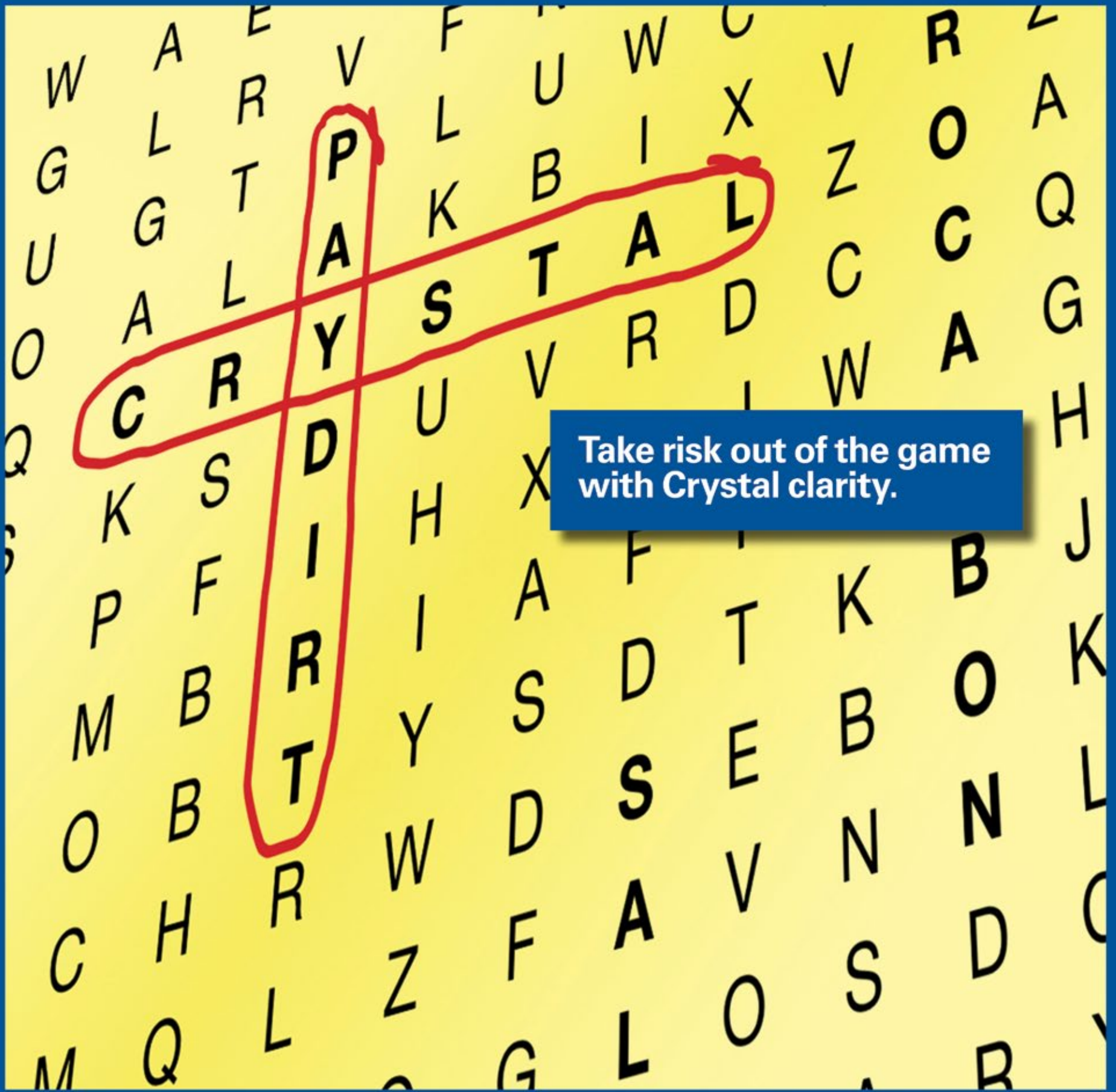
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Deal yourself in

# Zest of a Salesman: Tips for Putting It Together

By LOUISE S. DURHAM, EXPLORER Correspondent

**P**ssst, buddy, have I got a hot prospect for you. You're gonna love it.

Industry newcomers might cringe at the thought of such a sales tactic.

Veterans remember the here-again, gone-again euphoric times in the business when this is all it took to cut a deal, but today it requires a focused professional presentation.

Honing your selling skills is a must.

"A prospect presentation is a sales pitch," said AAPG member Steve Brachman



BRACHMAN

during a talk focused on prospect selling that he gave at the Playmaker Forum in Houston earlier this year. "You're selling

**"You're selling yourself and the prospect, play or whatever. To sell yourself, be yourself and present it as if to your best friend."**

yourself and the prospect, play or whatever.

"To sell yourself, be yourself and present it as if to your best friend," said Brachman,

exploration manager at Petro-Hunt LLC. "Even if your delivery is bad, you can show integrity and technical competence – you can convey the prospect better than anyone."

Brachman presented "Three Rules" for selling your prospect, which he reiterated several times during his presentation:

- ▶ Know your audience and their agenda (not yours).

- ▶ Get to the point – keep it simple.

- ▶ Listen.

He noted that you must keep in mind that a prospect is not a science project but rather an investment vehicle – people are willing to pay for it. It has present value to you and the potential for great future value.

Brachman pointed to two key audiences:

- ▶ Backers – These folks are behind you from the get-go. You can't promote to them but must convey risk and economics.

- ▶ Investors – A sophisticated lot who expect to be promoted. Investors look at risk from their own view, their internal parameters.

Prospect selling can be a tedious challenge, as Brachman demonstrated via a summary of prospect selling within one's own company. Different audiences require different presentations.

This is where the first of the Three Rules comes into play.

"Before you give your presentation," he cautioned, "think about the agenda of the audience and what type of presentation you have to give just within your company."

### The Art of the Deal

Here's a brief guide.

- ▶ Your initial spiel will be directed to the supervisor whose agenda is technical excellence, such as whether the prospect is technically viable and competitive.

*Your agenda is approval, in order for you to go to the next level to make the pitch.*

- ▶ At the second level, your presentation is directed to the exploration manager who is looking for technical excellence and all the other things, such as whether the prospect makes economic sense and fits into the budget.

*Once again, your agenda is approval so that you can move along to the next audience.*

- ▶ In a company where the exploration manager doesn't make the decision to drill, your next gig will entail company management, e.g. CEO, president, etc. Senior management's agenda is IMPACT, according to Brachman, and the presentation must be decidedly different from what you gave to your supervisor.

He emphasized that while you're standing there making noise, these higher-ups want to determine how the prospect fits into what the company is doing. Maybe constructing a pipeline overseas better suits its needs.

*Your agenda here is both prospect approval and personal approval.*

- ▶ Provided you get the go-ahead, your next step up places you in front of the board of directors who have an agenda of basic comprehension and assurance.

*You, however, want personal approval.*

You can put a map on the wall, but most of this audience won't understand it and won't care.

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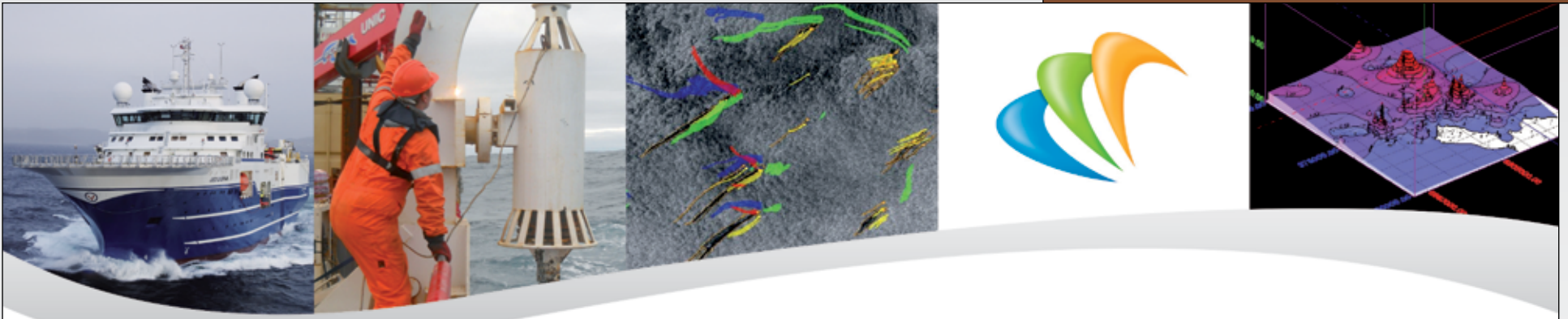
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See **Success Story**, page 24





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# He Earned Not Just An Award, But Public Trust

By **BARRY FRIEDMAN**, EXPLORER Correspondent

It's a wonder, considering how many hours he spent talking to the press during the Deepwater Horizon blowout in 2010, Donald Van Nieuwenhuise – one of this year's AAPG Public Service Award winners – didn't put his foot through his television when it was all over.

From the day of the initial explosion at Macondo, April 20, 2010, to the day the well was officially capped, almost five months to the day on Sept. 19, AAPG member Nieuwenhuise cajoled, cautioned, assuaged, informed and corrected reporters, hosts and public officials on PBS, CNN and NBC.

Maybe more than an award, he deserves a medal.

"Several times I was called at 3:30 in the morning for interviews," he said. "I tried to keep my interviews early in the morning or late in the afternoon so that I could do my day job."

And that day job is at the University of Houston, where he is director of the professional geoscience programs in the department of geosciences, as well as director of the Applied Sequence and Biostratigraphy Program.

During the crisis in the GOM, most agree he was a sane voice in the discussion, an honest arbiter, translating difficult geological phenomena between the industry and the press – a press that often had the attention span of a non-majoring freshman in Geology 101, forced to take the course, and the mood swings of a six-year-old who didn't want to get out of the pool.



**NIEUWENHUISE**

**"The interviewer and audience are hungry for real information."**

In boxing parlance, while those 4.9 million barrels were being soaked up in the waters of the Gulf of Mexico, he didn't stay on the ropes, didn't trade punches – he bobbed and weaved.

And considering the beating the industry in general and BP specifically were taking, he was "even" on most cards when the ordeal ended.

**As a Matter of Fact**

He still remembers the toughest rounds.

"BP's engineers and geoscientists assigned to fixing the problem were not the same as the ones that created it," he recalled. "The distinction was never made."

Legally, he said, "You cannot praise the company you are accusing of guilt." Nevertheless, his goal and biggest frustration was to remind reporters – and by extension, viewers – of that simple fact.

"BP personnel were all one group of bad people in the industry, according to most media folks," he said.

But he wants there to be no

misunderstanding – and said so at the time – who was at fault.

"BP was one thousand percent guilty," he said. "There were at least 11 serious mistakes (same as the number of deaths) prior to the blowout on their watch on their rented rig. Guilty as charged. I never excused that."

Deepwater, however, was a new kind of beast – for both industry and the press.

When it came to capping the well, Nieuwenhuise had to trumpet the credible information, debunk the hype, control the fear, temper the hope and discard the stupid – like the nuclear option.

"There is not enough room in the EXPLORER to explain how many ways that was a bad idea," he said. "I will say soft water-laden sediment, that makes up a big part of the continental shelf, is not a good thing to shake and I will leave it at that."

But it takes a skill – and patience – to explain to a nervous producer doing show prep at three in the morning the concept of hydrostatic pressure.

"One must be straightforward," he says

of his approach in general, "and only let the media lead you if you are 100 percent behind what they are saying."

And if you're not?

"Be ready to disagree with them when they get something wrong," he said, "but say it as it is, a matter of fact."

**Who Do You Trust?**

Talking to the press is a job he likes, but one, more importantly, he thinks is necessary.

"Actually, as an instructor, it's the reason to get on the news and spread the word," he said.

Where it gets tricky is when scientists use exaggeration or opinions.

"The interviewer and audience are hungry for real information," he said.

Nieuwenhuise doesn't overwhelm either the audience or the host with his science cred. As an example, CNN host Ali Velshi once asked him about the business of "top kill."

"When I explained how a top kill could work, Velshi looked at the camera and said to his viewers, 'He just explained that like he was tying his shoes.'"

To that extent, Nieuwenhuise said, "Many people fear science and complex systems because of the vocabulary. Most things can be explained in simple terms – and with simple terms you engender their interest."

And because of that approach and delivery, Velshi called Nieuwenhuise, "The professor we can trust."

**See Awardee, page 24**



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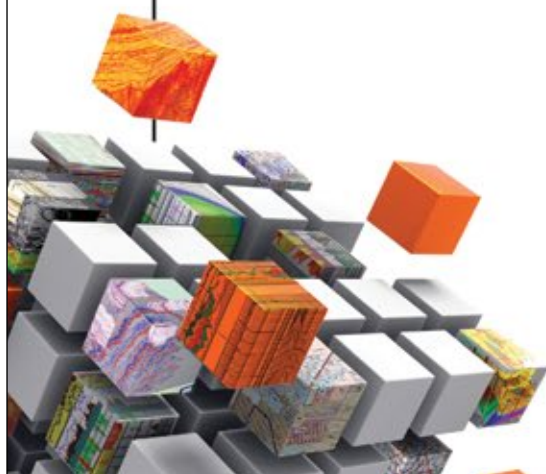
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**Awardee**  
from page 22

**Never Cry Wolf**

So how does one become the media's "Go To" guy, anyway?

"I never imagined this or anything like it would happen to me. It was very daunting at first," he said. "The first reason I was asked is because I do not work for an oil company."

In retrospect, he doesn't think the media did a disservice during Deepwater – in fact, it was a job nobody knew how to do, for this was unparalleled.

"The media was trying to do their best," he said. "They knew this was an important event."

And future events on this scale?

"The industry needs to be as transparent and as straightforward as possible when speaking to the press," whom he calls – don't laugh – "good listeners."

"The development of quick response companies is now a no-brainer," he said. "It should have been before the spill."

Pre-blowout, he says, too many corners were cut and way too many mistakes were made.

"This has really hurt the industry."

But "post-blowout," he says, "BP did a very good job, and a lot was learned from this disaster."

As for the media bias, both right and left, he has a warning.

"I would have to say that most did try to explain and find answers," he said. "Some media outlets, however, definitely have agendas. Unfortunately, all that does is

frighten people, and it takes human energy away from solving the problem by creating ones that do not exist.


"It is bad enough to cry wolf all of the time," he added, "but when someone is already facing a pack of wolves, it really is a bad idea to cry wolf from behind them."

The story he wants told – the one he has said before and will continue to help tell – is this:

"The oil industry employees are some of the smartest people on the planet."

He wants the press to know that many also are the safest.

For him, personally, he takes the television appearances with a sense of humor and perspective.

Pleased and honored to receive this award for the work he has done, he reminds us, "My spot was often bumped by the latest Lindsey Lohan news." 

**Success Story**  
from page 20

"They're looking at the president of the company while you're talking, and if he's nodding, that's good," Brachman said. "They're getting basic assurance the person standing up there knows what (she's) talking about."

"Your job is to look like a normal human being, don't drool, and don't look like an alien," he quipped.

**The Sixth Sense**

Moving on to the need to "get to the point and keep it simple," Brachman focused on two key elements.

One of these is the Five-Minute rule.

"Most experts say you've got five minutes to get to the point," he said. "I once listened to a presentation where the presenter talked from a map for 45 minutes about a certain field before he said 'and now way over here, we want to drill something just like that.'"

"I said to myself, why not just say that way back," Brachman said. "I had completely lost interest; you can only pay attention for so long."

"For my five minutes, I use what I call the 'Talking Map,'" he said. "Every seismic line, every cross section, everything you've got rotates around this map that stays in front of the audience."

"You want this map indelibly etched in their minds when you leave," Brachman emphasized. "This is your home base; it has everything about your prospect on it."

"But it can't be cluttered," he cautioned.

Segueing to the listening rule, Brachman noted that the most important thing is to listen to verbal and visual (non-verbal) clues.

"When you're giving a presentation, you must also listen to your sixth sense about where you're going and stay on topic," he said. "This is not related to technical merits."

**Don't Do This!**

So much for the DOs.

The DON'Ts are equally important.

Brachman summarized presentation don'ts:

- ▶ Not listening.

- ▶ Forcing your agenda – If you show two seismic lines and are told that's enough, don't insist on showing 12 more. The audience is either good with it or doesn't care, so don't antagonize.

- ▶ The "bedtime" story – A prospect presentation is not a story.

- ▶ Details, details, details – The audience is not as in love with the details as you are. Forget about how many bags of cement were used on a well.


- ▶ Not listening.

When it comes to prospect expos, Brachman said he prepares three presentations – a 30-second presentation, a five-minute presentation and the full, entire presentation.

"At the end of 30 seconds, you give out your card, the executive summary, shake hands and ask if they would like to see more," Brachman said. "Some say yes, but others move on, not because they're not interested but they may have a hundred others to look at."

There's a handy tool to help you give your presentation.

"That's the dreaded-but-very-useful montage," Brachman noted. "It's got all you need in close proximity and one place."

"You can talk 30 seconds, five minutes or two-and-a-half weeks on this," he said. "It helps to convey succinctly, precisely and briefly what you're trying to do." 



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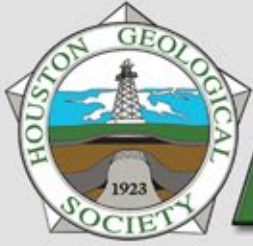
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# Lightning Strikes – A New Exploration Tool?

By **KEN MILAM**, EXPLORER Correspondent

**A**APG member H. Roice Nelson and his colleagues believe they have found a new type of geophysical data that will prove useful in resource exploration.

You might say the idea came like a bolt from the blue.

A few years back, a friend, Joseph Roberts, asked Nelson an old question, with a twist: "Does lightning strike twice in the same place? And if it does, could it be related to geology?"

Roberts has witnessed lightning strikes at apparently the same spot while on duck hunts a year apart. It was particularly intriguing because the hunt was on property near the Hockley Salt Dome in Harris County, Texas.

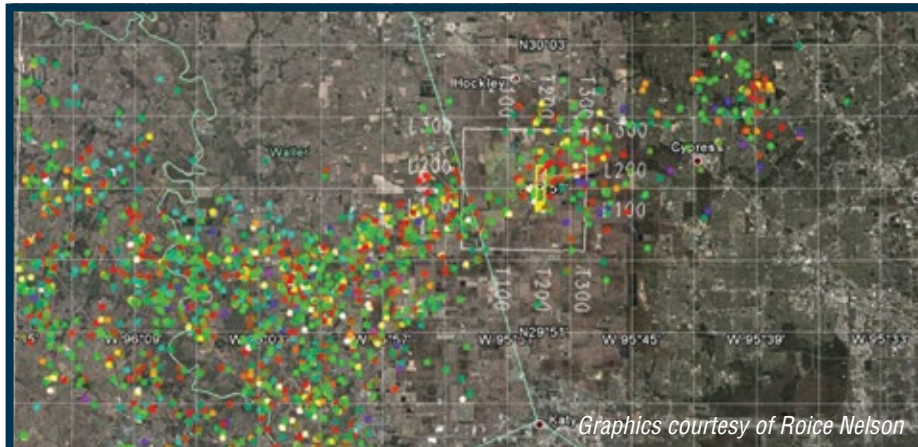
Nelson pursued the idea with another friend, Jim Siebert, chief meteorologist with Fox News in Houston, who has a background in earth science and has consulted for the industry.

They were aware of the National Lightning Detection Network, which had been recording lightning strike locations and related data since 1989, funded mainly by insurance companies.

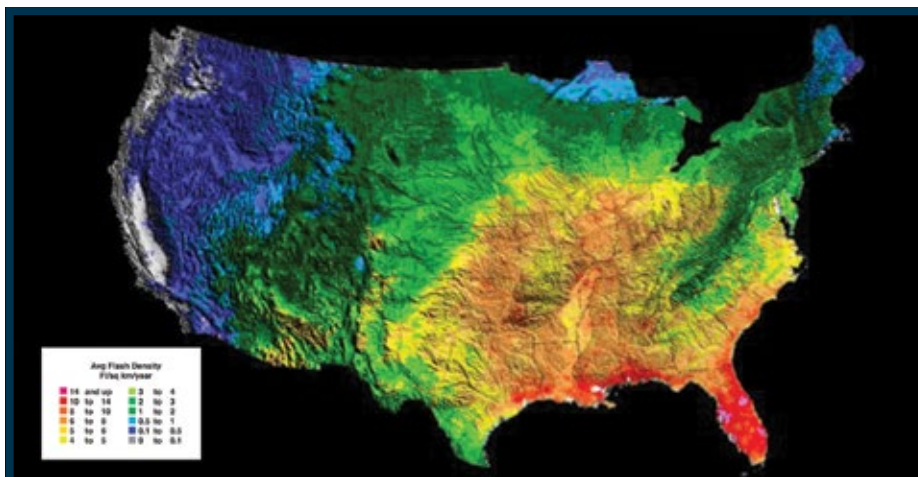
The NLDN database indicated lightning strikes do cluster – and the patterns tend to repeat over time.

Nelson compared the strike patterns with geologic and exploration maps and found some compelling correlations, especially to telluric currents in the earth.

Nelson, Siebert and Les Denham



Lightning strikes near Hockley Dome, Sept. 27, 2011.



NLDN cloud-to-ground flash density.

formed a company, Dynamic Measurement LLC, and acquired rights to use the lightning data for natural resource exploration.

"This is not a magic bullet," said Nelson, one of the founders of Landmark Graphics in the early 1980s.

"We get a new geophysical data type about every decade," he said. "When we get one, people tend to oversell it, and it never works out that way. Each new geophysical data type eventually develops a sweet spot, where it meets an exploration need."

"We're taking it slowly," he added. "We've been working on it for five years and acquired a patent for some of the methodology."

### An Attractive Concept

A paper Nelson presented at the recent AAPG Annual Convention and Exhibition in Pittsburgh was "the first really big presentation" of the development.

Noting that Ben Franklin's famous lightning experiments occurred along the now-famous Marcellus Shale, Nelson said the new research shows that cloud-to-ground lightning strikes appear to be controlled more by variations in telluric currents than topography or infrastructure.

See **Lightning**, page 28

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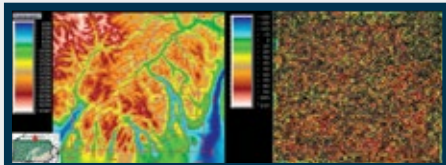
## By the Numbers: Database Reveals Lightning Clusters

Cloud lightning may travel a couple hundred kilometers. Why does it go to ground where it does? Tall trees? “A pipeline or a drilling rig that’s an 18,000-foot lightning rod?”

The questions are some that AAPG member H. Roice Nelson has been researching for the last five years.

In a paper he presented at the recent AAPG Annual Convention and Exhibition, Nelson and his co-authors concluded “lightning strikes cluster,” and that “lightning clusters appear to be controlled by telluric currents and geology, and by topography, vegetation, infrastructure and water depths less than 400 feet.

“These lightning strike clusters are somewhat consistent over time – data



*Topography (left) and lightning density in the Marcellus of Steuben County, New York.*

mining of lightning databases provides a new geophysical data type,” he said.

“This data type is unique in that it is already collected, ready for licensing and evaluation, and is evergreen in that new data is constantly being added to the database,” he added.

The National Lightning Detection Network database contains more than strike locations.

For each strike the location, time, rise-time, peak current, peak-to-zero time, number of sensors recording the strike, and some statistical measurements are recorded.

“Each lightning strike has a unique signature, and we can measure the different characteristics and compare them based on the location of the strike,” said Jim Siebert, meteorologist and a co-founder with Nelson of Dynamic Measurements.

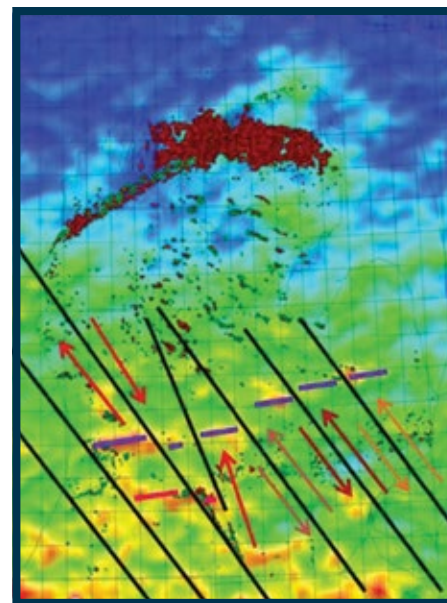
The NLDN is a network of some 330 sensors scattered across the continental United States, primarily at airports.

In addition, data collection has begun in other areas around the globe in the last couple of years, Nelson said.

– KEN MILAM



*Michigan topography (top) and lightning density interpretation (bottom), showing a possible correlation between lightning strikes and production (red gas, green oil).*



### Lightning from page 26

“These variations are the result of geology, like faults that interrupt the currents in shallow earth,” he said.

“Slate, certain minerals, copper and rare earths are conductive. Fresh water aquifers are resistive. Geothermal hot water sources are conductive,” he said. “Oil and gas are resistive, kimberlite conductive, salts resistive.”

Nelson said maps they have generated seem to bear a relation to gravity and magnetic maps.

DML has done studies overlaying strike maps and various subsurface and exploration maps in North Dakota, Michigan, New York and Texas. The maps show many apparent relationships between lightning clusters and the subsurface, he said.

From Siebert’s viewpoint, “A meteorologist cannot understand weather patterns without understanding how the ocean currents are moving.

“Now we’re learning that a geologist cannot completely understand the subsurface without taking into account subsurface electrical currents and meteorological phenomena such as lightning,” he said.

“This is going to impact many industries, from mining to geothermal exploration to the timber industry and understanding where forest fires are more likely to be started by lightning,” he continued.

“As the technology of measuring lightning strikes advances, so will our ability to exploit it to search for natural resources,” he said, “and it will change how everybody looks for oil and natural gas. □

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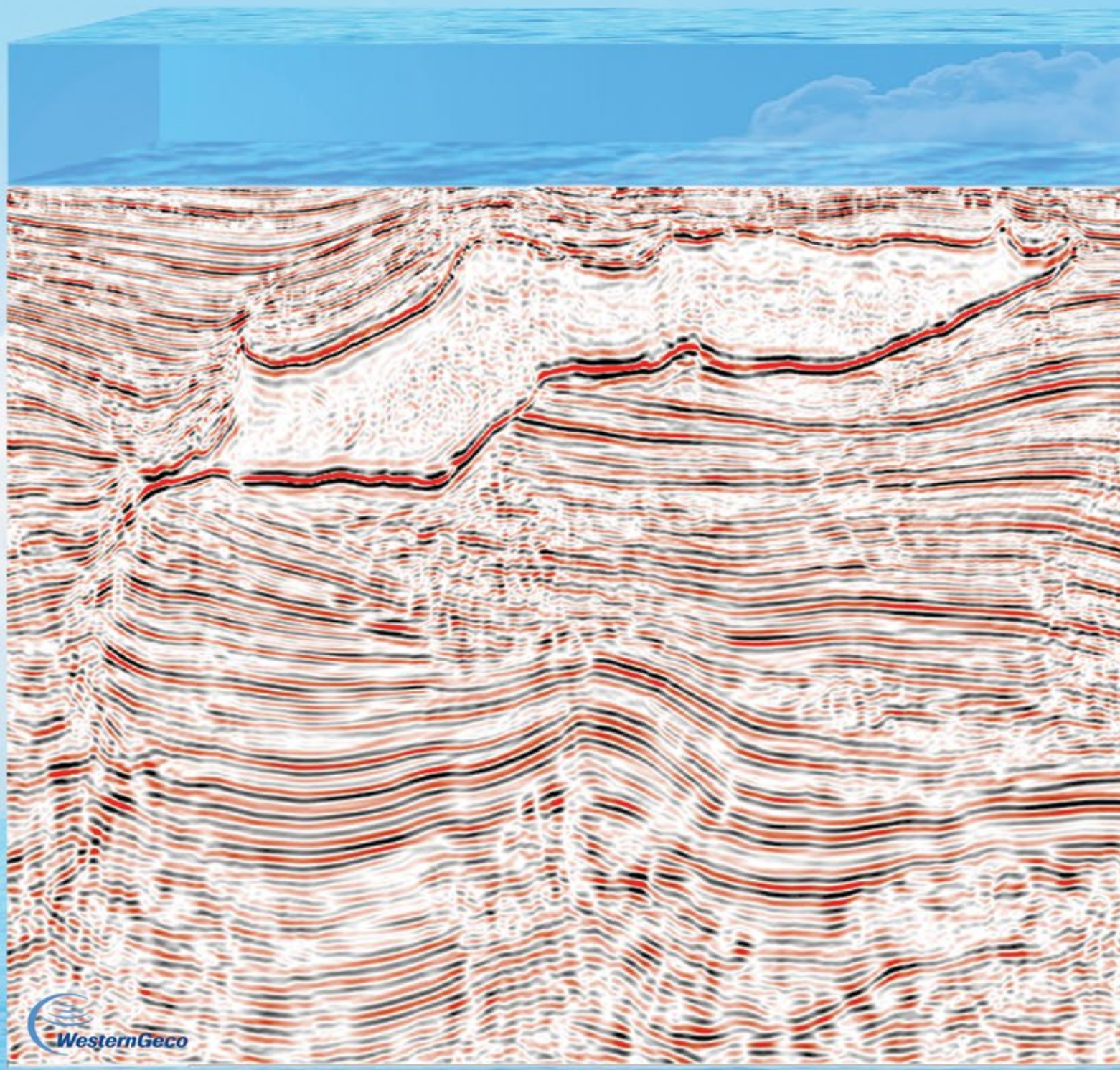
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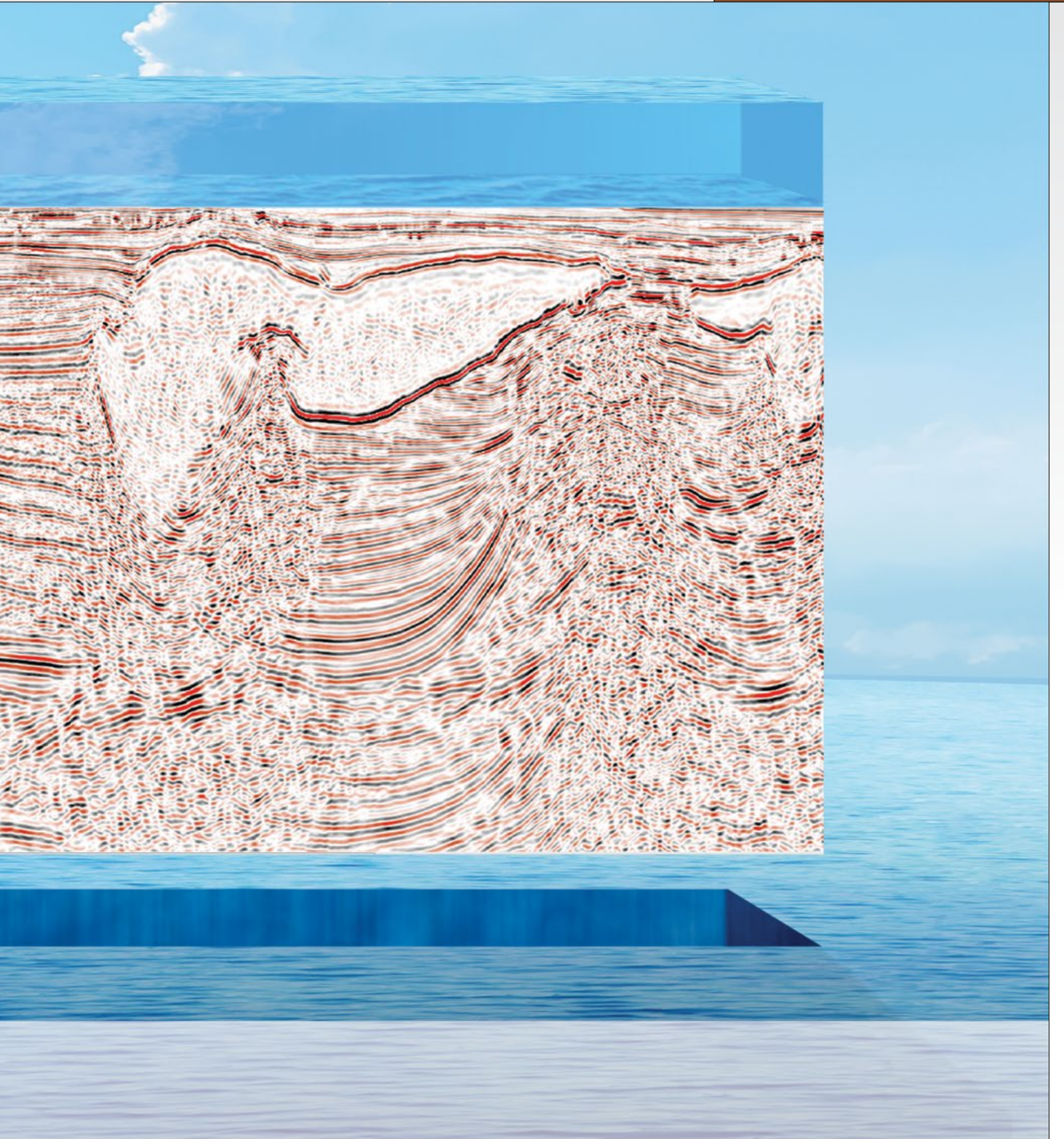
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## Multicomponent Seismic Interpretation

The editors of INTERPRETATION invite papers on the topic of "Multicomponent Seismic Interpretation" for publication in the August 2014 special section of INTERPRETATION.

Multicomponent seismic data allow geologic sequences to be defined with both P and S waves. These two wave modes provide different options for defining stratigraphy and facies within stratigraphic intervals because P reflectivity is controlled by different elastic properties than is S reflectivity. How should interpreters take advantage of the differences in P wave and S wave reflection behavior to expand their understanding of rock and fluid properties and to optimize geologic interpretations?

The purpose of this special issue is to encourage papers that offer guidance and insight for interpretation challenges such as:

- S waves seem to react more strongly to subtle faults than do P waves. Is this statement correct? Why? Can comparisons of P and S faults be presented?
- Is there a robust way to depth register P and S data so that P and S attributes are positively extracted from depth-equivalent data windows?
- Are there advantages to combining P and S data into joint AVO analyses?
- Interpreters need examples that show P waves reveal a target that S waves do not see, and conversely, S waves reveal a target that P waves do not see. Why does this happen? Are subsurface calibration data available to explain the differences in reflectivity behavior?
- Any multicomponent seismic interpretation case history will help others understand proper procedures for performing joint interpretations of P and S data. Case histories will be essential for proper application of S wave technology.

Interested authors should submit their manuscripts for review no later than **1 October 2013**. In addition, the special section/supplement editors would like to receive a provisional title and list of authors as soon as possible. Authors should submit via the normal online submission system for INTERPRETATION (<https://mc.manuscriptcentral.com/interpretation>) and select this topic in the manuscript type dropdown option. The submitted papers will be subject to the regular peer-review process, and the contributing authors are also expected to participate in the review process as reviewers.

We will work according to the following timeline:

Submission deadline  
1 October 2013

Peer review complete  
1 March 2014

All files submitted for production  
15 March 2014

Publication of issue  
August 2014

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# INTERPRETATION special section CALL FOR PAPERS

# Finding Energy Potential Across the Final Frontier

By BARRY FRIEDMAN, EXPLORER Correspondent

**A**APG Memoir 101, "Energy Resources for Human Settlement in the Solar System and Earth's Future in Space," is a comprehensive book that focuses on the potential for energy and mineral resources in the solar system – and the potential for human exploration and settlement of worlds beyond the earth.

And already it's having an impact. Produced in collaboration with AAPG's Energy Minerals Division and the Astrogeology Committee, this is a collection that "reflects AAPG's vision of advancing the science and technology of energy, minerals and hydrocarbon resources into the future."

Its editors, past EMD presidents William A. Ambrose and Douglas C. Peters, plus former NASA astronaut James F. Reilly II, sat down recently to discuss the book. And as a team, they responded to specific questions.



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more similarities than differences between deepwater exploration and development, and space exploration.

Beyond our own members, however, our audience is every rational human being who understands human health and well-being, quality of life, education and freedom are dependent on the energy and minerals that support our advanced civilization. Space is the next frontier, and as the world civilization expands beyond Earth's surface we hope this publication serves to illustrate there are abundant opportunities to support and maintain – and in fact, allow to prosper – civilization's expansion into space.

**An effective economy is possible beyond Earth's surface when we consider the resources available in near-Earth space.**

EXPLORER: Why is the book important? And why now?

**AUTHORS:** There are two competing pressures in our present environment that have come together to make this publication timely.

First, it is clear that the exuberance and excitement that characterized the Apollo program was lost in the later NASA administrations and in the U.S. government. The theme that seeped in and took control of the space program was a philosophy of zero risk, aggressive cost control and a failure to clearly define a mission other than long-duration campouts in Earth orbit. There seemed to be no reason for space exploration other than esoteric scientific investigations – and there was little perceived relevance to the demands of everyday life.

The budgetary battles that we have witnessed over the last eight years are the second driving pressure that makes this book important now. There is always a question of whether or not public funds should be expended in efforts that do not have an immediate benefit to the public, and when the public is flooded with crisis stories of school closings and public bankruptcies there is little incentive for funding rockets to low earth orbit. Our publication provides both the justification and the economics for space exploration by clearly demonstrating the real economic and social value.

Why now? The excitement generated by the Mars rover Curiosity's landing last August, and the interest shown by the public in general toward that mission clearly demonstrates that the public wants, and needs, something beyond the mundane crisis of the moment provided by the nightly news. The technical challenge and obvious expertise necessary to successfully complete the Mars rover landing energized young minds and demonstrated the importance of science, engineering and math education.

The Russian meteorite last February

EXPLORER: Talk, if you would, about the purpose of the book and its intended target audience.

**AUTHORS:** The book's purpose is to provide the quantitative foundation for beginning to think about developing energy and minerals outside of Earth's atmosphere that are necessary to support scientific missions, space and extra-terrestrial scientific stations and permanent colonies, and ultimately expand Earth's economy beyond the near-earth environment to include space resources.

We cannot envision a situation where all resources required for future space activities are exported from Earth, therefore, this book clearly illustrates that an effective economy is possible beyond Earth's surface when we consider the resources available in near-Earth space.

Our first audience is members of AAPG, American Institute of Mining, Metallurgical and Petroleum Engineers (AIME) and other professionals engaged in energy and resource development. As energy professionals, we are concerned on a daily basis with providing the necessary energy and minerals required for our growing world population and the increasing standard of living that comes with ample energy availability.

And more than anything else, AAPG members are explorers. We are the professionals who have pushed back the boundaries of our resource base, from capturing petroleum resources from surface seeps, to drilling onshore wells to extract oil and gas, and to venturing offshore into increasingly difficult and hostile environments to supply the cheap and abundant energy made available by our advances in technology. There are

See Space Memoir, page 34



# 2013 GRANTS-IN-AID RECIPIENTS

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**Space Memoir**  
from page 32

and the meteor clearly visible from the U.S. East Coast on March 22 also demonstrated the Earth is not an isolated environment, but is subject to real and serious threats from the space environment. The need for a presence in space could not have been better demonstrated, and the public understood the implications immediately of why a space program and presence in space is important for their very personal well-being.

These two very public events are important in demonstrating the relevance of a space program, but they also will fade from the public's memory with the passage of time. What is as important is that our society and science and technology need

**There are more similarities than differences between deepwater exploration and development, and space exploration.**

a frontier to explore, and we now have the capabilities to do that in ways that both benefit science and the public in general and also provide very exciting and attractive business opportunities for private industry.

Again, we address both of these issues at great depth with Special Publication 101.

EXPLORER: *Generally, when it comes*

*to funding, talk about the need for public involvement, if you think there should be, and the pitfalls of privately financed exploration, if you think there are any. My point in asking: What kinds of demands do both make on scientific exploration? On this note, how much will these projects cost?*

**AUTHORS:** Funding space exploration programs is more complicated than a simple bipolar separation between

public and private funding. They are now intimately interrelated, as governments are now customers for private industries' space expertise and private industry is a market for government's advances in space technology.

Private industry's space business is estimated at approximately \$300 billion annually in 2011, while NASA's budget for the same year was only \$18 billion. But the current business base from private industry might not be present without the early investment by NASA during the 1960s and later. The recent successes of SpaceX and the Dragon and Falcon rockets, and the technology demonstration projects by Burt Rutan and his firm Scaled Composites illustrate that private industry has a very real leadership role to play in current and future space missions.

Extending the private industry's base from launch facilities for low earth orbit and into geosynchronous orbit is certain within the next few years, and the 2010 start-up firm, Planetary Resources, whose goal is to mine the near-earth asteroids, believes they will be capable of returning valuable minerals from asteroids within the next decade.

Private industry, however, would not have been the first to launch a mission such as the Mars rover Curiosity, or to launch a mission such as the Cassini Mission to Saturn's moons in 1997 that is still in progress and sending fundamental information back to Earth today. The ion engine developed for and tested on the Deep Space One Mission will certainly benefit the interests of firms such as Planetary Resources in their efforts at asteroid mining, so there is a definite role for public funding of space research, but it must be kept in mind that government's role is not always beneficial.

Private industry is completely capable of launching vehicles to geosynchronous orbit and beyond, but both government and private industry could accomplish this at less expense and more efficiently if nuclear thermal rockets could be used. The U.S. government developed and tested these rocket engines in the 1960s and 1970s, but then prohibited their use because of fears of having nuclear materials in orbit.

Whether or not that fear is realistic is open to question, but the fact of the government prohibiting a technology that would have revolutionized space exploration and development has certainly had a negative effect on the advancement of space utilization. The stagnation of the U.S. space program, from 1980 to the present, a loss of 40 years and a generation of scientists and engineers, has been more damaging than any single action that has occurred in the interim period.

The most important impact is increased costs. The space shuttle averaged approximately \$25,000 per kilogram to put mass in orbit, with a rather poor safety record. Careful and detailed cost estimates based on using nuclear thermal rockets indicates they could operate at rates in the range of \$250 dollars per kilogram while providing a much greater level of crew and ground safety.

The obvious conclusion is that there is a role for both public and private funding. Public funding can benefit the growth of private industry by serving as the pathfinder for innovation that ultimately significantly benefits the public through technology advancements and tax revenue.

It should not be overlooked, however, that public involvement also can restrict



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**Continued on next page**



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the advancement of private industry by overly risk-averse regulations. The cost of neglecting a viable technology may be just as costly in a negative sense, as the positive return on investment that NASA has demonstrated over the last 50 years.

**EXPLORER:** *And I guess the \$64 trillion question would be: What are the potentials for reserves in the Solar System?*

**AUTHORS:** We calculate reserves for earth-based resources in two ways – one is to assess and identify the resource magnitude that exists, and the other is to define a smaller subset of the resources, the reserves, that can be extracted under existing technology and economic conditions.

Our approach on Earth is almost inapplicable when we consider space resources.

Begin first with access to space. Whether or not we transition to nuclear thermal rockets or continue to use chemical propulsion systems, simply moving our business focus to earth orbit has created the \$300 billion per year space business that includes weather monitoring, communication systems, GIS satellites and the myriad other activities that are occurring today.

What will be the next step? We have solar power satellites proposed that may be capable of obviating the need for any fossil-fueled or land-based power generation capabilities.

Early proposals for these systems were ignored because of excessive costs, but a recent reanalysis indicates they may be competitive with current renewable energy costs. Harrison Schmitt's detailed analysis of producing Helium-3 on the moon and shipping it to earth for power generation is now also within the realm of economic competitiveness with existing power generation methods. Extraction of minerals from metallic asteroids in space is certainly economic under today's existing conditions, and may effectively out-compete all existing earth-based mining of rare earth elements, heavy minerals and precious metals.

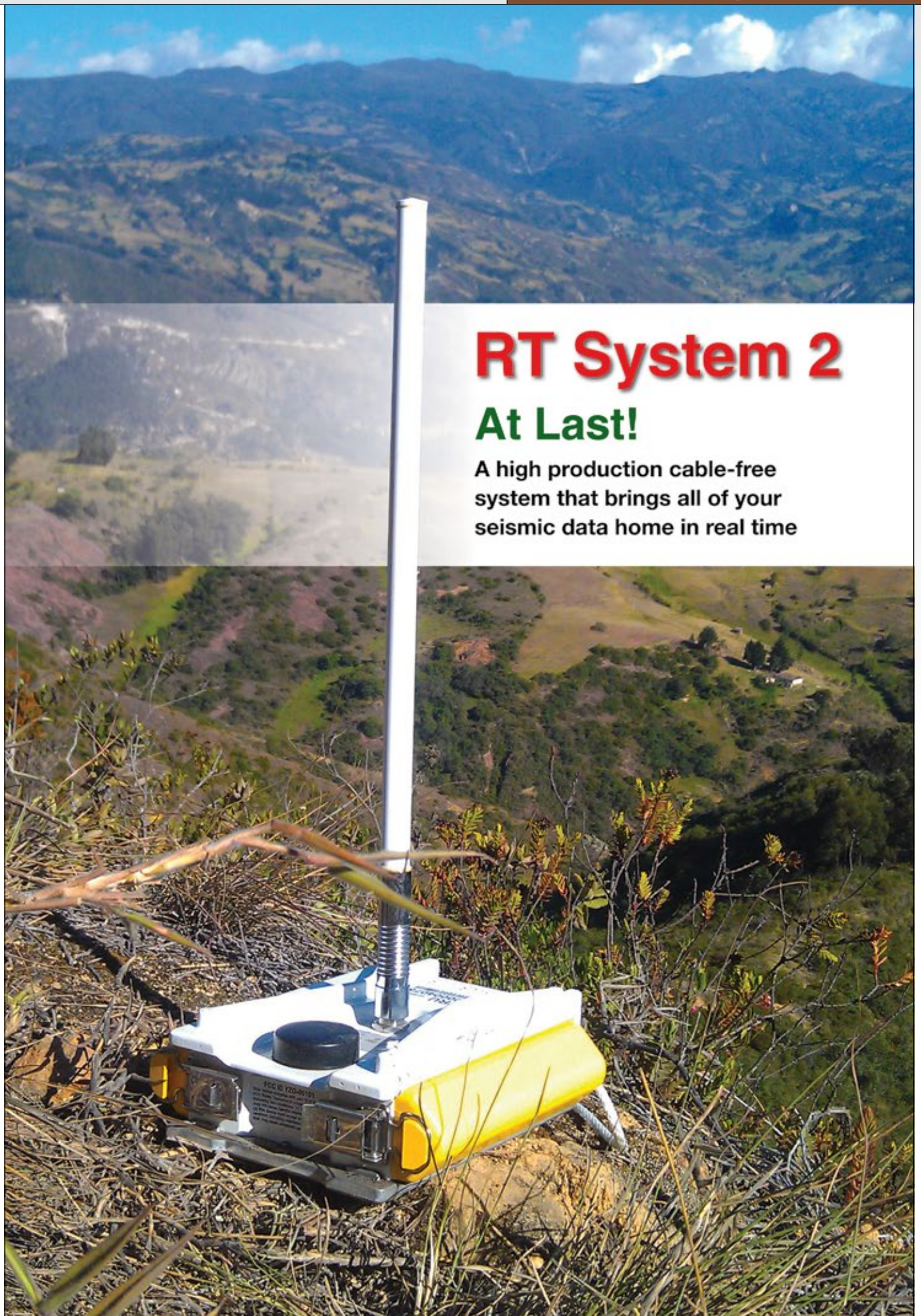
We should not forget the non-precious minerals, water and materials that also are essential to our existing economy. It does not seem likely that we would look to carbonaceous chondrites to provide kerogen-like material for our petroleum industry on earth, but these asteroids (and comets as well), contain very important materials that can provide fuels, breathing atmosphere and feedstocks for industrial organic chemistry in space.

All of the activities that we now are doing in earth orbit can be supported by industrial activities in space using the raw materials found in space, rather than having to transport material to space from earth's surface.

So how do we value these activities? The magnitude of the resources is incalculable at the present time, so instead, we have tried to demonstrate the value of reserves within the context of our present economy.

Are metallic asteroids valuable? Of course, even if we derate their value based on a single one kilometer-diameter asteroid flooding the market with platinum group metals. What's more, their value is presented in the context of the total cost of recovery and still provides an attractive return on investment that any venture capitalist would be proud to be a part of

[See The Planets, next page](#)



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**The Planets**  
from previous page

– and, as Planetary Resources and others have proposed, committed their own funds to demonstrate their confidence.

Solar power satellites and helium-3 fusion reactors are presented in light of their cost-competitiveness with existing business segments on earth, and the results reflected in the cost per kilowatt-hour confirm this.

In the final analysis, it is not really a monetary issue. What we have demonstrated is that we can expand humanity's activities beyond earth's surface, and that these activities can productively contribute to the cost of this expansion and can provide a profitable return for those private industries and those governments interested

**We, as exploration, energy and mineral professionals, have opportunities to apply our skills to near-earth space as effectively as we have proven them here on Earth.**

in supporting space exploration and development.

The aggressive growth and expansion of space-based businesses here on earth is confirmation that we, as exploration, energy and mineral professionals, have opportunities to apply our skills to near-earth space as effectively as we have proven them here on Earth.

EXPLORER: *Is the idea of exploration*

*and development beyond our atmosphere a tough sell, or do you think the will and agreement to do it has been reached?*

**AUTHORS:** We believe that we have now reached the point where motivated individuals, companies and governments understand the potential rewards – in both financial returns and in the sense of pure exploration – justify the expansion of space exploration and utilization.

Manned space exploration and

development is still perceived as a highly risky endeavor, and government institutions are classically risk-averse. Society as a whole has become more risk averse over the last 40 years since the Apollo program.

But for rational people, business managers and owners, and government officials, risk can be controlled when thorough scientific and engineering analyses are applied to define the risks and ensure that adequate measures are taken to address these risks.

We believe this book provides the foundation to assist decision makers in both public and private industry to commit to expansion into near-earth space.

We also believe that we have identified areas where significant improvements can be developed that will make this expansion safer, cheaper and ultimately more attractive.

New and more reliable launch systems must be developed; and nuclear thermal rockets represent the most immediate opportunity to address this area.

We have ample information on the long-term effects of micro-gravity and low gravity environments on human health; now we need solutions to make long duration space flights safer.

We must have more flexible and reliable space suits, for the previous ones used during the Apollo program and currently used on the International Space Station are dangerous, awkward and horribly unwieldy. We must have a suit that provides the same flexibility as an earth-bound construction worker's hardhat, gloves and safety goggles. Without this, we endanger our astronauts and limit the scope of work that is possible.

We will need to develop new mining and construction methods that are efficient in the absence of significant gravity. All of our earth-bound methods really work because we use gravity to work with us or against us for leverage. How we will face the environment where we must create our own leverage without the assistance of gravity remain to be developed.

Finally, we hope that readers of SP 101 will recognize that the human race has moved mountains, changed the course of rivers and built cities that span miles. Why should we hesitate to establish colonies on the moon or Mars, or construct permanent space stations that collect and beam solar energy to earth?


We do not lack the economic wherewithal or scientific and engineering know-how to accomplish these things. Our experience on earth is transferable to space, and we can succeed in these endeavors as we have succeeded in many others.

EXPLORER: *Any closing thoughts?*

**AUTHORS:** There is so much to be said about the why and how of space exploration and utilization that one volume is not enough to do more than simply provide an overview. Perhaps our thoughts can best be summarized in a quote from Robert Zubrin from his 1996 book, "The Case for Mars:"

*"Unless people can see broad vistas of unused resources in front of them, the belief in limited resources tends to follow as a matter of course. And if the idea is accepted that the world's resources are fixed, then each person is ultimately the enemy of every other person, and each race or nation is the enemy of every other race or nation.*

*"The extreme result is tyranny, war and even genocide.*

*"Only in a universe of unlimited resources can all men be brothers."* 

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*Japan records successful test*

# Hydrates' Gas Potential Leaps Toward Reality

By KIMBERLEY CORWIN

After decades of research and multiple onshore arctic production experiments, Japan has taken a leap forward in natural gas production by conducting the first successful production test of natural gas from marine hydrates.

"This is the world's first trial production of gas from oceanic methane hydrates, and I hope we will be able to confirm stable gas production," announced Japanese Trade Minister Toshimitsu Motegi following ignition of the burner on the Japanese drilling ship Chikyu on March 12, 2013.

Provisional data from the Japan Oil, Gas and Metals National Corporation (JOGMEC) indicate that during the six-day production test, the well produced 120,000 cubic meters of natural gas with an average daily production of 20,000 cubic meters.

A 2008 onshore, five-and-a-half day test in Canada using similar methods produced a total of 13,000 cubic meters of natural gas.

Further data analysis will indicate if gas production from the marine methane hydrate prospect in the Nankai Trough is commercially viable.

This methane hydrate deposit lies 300 meters below the seafloor in waters 500 meters deep, 80 kilometers off the Pacific Coast of central Japan.

The Nankai Trough may hold 1.1 trillion cubic meters of methane hydrates – enough to replace all of Japan's liquid natural gas (LNG) imports for 11 years.

Japan's National Institute of Advanced Industrial Science and Technology



CORWIN

Methane hydrates represent a potentially vast resource that could be the "bridge" fuel needed in the coming energy transition.

estimates that over seven trillion cubic meters of methane hydrates, or a 100-year supply, resides in the marine sediment around Japan.

Japan plans to initiate a three-year study of its territorial waters in the Sea of Japan to measure marine methane hydrate reserves.

Utilizing depressurization, JOGMEC aims for technologically and economically viable production of methane hydrates within five years.

In a country dependent on LNG imports and facing an unsure future for its once prominent nuclear program, domestic gas production from hydrates offers the potential for Japan to "finally have an energy source to call its own," said JOGMEC spokesman Takami Kawamoto.

### A Methane Cage

Methane hydrates, or clathrates, are methane (CH<sub>4</sub>) molecules surrounded by solid water-ice lattices. The water molecules form a cage around, rather than bonding

with, the methane.

Methane forms from biological and thermogenic processes. Biological methane is generated by the bacterial breakdown of organic material in shallow sediments.

Thermogenic methane is created when deeply buried organic-rich sediments are subjected to high temperatures and pressures. Such methane can move vertically through overlying sediment.

Methane hydrates form when methane gas reaches a depth and temperature where hydrates are stable and the gas becomes locked into the crystalline ice structure.

Methane hydrates are stable at high pressures and low temperatures. Arctic deposits predominantly occur in the lower parts of and beneath permafrost at depths greater than 200 meters. Marine deposits are found on and beneath the seafloor in water generally deeper than 500 meters. Gas hydrates have been identified in mounds on the seafloor, in veins and in cements in subsea sediments.

Production technology seeks to alter the surrounding conditions through heating or depressurization to achieve dissociation of the gas from the lattice structure. If ignited while dissociating, the methane hydrates look like "burning ice."

The concentration of methane gas in hydrate deposits is significant: one cubic foot of hydrate contains 164 cubic feet of gas at surface temperature and pressure, according to the Department of Energy's (DOE) National Energy Technology Laboratory (NETL).

### Hydrate's History

Once believed to exist only as synthetic products in the laboratory, naturally forming hydrates were discovered in the 1960s. Subsequent discoveries in the 1970s and 1980s of deposits in cores from the North Slope of Alaska and the Deep Sea Drilling Program prompted the creation of a national hydrate research and development (R&D) program in the United States in 1982.

Research in the 1980s and early 1990s focused on arctic permafrost deposits. Study of marine deposits began in 1995 with the Ocean Drilling Program's Blake Ridge exploration offshore South Carolina.

While Blake Ridge methane hydrate concentrations are too low to allow commercial extraction, field testing in

Continued on next page

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Topics include fluvial architectures, predicting facies changes, fluid flow models, thermodynamic modeling, seismic imaging, and reservoir characterization.

Examples will include Jubilee (offshore Ghana) and the Mississippian Lime (chat), as well as other illustrative and instructive examples.

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**Continued from previous page**

Japan's Nankai Trough in 1998 and 1999 confirmed substantial natural gas reserves. Sandstone in the Nankai Trough was found to contain up to 80 percent methane hydrate saturation.

In the United States, the Methane Hydrate Research and Development Act of 2000 and its subsequent extension under the Energy Policy Act of 2005 established an interagency collaborative methane hydrate R&D program directed by the DOE.

Japan and Canada partnered to conduct production experiments in the 2000s in the Canadian Arctic, demonstrating the feasibility of producing natural gas from hydrates. In 2012, the United States and Japan, in partnership with ConocoPhillips, successfully produced methane gas from methane hydrates in the North Slope of Alaska.

Additional methane hydrate explorations have been conducted by other countries, including China, India and South Korea.

The NETL methane hydrates primer provides a more extensive history of gas hydrate R&D.

**An Abundant Resource**

Natural gas accounted for 24 percent of U.S. energy production in 2010 and is projected to increase to 30 percent by 2040, according to the U.S. Energy Information Administration's Annual Energy Outlook 2013 Early Release.

Natural gas offers a fuel source that burns cleaner than other fossil fuels and may serve as a "bridge" fuel to aid in the transition to more renewable energy.

Methane hydrates represent a potentially vast resource that could create that "bridge."

Estimates of total methane trapped in hydrates globally vary widely:

▶ Some estimates indicate that twice as much carbon exists in methane hydrates than in all other fossil fuels.


▶ The U.S. Geological Survey's Gas Hydrates Project estimates global methane in hydrate form at between 100,000 trillion cubic feet (Tcf) — over 4,000 times the 2010 U.S. consumption — and 5,000,000 Tcf.

▶ NETL lists 700,000 Tcf as a common global methane estimate, but notes a possible range of 100,000 to 1,000,000 Tcf.

▶ Not all methane is technically or economically recoverable. Early estimates place technically recoverable methane at around 30,000 Tcf, according to the 2011 paper in Energy and Environmental Science by Boswell and Collett.

▶ The U.S. Bureau of Ocean Energy Management estimates that methane contained in the Gulf of Mexico would more than triple the U.S. total natural gas resource.

Natural gas in methane hydrate deposits may be a significant energy resource for the future. Research continues into the potential environmental and climatic impacts of methane extraction from hydrates.

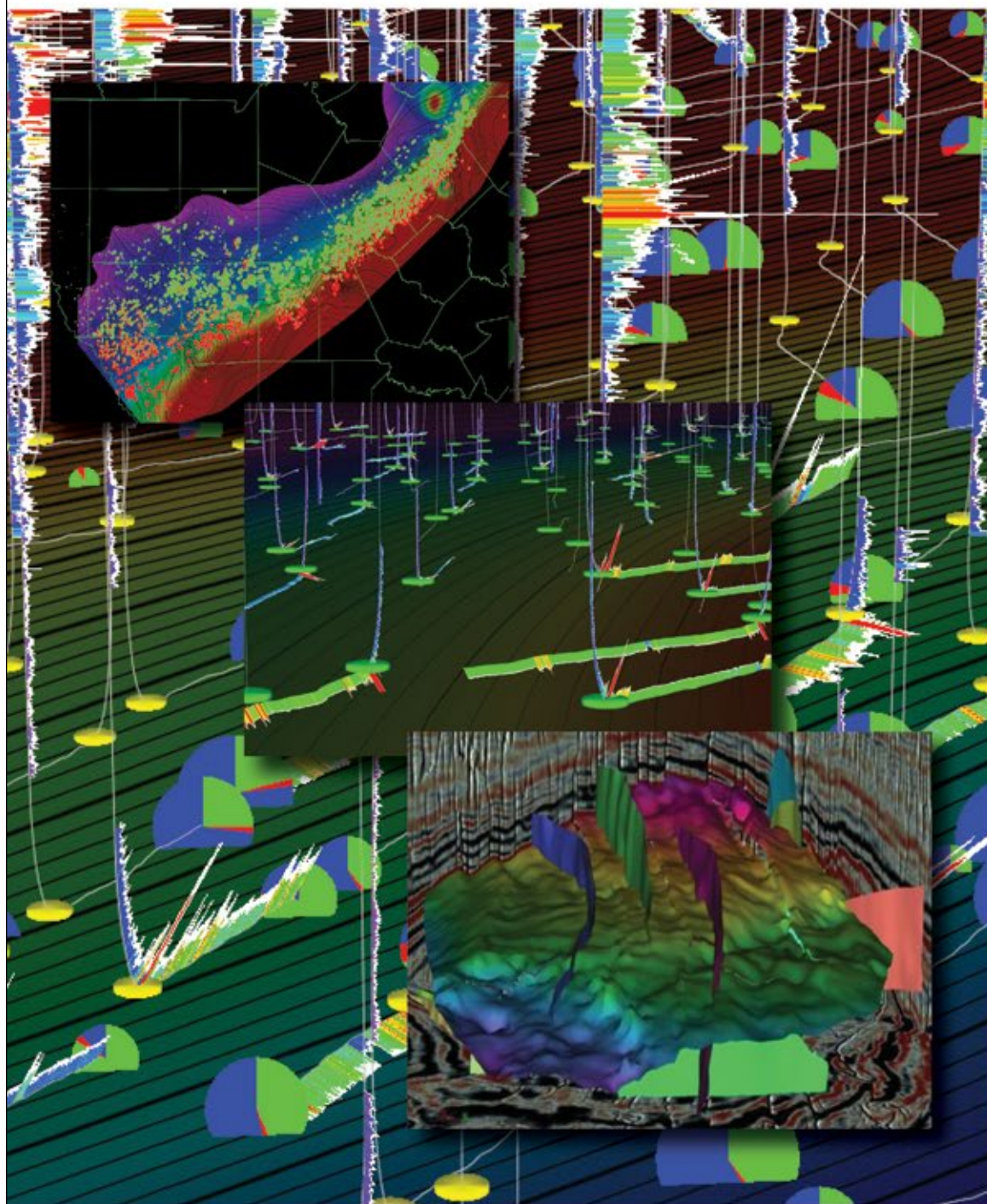
Marine methane hydrate resources contain an order or two in magnitude more methane hydrate than permafrost resources, but have posed greater production challenges. Japan's successful production is a tremendous technological breakthrough and offers hope of more easily accessing the world's extensive marine hydrate resources. 

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*Interpreting AVO*

The editors of INTERPRETATION invite papers on the topic of "Interpreting AVO" for publication in the May 2014 special section/supplement of INTERPRETATION.

Since amplitude variation with offset (AVO) analysis was introduced to the geoscience community in the 1970s, the interpretation of AVO data has become a basic component of many geoscience projects. The development of innovative interpretation technologies for AVO has been sustained through libraries of drilling analogs as well as better integration of stratigraphy, rock physics, direct borehole measurements, improved amplitude preserving data processing, and theoretical modeling. As a result, AVO and related quantitative interpretation methods now commonly influence decision-making throughout exploration and development.

The objective of this special INTERPRETATION section is to showcase both the history as well as recent advances in AVO interpretation. Emphasis will be placed on the art and science of the interpretation process of incorporating AVO into exploration, development, and production projects. Topics of the special section will include but not be limited to:

- impact of the rock types and stratigraphic facies on the AVO response,
- use of AVO for identifying lithology, determining fluids, booking reserves, monitoring reservoir pressure, and evaluating fluid dynamics,
- capturing and describing uncertainty in AVO predictions, and
- objective description of successes and pitfalls of AVO analysis in exploration and development projects.

Interested authors should submit their manuscripts for review no later than **31 July 2013**. In addition, the special section/supplement editors would like to receive a provisional title and list of authors as soon as possible. Authors should submit via the normal online submission system for INTERPRETATION (<https://mc.manuscriptcentral.com/interpretation>) and select this topic in the manuscript-type dropdown box. The submitted papers will be subject to the regular peer-review process, and the contributing authors also are expected to participate in the review process as reviewers.

We will work according to the following timeline:

Submission deadline  
31 July 2013

Peer review complete  
31 December 2013

All files submitted for production  
20 January 2014

Publication of issue  
May 2014

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INTERPRETATION special section  
**CALL FOR PAPERS**

**POLICYWATCH**

*The rite of spring*

**Annual CVD Takes AAPG to Washington**

By EDITH ALLISON, GEO-DC Director

**A**pril brought AAPG members to Washington, D.C., for visits with federal agencies and Senate and House offices.

At the same time, most of the local population and hordes of visitors

focused on the cherry blossoms, while lobbyists and citizen's groups advocated for or against federal spending and other legislation.

As part of our annual Congressional Visits Day (CVD) AAPG members visited agency and congressional offices, advocating for geoscience research and science-based regulation, learning about the activities and opinions of decision makers, and establishing contacts for future communication.

Our only complaint was that so few AAPG members were able to join us.



ALLISON

**Sudden Impact**

This year our group of 10 people – together or as smaller groups – met with six executive branch agencies and 20 senators' or representatives' offices.

At the U.S. Department of Energy's Office of Oil and Natural Gas we learned about plans for new research on unconventional oil and gas, and the expansion of the online library of research results from projects funded through RPSEA (Research Partnership to Secure Energy for America).

We had an opportunity to meet with several Department of Interior agencies and had the opportunity to talk about "best practices" of resource assessment methodologies and peer review.

On Capitol Hill, every senator and representative is actively involved in decisions about government spending, taxation or regulation, and they try to understand the facts as well as their constituents' views on pending legislation. AAPG-member communications are aided by the fact that most senators and representatives

have a staff member responsible for energy legislation and issues.

Elected officials welcome visits from their constituents, and they value objective information about issues that their constituents are asking them about,

**AAPG member visits have additional benefits in establishing bridges for future communication, making members a source of accurate scientific information for senators and representatives.**

such as the safety of hydraulic fracturing. AAPG members offer both. AAPG arranged that a constituent led each CVD meeting, and the diverse experience of our group meant we could answer most questions or offer an email follow-up.

AAPG member visits have additional benefits in establishing bridges for future communication, making members a source of accurate scientific information for senators and representatives.

AAPG members urged lawmakers to pursue policies that encourage responsible development of the nation's energy resources, and for continuing federal research and development funding that is the foundation of new technologies for more-efficient exploration and production.

Federal R&D also was highlighted as critical to research projects that help educate the next generation of geoscientists.

Hydraulic fracturing for unconventional resources is a major issue on Capitol Hill, and AAPG members were able to share insights and facts, and recommend research articles to staffers.

Discussions ranged from energy research to federal land access. For example:

**See Policy, page 42**

**HoD Elects Dolph, Approves Division**

**D**avid Dolph was voted chair-elect of the AAPG House of Delegates during the group's recent meeting in Pittsburgh before the AAPG Annual Convention and Exhibition.

Dolph, with Nexen Petroleum International in Calgary, Canada, will serve as the House's chair-elect for the 2013-14 term, and then will assume the chair for the 2014-15 term.

Delegates also elected **Dan Billman**, Mars, Pa., as the House secretary-editor.

The HoD chair for 2013-14 is **Lawrence H. Wickstrom**, with Wickstrom Geoscience in Worthington,

Ohio, who also will sit on the AAPG Executive Committee for the coming year.

All assume their offices July 1. In other HoD action, the delegates:

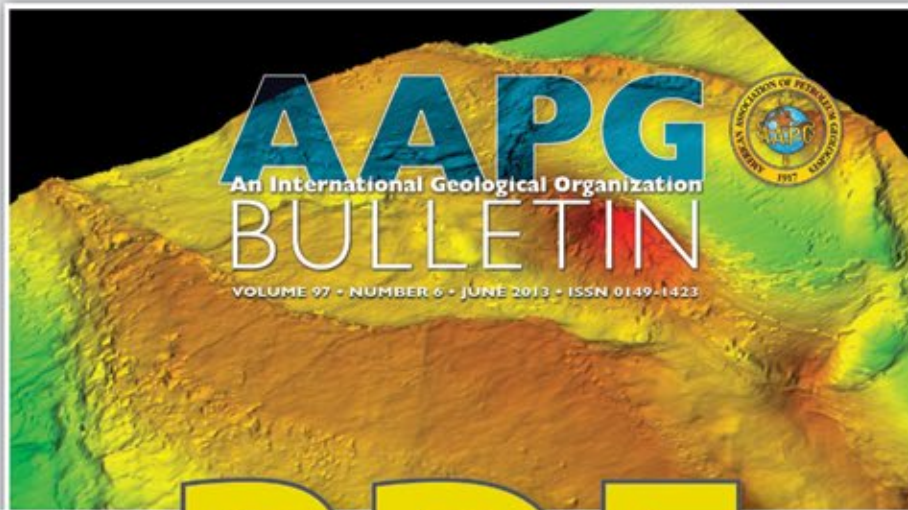
▶ Approved the creation of a new technical division of AAPG, to be called the Petroleum Structure and Geomechanics Division.

▶ Approved a proposal to change the boundary between AAPG's Asia Pacific and Europe Regions, which means five central Asian countries – Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan – are now part of the Europe Region.

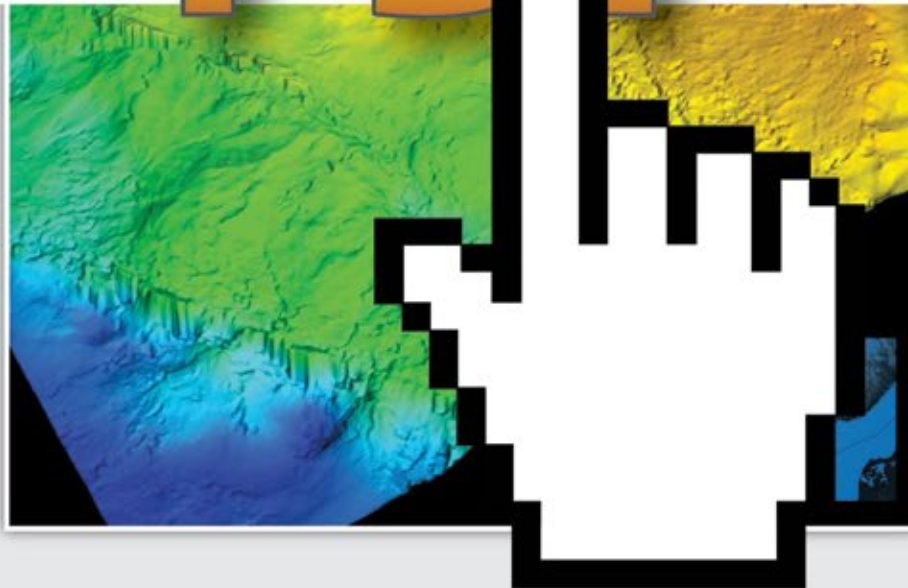


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### ANALYZING FAULT PATTERNS

*Darrell W. Sims, Alan P. Morris, Danielle Y. Wyrick, David A. Ferrill, Deborah J. Waiting, Nathan M. Franklin, Shannon L. Colton, Yoshihiko Tamura Umezawa, Mamoru Takanashi, and Emily J. Beverly*

Fault and fracture patterns above Middle East domes are influenced by the effects of dome shape, regional extension, and relative timing of uplift with respect to regional extension. The two adjacent domes in this study may have experienced different kinematic histories as previously assumed.



### USING ISOPACH AND PALEOGEOGRAPHIC MAPS

*Mark A. Kirschbaum and Tracey J. Mercier*

Facies are preserved as a function of their geographic location within the foreland basin. The higher accommodation depozones close to thrust fronts are most likely related to development of a foredeep while the lowest areas of accommodation are associated with a flexural or a broken forebulge depozone.



### UNDERSTANDING THE MANDAL HIGH

*Anders Rosslund, Alejandro Escalona, and Rinn Rolfsen*

This paper provides a detailed subsurface view, petroleum potential, and an evolutionary model for the Mandal High, North Sea. Three-dimensional imaging of crystalline rock and basin structures allow for a better understanding of the different fault families and provide insights into the basement structure.



Members may access the AAPG Bulletin online at:  
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Also, submit your next paper for consideration via [www.aapg.org/bulletin](http://www.aapg.org/bulletin).



## Energy Forum Set on Unconventional Oil Impacts

An energy policy forum dealing with issues that significantly impact oil and natural gas exploration will be held at this year's Rocky Mountain Section annual meeting, set Sept. 22-24 in Salt Lake City.

This forum looks at the "Environmental, Economic and Cultural Impacts of Unconventional Oil and Gas Development," and it will be held at 1:20 p.m. Monday, Sept. 23. Edith Allison, director of AAPG's GEO-DC office and the monthly columnist of the EXPLORER's popular "Policy Watch," will be the moderator.

The session will focus on an inescapable fact: As unconventional oil and gas production expands into new

regions, or exploration and production activity swells in historic producing areas, non-technical concerns increase.

For example:

- ▶ How does ground water consumption by the petroleum industry coexist with regulations and public perceptions about potential shortages in arid locales?

- ▶ Should communities encourage a particular energy technology, such as natural gas or renewables? And what should be the basis – air quality, increased jobs and/or protection of wildlife and scenery?

- ▶ Job growth and population increase – how much is too much?

This forum is part of a GEO-DC initiative to increase the two-way flow

of information between scientists and policy makers, bringing geoscience to Washington decision-making, and informing AAPG members about how policy affects their work.

The half-day session will focus on issues specific to the Rocky Mountain region, such as:

- ▶ Air quality issues in basins that suffer from winter temperature inversions, protecting sage grouse.

- ▶ Training workers for new jobs in the petroleum industry; state efforts to protect sparse water supplies; and the economic impacts of rapid unconventional resource development.

For more information visit the RMS website at [www.rmsaapg2013.com](http://www.rmsaapg2013.com).

## Policy from page 40

- ▶ The America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education and Science Act of 2007 (America COMPETES Act), was reauthorized in 2010 and will expire in 2013. The bill establishes and extends science, technology, engineering and mathematics (STEM) education and training programs. House Science Committee staff informed us that Committee Chairman, Lamar Smith (R-Texas), is planning to introduce a bill reauthorizing the legislation.

Subscribe to GEO-DC Action Alerts for announcements about pending legislation and the opportunity to inform Congress of your opinions.

- ▶ We learned that Representative Tim Murphy (R-Pa.) and Senator Rob Portman (R-Ohio) are planning to introduce bills that would accelerate offshore leasing and use those revenues for bridge, highway and other infrastructure renewal.

- ▶ Representative Steve Stockman (R-Texas) was interested in our group's explanations of the potential for shale gas plays to reach his east Texas district.

- ▶ Representative Jim Bridenstine (R-Okla.) is a freshman who is interested in learning more about energy issues and energy-related employment – areas where AAPG members can provide useful information.

### CVD and Federal Budgets

AAPG Congressional Visits Day traditionally is scheduled in the spring to allow members to discuss budgets and spending plans with federal agencies such as the U.S. Geological Survey and the Department of Energy, and allow members to urge funding priorities to Congress.

The president rolled out his fiscal year 2014 budget in early April rather than at the usual time in early February. This late release, as well as the fact that Congress is moving slowly in its budgeting process, meant that our group had few discussions about specific energy and research funding issues.

However, the contacts that we established at CVD will give us an opening to discuss budget issues in the future.

\* \* \*

All AAPG members are encouraged to participate in Congressional Visits Day – no experience is required. It is difficult to get away from the office for several days, but past CVD participants will tell you that it is well worth the effort.

Our next AAPG CVD will be in spring 2014, although another opportunity is the Geoscience Congressional Visits Day on Sept. 17-18, which is hosted by the American Geosciences Institute. AAPG members participate in these fall visits, too, with scientists from other AGI member organizations such as the Geological Society of America, the American Geophysical Union and the American Institute of Professional Geologists.

If you cannot participate in either of these annual events, you can ask the GEO-DC office for assistance in setting up visits to your senator or representative whenever you can make it to Washington, D.C.



## AAPG EUROPEAN REGION - UPCOMING EVENTS

### Education Week

*Budapest, Hungary*

26-30 August 2013

[europe.aapg.org/2824](http://europe.aapg.org/2824)

### Petroleum systems of the Paratethys: Exploring the Pathway from Europe to Asia

*Tbilisi, Georgia*

26-27 September 2013 - CALL FOR ABSTRACTS DEADLINE: 31 May 2013

[europe.aapg.org/2796](http://europe.aapg.org/2796)

### 3P Arctic Conference & Exhibition

*Stavanger Forum, Norway*

15 - 18 October 2013

[www.3parctic.com](http://www.3parctic.com)

### APPEX Regional 2013

*Ceylan Intercontinental Hotel, Istanbul, Turkey*

5-7 November 2013

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

### APPEX Global 2014; Prospect and Property Conference & Exhibition

*Business Design Centre, London, UK*

11-13 March 2014

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Montana August 17-25, 2013

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Deposits to Changes in Accommodation  
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Application of Structural Geology in Prospecting in  
Thrust and Extensional Terrain  
Jackson Hole, WY August 19-23, 2013

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**GEOPHYSICAL CORNER**

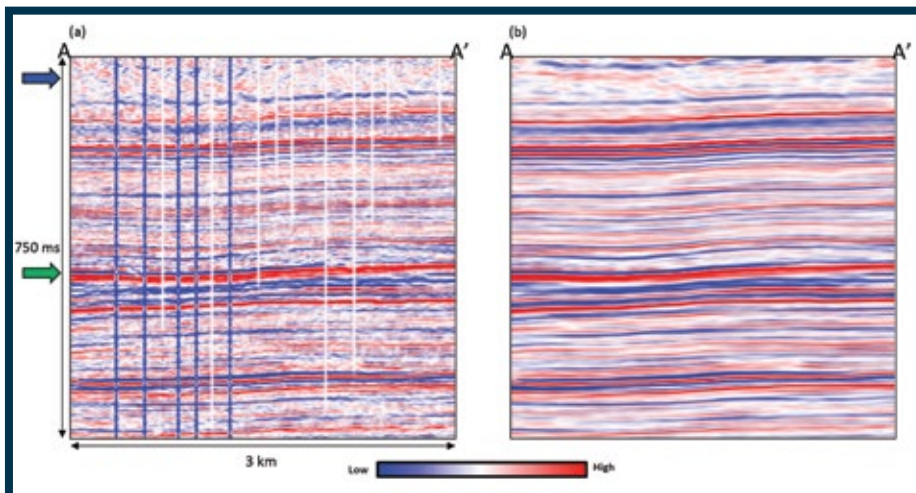
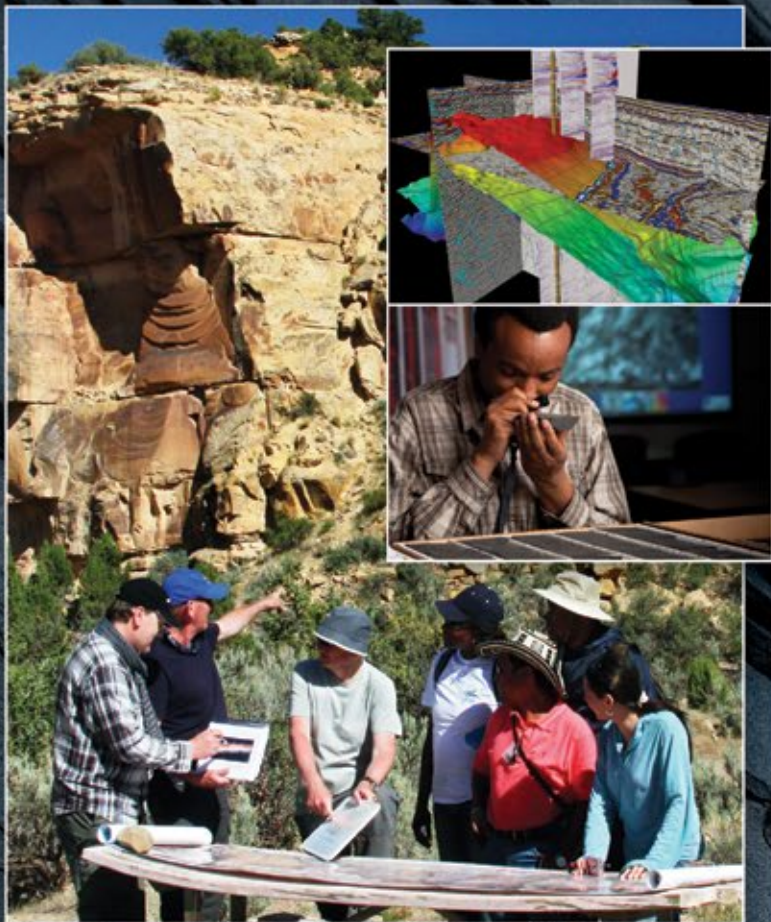


Figure 1 – Vertical seismic sections through the seismic volume (a) before, and (b) after 5-D interpolation.

*Confident displays*

# Finding the Path Past 'Attribute Footprints'

By SATINDER CHOPRA and KURT J. MARFURT

Three-D seismic surveys usually are designed in a way that the subsurface features are regularly sampled in different dimensions, comprising the spatial coordinates, offsets and azimuths.

Many processing algorithms require this regularity for their optimum performance. For example:

- ▶ Marine acquisition suffers from platforms, shallow shoals, and tides and currents that give rise to feathering, all of which result in irregularity in spatial sampling of the data.

For older marine surveys, inlines are well sampled while crosslines are more coarsely spaced.

- ▶ Land acquisition encounters a different suite of obstacles, such as highways, buildings and lakes.

Such obstacles, coupled with limited recording capacity and greater cost, results in missing data or "holes" in seismic data coverage.

- ▶ Finally, recording equipment malfunctions and noise bursts during acquisition may add more missing traces to the usable recordable data.

Sparse or missing data create problems while processing, as the

different algorithms applied pre-stack or post-stack demand regularity in the offset and azimuth dimensions for optimum performance.

Non-uniformity in offsets and azimuths leads to inconsistencies in fold that follow a regular pattern we refer to as "acquisition footprint." This imprint is an undesirable artifact that masks geologic features or amplitude variations seen on time slices from the seismic data, especially at shallow times.

Besides, the seismic data-derived attribute volumes also show acquisition footprint and other artifacts.

Obviously, the ideal way to fill in the missing data gaps would be to reshoot the data in those areas – although such infill acquisition would be extremely expensive per data point, if the equipment could be made available for such a small time in the field.

Such problems have been addressed at the processing stage since the advent of digital processing. The most common preconditioning of seismic data improves the signal-to-noise ratio of the seismic data by removing spatial



CHOPRA



MARFURT

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**May 27–June 1, 2013: Malta**

Oligo-Miocene Carbonate Sedimentary Modeling and Analogs for Cenozoic Reservoirs Worldwide

**June 3–8, 2013: South West Province, UK**

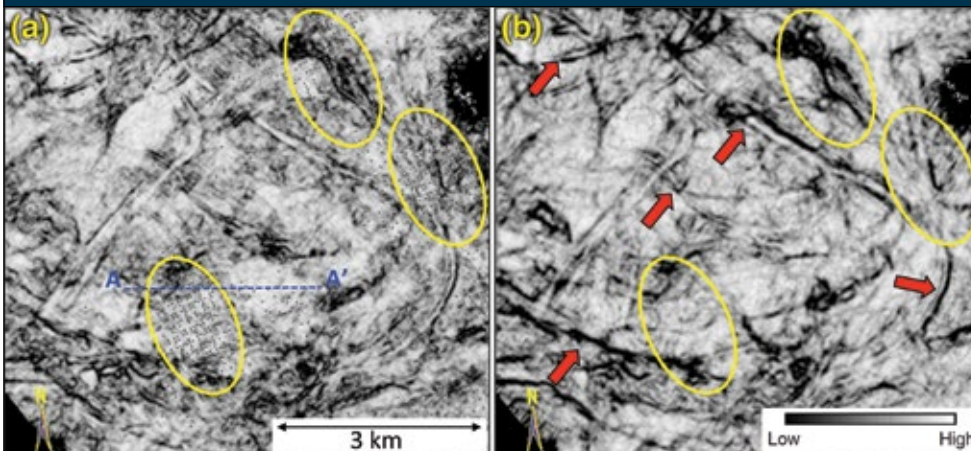
Late Paleozoic–Early Mesozoic Sedimentation

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Figure 2 – Horizon slices a few milliseconds above the marker indicated with the green arrow in figure 1a, from the coherence volumes computed from seismic data (a) before, and (b) after 5-D interpolation.





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# A Message From One of the 'Oldest New Guys'

By JOSH HICKMAN, YP Eastern Section Leader

At the age of 33 and with 10 years of work experience in the oil and gas field under my belt, I find myself at a transition point that I never thought much about.

By most accounts, I am rapidly approaching the limit of my designation as a Young Professional (YP).

I am, therefore, uniquely positioned to challenge on the following statement: AAPG does not meet the needs of today's YPs.

The source of this statement is inconsequential to the issues it suggests. Chief among these are that



HICKMAN

modern YPs are somehow different than their predecessors and that AAPG is somehow ill-equipped to handle their needs.

AAPG always has been my lifeline to the industry-at-large and a huge part of my education as a geologist.

\* \* \*

I graduated and began work at the tail end of the last major hiring "freeze," which

lasted from the mid-1990s to the early 2000s. This "freeze" has defined our YPs and affected the demographics of most companies in the oil and gas sector.

A large age and skill gap exists in what is now the 35-45 age range throughout the world. This has set our industry up for the "Great Crew Change," where those who are currently 50 years of age or older are nearing retirement, but there are few middle-aged professionals to fill the many soon-to-be vacant positions.

To counteract the wave of impending retirements, the industry has been hit by an influx of new hires. Not only does this mean that the YPs represent a large segment of today's industry, but also that there are fewer mentors to train them. As a consequence, YPs will necessarily have to take on greater responsibilities sooner rather than later.

This is what makes today's YPs different from in the past – and compounding the typical hunger to learn and prove themselves is the urgency for YPs to grow and achieve at a faster pace.

\* \* \*

AAPG always has been my lifeline to the industry-at-large and a huge part of my education as a geologist.

Like many who do not go to work for the major corporations, which have established training programs, my first job out of graduate school was analogous to crazy Uncle Dave throwing you as a six-year-old into the deep end of the swimming pool to teach you how to swim.

After a few weeks at my first full-time job, it became readily apparent that there's a high degree of stress that comes with planning an exploration drilling program – and in dealing with that stress, I came to realize the value of the monthly lifesavers that AAPG delivered to me in the form of the BULLETIN and EXPLORER. The mapping workflows or exploration ideas they provided in the articles were like on-the-job training that I could directly apply to my projects.

Sometimes what I tried worked well, and sometimes it did not, but science thrives on trial-and-error.

While the publications and Internet components of AAPG are more resources for the individual, the Section/Region meetings, continuing education courses and international events are what breathe life into the earth science community. This aspect of AAPG is indispensable for YPs, because while leveraging what you know is a good way to solve a problem, leveraging the knowledge in your network is a powerful recipe for success.

In the AAPG Eastern Section, the few of us who were hired in 2003 fondly refer to ourselves as the "oldest new guys." At the Eastern Section's annual meeting that year we were the youngest people there by 15 years. We knew no one outside of our companies going into that meeting, but after a few days and lots of handshakes we came away representing not only our respective companies, but also "the Industry."

I keep in close contact with the friends and mentors that I met at my first Eastern Section meeting. This sense of community is a great and necessary service that AAPG provides to YPs.

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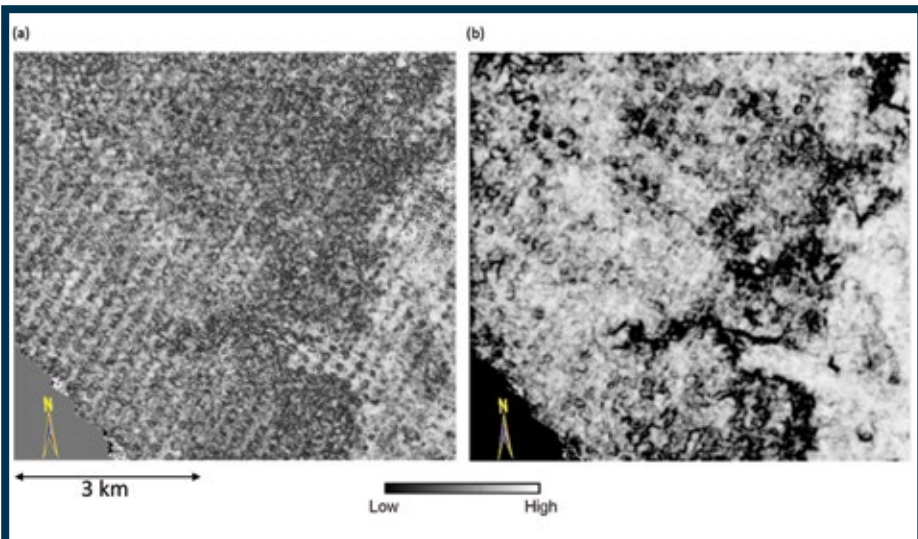


Figure 3 – Time slices at the level of the blue arrow in figure 1a, through the coherence volumes computed from seismic data (a) before, and (b) after 5-D interpolation.

## Geophysical Corner from page 44

noise or enhancing the coherency and alignment of the reflection events, without unnecessary smoothing or smearing of the discontinuities.

Although we usually think of removing unwanted features, we also can improve the signal-to-noise ratio by predicting unmeasured signal, such as dead traces and lower-fold areas corresponding to unrecorded offsets and azimuths in the gathers.

\* \* \*

Prediction or population of missing traces in seismic data is referred to as interpolation. Initial interpolation methods used localized information, such as creating a missing trace by taking the lateral average of measured adjacent traces.

These methods worked well on stacked data volumes. A geologic feature seen on seismic data has three dimensions – time, an easting (x) and a northing (y). However, modern seismic processes such as prestack impedance inversion uses a fourth dimension of source-receiver offset (h), while azimuthal anisotropy uses a fifth dimension of source-receiver azimuth.

The gap between the measured traces of a given offset-azimuth volume can be quite large, such that simple interpolation of spatial neighbors no longer works.

During the last decade or so, more sophisticated methods for data interpolation have evolved that interpolate the missing traces using not only in with neighboring samples in t, x and y, but also in offset and azimuth. Such “5-D” interpolators operate simultaneously in all dimensions, and are able to predict the missing data with more accurate amplitude and phase variations.

As expected, these methods are compute intensive and have longer run-times than the simplistic interpolation methods.

\* \* \*

We demonstrate here the application of one such method of 5-D interpolation on seismic data and show how it aids some of the seismic attributes derived from them.

In figure 1a we show a representative

vertical slice through a merged 3-D amplitude volume that has many dead traces. Such dead traces are seen on other inlines as well.

The location of this inline is shown in figure 2a, where we show a horizon slice through the corresponding coherence volume.

The dead traces result in the speckled pattern indicated with yellow ellipses. To regularize the data, 5-D interpolation was run on the seismic data prior to migration with the equivalent displays shown in figures 1b and 2b, respectively.

Notice in figure 1b that not only are the missing traces interpolated, but the overall signal-to-noise ratio and reflector continuity is improved.

Similarly, note the absence of the speckles associated with the missing traces and the greater continuity of the channel and other discontinuity features as indicated by the red arrows.

The inference we draw from this example is that regularization by 5-D interpretation yields better-focused images. Interpretation carried out on such attributes will definitely be more accurate than the one carried out on data without regularization.

\* \* \*


As 5-D interpolation discussed above regularizes the geometry of the seismic data, it addresses the root cause of the footprint arising due to the acquisition irregularities.

In figure 3a we show time slices at 158 ms, where the acquisition footprint appears prominently on the coherence attribute as striations in the NE-SW direction masking the reflection detail behind them. Figure 3b shows the equivalent coherence slice after 5-D regularization exhibiting considerable improvement in data quality.

Seismic data usually have geometry regularization issues that give rise to artifacts on geometric attribute displays. Five-D interpolation methods adopted during processing help address issues such as missing data pockets and acquisition footprint striations.

Coherence and curvature attributes computed on regularized seismic data yield displays clear of these artifacts, and so lead to more confident displays.

We thank Arcis Seismic Solutions, TGS, for encouraging this work and for permission to present these results.

*Editor's note: AAPG member Kurt J. Marfurt is with the University of Oklahoma, Norman, Okla.* 

# FOUNDATION GRANTS FOR UNDERGRADUATE STUDENTS



The L Austin Weeks Undergraduate Grant Program for 2012-13 is made possible through a generous gift from the late L Austin Weeks and Marta Weeks-Wulf. In 2013, there are 61 recipients. Qualified student applicants and their AAPG Student Chapters receive \$500 each. The purpose of the grant is to support educational expenses of undergraduate geoscience students and their departments. With more than 300 student chapters operating, the need is very great. Consider supporting this fantastic grant program.



### To the AAPG Foundation.

On behalf of the University of Iowa Student Chapter, Thank you!

Meredith Petrie  
University of Iowa  
AAPG Student Chapter  
President



### A thankful student

I feel extremely blessed to receive this scholarship and our AAPG chapter is very thankful as a whole for the money you have provided. The chapter will use the money to fund our yearly AAPG field trip. This year, we will be going to Sudbury to look at the different types of mineralization. I will personally use the money provided to pay for our exploration geology field trip and new articles of field gear.

After I graduate in the fall, I plan on pursuing my masters in geochemistry and stratigraphy. My long-term goals involve working in the petroleum exploration industry. This summer I will participate in a short course with Exxon Mobil. The grant you provided has helped prepare me to succeed in this course and obtain my goals.

Again, thank you very much.  
Samuel H. Saltzman

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**HISTORICAL HIGHLIGHTS**

*D-Day memories from afar*

# Hero at Large – The Ultimate Quiet Man

By OLIVER L. CAMPBELL

In 1953 I started work with the Shell Company of Venezuela in its Caracas head office at the end of Avenida Vollmer in San Bernadino. It was a pleasant place to work and my office had a fine view of the Avila mountain that provides the backdrop to Caracas.

It also was far removed from Shell's operations in the western part of Venezuela.

In 1955 my bosses decided I should learn what oil was about from the grass roots, so they transferred me to the center of their production operations in Lagunillas on the east coast of Lake Maracaibo.

Arriving in Lagunillas, a chap from the personnel department showed me my accommodation. This was a room in the "bunkhouse," a long and narrow wooden building for the male bachelor employees, built on stilts with staircases at either end that led to an outside corridor.

It had an uninviting appearance, somewhat run down, and I was not surprised to subsequently learn it had been constructed in the 1920s.

I lived at one end and at the other lived a Spaniard. He was short, stocky and always neatly dressed – dapper, you might say. He must have been in his early 40s and seemed quite an ordinary sort of person.

We had a nodding acquaintance and did not meet all that often because he



CAMPBELL

**He was awarded the MBE in 1945, but at the time he had gone into hiding and only emerged in 1984 to receive it.**

was not in the mainstream oil business, but gave Spanish lessons to expats and their spouses. Like most Catalans, he had a choice vocabulary, and an expat told me he had learned some phrases from Pujol that were colloquially most useful.

Our conversation, when we crossed paths, rarely went beyond, "¿Qué tal, cómo estás?" He was considerably older than I, and we had different friends but occasionally I saw him in the club and we had a drink together.

Oliver L. Campbell was born in 1931 in El Callao, Venezuela, where his father worked in the gold mining industry. He spent the World War II years in England, then in 1953 returned to Venezuela and worked with Compañía Shell de Venezuela (CSV). He spent 15 years in the oilfields and ended up as company financial controller.

My Spanish acquaintance did not speak about his past, though rumor had it he had spent the war years in England. I, too, had spent those years at school in England and could not fathom why anybody should have chosen to go there of all places with the bombings, food rationing and other hardships.

This was partially explained, however, by further rumor that said he had to leave Spain because he was extremely anti-fascist and at odds with the Franco regime.

Upon nationalization of the oil industry he went to Petróleos de Venezuela (PDVSA) as its head of finance. In 1982 he returned to England and was the finance manager of the British National Oil Corporation prior to its privatization.

He then worked as an oil consultant and retired in 2002 after 50 years in the oil industry.

**Missed Opportunity?**

After having done the rounds of several oil camps I returned to Caracas, but this time to Shell's new and larger offices in Chuao. In 1971 the powers that be transferred me to Lagunillas once more, this time as the financial controller.

Since my previous stay, considerable new construction had taken place in the Shell camp area, and on the camp's perimeter there was now a hotel and a commercial center with several shops.

One Saturday I entered a shop that sold books, papers and magazines – in English as well as in Spanish since many of his customers came from the nearby oil camp – plus small electrical goods and gifts. I chose the present I wanted and went to pay for it.

Imagine my surprise on seeing my Spanish acquaintance of former years behind the counter.

He obviously did not recognize me (I was 15 years older and 20 kilos heavier), and I suppose I felt a little embarrassed – and, to my everlasting regret, I did not make myself known.

The years passed and my family and I came to live in the United Kingdom. It was June 6, 1984, and we were watching a TV program commemorating the Normandy landings 40 years

**Continued on next page**



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**Continued from previous page**

earlier, when suddenly I saw a face I recognized among those who were being honored – it was none other than my old acquaintance from Lagunillas, Juan Pujol, as large as life on the screen!

They referred to him as “Garbo,” and said he was the double agent who fooled the Germans into thinking the Allied landings would take place much further north around the Pas de Calais. He is a hero and was being feted as such – his fame was such that he had a special audience with the Duke of Edinburgh at the latter’s invitation.

The British government awarded Juan Pujol the MBE in 1945 at the end of the war, but at the time he had gone into hiding and only emerged in 1984 to receive it.

The award has always seemed to me very little recognition for a man who did so much for the Allied cause. The Germans were far more generous: They awarded him the Iron Cross. I think the British government should have awarded him the equivalent civil decoration.

**Garbo Talks**

Juan Pujol’s story was this: He spoke no English when he arrived in England, so he was given a controller, Tomás Harris, from MI5, who spoke fluent Spanish. Pujol and Harris were so successful deceiving the Germans that the latter decided there was no need to recruit any more spies in England.

One of the ploys devised by Pujol and Harris was to send accurate information to the Germans, though ensuring it arrived just too late to do anything about it.

On one occasion, the Germans were so pleased with his reports they congratulated him with the message: “We are sorry they arrived too late but your last reports were magnificent.”

Their finest coup was in 1944 with Operation Fortitude. “Garbo” and Harris convinced the Germans the landing at Normandy was only a diversion and that the main attack would come further north in the Calais area. The Germans hung on to two armored divisions and 19 infantry divisions in the Pas de Calais instead of sending them to Normandy.

This single deception meant the Allied forces met less resistance on the beachheads and saved numerous lives.

Several books have been written about Garbo, including “Operation Garbo” by Pujol himself and Nigel West. The latter is a well-known writer on espionage, security and the secret service. He is also known for bringing, and mainly losing, libel suits against various publishers and the BBC.

**A Day to Remember**


You may wonder why Juan Pujol went to live in Lagunillas, a relatively remote oil town. He was sent there by British Intelligence to be safe from German retaliation. The intention was he should live in Lagunillas in anonymity and he did so until it was thought everyone had forgotten about the war.

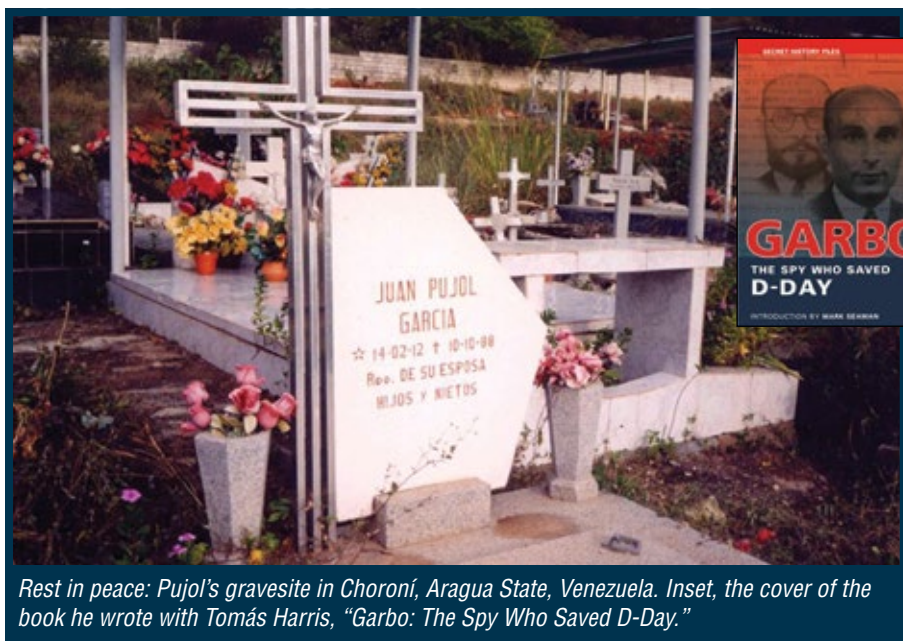
Juan (Joan in Catalán) Pujol was born in Barcelona, Spain, on Feb. 14, 1912, but after the war he lived the rest of his life in Venezuela, a country he grew to love. He died in Caracas in October 1988 at the age of 76, and was buried in Choroni, Aragua State, his wife’s birthplace and where the couple had been living.

I feel humbled to have met a man who did such extraordinary things and yet kept them to himself for so many years.

In London we have blue plaques that are placed on the houses and buildings where famous people lived. The bunkhouse in Lagunillas was demolished years ago, but it is a pity there is no memorial to Juan Pujol in Venezuela other than his gravestone. Many Venezuelans do not know who he was nor that he was one of the most successful double agents of World War II.

This is just a small tribute to Juan Pujol. History will confirm he was an extraordinary man, for few people can have helped the Allied cause more. Who can say how many lives he saved by his actions?

The anniversary of the Normandy landings is this month, June 6 – an appropriate time for Spaniards, Venezuelans, Britons, North Americans, Australians and all who fought against the Axis powers to honor his memory. 



Rest in peace: Pujol’s gravesite in Choroni, Aragua State, Venezuela. Inset, the cover of the book he wrote with Tomás Harris, “Garbo: The Spy Who Saved D-Day.”

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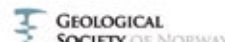
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# Lost It? Mangled It? AAPG Store Can Help

By JANET BRISTER, AAPG Website Editor

There are many reasons business people need to have receipts to prove a purchase – proving business expenditures for tax purposes, for example, or for proving use of personal funds on expense reports that need reimbursement.

And it is very inconvenient when you have closed your browser window only to find your receipt has gone missing.

Admit it – there have been times you have purchased an education course and lost your confirmation. Or you made an online purchase and thought you printed your receipt, only to find it is now lost in cyberspace.

Or possibly your co-worker picked it up and “filed” it in the trash not knowing it was yours.

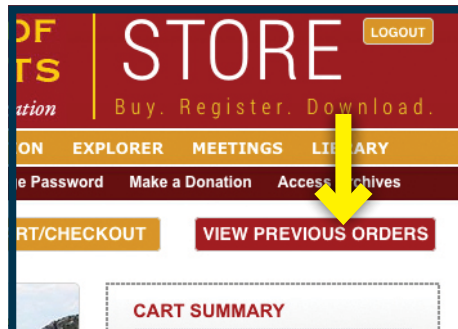
Or ever spilled a beverage on one?

But when these things happen to you regarding an AAPG expense, our “View Previous Orders” function now becomes a valuable feature on the AAPG Store.

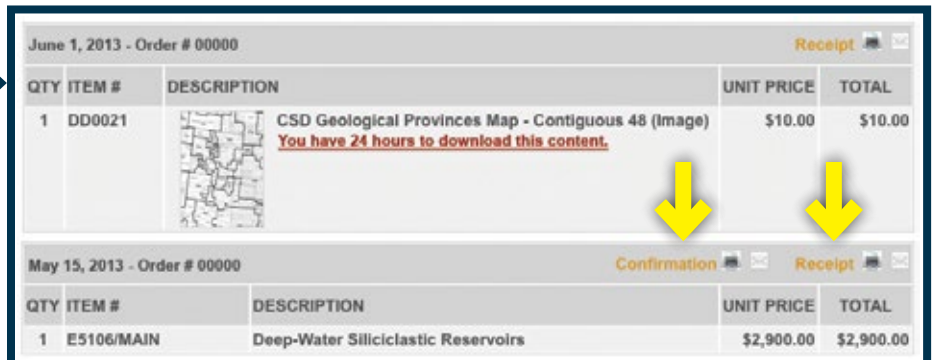
### Log In to View

When you first go to the store the receipt button is not visible. It requires you to identify yourself before it knows whose orders to display. Of course, this is the same as clicking on “Login” and providing your information to the server.

Once there you can click on this history button and find there every electronic purchase or transaction you have made



The “View Previous Orders” button only displays when you have successfully logged into the site.



Notice the “Confirmation” and “Receipt” buttons have two images to their right: a printer and an email.



Example of a receipt for a purchased event. Notice how the amount displayed due is \$0.00 communicating the payment received has covered the expense of the purchase.



The field just to the right allows you to enter one or more email addresses. Simply separate these with commas and your receipt or confirmation letter will go to those addresses.



Once the “Send Email” button is selected you get immediate feedback.

Continued on next page



## 2014 ARCTIC TECHNOLOGY CONFERENCE

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Paper proposals are now being accepted through 13 June 2013 for Arctic Technology Conference 2014. ATC will deliver a multidisciplinary program covering all aspects of Arctic activity. The program will be developed soliciting talks in the key topical areas listed below. You're invited to submit in any of these areas that meet your professional expertise and interests. Subcategories of each theme can be found online.

#### 2014 Themes and Sub-categories

##### Theme 1: Geology and Geophysics

- Basin potential
- Frontier basin geology
- Geophysics
- Hydrates

##### Theme 2: Exploration and Production

- Drilling
- Drilling and production facilities and structures
- Pipelines and export
- Gas and oil processing
- Flow assurance
- Offshore
- Transition zone
- Season extensions
- Gas hydrates
- Shallow gas
- Operations
- Autonomous Underwater Vehicles (AUVs)

##### Theme 3: Physical Environment

- Ice
- Ice management
- Ice barriers
- Ice load prediction and modeling
- Measurement of ice properties
- Met ocean, seismicity, forecasting and weather, ice predictions
- Ice roads
- Climate change

##### Theme 4: Logistics

- Icebreakers and ice-worthy vessels
- Offshore terminals
- Active ice management
- Arctic navigation
- Logistics and resupply — land, sea and air

##### Theme 5: Regulatory Environment and Social Responsibility

- HSE (Health, Safety, Environment)
- ERR (Emergency Escape and Rescue)
- Oil spill prevention and response
- Codes and standards
- Legislation
- Emissions and discharges
- Regional and social development in frontier areas

[www.ArcticTechnologyConference.org](http://www.ArcticTechnologyConference.org)



**PROFESSIONAL**newsBRIEFS

**Edward J. Bucher**, to asset development geologist, Chevron North America Exploration and Production, Houston. Previously senior staff geologist, Anadarko Petroleum, The Woodlands, Texas.

**E.A. "Ed" Clerke**, has been named principal professional-reservoir characterization/exploration, Saudi Aramco, Dhahran, Saudi Arabia. Previously head of petrophysics, Pennzoil.

**Michael T. Currie**, to president and principal consultant, Predictive Geoscience Solutions, Magnolia, Texas. Previously staff geophysicist-corporate technical services, Newfield Exploration, The Woodlands, Texas.

**Mohamed "Mo" Etemadi**, to geologist/geophysicist senior seismic interpretation specialist VII, Pacific Rubilias Energy, Houston. Previously senior advising geophysicist, Repsol USA, The Woodlands, Texas.

**Sam Harvey**, to president and managing partner, Bull Run Energy, Warren, Pa. Previously planning and development manager, Pennsylvania General Energy, Warren, Pa.

**Simon R. Haynes**, to principal geologist, Statoil Canada, Calgary, Canada. Previously senior geologist, Statoil Canada, Calgary, Canada.

**John Kaldi** has been selected as an SPE Distinguished Lecturer for 2013-14. Kaldi is the chief scientist for CO2CRC and holds the chair of geosequestration at University of Adelaide, Australia.

**Jerry Kier** has retired as senior staff geologist, Core Laboratories, Houston. He resides in Houston.

**Geoffrey Mason**, to data manager, Sirius Exploration Geochemistry, Evergreen, Colo. Previously geology student, Colorado School of Mines, Golden, Colo.

**Kevin J. McLachlan**, to executive vice president-global exploration, Murphy Exploration, El Dorado, Ark. Previously vice president, Nexen, Calgary, Canada.

**Doug Neese**, to manager of geology and geochemistry, Sirius Exploration Geochemistry, Evergreen, Colo. Previously exploration geologist, Anschutz Energy, Denver.

**Kevin Schmidt**, to chief geologist, Kinder Morgan, Houston. Previously Permian area geoscience manager, Pioneer Natural Resources, Irving, Texas.

**Scott Silver**, to exploration manager, Blackdog Oil and Gas, Silverthorne, Colo. Previously senior geophysical adviser, Forest Oil, Denver.

**Taury Smith**, to consulting geologist, Smith Stratigraphic, Albany, N.Y. Previously acting state geologist, New York State Geological Survey, Albany, N.Y.

**Doug Waples**, to president, Sirius Exploration Geochemistry, Evergreen, Colo. Previously consultant geochemistry and basin modeling, Evergreen, Colo.



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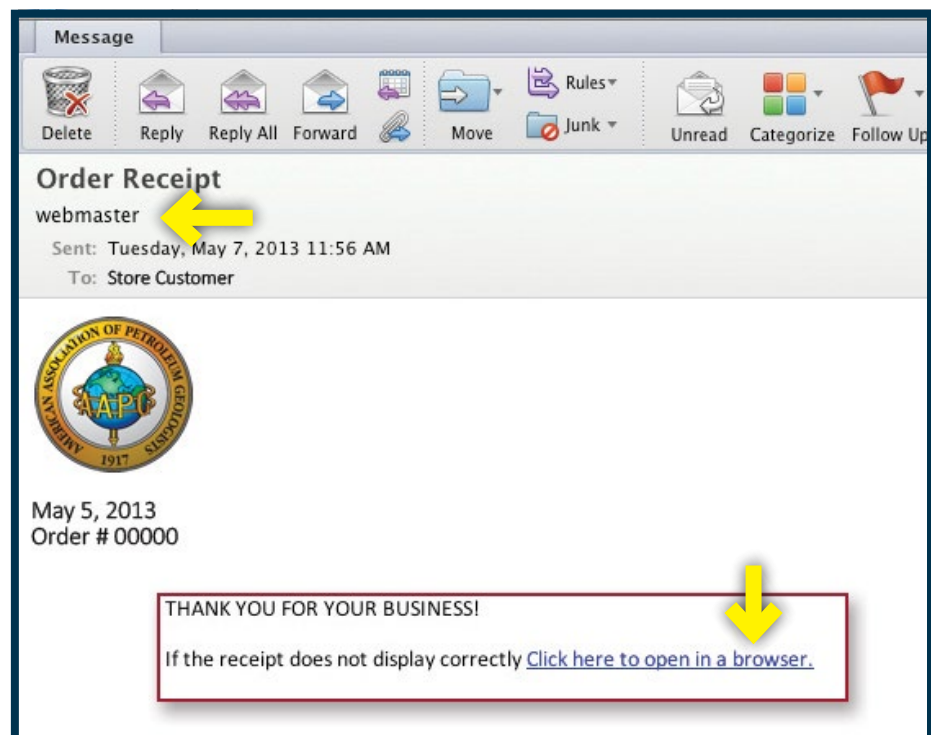
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# Online Registration Open for Inaugural URTeC

Online registration is now open for the inaugural Unconventional Resources Technology Conference (URTeC), a joint venture that will bring together for the first time the key disciplines and technologies engaged in the development of North American unconventional resource plays.

URTeC, sponsored by AAPG, the Society of Petroleum Engineers and the Society of Exploration Geophysicists, will be held Aug. 12-14 in Denver.

AAPG, SPE and SEG members who register on or before July 17 can save \$100 on registration fees.

The URTeC technical program, also available online, boasts papers from petroleum engineers, geologists, geophysicists and other professionals dealing with innovations, best practices and experiences in integrated approaches for North American unconventional resource plays.

The event has been designed to fill the unique need for a peer-reviewed, science-based unconventional resources conference that will take an asset team approach to development of unconventional resource plays – similar to how oil and gas professionals work in today's market.

- URTeC also is designed to:
- ✓ Create a premier forum for technical exchange between vendors and users.
  - ✓ Identify and solve E&P problems.
  - ✓ Raise the competency of all petroleum professionals.
  - ✓ Elevate the image of petroleum

professionals and the societies in all communities

The technical program includes 20 themes applicable to unconventional resources and appeals to engineers, geologists and geophysicists, including:

- ▶ Unconventional Project Development.
- ▶ Unconventional Reservoir Characterization.
- ▶ Unconventional Shale Plays.
- ▶ Unconventional Tight Oil and Tight Gas.
- ▶ Unconventional Coal Seam/Bed Methane.

- ▶ Other Unconventional Reservoirs.
- ▶ Formation Evaluation of Unconventional Reservoirs.
- ▶ Fracture Characterization.
- ▶ Lateral Well Characterization.
- ▶ Flow Mechanics in Tight Reservoirs.
- ▶ Laboratory Methodologies.
- ▶ Reservoir Monitoring.
- ▶ Organic Geochemistry.
- ▶ Well Performance Prediction.
- ▶ Fluid Behaviors.
- ▶ Drilling Optimization.
- ▶ Completion Optimization.

- ▶ Geomechanics.
- ▶ Three-D Seismic Applications.
- ▶ Health, Safety and Environmental Issues.

The three technical program co-chairs are AAPG Honorary member and past president Steve Sonnenberg, with the Colorado School of Mines; AAPG member Ken Beene, with Devon Energy; and Luis Baez, with BG Group.

For more information, visit the URTeC website at [www.urtec.org](http://www.urtec.org).

## REGIONS and SECTIONS

### Joint Workshop Tackles Wedge Plays

The inaugural EAGE-AAPG workshop, titled "Basin-Margin Wedge Exploration Plays," will be held Nov. 20-22 in Lisbon, Portugal.

The workshop intends to cover exploration play concepts, know-how and case studies, presented in oral sessions and discussed in a round-table format.

The sessions themselves will include a combination of keynote papers and a call for papers, which closes on July 15.

The workshop's theme is exemplified by several significant recent discoveries on the margins of the South Atlantic. Its intent is to promote discussion on the strengths and failings of such a play concept and about the risks associated with each component of the petroleum systems:

- ▶ Charge.
- ▶ Reservoir occurrence and quality.
- ▶ Vertical and lateral seals and traps.

The workshop is open to explorationists and specialists dealing with the architecture and evolution of continental margins, along with doctoral and post-doctoral students

The number of participants will be limited to 100-120. Priority will be given to participants who submit papers.

This inaugural EAGE-AAPG workshop is planned to be the first in a series of jointly sponsored events that will alternate each year between Europe and North America.

Comprising the organizing committee are, for EAGE, J.J. Jarrige, with Total;

AAPG member H. Ligtenberg, with Shell International E&P; and C. Duguid, with Tullow. Representing AAPG are current AAPG vice president-Regions Stuart Harker, with Circle Oil; David Blanchard, with Energy XXI; and N. Frewin, with Hess.

Additional information can be found by visiting the EAGE ([eage.org](http://eage.org)) and AAPG ([aapg.org](http://aapg.org)) websites.

*Editor's note: Regions and Sections is a regular column in the EXPLORER offering news for and about AAPG's six international Regions and six domestic Sections. Contact: Jeremy Richardson, director of AAPG's Europe Office in London, at [jrichardson@aapg.org](mailto:jrichardson@aapg.org).*

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### Hydrocarbon Charge Considerations in Liquid-Rich Unconventional Petroleum Systems

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[www.aapg.org/gtw/2013/vancouver/index.cfm](http://www.aapg.org/gtw/2013/vancouver/index.cfm)

### Deep Horizon and Deepwater Frontier Exploration in Latin America and the Caribbean

8-10 December 2013 • Trinidad & Tobago

Co-Hosted by: AAPG Latin America Region and Geological Society of Trinidad & Tobago (GSTT)

Watch for details:

[www.aapg.org/gtw/2013/trinidad\\_tobago/index.cfm](http://www.aapg.org/gtw/2013/trinidad_tobago/index.cfm)

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For information on these AAPG GTW's, please log on to our website at <http://www.aapg.org/gtw>.



# Call for Papers Deadline Hits This Month for ATC

The call for papers remains open – but the deadline is fast approaching – for the next Arctic Technology Conference (ATC), set Feb. 10-12 at the George R. Brown Convention Center in Houston.

Paper proposals will be accepted through June 13.

ATC is a technical and scientific event created by and modeled after the annual Offshore Technology Conference. It is designed to offer a multidisciplinary approach to exploration and development of the Arctic region.

ATC is managed and co-sponsored by AAPG. Fourteen other groups co-sponsor or endorse the event, including the Society of Exploration Geophysicists and the Society of Petroleum Engineers.

AAPG's representatives on the 2014 program are Michael Enachescu, with MGM Energy Corporation in Calgary, Canada, and Don Gautier, with the U.S. Geological Survey in Menlo Park, Calif. They join AAPG Honorary member John Hogg, also with MGM Energy, who was chair of the highly successful 2012 ATC.

ATC's format features oral and poster presentations, special panel sessions and topical breakfasts and lunches.

"We are looking for a range of presentations that cover all aspects of technical and social performance in the Arctic," said Han Tiebout, chair of this year's Technical Program Committee.

"Further, it's a fantastic opportunity

to learn from you how we can improve our business through new technology applications and practices in a wide range of activities in the Arctic," he added. "We also are interested in hearing how these technical developments are being managed, both in the current business environment and for the future challenges we face in our industry."

Organizers seek proposals for five themes:

- ▶ Geology and Geophysics (including specific sessions on basin potential, frontier basin geology, geophysics and hydrates).

- ▶ Exploration and Production (including flow assurance, transition zone, offshore, gas hydrates and shallow gas).

- ▶ Physical Environment (including ice management and barriers, seismicity, ice predictions and climate change).

- ▶ Logistics (including icebreakers and "ice-worthy vessels," offshore terminals and Arctic navigation).

- ▶ Regulatory Environment and Social Responsibility (including oil spill prevention and response, health/safety/environment, emergency escape and regional/social development in frontier areas).

To submit a paper, or for more information, go to [www.arctictechnologyconference.org](http://www.arctictechnologyconference.org).

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### Technical Program Highlights

- Lacustrine Basins
- Microbial Carbonates: Modern and Ancient
- Great Oil/Gas Fields of the Rocky Mtns.: A Historical Perspective
- Unconventional Resource Plays
- Carbon Capture, Utilization, and Storage
- New Resource Plays
- Geothermal Resources of the Rocky Mountains



### Other Convention Events

- 5 Utah-based field trips and 4 short courses
- ACL: Roving the Red Planet: A Field Geologist Explores Gale Crater  
*Dr. Rebecca Williams, Mars Scientist, Planetary Science Institute*
- Night at the new Natural History Museum of Utah
- Guest hospitality suite and 3 days of special activities



# Foundation Grants-in-Aid Recipients Announced

By NATALIE ADAMS, AAPG Foundation Manager

**C**ongratulations to the 89 recipients of the 2013 Grants-in-Aid Award Program. A total of \$191,500 was distributed to these worthy graduate students from Australia, Canada, China, Malaysia, Russia, Ukraine, the United Kingdom and the United States.

Recipients came from 45 different schools in 28 U.S. states, and from 15 schools representing seven non-U.S. countries.

The complete list of GIA recipients can be found in the Foundation ad on page 33 of this EXPLORER.

Thank you letters are already starting to pour in. One excellent example is this letter from a student at St. Louis University:

*"Dear AAPG Foundation Trustees, I would like to express my gratitude to the AAPG Foundation Board of Trustees for accepting me into the Grants-in-Aid program. I was very excited and appreciative when I received notice of the generous \$2,250 award from the Classen Family Named Grant.*

*I am a Ph.D. student at Saint Louis University and am exploring fluid-rock interactions in a fault zone. I will use this award to perform carbonate clumped isotope analysis on drill core samples obtained from the San Andreas Fault Observatory at Depth (SAFOD). This work combined with results of previous laboratory analyses will help me to determine the source, temperature,*

*and isotopic composition of fluids that once migrated along and through the San Andreas Fault zone. This data will hopefully further our knowledge of processes related to earthquake nucleation, propagation, and arrest.*

*Thank you again for your support and generosity. I will work hard to complete this project in a timely and effective manner.*

*Sincerely, Patrick Benjamin Luetkemeyer."*

All "Thank you" letters will be posted on the Foundation website. Some of the recipients recently attended ACE and were able to meet with donors – a fantastic experience for all.

Reading these letters makes this whole process personal and meaningful.

\* \* \*

Andy Klein, the GIA Committee chair, tallied up some numbers and found that applications were up this year, from 308 to 492, and the acceptance rate was 19 percent.


Applications were received from 55 countries this year, he found, also up from last year's 38.

To establish a named or memorial grant as part of the GIA program, please contact the AAPG Foundation today. Visit [foundation.aapg.org](http://foundation.aapg.org) for more information.

Another way to help today's students is by enabling more universities to have access to AAPG's Digital Products, such as the Pubs Internet and the GIS-UDRIL University Subscriptions, which allows students at the university of your choice to have access to over a million pages of geological information and maps.

To see which universities already have access, visit [foundation.aapg.org](http://foundation.aapg.org).

\* \* \*

And finally, many thanks to Todd Stephenson for recently establishing a university subscription for the University of Cincinnati. 

## Geology Volunteers Needed for Scout Jamboree

**A**APG is still looking for a few good men (and women) to talk to young people about geology and petroleum careers, but time is running short.

A few slots are still available for geologists wanting to help teach Geology Merit Badge at the Boy Scouts' 2013 National Jamboree, set July 15-24 near Beckley, W.Va.

Anyone willing to serve one (or both) weeks should contact Ron Hart, at AAPG headquarters ([rhart@AAPG.org](mailto:rhart@AAPG.org)), who coordinates the volunteer program on behalf of the AAPG Foundation.

"All programming at a Jamboree is

organized by volunteers," Hart said, "and every four years, the AAPG Foundation provides funding for materials and logistics in support of the Jamboree instructional team."


Nearly 30,000 teenage boys (and a few thousand teenage girls) will come to the new Summit Bechtel Reserve scout camp, northeast of Beckley.

"Of course, we want geologists to talk about rocks, minerals, and petroleum," Hart said, "but this year we also are looking for people who can talk about GIS and GPS navigation.

"Our program at the 2013 Jamboree

is going to be a mixture of both high technology and low technology," he continued. "We have to show the next generation of geologists how to adapt and use new technology in their field work."

This year's instructional team includes people from ESRI (the GIS software company), the West Virginia Geological Survey, Concord University (Athens, W.Va.) and several petroleum organizations.

Volunteers are asked to serve either a one- or two-week tour. Accommodations are provided, but may be a little rustic. 

## WHY I DONATE TO THE AAPG FOUNDATION



By the time I had completed A.I. Levorsen's Geology of Petroleum course at Stanford University back in the late 40s, I had read every word published by AAPG in its varied publications. AAPG was an important source of information and played a very significant part in my education and career with its vast and varied coverage of the science of petroleum exploration. AAPG continues to provide a critical, necessary and even inspirational contribution to the education and development of young geologists. My contributions to the AAPG Foundation hope to pay back some of the benefits they afforded me.

*Sincerely  
Harry Ptasynski*

Ptasynski has been a faithful contributor to the AAPG Foundation's General Fund and other funds for more than 30 years. Gifts to the General Fund are welcomed, as they are used to support many activities which the Trustees deem worthy and are in accord with the purposes for which the Foundation was established.



For more information or to make a contribution go online to [foundation.aapg.org](http://foundation.aapg.org).

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A joint publication of SEG and AAPG  
**Interpretation**  
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## Well ties to seismic data

Well ties to seismic data establish the fundamental link between geology as we measure it in a well bore and the seismic expression of geology that we work with as interpreters. It is the fundamental link between well data collected in the depth domain and seismic data acquired in the time domain. The quality of a well tie reflects the uncertainties contained in all of the geologic and geophysical data we use in making the tie and critically affects the progress of and confidence with which we interpret into areas away from wells. With the increasing availability of broadband seismic data, high-fidelity imaging, advanced logging techniques, and more powerful and versatile analytical techniques, we are now able to tie wells to seismic in greater detail and with greater confidence throughout the value stream from exploration through production. But geological complexity, basic physics, irreducible uncertainties, and pitfalls remain....

The editors of INTERPRETATION (<http://www.seg.org/interpretation>) invite papers on the topic "Well ties to seismic" for publication in the May 2014 special section or supplement. Contributions are invited on all aspects of the geology, geophysics, and petrophysics of tying wells to seismic as we apply and integrate them in subsurface projects.

- analytical and interpretive tools and techniques for tying wells to seismic
- assessing the quality and uncertainty of well ties to seismic
- case histories of well ties to seismic
- pitfalls and lessons learned in tying wells to seismic

Interested authors should submit their manuscripts for review no later than **30 August 2013**. In addition, the special section/supplement editors would like to receive a provisional title and list of authors as soon as possible. Authors should submit via the normal online submission system for INTERPRETATION (<https://mc.manuscriptcentral.com/interpretation>) and select this topic in the manuscript type dropdown option. The submitted papers will be subject to the regular peer-review process, and the contributing authors are also expected to participate in the review process as reviewers.

We will work according to the following timeline:

Submission deadline  
30 August 2013

Peer review complete  
31 December 2013

All files submitted for production  
20 January 2014

Publication of issue  
May 2014

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## READERS' FORUM

### Leach and Sustainability

Regrettably, I won't hear Patrick Leach (see May EXPLORER) speak at the DPA-AWG luncheon in Pittsburgh, but I am happy to see someone share some of my thoughts: Societies unsustainable by available resources must change or collapse.

Anthropologist/archeologist V. Gordon Childe argued in "What Happened in History" that powerful, resource-limited empires appropriated land, water, etc., from their neighbors until they reached the limits of the then-developed world and thereby their own viability as well.

The historical norm was collapse, in part because there was no further opportunistic loot with which to pay soldiers.

The lesson from science, as I see it, is two-fold. Thermodynamics teaches that real processes are irreversible (can't unring the bell), all such processes consume energy and raise entropy (polluted air and oceans are global aspects of entropy), cannot reach equilibrium and both intensive parameters (temperature and other climatic variables) and extensive parameters (ores, energy sources, etc.) can be limiting. The conservation laws of physics ("some of it plus the rest of it equals all of it") set inviolable limits.

I conclude, as Leach seemingly does, that the current world economy violates these constraints. Indeed, as Leach implies, human centuries are short in the context of societal problems, but long enough to eradicate essential resources (a healthy environment is one such resource) before

humans learn to pause and reconsider their situation.

An ex-mother-in-law argued that "somebody will invent something." That's the technology argument. But technology is only a tool; by itself it's no better than Midas' gold.

A VP of my old company argued (evidently seriously) that we'll colonize another planet.

Earth is still the most hospitable planet we know. If we can't make it here, I doubt that we'll do better elsewhere.

Manuel N. Bass  
Fullerton, Calif.

### Ahead of His Time

Reading the article on the Bakken shale in April's EXPLORER reminded me of a little known piece of history about this resource.

As a young geologist fresh out of school in 1990, I was sent to the wellsite of a Shell well in North Dakota. It was the company's first horizontal well in the Williston Basin.

Called the Connell 24-27, it drilled a 3,665-foot lateral into the Bakken, and tested 1,500 barrels per day of 46 API oil.

Months later I received a plexiglass plaque for my work on the well – and given the news that the project had been abandoned by management as an uneconomic "technical success!"

It took more than a decade later for others to "discover" this great play.

Vince Hamilton  
Geneva, Switzerland

## ProTracks from page 46

AAPG has come to realize how large and important the YP sector is – and that they have specific needs.

In a major effort to meet these needs, AAPG has revitalized the Young Professional Committee and created YP liaisons for each Section and Region. These efforts have given YPs a voice within the Association at both the local

and global levels.

I am proud to be a part of this initiative as the AAPG YP Eastern Section "lead," because it provides an easier way to network and help newly hired or graduated geologists feel part of the larger AAPG community. The recent YP events at ACE Pittsburgh are an excellent example of this – and from my perspective, the future looks bright for YPs.

If you would like to help shape future YP events and contribute to your earth science community, please get in contact with your Section or Region liaison at [www.aapg.org/youngpros/](http://www.aapg.org/youngpros/).

## DEG from page 58

I also encourage all of you to become DEG members, if for no other reason than to demonstrate your commitment to doing your job in a safe and environmentally

responsible manner.

One of the things that David Curtiss said in several of our meetings with Congress was "nobody went into geology to destroy the earth" – on the contrary, most geologists have a deep appreciation of the earth and make every attempt possible to leave it in the manner we found it.

## INMEMORY

- Jim Bain, 71  
New Braunfels, Texas  
March 1, 2013
- Lorenz M. Braren, 77  
Petaluma, Calif., April 29, 2012
- \* Wallace De Witt Jr., 91  
Glenwood, Md., Aug. 7, 2012
- Phillip Benny Drisko, 85  
El Paso, Texas, March 27, 2013
- Thomas Glenn Fails Jr., 85  
Denver, April 14, 2013
- Gary E. Hall, 58  
Longview, Texas, April 12, 2012
- Paul Moore Hardwick Jr., 83  
Horseshoe Bay, Texas  
March 31, 2013
- H. Robert Hirsch, 79  
Kerrville, Texas, March 4, 2013
- Robert T. Holleman Jr., 52  
Lafayette, La., March 25, 2013

- Bobby J. Lane, 82  
Lafayette, La., Oct. 25, 2012
- King David Lankford Jr., 91  
Shreveport, La., July 22, 2012
- Horace Richard Pipe, 46  
Poplar, Mont., March 5, 2013
- William Eddy Richardson, 86  
La Jolla, Calif., March 20, 2013
- Cecil Charles Rix, 88  
Houston, Dec. 9, 2012
- Carl Nelson Roberts, 84  
Kingwood, Texas, Aug. 13, 2012
- Robert Eugene Swenson, 84  
Chico, Calif., Jan. 21, 2013

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



**CLASSIFIED ADS**

**POSITION AVAILABLE**

**NATIONAL UNIVERSITY OF SINGAPORE  
DEPARTMENT OF GEOGRAPHY**

**Teaching-Track Position  
in Petroleum Exploration**

The Department of Geography at the National University of Singapore, (with the support of the South East Asian Petroleum Exploration Society (SEAPEX) and the Economic Development Board of Singapore) will introduce a new Minor in Petroleum Exploration programme in August 2013. The Department invites applications for a Teaching-Track (i.e. non Tenure-Track) Lecturer or Senior Lecturer beginning 1<sup>st</sup> January 2014 in the following areas: sediments and sedimentary basins, applied petroleum exploration, and energy environmental impacts/futures. A Ph.D. at the time of appointment is required. The appointment will be for two years initially with the prospect of further extension. The successful candidate will teach undergraduate and graduate students in their area of expertise which is expected to include some or all of the following: seismic interpretation, well logging interpretation, basin analysis, application of GIS, and energy and environment, and lead local and overseas field excursions to visit petroleum producing areas. Candidates will have experience teaching undergraduates and will be encouraged to conduct research in these fields in South East Asia. Some experience of previous research or employment with the upstream petroleum industry would be desirable. NUS Geography has an Earth Lab with an extensive collection of rocks, minerals and maps for teaching and a refurbished Geo Lab with analytical equipment for physical and chemical analysis (e.g. grain size, ICP-OES for major and minor element, TOC). The Department also has its own dedicated computation facilities for the teaching and practice of GIS which the candidate will be encouraged to utilise.

Interested candidates should consult our website [www.fas.nus.edu.sg/geog](http://www.fas.nus.edu.sg/geog) for full application details and further information on the Department of Geography.

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# Finding Value In A Multi-Disciplinary Venture

By DAVID K. CURTISS, AAPG Executive Director

Last month in this column I made the point that AAPG's success as a scientific and professional society is highly dependent on the relevance and value of our products and services to our members and customers.

Relevance, to me, indicates that we are focusing on topics that really matter and that move us closer to fulfilling our mission of advancing the science. Value is a subjective thing, but our intent is that AAPG members and customers be enriched by what the Association offers – and that they ask for more.

That's one way to describe AAPG's strategic goal of being indispensable to the energy geoscientist.

If you joined us in Pittsburgh last month for the 2013 AAPG Annual Convention and Exhibition (ACE) you saw our most recent effort to deliver on these two themes. The organizing committee worked closely with our staff to plan and execute a conference that delivered relevant science content and valuable learning and networking opportunities for each of the participants.

Thanks to everyone who contributed to another successful ACE, and to all of you who attended for your support.

\* \* \*

As you have read in this issue of the EXPLORER, our attention is now shifting westward to the Rockies and a brand new initiative to deliver relevance



CURTISS

Geoscientists and engineers work together in teams to successfully find and produce hydrocarbons.

and value to the oil and natural gas marketplace: The Unconventional Resources Technology Conference (URTeC), scheduled Aug. 12-14 in Denver.

URTeC is brought to you by the Society of Petroleum Engineers, AAPG and the Society of Exploration Geophysicists.

The conference is multi-disciplinary, encompassing both the geosciences and engineering. But what makes it unique is its cross-disciplinary emphasis, where the technical program focuses attention on the intersections of these disciplines in relation to unconventional resources.

The design of this conference mirrors how companies operate. In the days of old a new ventures team may have developed a prospect and thrown it over the wall to the drillers, while they then moved on to the next opportunity. Today, however, geoscientists and engineers work together in teams to successfully find and produce hydrocarbons.

And it is here where we can expect to recognize and develop new insights and potentially breakthroughs.

URTeC attendees will have the opportunity over three days to choose from more than 300 presentations and "ePapers" across 20 themes, ranging from well design and geosteering to fluid flow, fracture prediction and case studies from unconventional plays across North America.

If you are interested in the science and technology of unconventional resource development, you will have no trouble finding talks that you want to see.

The technical program committee has put the emphasis for the conference on science and technology. That's where we can deliver maximum value. But they also have provided significant opportunities to put the science and technology – and its broad societal impact – into context, through the opening plenary session, interactive expert panels and an energy policy forum.

This is essential, because the oil and natural gas industry's ability to find and produce unconventional oil and natural gas ultimately depends on its social license to operate – that is, public acceptance to develop these resources.

One conference theme, for example, is dedicated to health, safety and environmental issues.

My hope is that URTeC will enable us to learn from each other and effectively communicate the best science, technology and operations practice. This will ensure our ability to deliver the potential that these resources have to offer.

\* \* \*

I began this column talking about relevance and value. This is foremost on our minds here at AAPG. And URTeC is one more way that we, together with our sister societies, are innovating to advance the science and to provide you with products and services that help you do your job better.

You can find more information and early registration deals at [www.urtec.org](http://www.urtec.org).

See you in Denver this August!

## DIVISIONS REPORT

# Successful Year Capped By CVD Experience

By TOM TEMPLES, DEG President

This will be my last column in the EXPLORER as president for DEG. In June I will turn over the reins to Doug Wyatt, and I wish him well.

Some of the things DEG accomplished this year included:

- ▶ All of our publications have gone digital.
- ▶ We assembled and offered a strong DEG program at the recent AAPG Annual Convention and Exhibition in Pittsburgh.
- ▶ We celebrated our 20th anniversary.
- ▶ We held a joint workshop with SAGEEP on Hydrofracturing.
- ▶ We held a joint DEG-EMD GTS on Hydraulic Fracturing.
- ▶ We co-sponsored with SME "Environmental Considerations in Energy Production."

\* \* \*

A few weeks ago I had the privilege to travel to Washington, D.C., with several other AAPG members for Congressional Visits Day (see related story, page 40). There we had the opportunity to meet with several federal agencies that have a role in our industry and also to meet with numerous congressmen and senators.

Our purpose was to introduce AAPG and its members to the Congress as a source of information on issues that they may be debating.

One of the hottest topics was – yep, you guessed it – hydraulic fracturing.

It would appear – by my unscientific



TEMPLES

We have a great opportunity to get unbiased information into the hands of our legislators.

poll of articles appearing in the media – that some of the furor has died down on hydraulic fracturing. Still, there are a lot of misconceptions in Washington about how we do our business, and this topic is one of the least understood.

I was pleasantly surprised, though, at the level of understanding that several of the congressmen had about hydraulic fracturing, and the willingness of the opposition to sit down and have a meaningful discussion on the topic.

We have a great opportunity to get unbiased information into the hands of our legislators. Please work with Edith Allison, our GEO-DC director.

I encourage all of you to get in touch with your congressional delegation, introduce yourself and offer to be of help. We can make a significant impact on legislation that affects our industry.

Other CVD discussions involved:

- ▶ One topic that came up in Washington was centered on fugitive methane emissions. This seems to be one of the

topics that opponents to production from resource plays are taking to stop future drilling.

EPA just released a report in which it reduced its estimate of methane volumes escaping from drilling activity in the Haynesville Shale play by 20 percent.

- ▶ Another discussion topic was the impacts of induced seismicity from hydraulic fracturing activities.

The National Academy of Sciences recently released a report on induced seismicity ([des.nas.edu/besr](http://des.nas.edu/besr)). Their conclusion was that "a very small fraction of injection and extraction activities among hundreds of thousands of energy development sites in the United States have induced seismicity at levels noticeable to the public."

- ▶ The last topic of discussion focused on creating jobs and the role that the oil industry can and does play in job creation.

A recent report by the American Petroleum Institute stated unconventional



oil and gas industry has created 1.7 million jobs in 2012 – and that will grow to 3.5 million by the year 2035. That's a significant number of new jobs the

country needs.

The problem, however, is our university system is not producing enough qualified students to meet this demand. In a report by the National Academy of Sciences, the projected shortfall between projected workforce and new graduates is significant.

\* \* \*

I have spent time talking with numerous students in schools not traditionally associated with the oil industry. Many of them are not considering a job in the petroleum industry because of our perceived negative attitude to the environment.

We as a profession need to provide the right information to these students so that they can make an informed decision based on factual information and not on what they see in the news media.

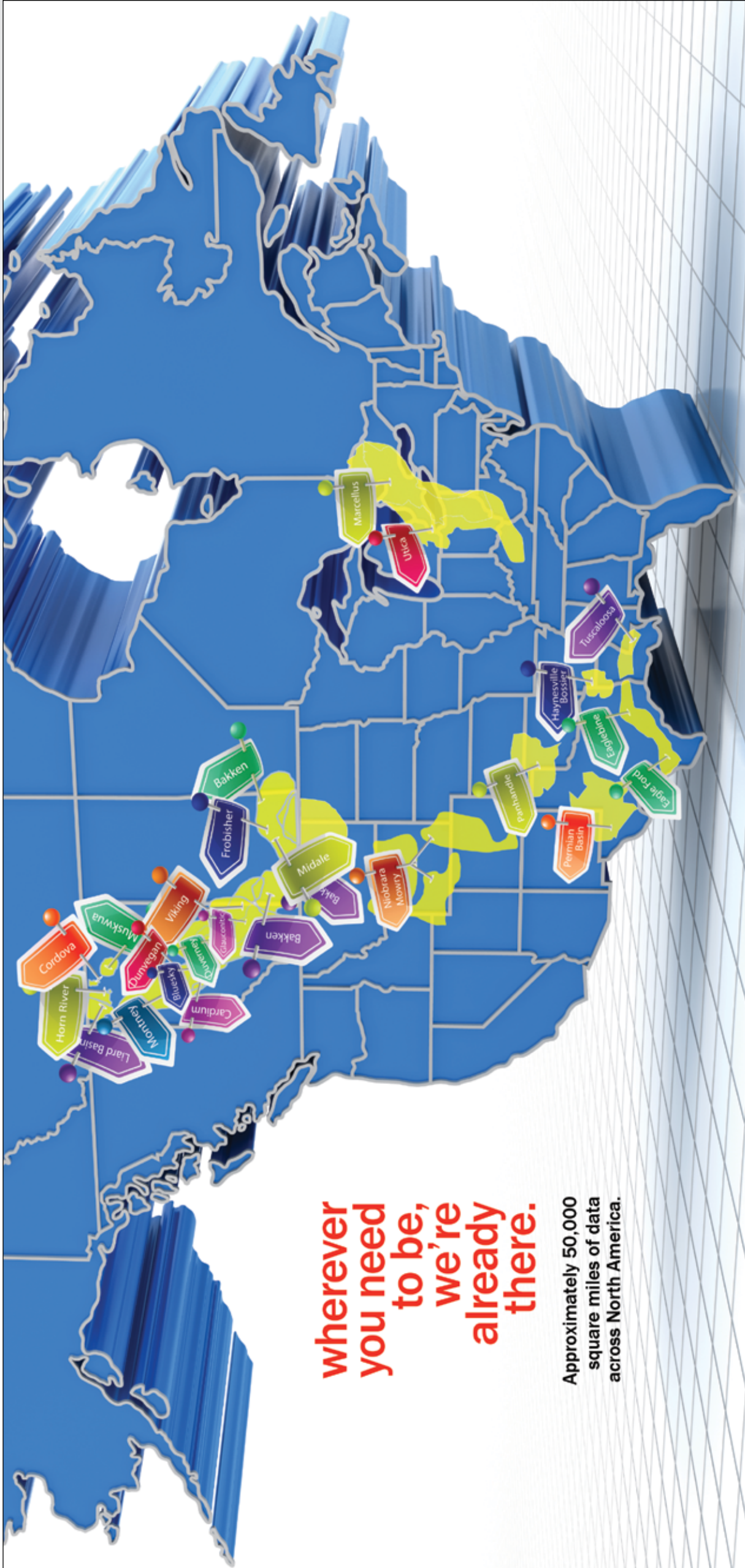
I encourage you to go visit your local schools – be it elementary, middle or high school – and give the facts about our industry and our record on environmental issues. Visit your alma mater and talk to the geology students about your career in the industry.

See DEG, page 56



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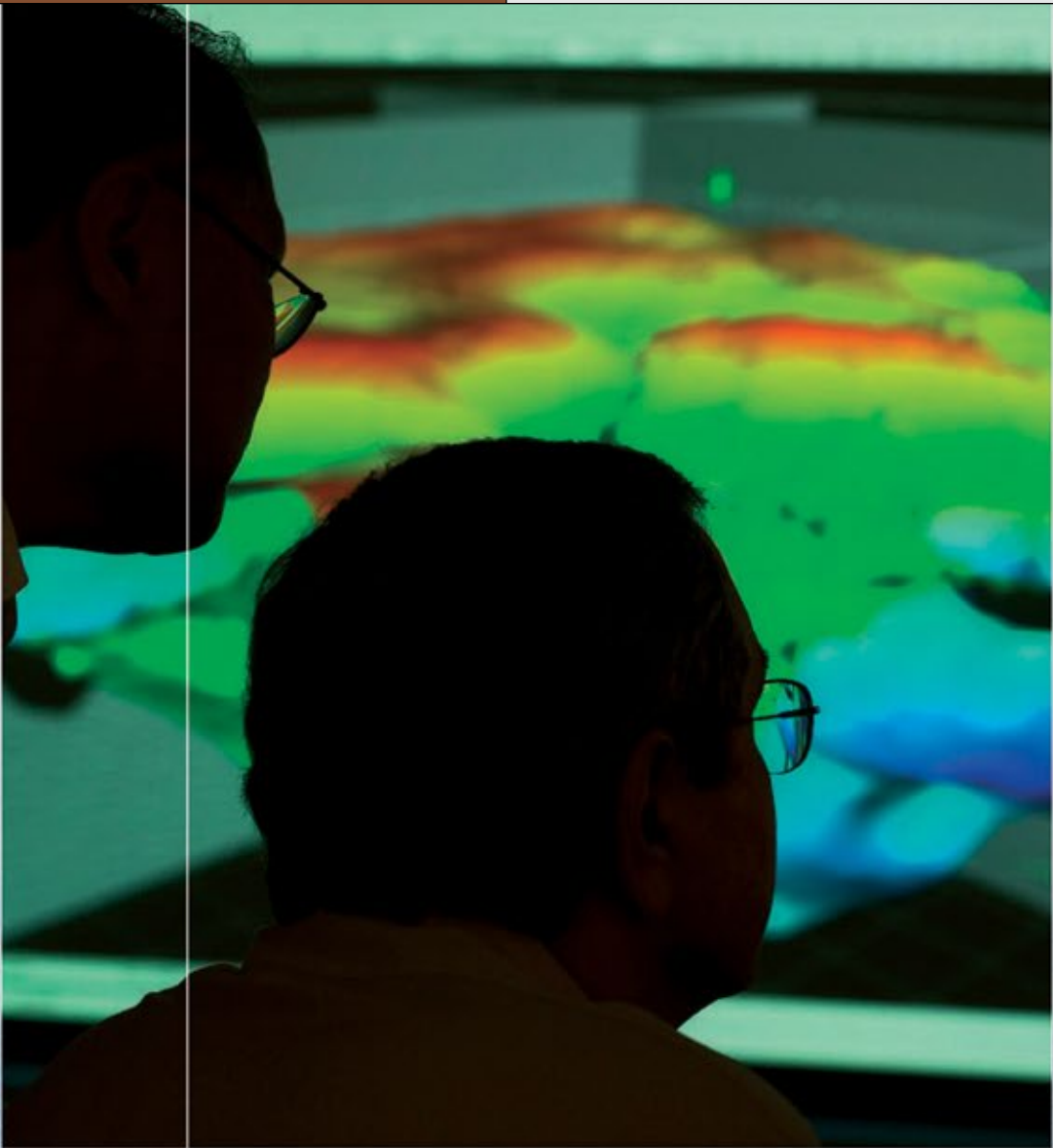
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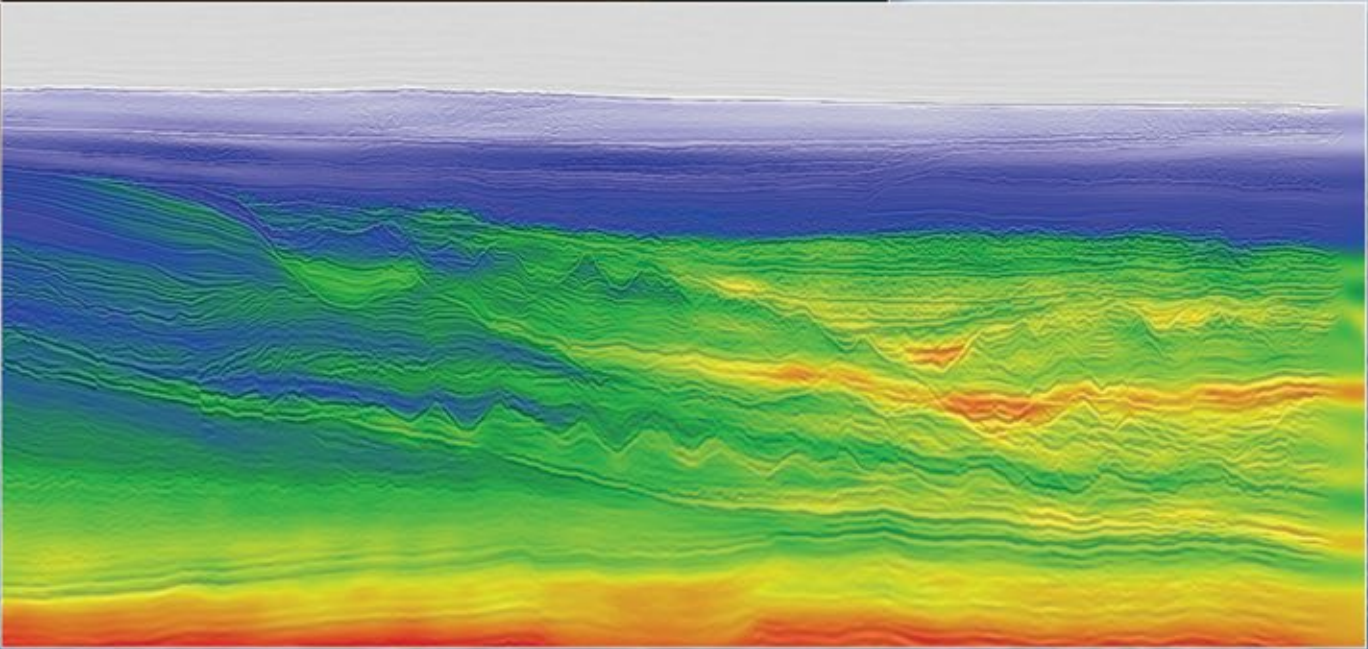
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