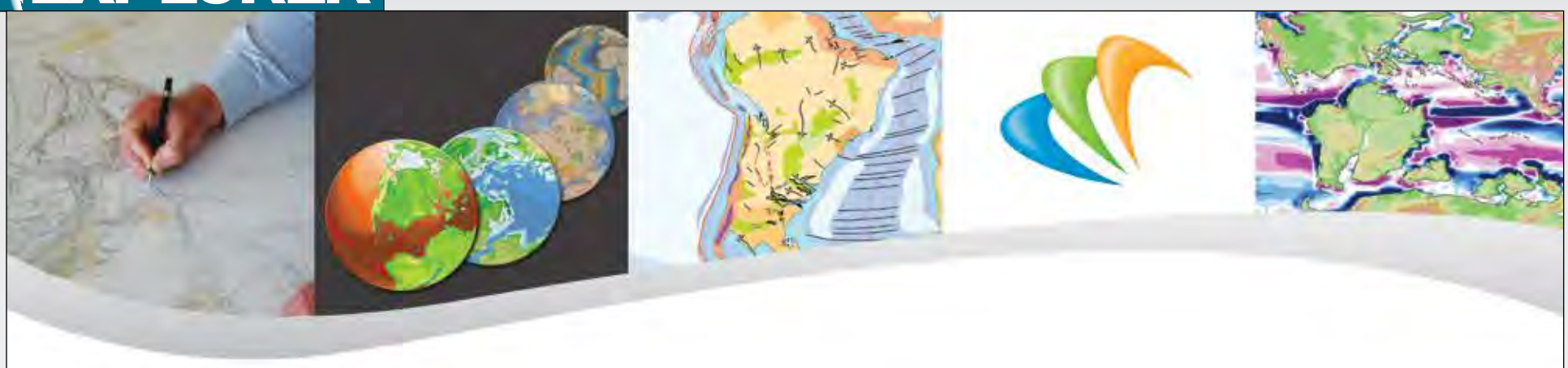
AAPG EXPLORER

MARCH 2014

The Far Horizons

Scenic Canadian coasts provide clues to a complex world

See page 38



Vol. 35, No. 3
March 2014

PRESIDENT'SCOLUMN

Are we doing what we say?

Here's a Tip: Some Cows May Not Be So Sacred

BY LEE F. KRYSTINIK

At AAPG we often say that we are becoming an ever more nimble, constantly evolving organization. The question for all of us is: Are we doing what we say we do?

* * *

I grew up as a city kid at the outer edge of a suburb, with fields and cattle literally just out my back door – and the mythical idea of cow-tipping always intrigued me.

The cow of interest needs to be sleeping on its feet. (Note: My horse, Kilo, who does sleep standing up, tells me that this is NOT a typical bovine trait.) The urban legend suggests that leaning into said sleeping cow results in an overturned cow waking suddenly to a world gone awry; or, a less skillful effort offers a fair chance of the errant cow tipper being butted by a very awake, very irate cow.

While the former has never actually been photo-documented, the latter apparently has occurred with predictable regularity for the rather inebriated fellows who've tried it.

* * *

Today, in my capacity as president of AAPG, working in concert with our very capable Executive Committee, I find myself dealing with a whole different breed of cows – the sacred ones.

Our business is all about distributing and promoting petroleum geoscience and supporting professionalism, and one of the critical charges we have at the EC is to look at what we are doing as an organization, within the context of our ever-changing business and product price environment.


KRYSTINIK

We regularly and continually evaluate our long-term strategies and actual-versus-predicted outcomes and look for what is working well.

We regularly and continually evaluate our long-term strategies and actual-versus-predicted outcomes and look for what is working well – and what has become a teetering sacred cow.

In the nearly 100-year history of AAPG, we have developed a remarkable range of ways in which we spread our geoscience. Many of these pathways have become heavily entrenched and some might easily be considered sacred cows.

Let us examine a few cows in our product herd:

▸ What about our **AAPG BULLETIN**?

My off-site storage shelves contain numerous overstuffed boxes full of old AAPG BULLETINs (these will soon be donated to the AAPG Publications Pipeline to send to geoscience students in developing nations – this is a great cause, and I invite you to do the same!).

I now have my BULLETIN delivered over the Net and on disk. At this moment, there is a backlog of more than 40 papers waiting in "Ahead of Print" for publication in the BULLETIN … if delivered digitally, perhaps they would be in broad distribution at this very moment.

See **President**, next page

Voting Begins for AAPG Executive Committee

Voting season for the 2014-15 AAPG Executive Committee officially opens March 3, with members having the option of casting a ballot either online or via mail.

Voting will remain open through May 15.

A special candidate voting guide designed for the upcoming AAPG election period has been inserted at page 9 of this month's EXPLORER.

The six-page insert provides biographical information on all six AAPG officer candidates for the 2014-15 Executive Committee, plus their responses on the topic: "Why I Accepted the Invitation to be a Candidate for an AAPG Office."

Videos of all six candidates – featuring a new question-answer format – continue to be available online, where they will remain throughout the election season.

The videos show candidates responding to six specific questions, and are intended to allow members around the world to have a better introduction to those running for office.

Biographies and individual information for the candidates also remain available on the website.

The person voted president-elect will serve in that capacity for one year and will be AAPG president for 2015-16. The terms for vice president-Sections and treasurer are two years.

To view the videos, go online to www.aapg.org/about/aapg/leadership/officer-candidates

The slate is:

President-Elect

❒ **Alfredo E. Guzmán**, consultant, Veracruz, Mexico.

❒ **John R. Hogg**, MGM Energy Corp., Calgary, Canada.

Vice President-Sections

❒ **Steven H. Brachman**, Wapiti Energy, Houston.

❒ **Hannes E. Leetaru**, Illinois State Geological Survey, Urbana, Ill.

Treasurer

❒ **Vlastimila Dvorakova**, Czech Geological Survey, Brno, Czech Republic.

❒ **James W. Tucker**, consultant, Houston.

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REGULARDEPARTMENTS

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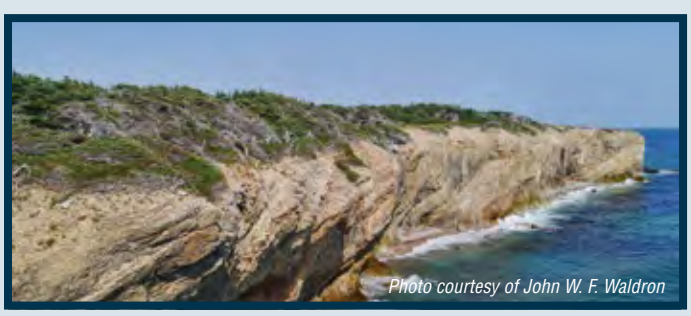
Photo courtesy of John W. F. Waldron

ON THE COVER:

The Canadian coastal regions of Newfoundland and Labrador, as seen on both this month's cover image of the Cambrian Port au Port Group at Cape St. George and the photo on this page of the Ordovian St. George Group on the south coast of Port au Port Peninsula, are spectacular, scenic and perfect places to ponder the universe. For geoscientists, they're even more special than that – they're clues to offshore discoveries, and these outcrops will be among those considered at the upcoming Atlantic Realm Conjugate Margins Conference (see page 38). Photos courtesy of John W. F. Waldron.

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Save Now On ACE Registration

Online registration is open for this year's AAPG Annual Convention and Exhibition, which will be held April 6-9 at the George R. Brown Convention Center in Houston – and reduced registration fees are still available for those who act fast.

Those who register on or before March 17 can still save up to $105.

This year's ACE marks the 13th time Houston has played host for the AAPG annual meeting.

This year's theme is "Ideas and Innovation: Fuel for the Energy Capital," and the comprehensive technical program will include more than 400 oral presentations and 390 full-day poster presentations.

Highlights include:

- Sunday's opening session, featuring an address by AAPG President Lee Krystinik and the bestowing of honors to the Association's and profession's best, led by Sidney Powers Memorial Award winner Ernest A. Mancini and Michel T. Halbouty Outstanding Leadership Award winner Peter R. Rose.

- This year there will be not one but two Discovery Thinking Forums – making them the ninth and tenth in in the AAPG 100th Anniversary Committee's initiative honoring "100 Who Made a Difference." The sessions will be held in the morning and afternoon Monday, April 7.

- Kirk Johnson, Sant Director of the Smithsonian's National Museum of Natural History, will be the All-Convention Luncheon speaker, talking on "Evolution, Time, Tectonics, Asteroids, Climate and the Trajectory of Earth Science."

- Carlos A. Dengo, director of the Berg-Hughes Center for petroleum and Sedimentary Systems at Texas A&M University, will present this year's AAPG Foundation-sponsored Michel T. Halbouty Lecture, at 5:10 p.m. Monday, April 7.

- A forum that takes an in-depth look at the spotlight-grabbing shale gas experience, titled "U.S. Shale Gas Reserves and Production: Accelerators and Inhibitors," set at 8 a.m. Tuesday, April 8.

- The AAPG Imperial Barrel Awards ceremony once again will be presented in a colorful, exciting setting immediately preceding the opening session, open to all attendees.

- As always, the exhibits hall will be filled with the latest technology, information and energy services – and will be the site for the annual Icebreaker reception, daily refreshments, the Cyber C@fé and the AAPG International Pavilion.

Meeting details – including the complete technical program, field trips, short courses and various events – can be found in the official ACE announcement that accompanied the January EXPLORER, or online at ace.aapg.org/2014

President
from page 3

Is the time approaching when we go fully digital with the BULLETIN? Are we moo-ving toward that time now?

- What about the AAPG website?

By now it is likely that most of you have seen and even used some aspect of AAPG's new website, which was unveiled in late February.

And it might be possible that some of you, in the past, had thought our old website was a "cow," pig or something else more unpleasant that one might find in abundance in a barnyard. In any regards, something that needed to be changed.

In some ways the previous website *was* a weary cow that served its purpose when first introduced in 2008, but AAPG took upon itself to cull from our pasture.

It's there for you now – and I think you will find the "customer experience" to be vastly improved.

Mainly, this new site is the result of a huge amount of collaborative thought and ceaseless effort by our headquarters team, led by web editor Janet Brister, IT developer Justin Acton and project manager Kerrie Chamberlain, plus their key team of Bogdan Michka, Mark Donnini, Chris Salmon and Taron Graves. Dozens of others at headquarters provided valuable support.

That's one old cow that we tipped, largely in an effort to give our members a more valuable website experience. Be sure to check it out – and let me know what you think!

- And what about our historically preferred "go-it-alone" approach to running conferences and workshops?

This sounds like a teetering sacred cow to me.

No matter what the topic, it is typical for people to assume ownership of a project and think of it belonging to "us" and not to "them."

But we have overwhelming input from vendors/exhibitors, our key sponsoring companies and our meeting attendees, that they want to see integrated meetings that involve more facets of petroleum geoscience and engineering than just geology.

Accordingly AAPG is actively exploring and implementing more ways to partner with SEG, SPE and our other sister organizations to create more fully "integrated" conferences and workshops, while still holding onto other meetings for a uniquely AAPG brand.

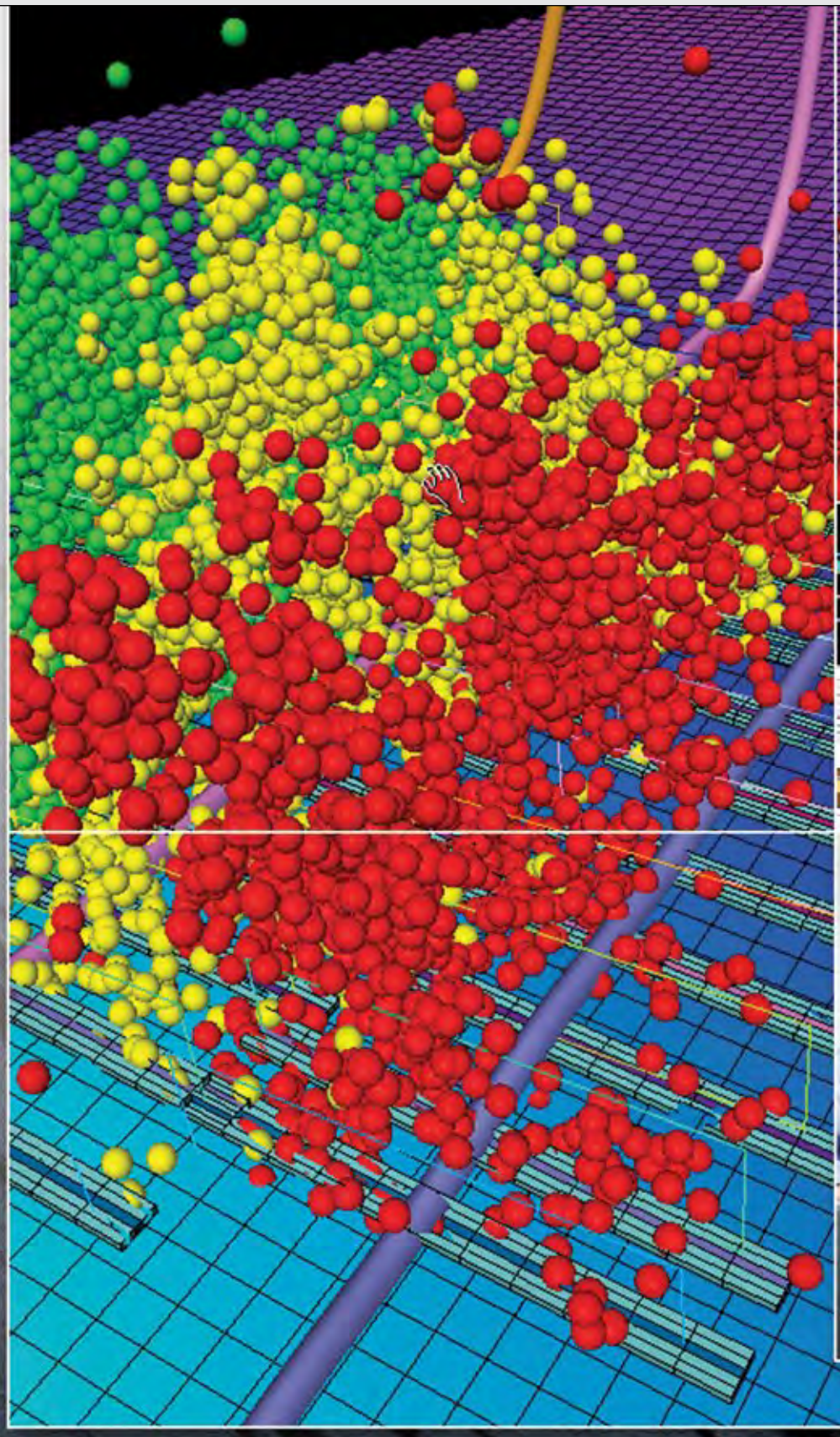
(See related story above.)

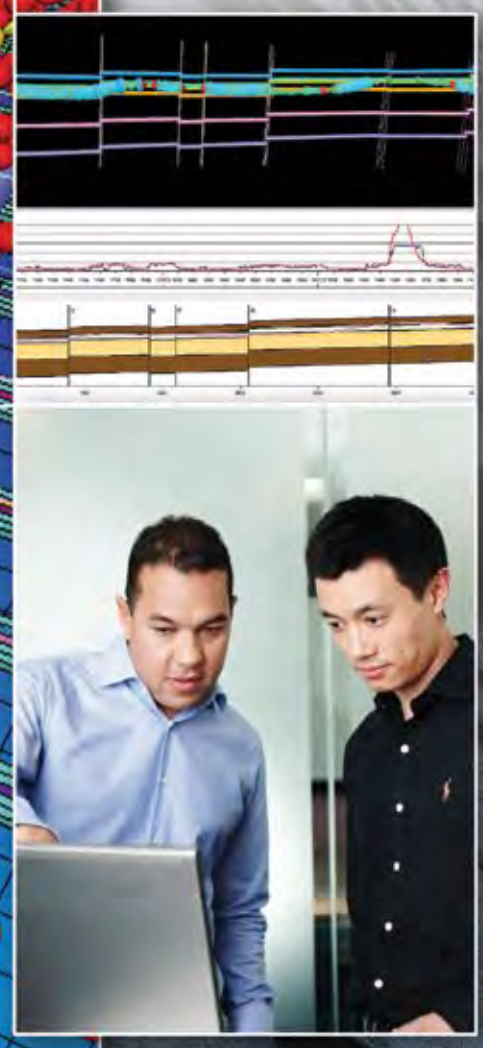
* * *

We will keep on tipping sacred cows at AAPG – but now while I dangle, bleeding and bruised from the horns of one or more of those rather alert sacred cows, I invite you to take a serious look at your own sacred cows – whether in AAPG, your company or your own specific piece of geoscience.

Any other teetering sacred cows out there?

It's not just a moo-t point, this need for innovation and change to remain relevant in a new century. Feel free to ping me at lee.krystinik@aapg.org and let me know how AAPG might more nimbly do what we say we will do!





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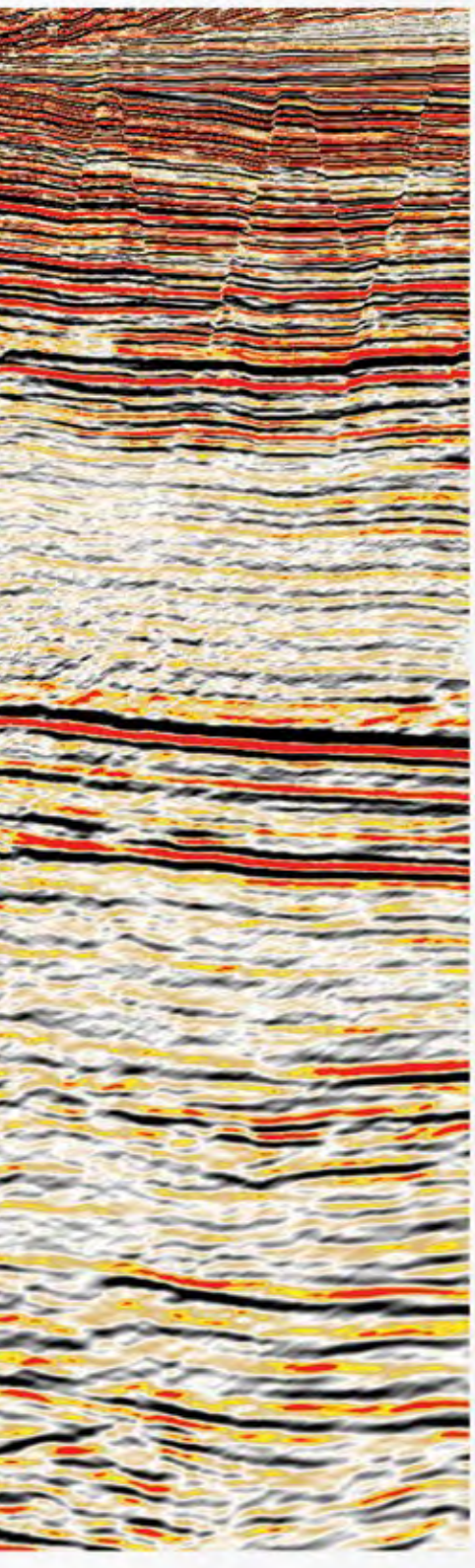

Polarcus is pleased to announce the availability for licensing of 2,380 sq. km of high density multi-client 3D data over Block 7B offshore Guinea Bissau. The survey, acquired in conjunction with Petroguin and GeoPartners, lies at the confluence of the Southern Mauritania-Senegal—Guinea Bissau Basin and the West Africa Transform Margin trend. The new survey provides significantly improved imaging of both the Barremian Carbonate shelf play and the deeper water Santonian and Turonian sandstone turbidite plays.

The survey has been processed by DownUnder GeoSolutions through a state-of-the-art true-azimuth 3D SRME & Pre-Stack Time Migration flow. World class discoveries in adjacent basins have generated an unprecedented amount of interest in the region. Until now, this area has lacked the modern 3D data required to properly understand the geology both on a regional and on a prospect scale. With the renewed focus on Guinea Bissau, the open blocks and farm-in opportunities in this area are being increasingly sought after.

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Here's the SCOOP

Oklahoma Plays Offer Untapped Potential

By DAVID BROWN, EXPLORER Correspondent

Sometimes people in the industry say an unconventional resource play has become "unlocked."

The term indicates that a resource play is well enough understood to be developed economically and effectively with continual drilling.

In that sense, the emerging SCOOP and STACK plays in Oklahoma haven't yet been completely unlocked.

SCOOP stands for South-Central Oklahoma Oil Province. This relatively new play targets the Woodford shale across parts of a seven-county area south and southwest of Oklahoma City.

To AAPG member Rick Andrews, geologist for the Oklahoma Geological Survey (OGS) in Norman, SCOOP is basically an extension of the Woodford Cana play in Oklahoma's Canadian County, extending southward on the edge of the Anadarko Basin.

"The Woodford is over 10,000 feet deep in this area, and it deepens as it goes into the basin," Andrews said.

Like the Eagle Ford, the Woodford SCOOP includes areas prospective for oil production, for wet gas and for dry gas, generally changing east to west across the play.

Operators to date have focused on developing liquids-rich gas production.

"It has a thermal maturation that's conducive to natural gas liquids, NGLs," Andrews said. "It's in a corridor several miles wide where the gas has a high heating value."

So far, the STACK play includes limited drilling in Canadian and Kingfisher counties, to the west and northwest of Oklahoma City.

Newfield Exploration Co. in The Woodlands, Texas, announced the STACK play last November.

It sees the play as a combination of prospects in the Woodford shale plus shale zones in the younger Mississippian Meramec.

"The Meramec is a relatively thick sequence of limestone and interbedded shales," Andrews noted. "Historically, it's part of the Sooner Trend.

"The problem is, as you go north, northeast, the Woodford thins dramatically," he said. "The STACK is in an area where the Woodford is thinning and they're picking up other horizons."

ANDREWS

> **Horizontal wells: "They're opening up a lot more rocks than what vertical wells did, that's for certain."**

Photos courtesy of Newfield Exploration Co.

Newfield Exploration, based in The Woodlands, Texas, is a major operator in the Oklahoma SCOOP and STACK plays, which targets the Woodford shale.

Old Trends, New Interest

Beginning in the 1950s, the Mississippian Sooner Trend became a hotspot for Oklahoma exploration. Eventually it included more than 100 named fields, according to the OGS.

In western Garvin and McClain counties, especially, the SCOOP play encompasses another famous Oklahoma oil trend, the Golden Trend. Not officially named until 1947, the trend also produced a number of important oil discoveries.

Consequently, current geological understanding of these areas has roots in the 1940s and 1950s.

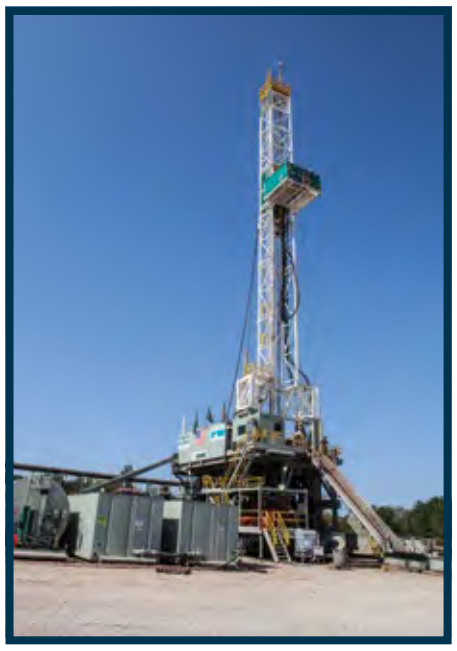
Andrews said the play-area Woodford is "a restricted marine depositional setting where it's very anoxic. Because it was a reducing environment over millions and millions of years, a lot of organic material built up.

"As you jump up a level to the Mississippian, which overlies the Woodford, you get into a completely different geological deposition," he added. "Most of the rocks are carbonates. They're definitely more shallow marine."

With horizontal drilling and hydraulic fracturing, these old trend regions are attracting new interest, this time around as liquids-prone and oil-prospective, unconventional shale plays.

"It's just a new area in that they're applying horizontal drilling technology," Andrews said. "They're opening up a lot more rocks than what vertical wells did, that's for certain."

See **SCOOP**, page 10



SCOOP
from page 8

Thick as a Brick

Newfield Exploration identified the STACK play and is a significant participant in the SCOOP play. The company has more than 150,000 acres in the STACK and about 75,000 acres in the SCOOP.

In announcing capital expenditure plans, Newfield said it intends to spend $700 million and operate eight rigs in Anadarko Basin plays in 2014, by far its biggest presence in any of the company's four main operating areas.

Steve Campbell, Newfield vice president of investor relations, said the company entered the Woodford shale as a dry gas driller. That experience provided the company a good understanding of the formation, he noted.

"We started in the dry gas portion of the Woodford in 2003. That's in an adjacent basin to the east, the Arkoma Basin," he said.

As gas prices declined steeply, Newfield looked for more lucrative prospects. It extended drilling to the west and "got oilier wells" in Stephens, Garvin and McClain counties.

"We were seeing enhanced economics from the liquids cut. We went on a tear and accumulated about 75,000 acres," he said.

Evaluation of the Woodford and Meramec led Newfield north into the STACK play area.

Last year, it acquired interests in about 76,000 net undeveloped acres in Kingfisher and Canadian counties from Gastar Exploration USA.

Newfield reported it drilled eight producing STACK wells as operator in 2013, with an average 90-day production rate of 597 barrels of oil equivalent (boe) per day, 74 percent oil.

Campbell said one secret of success in the main STACK play area is the thickness of the Meramec, which the company interprets as a shale.

Where the Woodford thins to 200 feet or less, the Meramec can reach 475 feet of thickness, and Newfield has obtained core through a 400-foot saturated interval, according to Campbell.

"Because of the thickness, we think we can place wells at different intervals in that play," he said.

Above the Meramec is the Chester shale, a regional topseal that "acts as a natural frac barrier so your fracs don't propagate upward," Campbell noted.

Going Deeper

In the SCOOP play, Newfield divides development operations into a wet gas area and a more oil-prone area. Last year its wet-gas SCOOP wells had an average 90-day production rate of 1,430 boe per day – 24 percent oil but rich in gas liquids.

Keys in this area are liquids content, over-pressured zones and high production rates, Campbell said. Some of the company's SCOOP wet-gas wells IP'ed at over 2,100 boe per day.

So far, SCOOP has been an NGLs story for operators economically, although oil chances exist.

In 2013 results, Newfield had 90-day average production rate of 1,112 boe per day, 52 percent oil, from seven SCOOP oil producers.

In the main SCOOP play area, the Woodford shale can be 225 to 400 feet thick, siliceous, highly fractured and high in organic content, with porosities of 3 to 10 percent.

While the Woodford can be found at 8,500-10,000 feet in the STACK play, some SCOOP wells target the shale at almost 16,000 feet depth. Andrews and Campbell agree that depth and thermal maturity are important considerations.

"That's why these plays are located where they are," Andrews said. "If they go too shallow it gets out of the thermal maturation window. If you go too deep, you get dry gas."

Location, Location, Location

In November, Gary Packer, Newfield chief operating officer, said initial STACK wells were providing about 35 percent rates of return.

"We are early in our learning curve in the STACK and history proves that we can lower costs and enhance returns as we move to development mode," he said.

It's still too soon to call the SCOOP and STACK fully unlocked resource plays. In these emerging plays, operators will "have to do some drilling to establish the viability of production," Andrews observed.

Campbell did identify one additional edge in favor of the SCOOP and STACK, and it echoes the old real estate adage about property desirability:

Location, location, location.

"The fact that these plays are in Oklahoma," he said, noting that the state offers established procedures, favorable laws and extensive infrastructure, "is a distinct advantage."

Global growth flattens, local demands spike

Seismic Industry Tightens Its Belt in 2014

By BRIAN ERVIN, EXPLORER Assistant Managing Editor

The seismic industry globally is expected to be much tighter in 2014 than in recent years – but due to local licensing and policy developments in certain jurisdictions, some corners of the world are expected to see a sharp uptick in demand for seismic services.

"It's a transitional year between what's been a very good market in 2012 and the first part of 2013 into a more challenging market in the middle of 2013, when companies started to pull back a bit in terms of their seismic activity," said Kristian Diesen, a financial analyst for Pareto Securities, an Oslo, Norway-based investment firm with a strong presence in the international oil and gas sector.

Diesen spoke about the market outlook for the year to come at the annual meeting of the International Association of Geophysical Contractors in Houston last month.

He explained to the EXPLORER that seismic demand tends to correlate with oil companies' E&P spending, which had been growing by 10-15 percent each year from 2010 to 2012, but slowed to about 8 percent in 2013 – and is expected to grow only by about 6 percent in 2014.

"That's globally," he added. "That's not anyone's particular E&P spending."

Diesen's remarks aligned with the expectations of other industry experts.

"I think we're going to be seeing slower growth in the seismic business this year than we have in past years," concurred

Photos courtesy of Dawson Geophysical

AAPG member Robert Hobbs, CEO of TGS, a multi-client geoscience data company that does the bulk of its business in the seismic sector.

Hobbs also is chairman of the IAGC.

He reiterated that seismic spending typically follows overall E&P spending, but it appears that it will be a little bit less than E&P spending in 2014.

"I think it's because oil companies are looking at really managing costs this year," he said.

"Oil company shareholders are wanting the companies they've invested in to start showing returns for all the exploration dollars they've spent over the past four or five years, and there's been a lot of money spent in exploration … Now there's a big push for oil companies to start returning some value back to their shareholders from all this money that's been spent," Hobbs continued.

"It's not a major downturn – don't get me wrong," he said. "It's just a temporary period where oil companies are just monitoring their costs very closely."

No 'One' Is to Blame

Diesen and Hobbs both said they based their analyses on quarterly reports from several major and independent oil companies.

"When I got through the Q4 reporting, there's an overriding theme from the oil companies," Diesen said. "Cash-flow focus and capital discipline – and that, of course, translates into a more challenging seismic market."

That's the bird's eye view of the global seismic market, but the picture looks much different up close, depending on which pockets of the world are in view.

"The seismic market is extremely dynamic, and it's quite volatile from region to region," Diesen said.

"For instance, if you take this winter, **West Africa** has been extremely quiet … A year ago, you had this big presold Angola service and West Africa was very good.

"On the other side, the Gulf of Mexico was down in 2010, '11 and '12, but has started to come back. Brazil has been down for quite some time, but we've actually seen increased activity again close to this time last year," he said.

"Brazil is up, West Africa is down, if you're just talking about the current snapshot. I think the North Sea this summer is probably going to be fairly flat here and there. Asia has been soft for quite some time, and that's likely to continue," Diesen added.

"Those are some of the main regions, but I wouldn't highlight any one region in particular that's sort of causing the softness," he said. "This is an overall, macro-trend in the sense of why companies are reluctant to spend. And it's not any particular region, because the economics there aren't any poorer than anywhere else.

"I wouldn't attribute the weakness to any particular region," he reiterated.

See **Outlook**, page 14

Outlook
from page 12

Around the World

Market forces are shaping the generally weak seismic sector globally, Diesen explained, but region-specific licensing activities and public policy changes are creating hot spots in various places.

Many investors, for instance, will be watching **Mexico** with keen interest for the next few years, resulting from a major policy-shift in the country's energy policy (see related article on this page).

Hobbs joined Diesen in singling out **Brazil** as an emerging hot spot, owing to the country's first round of licensing in several years.

Hobbs explained that the Brazilian government went from 2008 to 2013 without any license rounds.

"I think you're going to see more seismic vessels working offshore Brazil from those oil companies in 2014 starting to acquire the data they've committed to as part of their bids to the Brazilian government," he said.

Also, Hobbs said the number of seismic vessels operating in the **Gulf of Mexico** has doubled to about a dozen over 2013's activity.

"That's activity that's going to be focused on acquiring higher-end technology to solve the remaining imaging problems from the subsalt of the Gulf of Mexico," he explained. "It's quite an active year so far for deep water off the Gulf of Mexico."

Also, Hobbs said **northwest Europe**, and the **Norwegian Barents Sea** in particular, is seeing an uptick in activity in the seismic sector.

"There's a consortium of oil companies that will be undertaking quite a bit of 3-D activity in the southeastern Barents Sea, as part of what's called a 'group shoot.' I think you'll see several large 3-Ds being acquired there," he added.

Overall, though, Hobbs reiterated that caution and spending discipline will characterize the seismic industry for the year to come.

"There seems to be a focus on cost management in oil companies, so I think they're high-grading areas of the world that they're planning to work in, and making sure they manage costs appropriately," Hobbs said.

"So, I think the seismic spending that they do in 2014 is going to be looked at very carefully."

Mexico: Open For Business

By BRIAN ERVIN, EXPLORER
Assistant Managing Editor

Amid the backdrop of a comparatively soft market for the seismic industry in the coming year or so, oil and gas producers are watching Mexico with considerable expectation after the country passed historic constitutional reforms late last year to end the 75-year-old state monopoly on Mexico's abundant oil and gas resources.

"Yes, Mexico is in the process of opening their oil and gas resource base for foreign investment and exploration," said AAPG member Chip Gill, president of the International Association of Geophysical Contractors.

The reforms passed Mexico's Congress in early December and were approved by President Enrique Peña Nieto on Dec. 20, but because they require changes to the national constitution, the reforms have to be approved by at least 17 of Mexico's 31 state legislatures.

If the reforms are approved, foreign investors would be able to compete with Pemex, the state-run oil and gas company, by entering into "production-sharing" agreements with the Mexican government.

"Mexico is a highly prospective region of the world," Gill added. "The oil and gas industry is excited about that."

An Exciting Era?

In particular, he said his constituents within the IAGC are excited because, in an otherwise sluggish global market for their industry this year, seismic contractors are expected to be in high demand in Mexico.

"The government of Mexico is very interested in modern seismic data being acquired and made available to oil and gas companies considering applying for licenses for the right to explore for and produce oil and gas," Gill said.

But there is still a lot of ground to cover in hammering out regulations for obtaining that data, so decision-makers within the seismic industry will be paying close attention to Mexican policy discussions in 2014.

"The government of Mexico is currently exploring how they should best set up their scheme around – not only permitting and these ground rules … for seismic data, but also the licensing of oil and gas rights themselves," Gill said.

"They have a lot of other ground rules they have to set up beyond ours, of course, but seismic data is the first stage … Being able to evaluate the subsurface to have a start framing your risk, to identify the areas that might be potential," he said.

"Also, there's lag time. It takes a while for us to budget the money, justify the investment, go actually acquire it and process it and get it in the hands of the companies that would want to consider buying a license," he continued. "So it's a very significant amount of time. We're talking years of lead time, especially when you think about the size of the country of Mexico."

He said there also is the question of what role seismic data already obtained in Mexico will play.

"What about the data that Pemex found?" he asked. "They own seismic data they've been acquiring in Mexico over the years. So how does that come into play?

"Again," he said, "these public policy decisions will affect the seismic sector in some fashion."

Colombia offers high hopes, hurdles

'Geoscientists Dream' Complicated By Politics, PR

By EMILY SMITH LLINAS, EXPLORER Correspondent

Colombia has one of the world's most complex geological landscapes – the convergence of the Caribbean, South American, Cocos and Nazca tectonic plates creates a dynamic environment and geoscientists' dream.

And the promise of hydrocarbon discovery – both conventional resources in the offshore Caribbean and non-conventionals in the interior sub-Andean basins – have made the country a hotspot for exploration.

CARSTENS

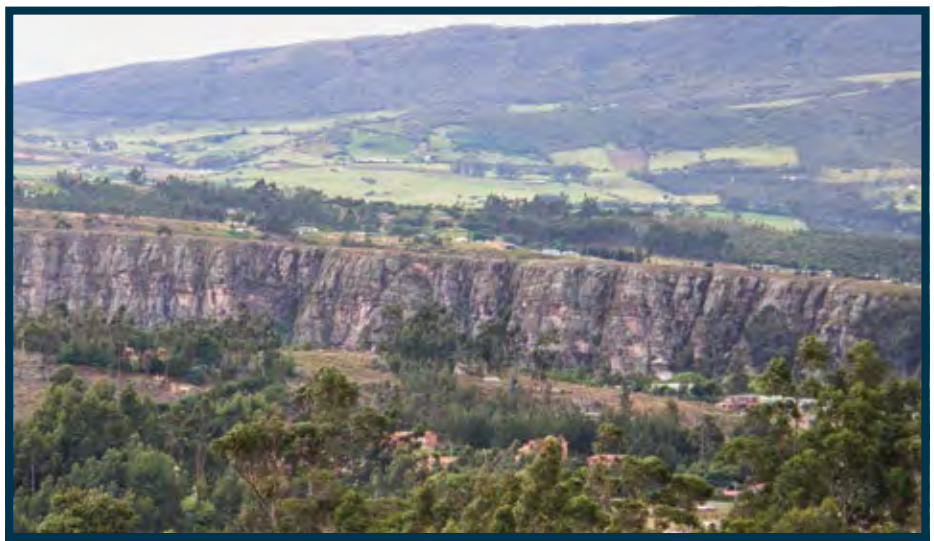
Foreign operators and companies, particularly from North America, are taking notice. Both Anadarko and Exxon-XTO expressed plans for 2014 during a visit to the Colombian Oil and Gas Congress in Bogotá in October – and they are just two among dozens of companies that have come to the country with high hopes.

But their quest does not come without challenges, the greatest of which are unrelated to geology.

Foreign and domestic operators are confronting two major hurdles to exploration in Colombia:

- A lengthy environmental licensing process.
- Resistance from local communities.

According to AAPG member Gustavo Carstens, a 34-year veteran geophysicist and business development adviser, while the region's geology and technology is similar to other parts of the world, each country's operating environment is unique.



A view of Colombia's Eastern Cordillera-Upper Magdalena; complex geological structures like these are only some of the challenges that exist for seismic crews and operations.

"Running a seismic crew in the jungle in Amazonas is not the same as running a crew in West Texas or the middle of the desert in Saudi Arabia," Carstens said.

"Any geophysicist can come to Latin America and start seismic interpretation," he said, "but until they work with the communities and the regulators, they can't make progress."

Licensing

Carstens noted getting an environmental permit in Colombia can take seven months to a year.

"It is difficult for companies to keep all the key people and equipment idle for a long time if there's no activity in other areas," he said.

While some companies are willing to stay the course, others are unwilling or unable to make the long-term commitment.

Colombia has a lengthy licensing and permitting process, which involves site visits, community impact analyses and legal reports compiled by multiple regulators.

A primary frustration for energy companies is that exploration and production contracts in Colombia have three-year phases, while licensing and permitting process takes an average of two years of the first phase.

Companies can extend the timeline if they prove that delays were not due to negligence – but many companies do not always know about or care to apply for the extension.

While obtaining licenses and permitting is a taxing process, an even greater challenge can be working with local communities.

Communities

According to Carstens, the number one problem industry faces is that few people living in local communities understand what the industry really does.

"People are always afraid of what they don't understand," he said, "and if they don't understand, the default answer is 'no.'"

The answer was "no" in Tauramena, Casanare, in December 2013, when the community voted to stop Equion Energía's seismic exploration, drilling and transportation in nine area townships.

Negative sentiments are echoed by Colombian senators promoting stricter

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Photos courtesy of Ecopetrol

Colombia
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regulation on seismic acquisition, which they claim has a significant negative impact on the environment.

Region-Wide Issues

The challenges of regulatory delays and community resistance are not unique to Colombia. During the first-ever AAPG Latin America Region Energy Policy meeting, held last fall at Cartagena ICE 2013, 17 representatives from seven countries discussed strategies and struggles related to environmental restrictions and community resistance.

Those included:

- AAPG member Pedro Alarcon, past president of the Peruvian Geological Society, said Peru has seven regulatory agencies, "and all of them are after the oil industry."

Non-government organizations also are involved, particularly in issues related to offshore drilling and seismic acquisition in the jungle.

- Brazil and Mexico – which each have a blend of federal and local regulatory authorities – and seismic acquisition, offshore drilling and hydro-fracturing are hot topics both for regulators and communities.

- Petrotrin and BHP Billiton's offshore seismic surveys in Trinidad and Tobago have faced heavy resistance from the fishing industry and environmental groups.

Newspaper editorials claimed that air guns used in seismic operations drive fish away, and that fishing nets get caught in seismic lines.

Energy Policy meeting participants agreed on the need to establish a coordinated effort among local and global geoscience organizations that can provide accurate information to regulators and community members.

They also discussed working with the AAPG GEO-DC office in Washington, D.C., and the Division of Environmental Geology to develop a set of regional talking points.

Carstens, who works on public affairs as a director-at-large with the Society for Exploration Geophysicists, agreed that a coordinated, region-wide approach would provide great benefit to all involved.

"We need to explain that what we do today is completely different than what we did 20 years ago," he said. "We bring opportunities to the communities, including development and jobs."

Carstens said that while most companies have special divisions working on community relations, the work is not always coordinated.

"What I haven't seen yet is coordinated work – not only with communities, but also with regulatory authorities," he said. "We should have some kind of lobby with governments and regulatory authorities to get to a common point."

Until that happens, companies are left to their own devices.

Success Stories

Some organizations, however, are making progress.

Trinidad and Tobago's Ministry of Energy and Energy Affairs (MEEA) serves as facilitator of exploration activities. On a recent seismic acquisition exercise, the ministry reached out to members of the fishing industry who were concerned about seismic acquisition's impact on their livelihood.

AAPG member Helena Inniss-King, the Geological Society of Trinidad and Tobago's past president, said the MEEA and the seismic contractor met with fishing associations to help promote an understanding of the process.

"We showed films that highlighted the lack of harm to fish, and we explained the seismic process simply," she said.

The seismic contractor brought a fishing liaison from the North Sea, who gave advice on better fishing methods and facilitated peer-to-peer interaction.

Inniss-King said consultation and communication are keys to working with local communities, who are more likely to cooperate with industry when they can share in the profits.

See **Latin America**, page 24

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Path in the wilderness

'Tabasco' Database Charts Seismic Terrain

By LOUISE S. DURHAM, EXPLORER Correspondent

Petroleum industry activity continues to move ahead in the often-frigid Arctic, where a widespread database to mitigate exploration risk and encourage successful exploration is sorely lacking.


BATHELLIER

Bracing themselves against the elements, CGG workers ventured forth a couple of years ago to acquire a land-based high-resolution 3-D seismic survey on Alaska's North Slope.

Dubbed "Tabasco," the multi-client data set covers 133 square miles.

It was the first multi-client survey performed in the area in more than a decade, according to Eric Bathellier, technical sales manager at CGG. The company has been engaged for more than 30 years in both onshore and offshore Arctic acquisition.

"Tabasco was designed for optimum imaging of the faulting and onlaps in the Cretaceous and Jurassic hydrocarbon-bearing sequences," Bathellier said. "It was acquired in separate northern and southern parts, both of which were processed independently and saw the first use of many high-end acquisition techniques in the region."

"The high productivity techniques that were employed for Tabasco enabled the high-density survey to be carried out in 60 days, from February to April, 2012," he noted.

The North Slope sits on a coastal plain abutting the Beaufort Sea. Besides being home to the famed Prudhoe Bay oil field, it contains both the National Petroleum Reserve and the Arctic National Wildlife Refuge.

To call this region "environmentally sensitive" would be a gross understatement.

"Onshore exploration is permitted only in a short season during the winter, when the snow cover reaches 15 centimeters and the ground is sufficiently frozen for vehicles to be taken over the snow without damaging the tundra," Bathellier said, "December at the earliest to May at the latest."


Photos courtesy of CGG

Bearing the Challenges

Ensuring minimal impact on the fragile locale is fundamental to the seismic crews. In addition to painstaking vehicular management and control, long-term camp areas are iced over manually or else set up on frozen pools to minimize effects on the ground.

Bathellier noted that the 150-person Tabasco camp was comprised of sled-mounted units that were moved one or two miles every few days with the acquisition spread, leaving absolutely nothing behind in accordance with the company's strict "no spills" policy.

Program participants faced the potential of having to deal with a somewhat unusual problem: bears.

"The crews used integrated GPS tracking units to map and enforce exclusion zones … such as government-supplied locations of polar bear or grizzly bear dens," Bathellier said. "Approaching closer than one mile to a known bear den causes an alarm to be triggered in the recorder truck, as well as in the offices of the recording crew manager."

Because grizzlies tend to snooze their time away during the winter and polar bears hang out on or near the sea ice away from land, the likelihood of an encounter was slim. Yet crew members likely kept a wary eye – not only for bears, but wolves as well.

And you thought the south Louisiana swamps were a tough tour of duty.

Rough conditions aside, the activity moved right along.

"Tabasco was a first for the North Slope in that it was a high-productivity, extended slip-sweep vibroseis program," Bathellier commented. "It broke previously established records and set a new standard at 5,000 records gathered in a 24-hour period."

For the geophysically challenged, slip-sweep entails starting up a vibroseis fleet while the previous one is still shaking – in other words, one vibroseis cycle slips over the top of another. Simultaneous shooting is critical to expedite high-density applications in the limited time windows available (in this particular region), while keeping equipment and manpower to a manageable assemblage, according to Bathellier.

Acquisition using slip-sweep is commonplace in numerous parts of the world. But the strict regulations in the Arctic tundra are designed to maintain tight control on vibroseis applications. In fact, the vibrator operators are required to check the machines every hour to avoid any fluid spills.

The acquisition program was improved via use of the proprietary EmphaSeis low-dwell sweep.

See **North Slope**, page 24

North Slope
from page 22

"This target spectrum sweep starts at lower frequency, which was 4 Hz in this case compared to conventional linear sweeps starting at 8 Hz," Bathellier explained.

"The sweep has a short, low-dwell component that lasts a little more than a second," he said. "This is designed to fit the vibrator mechanical constraints, which in this case (was) mostly the pump flow for the type of vibrator used."

A New Norm?

Processing of Arctic data includes resolving image problems related to permafrost and dealing with the intrusive noise from ice breaks.

The dense sampling and high fold of the Tabasco survey ensured that ice break noise did not pose a severe problem for processing, according to Bathellier.

He emphasized that the project represents the first production application of high-density, high-productivity broadband vibroseis in Alaska.

"The broadband data, with added low-frequency content, penetrates to deeper targets, improving illumination and thin beds separation through the inversion process," Bathellier said.

"We believe that with ever-improving seismic technology, tighter geometries and efficient seismic acquisition should become the norm on the North Slope," he predicted.

For sure, the CGG team proved with Tabasco that it's possible to acquire high-density broad bandwidth data in remote areas such as this, despite the tight time window.

Latin America
from page 18

"Folks believe there is a lot of money in oil and that they should benefit," she said. "People living in the area want work and believe they should get first preference."

Colombian companies are using similar strategies to improve their community relations.

- Equion has worked to make social responsibility a pillar of its operations, and the company recently opened four child development centers and a business training center in Tauramena.

- National Oil Company Ecopetrol was a two-time winner of Accenture's Innovation in Corporate Social Responsibility award; in 2013 for a strategy to prevent fuel theft, and again in 2014 for its program developing artificial reefs to recover degraded marine beds.

- Shell Colombia has worked with non-profit agencies in the Bolívar state to establish environmental recovery and protection programs as well as training for farmers and merchants.

Socioeconomic investment is on the rise throughout the country.

According to the 2013 Social Management Report (Colombian Association of Petroleum Geologists and Geophysicists), companies reported the hydrocarbon industry created 60,000 jobs for unskilled workers – 97 percent of whom were hired in areas influenced directly by operations. Also, energy companies' voluntary social contributions in Colombia totaled 241 billion pesos ($117 million U.S.). Social investment mandated by government contracts totaled 88 billion pesos ($42 million U.S.).

Goods and services provided as a part of these investments included improved roads as well as educational facilities and job training programs.

"We go to primary and secondary schools and explain to kids what we're doing," Carstens said. "Those kids go back home and tell their families what they've learned in the schools. In communities with low education levels, what kids say has a big influence."

These efforts not only have the potential of improving industry's image in the region. They may also help to produce the next generation of geoscientists who will one day tackle these complex geological environments.

Statoil-Husky venture brings back-to-back success

Discoveries Breathe New Life In Newfoundland

By SUSAN R. EATON, EXPLORER Correspondent

New life is being breathed into the Newfoundland and Labrador offshore oil industry thanks to two recent back-to-back light crude discoveries in the deepwater Flemish Pass Basin.

The larger of the two discoveries, the Bay du Nord exploration well – announced in September by Statoil ASA and joint venture partner Husky – confirmed the existence of 300 to 600 million barrels of 34 degree API oil recoverable.


RICHARDSEN

Located some 500 kilometers northeast of St. John's, in 1,100 meters of water – and described as "high impact" by both companies – the Bay du Nord light oil discovery represents Statoil's largest-ever operated oil discovery outside of Norway.

Geir Richardsen, Statoil Canada's vice president of exploration, said follow-up plans include acquiring additional 3-D seismic surveys and drilling exploration and appraisal wells in the largely unexplored Flemish Pass Basin.

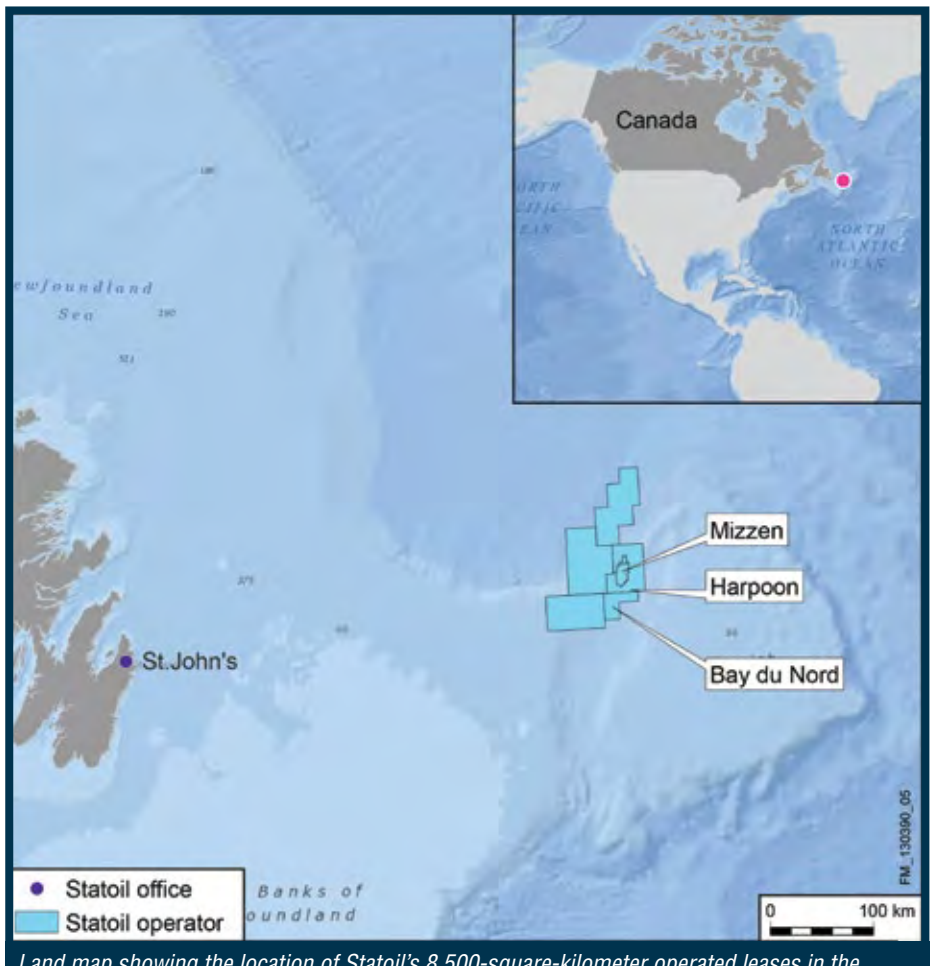
Given continued success, he said, the Bay du Nord discovery could be producing light crude sometime after 2020.

"We rank the Grand Banks and the Flemish Pass Basin very highly," Richardsen said. "Canada is a core area for us – and it's an environment where we hope to create good value."

Hailed as the largest oil discovery in the Newfoundland and Labrador offshore in 30 years, the "high impact" Bay du Nord well couldn't have come at a more critical time in the province's history of offshore oil and gas development.


Courtesy of Statoil ASA

The semi-submersible rig West Aquarius, near St. John's, Newfoundland, drilled Statoil's Harpoon and Bay du Nord light oil discoveries in 2013.



Land map showing the location of Statoil's 8,500-square-kilometer operated leases in the Flemish Pass Basin.

Game Changer

Simply put, the Bay du Nord discovery is a "game changer" for Newfoundland and Labrador's offshore oil and gas industry.

Statoil's light crude discovery has opened up a new oil and gas frontier – from the continental slope to the deep water – that could arrest the province's projected crude production decline and attract new industry players to several of the province's largely unexplored deepwater basins.

According to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), the province currently produces approximately 280,000 barrels per day from offshore fields – or about 40 percent of Canada's light crude production. During the next decade, however, the maturing Hibernia, Terra Nova and White Rose fields will experience predictable and steep decline curves.

When Hebron, the fourth commercial energy project in the Jeanne d'Arc Basin, comes on stream in 2017, overall production will jump to approximately 320,000 barrels per day. But, after several years of peak oil production at Hebron, the province's offshore production will resume its projected decline curve.

Involved in the Grand Banks since the late 1990s (though its predecessor Norsk Hydro ASA), Statoil holds non-operated interests in the Hibernia and Terra Nova fields, the Hibernia tie-in and Hebron development fields, as well as non-operated interests in exploration licenses in the Jeanne d'Arc and East Orphan basins.

Applying lessons from Statoil's deepwater oil and gas operations in the Barents Sea, north of Norway, to its deepwater exploration of the Flemish Pass Basin, Richardsen said, "You get adapted to the distance from land, and the climate, weather and water depth. In fact, the deeper water provides protection from scouring by icebergs."

The Bay du Nord oil reservoir – a Jurassic-age sand with excellent porosity and permeability – lies two kilometers below the seabed.

"Bay du Nord's geology can be drilled using standardized drilling operations," Richardsen said. "For example, we don't have any high pressure reservoir conditions to contend with."

"Bay du Nord could become a giant field if the satellite blocks turn out to also contain light oil," said AAPG member Michael Enachescu, adjunct professor of geophysics at Memorial University's Department of Earth Sciences in St. John's and chief geophysicist with Calgary-based MGM Energy Corporation. "Bay du Nord could become the first deep water development in offshore Canada."

Shining the Light

In fact, each of Statoil's three discoveries in the Flemish Pass Basin are located on separate geological structures, within 10 to 20 kilometers of each other.

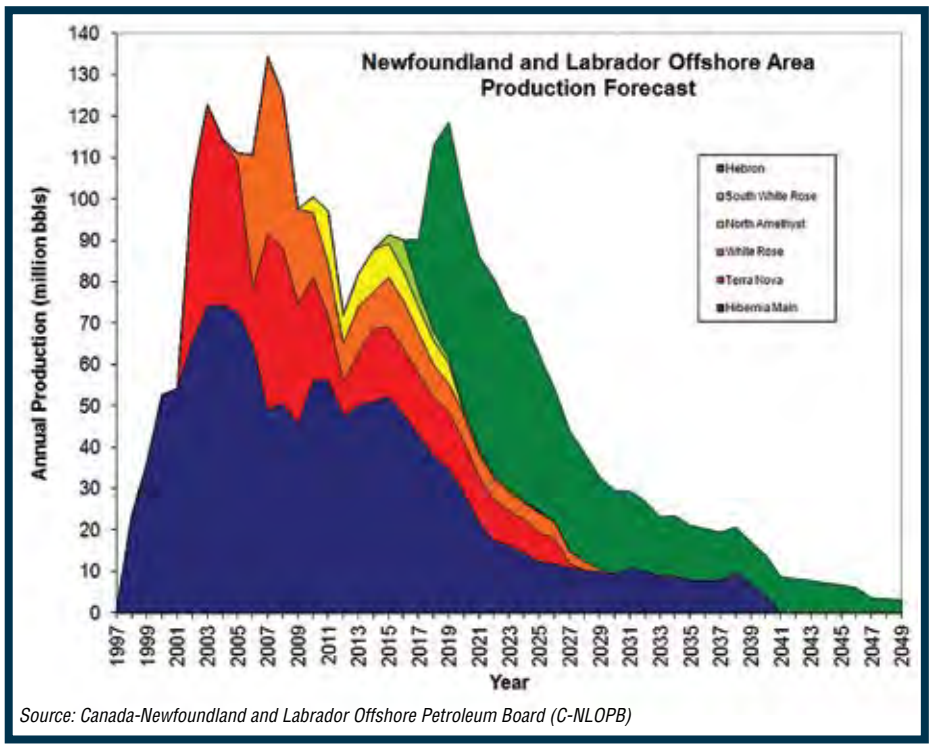
The Mizzen exploration well, drilled in 2009 by Statoil and its joint-venture partner, Husky, flowed 6,290 barrels per day of 22 degree API crude and defined a resource of 100 to 200 million barrels of oil recoverable. The Statoil-operated light oil discovery at Harpoon, drilled in June 2013, will require additional appraisal wells to determine its magnitude.

One production scenario for Statoil's three light oil discoveries might involve the construction of a central production facility with subsea tiebacks.

Comparable in size to the Jeanne d'Arc Basin, which has been tested by 155 exploration and 55 development wells, the Flemish Pass Basin has been explored by just 10 wells to date. The Statoil-operated leases span 8,500 square kilometers or approximately 75 percent of the Flemish Pass Basin; the remainder of the basin is open crown land, a portion of which will be publicly auctioned in 2014 by the C-NLOBP.

In 2004, the C-NLOPB released a Flemish Pass Basin hydrocarbon resource assessment, calculating that the basin contained 1.7 billion barrels (at a 50 percent probability) with expected field sizes ranging from 44 to 528 million barrels. An upward revision of the basin's hydrocarbon potential may be justified, given Statoil's three exploration discoveries, which represent a 75 percent success rate.

See **Discovery**, page 30



Source: Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB)

Following Statoil's model

Exploration Is the Goal

By SUSAN R. EATON, EXPLORER Correspondent

In 2007, as part of its long-term strategic energy plan, the government of Newfoundland and Labrador created Nalcor Energy, its arms-length crown corporation responsible for leading the development of the province's energy resources.

Nalcor's diverse portfolio includes hydroelectric power projects, energy marketing and oil and gas and industrial fabrication.


KEATING

The crown corporation's oil and gas division manages the province's offshore and onshore resources, and is focused on the continued growth and long-term sustainability of the oil and gas sector.

Nalcor also holds and manages the province's equity "back-in" for offshore commercial energy projects. In the mid-2000s, then-premier Danny Williams negotiated a larger share of the offshore resource pie – he successfully established the historic right for Canada's former "have not" province to acquire up to a 10 percent equity position in oil and gas projects requiring development plan approvals by the federal and provincial governments.

Under the terms of the equity ownership agreement, Nalcor pays its pro rata share of historical exploration and pre-development costs incurred by the joint-venture parties – on a go-forward basis, the crown corporation contributes its equity share of development and operational costs.

A Statoil in the Making?

"We're modeling ourselves after Statoil, a state oil company that was carried at the beginning," said Jim Keating, vice president of Nalcor's oil and gas division. "We've become active participants in shaping the offshore oil and gas industry, and that's something Newfoundlanders and Labradorians haven't had an opportunity to do before."

Statoil began in 1972 as Norway's arms-length state oil company. Since then, it has evolved from exploring the Norwegian continental shelf (where it still produces two-thirds of its daily production) to a global E&P company that operates in more than 30 countries around the world.

> **Nalcor is focused on the continued growth and long-term sustainability of the oil and gas sector.**

In 2001, Statoil was partially privatized and publicly listed – the Norwegian state, however, still owns a 67 percent interest, which is managed by its Ministry of Petroleum and Energy.

Today, Nalcor produces between 3,000 to 4,000 barrels per day from its 10 percent equity stake in the Hibernia South Extension and its 5 percent equity stake in the White Rose Growth Project, which also includes the North Amethyst field, the West White Rose field and the South White Rose Extension.

The crown corporation has also acquired a 4.9 percent working interest in Hebron. Second in size to the giant Hibernia field, Hebron was discovered in 1980. Operated by ExxonMobil, Hebron contains 400 to 700 million barrels of 18 to 25 degree API oil recoverable.

Keating estimates that Nalcor's production will skyrocket to between 10,000 and 14,000 barrels per day when the Hibernia South Extension and Hebron field come on stream. Pointing to this measurable and relatively risk-free growth in production, he explained that Nalcor will be cash flow positive by 2016, enabling it to fund current and future oil and gas investments in the province's onshore and offshore.

See **Nalcor**, page 30

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Discovery
from page 26

"In my opinion, Statoil is the right company with the right expertise and people – it has emerged as a leader in offshore Newfoundland," added Enachescu, a former Husky geophysicist with 30 years of experience in the Newfoundland and Labrador offshore. "The Statoil-operated discoveries of the Flemish Pass Basin also shine a new light on the potential of the Southeastern Orphan and Carson basins."

"The key to successful exploration is the presence of source rocks," he added, "and I believe that these basins are on the 'Late Jurassic Superhighway' (for source rocks) which extends from Nova Scotia, to the Grand Banks and the Flemish Pass, and across the Atlantic to the Irish Sea and the Porcupine Basin."

Photo courtesy of TGS-NOPEC Geophysical Company ASA (TGS)

The M/V Sanco Spirit seismic vessel in St. John's, Newfoundland.

Show of Support

Enachescu's comments were echoed by Derrick Dalley, Newfoundland-Labrador's minister of natural resources, who said "The discovery is a result of an ambitious and targeted drilling campaign in the Flemish Pass Basin."

"The discovery proves there is oil in our province's deepwater basins and it will encourage increased offshore exploration activity," Dalley said. "The Provincial government is committed to encouraging exploration in frontier areas and is investing in geoscience, marketing, and updating the land tenure system to attract more interest and players."

The province's new land tenure system, released in December, was designed to improve transparency, predictability and input by industry. Aligning its land tenure system more closely with those of other offshore jurisdictions, the C-NLOPB has created three different categories:

- Four-year cycles for regions of low activity.
- Two-year cycles for regions classified as high activity.
- One-year cycles for mature regions.

The C-NLOPB also announced a 2013 call for nominations in the Labrador Southern and Eastern Newfoundland regions.

Nalcor
from page 28

Coming Home

In addition to its equity purchases, Nalcor has undertaken an ambitious geological assessment of the province's offshore hydrocarbon resources, including a regional rock physics study, a seabed core analysis study and the satellite imaging of hydrocarbon seeps emanating from the sea floor.

According to Keating, 85 percent of Newfoundland and Labrador's historical seismic data base is more than 15 years old; acquired with old technology, he said, this legacy 2-D seismic data makes it challenging to attract new oil and gas investment to the province.

During the past three years, however, Nalcor has proactively invested $15 million for a 20 percent stake in 47,000 kilometers of new 2-D multi-client seismic data acquired in a joint venture between TGS-NOPEC Geophysical Company ASA (TGS) and Petroleum Geo-Services ASA (PGS), two Norwegian seismic companies specializing in imaging frontier regions of the world.

Working collaboratively with TGS/PGS, Nalcor assisted in planning the state-of-the-art 2-D seismic surveys, often locating them over active sea floor petroleum seeps. According to Keating, 75 percent of the new 2-D multi-client seismic data is situated in the province's new oil and gas frontier – the continental slope and the deep water.

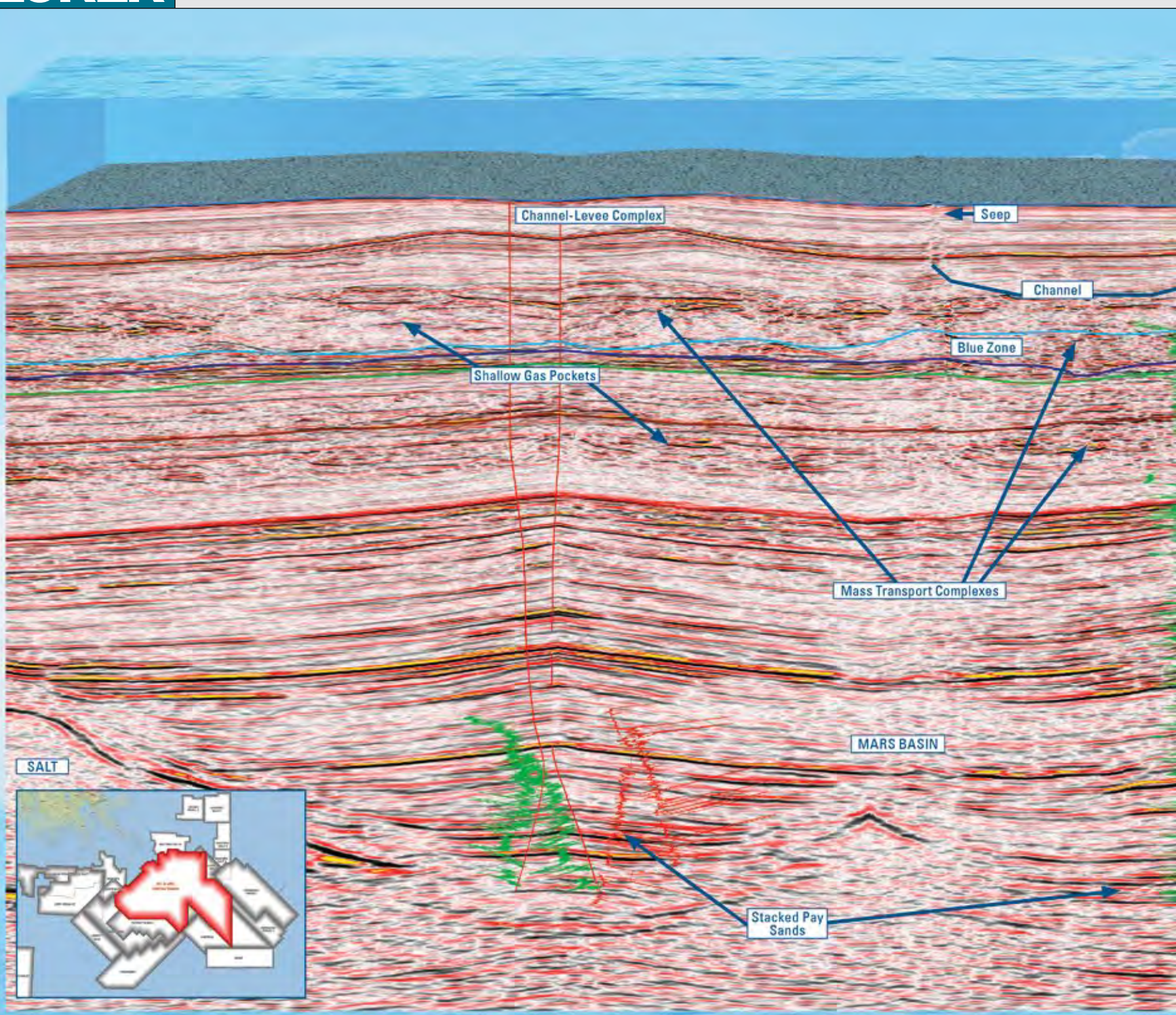
The multi-client seismic surveys are all available, for licensing, by industry.

Nalcor's investment is reaping rewards: The new 2-D seismic data have revealed the existence of several new deepwater Tertiary-age geological basins offshore Labrador – Chidley, Henley and Holton – and have increased the extent of the Hawke Basin.

Nalcor's staff is keeping pace with its growing production base. The company's current staff of 25 oil and gas professionals comprises predominantly individuals who gained their oil and gas experience in the private sector.

Keating described many of Nalcor's employees as "Newfoundlanders who have come home to ply their trade in an environment that they're familiar with."

"Now, for the first time, we're able to drive exploration activities," he said, "setting the pace of the province's offshore oil and gas industry."



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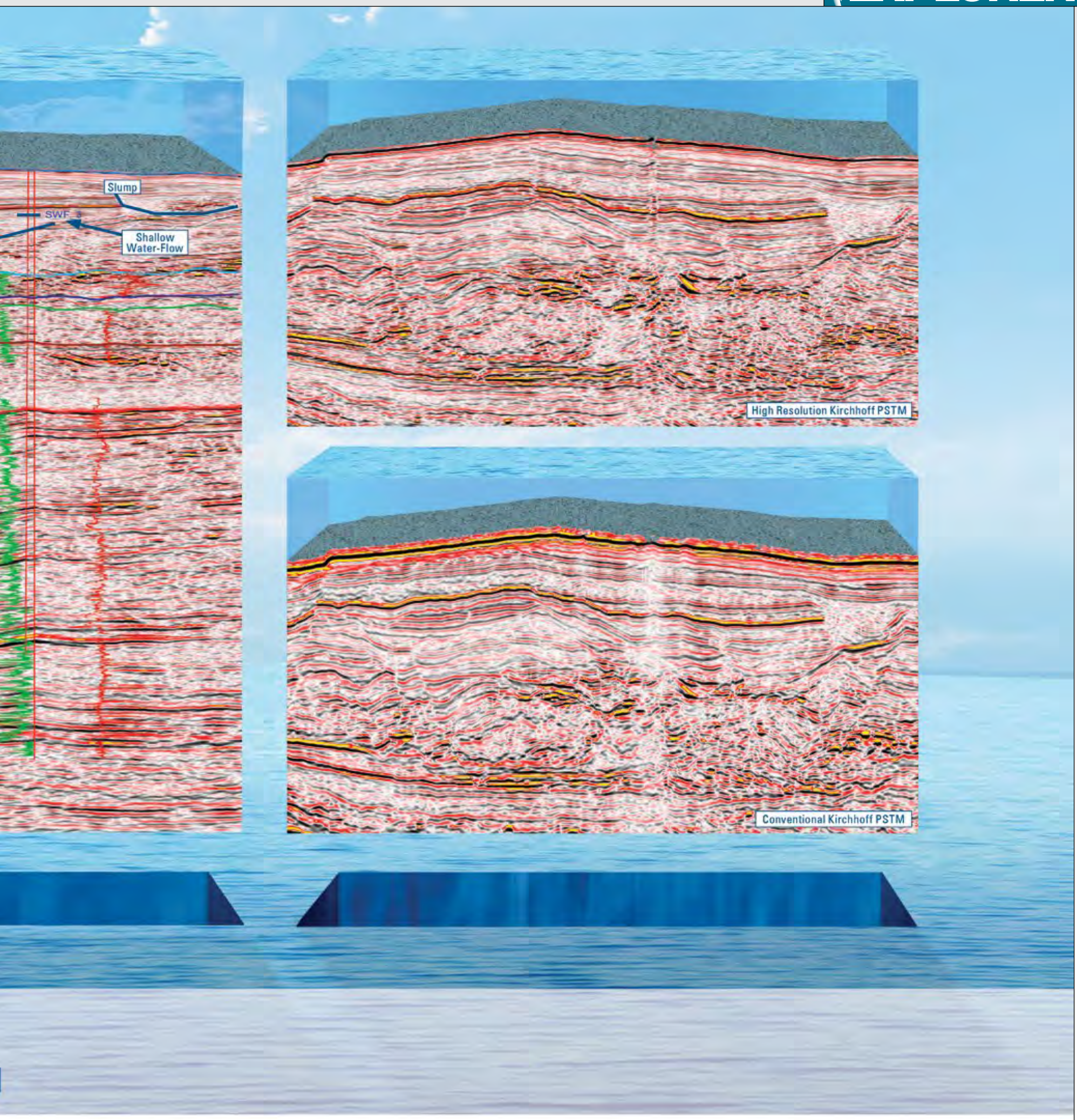

Earth, interrupted

Exploring the Causes of Induced Seismicity

By LOUISE S. DURHAM, EXPLORER Correspondent

Energy independence for the United States – the mere fact that it's being talked about tends to spark a warm, fuzzy feeling among the folks who recognize the positive financial and geopolitical impact from the somewhat recent surge in domestic production.

Hydraulic fracturing (HF) technology inarguably underpins the United States' ascent to prominence as a leading hydrocarbon producer. After all, the abundant shale formations primarily responsible for this production need all the help they can get to give up their contained treasure, and induced fracturing of these dense rocks is key.

Even so, it's a process that certain politicians, citizens in general and a number of grass roots organizations consider to be akin to the work of the devil.

Love it or hate it, hydraulic fracturing technology used to tap this abundant domestic hydrocarbon resource is crucial to the nation's energy needs – and, in turn, the economy.

Certain unsubstantiated accusations related to HF, including poison-contaminated drinking water, have kind of faded into the background. Currently, earthquakes supposedly caused by water injection are the headline-makers.

Flowback and produced water resulting from HF and hydrocarbon production have resulted in an increase in wastewater disposal via underground injection wells. As a result, studies suggest that recently felt seismic events may be associated with injection wells in several states, including Arkansas, Ohio, Texas and Oklahoma.


TYMCHAK

> "It's not clear why earthquakes have appeared near some injection wells but not others."

One of most recent headline makers concerns a string of small earthquakes northwest of Fort Worth. Researchers are investigating the possible tie to injection wells in the area.

"The scientific community has known that earthquakes can potentially be caused by fluid injection or extraction activities since the 1920s, commonly referred to as 'induced seismicity,'" said Matthew Tymchak, hydrologist at Gradient Corp. in Cambridge, Mass.

"But in many cases, such as Oklahoma, there is debate about whether the earthquakes resulted from fluid injection, natural tectonic processes or remote events," Tymchak noted.

"Also, it's not clear why earthquakes have appeared near some injection wells but not others having apparently similar geology, target reservoirs and injection rates," added Samuel Flewelling, Tymchak's hydrologist colleague at Gradient.

Natural or Induced?

Distinguishing between tectonic (natural) and induced seismicity can cause sleepless nights for members of the scientific community.

Tymchak said the National Research Council in 2012 noted that previous attempts to evaluate potentially induced seismicity have relied on inferences based on spatial and temporal proximity of earthquakes to human activity.

Spatial correlation has been a qualitative approach that essentially plots locations of earthquake epicenters – or in some cases, hypocenters – and injection wells, according to Tymchak. Even though the induced seismic event likely would be near an injection well, it's essential to have knowledge of a region's seismic history and other ancillary data to have sufficient info to identify induced versus tectonic events.

As to temporal correlation, Flewelling noted that it entails a comparison of the timing of injection volumes and subsequent downhole pressure changes with increased seismic activity in the area.

The ability to distinguish between induced and tectonic seismicity is considerably enhanced where there is a site-specific seismic monitoring network near a fluid injection site, particularly if a known fault is present near the well.

Unfortunately, there are no site-specific monitoring networks for most injection wells. Additionally, traditional seismic monitoring networks usually are inadequate to detect most low magnitude events that would typify a region's potential seismic response to fluid injection.

"What you generally have is seismic catalogs from larger regions like states, and monitoring networks detecting events are not so dense," Flewelling said. "You can't locate those events quite as accurately, and there are many injection wells operating in the area, so it becomes very difficult to do a site specific analysis.

"We're seeing some approaches where people are trying to look at spatial

See **Seismicity**, page 42

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Acclaimed 'refresher' course offered at ACE

Don't Know It? Don't Worry! This is For You

By LOUISE S. DURHAM, EXPLORER Correspondent

If you're a geologist who recognizes that you need to get up to speed on seismic technology, or a geophysicist with a yen to understand the geologic concepts needed for seismic interpretation, Bruce Hart may be the go-to guy for you.

Hart, an AAPG member and leading researcher at Statoil, did an earlier stint in academia as a professor at McGill University in Montreal. While there, he traveled the globe extensively, educating geoscientists in the esoteric realm of 3-D seismic.

Today, his short course, "3-D Seismic Interpretation for Geologists," is a crowd-pleaser – as were his earlier programs. The course is designed to introduce participants to the art and science of seismic interpretation.

It's based on Hart's digital textbook (AAPG Discovery Series No.16), which synthesized material presented to students and industry professionals in Cairo, Houston, Copenhagen, London, Kuala Lumpur, Denver, New Orleans, Calgary and other locales since 1995.

Hart first recognized the need for this focused approach when attending an "introductory" workshop on 3-D seismic technology a number of years ago.

"The speakers were geophysicists, and the audience seemed to consist mostly of geologists," he said. "I watched as the audience's eyes rolled backward, closed or started drifting when the speakers began talking about the 'distribution of azimuths' in a 3-D survey or other relatively advanced topics, at least for geologists.

"A short while later, I was asked to be a co-instructor on a 3-D seismic short course for small independent producers, and decided I should start with a 'refresher' on the basics of the method before diving into 3-D seismic techniques," Hart noted.

"The response was quite good," he said, "and since then this format has been well received in other courses I've taught."


HART

Statoil researcher Bruce Hart will be leading a short course titled "3-D Seismic Interpretation for Geologists" in Houston April 5-6, as part of the short course program for the AAPG Annual Convention and Exhibition.

Hart's course will be offered at the Hyatt Regency Hotel.

His is one of 19 short courses that will be offered both before and after the convention, ranging from "Shale Reservoir Evaluation" to "The Business of the Oil Business" to "Applied Concepts in Naturally Fractured Reservoirs."

Details and a complete list of the short courses being offered can be found in the ACE announcement that accompanied the February EXPLORER, or online at the new AAPG website.

Upping Your Game

The industry has long recognized the value that 3-D seismic brings to the table in the E&P world. Even so, it's actually not used everywhere.

"One place where it's not used as much yet – but it depends on the play – is in the unconventional world," Hart noted.

"People are definitely doing structural attributes, picking up faults and things in the Marcellus, Eagle Ford and other plays," he said. "But there are still a lot of companies in some parts of some plays not using it much.

"In some places like the Bakken, where the reservoirs are so thin, they don't see the value in it."

Hart commented that one of the advances he sees today is that geophysicists are really off and running in the realm of geophysical-based prediction of rock properties. Yet the geologic community overall has not embraced what's doable here and how it's done.

"The geophysicists have ways of doing seismic inversion to predict rock properties," he said, "but I think some of the math is beyond the average geologist.

"Some inversion-based predictions have math and physics on the side sometimes, but you need a geologist to look at this and say whether they make geologic sense.

"To make a contribution, geologists should up their game a bit and learn more about the methods and be in a position where they could say this image doesn't make sense geologically," Hart noted. "Or maybe it's something new about the geology they didn't understand before."

An Unconventional Approach

Inarguably, much has changed in science and technology over the past decade or so, but it still holds true that the

See **3-D Course**, page 57

Conference Conjugates Researchers, Explorers

By SUSAN R. EATON, EXPLORER Correspondent

Energized by the recent Statoil ASA-operated Bay du Nord light oil discovery in Newfoundland's offshore Flemish Pass Basin, earth scientists are gearing up to host the fourth Atlantic Realm Conjugate Margins Conference in St. John's, Newfoundland, Aug. 20-22.

Titled "Go Deep: Back to the Source," the conference will bring participants together from academia, government and industry to discuss the latest ideas, newest data and E&P activity pertaining to the evolution of the Atlantic conjugate margins and their petroleum systems

Located some 500 kilometers northeast of St. John's in 1,100 meters of water, the Bay du Nord well is estimated to contain 300 to 600 million barrels of 34 degree API oil recoverable. It is the largest discovery in offshore Newfoundland in 30 years, and the province's first deepwater discovery.

During the past decade, the Atlantic conjugate margins have undergone an exploration renaissance, leading to drilling successes in the intermediate and deepwater basins of offshore Brazil, Angola, Canada, Norway and central west Africa.

Improvements in 2-D and 3-D seismic data acquisition and processing techniques – and recent deepwater drilling results – are driving this exploration renaissance, and have led to the re-evaluation of the Atlantic conjugate margins' tectono-stratigraphic frameworks, source rock distribution and basin models.

Technological advances also include the acquisition of deep seismic profiles in frontier regions, which have provided new insights into conjugate margins.

Equipped with newfound knowledge, the petroleum industry is taking a new look at the hydrocarbon potential of deepwater areas of Northwest Brazil, Ireland, Morocco, Nova Scotia, Newfoundland and Labrador, Greenland, Norway, the Faroe Islands and Portugal.

ENACHESCU

Photo courtesy of Larry Hicks

Interbedded, brown weathered dolomitic siltstone, ribbon limestone and shale of the Cambro-Ordovician Cow Head Group exposed along the shoreline beneath Lobster Cove Lighthouse at Rocky Harbour, Bonne Bay, in Western Newfoundland.

Evolution Continues

From its humble beginnings in 2008, the biennial conjugate margins conference has grown into a major international event.

The inaugural Central Atlantic Conjugate Margins Conference was held in Halifax, Canada; the second Central and North Atlantic conjugate margins conference took place in August 2010, in Lisbon, Portugal; more recently, the third conference was held in August 2012, at Trinity College, Dublin, Ireland.

Some 277 delegates from 17 countries convened in Dublin, delivering 48 oral and 52 poster presentations. Attendees participated in field trips to western Ireland, northern Ireland, southern England and southern Portugal.

AAPG member Michael Enachescu, one of the co-chairs of the upcoming conference, said the term "Atlantic Realm" signifies not only the conference's coming of age, but the fact that basin evolution along the conjugate margins – from Cape Horn and Cape Good Hope to the North Atlantic – involves fundamentally similar tectono-stratigraphic processes.

Calgary-based Enachescu is the chief geophysicist of MGM Energy Corporation and an adjunct professor of geophysics with Memorial University of Newfoundland's department of earth sciences.

"The conference provides a great opportunity for basin modelers – who work on the theoretical, crustal scale – to meet with industry counterparts who work in the upper three to four seconds (two-way travel time) of the seismic data where the hydrocarbon prospects lie," he said.

"A network of intra-connected basins and sub-basins formed on the Newfoundland continental margin," he said. "While some of the basins are separated today, they were connected during the Triassic to early Cretaceous period."

Coining the term, the "Late Jurassic Superhighway," he pointed to the existence of source rock migration routes that extend from Nova Scotia to offshore Newfoundland (the Grand Banks and the Flemish Pass), and across the Atlantic to the Irish Sea and the Porcupine Basin.

The conference will feature the following thematic sessions:

- Atlantic Margins.
- Geodynamics.
- Deepwater Systems.
- Structural and Tectonic Settings.
- Petroleum Exploration.

The conference will feature several keynote speakers, an industry exhibition, and oral and poster presentations from both sides of the Atlantic, detailing

See **Margins**, page 55

Highlights Set for Margins Conference

Highlights of the fourth Atlantic Realm Conjugate Margins Conference in St. John's, Newfoundland include:

- **John Waldron**, associate chair of the University of Alberta's department of earth and atmospheric sciences, will lead a field trip to view spectacular outcrops of the Cambro-Ordovician carbonate succession in Western Newfoundland. The carbonates are characterized by karst topography, Mississippi Valley Type mineralization, oil seeps and historical oil production at Parsons Pond.

- **Derek Wilton**, professor of geology with Memorial University of Newfoundland's department of earth sciences, will lead a field trip to Western Newfoundland, to view some of the best exposures of ophiolite complexes in the world. Participants will be able to stand on the exposed mantle and touch the Moho discontinuity, which outcrops in Gros Morne National Park.

The field trip also includes a visit to Signal Hill and Cape Spear to view the Signal Hill Group comprised of the remnants of a late Precambrian deltaic system.

- **Gianreto Manatchal**, from the University of Strasbourg, France, will be the Atlantic Realm's keynote speaker, addressing the "Inter-Relationship Between Tectonic, Magmatic and Sedimentary Processes During Hyperextension and Lithospheric Breakup: The Lesson from the Tehtys and Iberia-Newfoundland Rifted Margins and Its Applications to the North and South Atlantic margins."

The Canadian keynote speaker is **Richard Wright**, exploration manager of St. John's-based Nalcor Energy's oil and gas operations.

AAPG Distinguished Lecturer Mohriak Focuses on Red Sea's Analogies

Current AAPG Distinguished Lecturer Webster Mohriak is one of the confirmed keynote speakers for the upcoming Atlantic Realm Conjugate Margins Conference, set this August in St. John's, Newfoundland.

Retiring in 2011 after a 30-plus-year career with Petrobras Brasileiro S.A., Mohriak is currently an oil and gas consultant and an adjunct professor of geology with the University of Rio de Janiero State.

Mohriak, who attended the first conference in 2008, has been actively involved in the conjugate margin conferences' technical committees.

Mohriak will deliver his AAPG Distinguished Lecturer presentation, "Birth and Development of Continental Margin Basins: Analogies from the South Atlantic, North Atlantic and the Red Sea." His presentation is based upon a book, published recently by the Geological Society of London and titled "Conjugate Divergent Margins," which focuses on the South and Central Atlantic divergent margins.

Mohriak is enthusiastic when he discusses the Red Sea, which, he said, is in the "embryonic stages of opening."

MOHRIAK

"The Red Sea and the Gulf of Aden to the south are unique examples of basins that illustrate the process of break-up and the development of passive continental margins."

Salt deposition happened 10 to 15 million years ago in the Red Sea. In comparison, salt deposition occurred in the Scotia Margin (offshore Nova Scotia) 200 million years ago, and, in the South American offshore, some 115 million years ago.

The salt basins on the opposite side of the South Atlantic – in the conjugate margins of Brazil and Angola – were separated by oceanic spreading centers 100 million years ago. Today, these basins are geographically separated by thousands of kilometers.

In contrast, the salt basins in the Red Sea are just starting to drift apart. And, as the Red sea opens, parts of it are developing oceanic crust.

"The Red Sea gives us a glimpse of what happened in these margins after the salt was deposited," Mohriak said. "We can use the Red Sea as a unique natural laboratory to conduct conceptual, physical and numerical models."

– SUSAN R. EATON

3-D Seismic Symposium: A 20-Year Institution

By DIANE FREEMAN, EXPLORER Correspondent

It started as a small, specialized meeting for the few people who then had an interest in 3-D seismic.

Today, 20 years later, it's grown into something very big – and very special –not just to a lot of people, but the entire Rocky Mountain exploration community.

And that made its most recent rendition more than just one more symposium. It made it a celebration.

The 3-D Seismic Symposium, held annually in Denver for the last 20 years, has introduced new concepts, technological advances and launching pad-boosts for several careers – and led to greater cooperation between disciplines in the energy industry.

Geologists and geophysicists work together to put on the conference that yearly attracts up to 700 people for the single-day event.

Founders R. Randy Ray and Bill Pearson – both AAPG members, with Ray holding Honorary status – said the idea for the original 3-D Seismic Symposium in 1995 grew from a guidebook on the topic published by the Rocky Mountain Association of Geologists.

"We quickly realized there would be a high interest in this new technology of 3-D seismic," said Ray, a consulting geophysicist and geologist in Denver.

"The expectation at the first meeting was for 200 people," he said. Instead, some 500 attendees showed up.

The conference is a joint effort of the Rocky Mountain Association of Geologists and the Denver Geophysical Society.

RAY

> "Denver has always been a leader in how geology and geophysics fit together."

"We've set the precedent of geologists and geophysicists working together in Denver. Now we're seeing that more nationally and globally. Denver has always been a leader in how geology and geophysics fit together," Ray said.

And that has benefits.

"This close camaraderie has allowed for great technological talks," said Pearson, a geophysical and geological consultant at Pearson Technologies Inc. in Golden, Colo.

"The ability to cooperate between (professional) societies has helped," he added. "One of the biggest battles of the conference committee at first was when we went for information that a company considered proprietary."

Launching Pad

But because participants in the symposium often knew employees of those businesses, companies soon began allowing their representatives to present papers and talks on those projects at the conference.

Early on one of the primary speakers was AAPG member Michael Bahorich, now executive vice president and chief technology officer at Apache Corp. in Houston. He originally spoke at the 5 p.m. slot, but then was invited back a year later to deliver the keynote presentation on coherence technology, a topic he basically invented, Pearson said.

"It's been a launching board for people in the industry," Ray said. "People who were not well known in the industry become famous after speaking here."

Other early speakers include the well-recognized geophysicists like Bob Hardage and Peter Duncan, both AAPG members and former presidents of the Society of Exploration Geophysicists. Hardage, like Ray, is a former editor of the EXPLORER's popular Geophysical Corner.

At this year's meeting, Hardage presented the first public announcement of the BEG's patented techniques for recovering shear wave data from existing conventional P-wave data. The revelation of this hidden content within already existing 2-D and 3-D seismic could be a breakthrough concept. Shear wave data is valuable for identifying subsurface reservoir fluids and has been too expensive to routinely acquire in most seismic surveys.

AAPG member Julie Shemeta, a consultant and president of MEQ Geo in Denver, was another early speaker on microseismic technology, Pearson said. Microseismic is used to monitor subsurface hydraulic fracturing in horizontal wells.

"She was a big draw and became involved in the committee and became a co-chjair of several symposiums," Ray said. "Our members on the committee draw in activity."

Ray noted that many professional conferences are set up so a speaker presents a paper to at most 150 people in a room. In contrast, at the 3-D seismic symposium only one speaker makes a presentation at a time to a crowd of up to 700.

"We bring top scientists in," he said. "It can be very effective to pass on their information to such a large group of people all at once."

Of course, along with the triumphs, have also brought challenges over the past 20 years.

For example, many of the presenters have been first-time speakers, Ray noted. "Many are nervous talking to some 600 to 700 people," he said.

And there was the weather challenge of 2009, when a Denver blizzard trapped many participants in airports and stranded others trying to get to the

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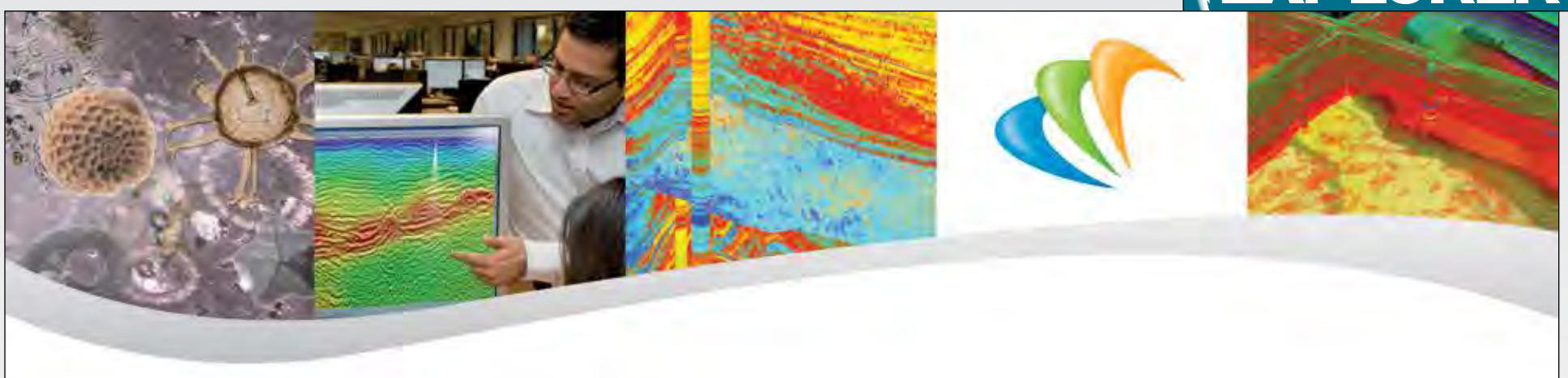

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correlation of events with injection wells, or time correlation of events with the timing of injection," he noted. "But if there is not an intensive monitoring program, it's difficult to say definitively whether or not these events are induced."

On the Job

But these savvy researchers are on it.

They have nailed down some approaches to explore to distinguish between natural and induced seismic events. These include recently developed quantitative approaches, such as the analysis of frequency magnitude distributions or the number of earthquakes that occur for a given magnitude.

"We've been exploring whether frequency magnitude distributions could be a more useful tool for evaluating potential induced seismicity with the existing monitoring network in addition to looking at spatial and temporal correlation," Tymchak said.

"Frequency magnitude distributions have been used to characterize seismicity of particular regions and have been shown to vary with different tectonic processes, as well as for induced seismicity around individual wells," he noted. "We are evaluating whether the frequency magnitude distribution of seismicity detected by the current monitoring network in a particular region should change if there are induced events, and if so, how."

This whole topic has potential impacts beyond the oil and gas industry.

The USGS intends to update the country's earthquake hazard maps, which will take induced seismic events into account.

"Part of this process will inherently involve picking which seismic events in the past have been induced," Flewelling stated. "It's not entirely clear how such a differentiation should be made.

"One of the points of our work," he added, "is to move the discussions and qualitative approaches to be more quantitative, or mathematical, if possible."

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conference by road.

When one speaker couldn't get to the conference, the planning committee called up local professional Murray Roth, senior geophysicist with Drilling Info (formerly Transform Technologies), who had addressed the conference before and asked him to fill in.

"He was at his office and came over in the afternoon and gave a great talk," Pearson said.

A morning speaker that year ran overtime but had more drilling results, so he was asked to give a second talk in the afternoon.

"It was (AAPG member) Keith Johnson from Wolverine Gas and Oil Corp. who spoke on the Utah Thrust Belt Discovery – that was a hot topic then," Ray said. Johnson is now manager of geophysics at Wolverine.

'An Evolving Topic'

At its first meeting the keynote speaker was the well-known and highly regarded Alistair R. Brown, another past editor of the EXPLORER's "Geophysical Corner" and author of the bestselling AAPG memoir, "Interpretation of 3-D Dimensional Seismic Data."

"When we had our first meeting, 3-D was a brand new technology," Ray said. "The conference has followed its improvement and refinement. It was used early on as an exploratory tool and now has become the 'catscan' that guides horizontal development drilling in resource plays."

Angie Southcott, of WPX Energy in Denver, showed 3-D seismic geosteering horizontal wells in the Bakken play.

"Her outstanding presentation showed the practical applications for which the symposium is known," Ray commented.

Now after 20 years, 3-D seismic is still a popular subject in the energy industry – "still an evolving topic," Pearson said.

Ray and Pearson ran the conference for 16 years. They noted that members of the planning committee often stay involved for many years.

"The success of the 3-D symposium comes from the close-knit community here in Denver that formed the committee," Ray said.

Some committee members have served on it for 19 years, also serving as conference speakers.

"What's so remarkable is that the committee doesn't turn over every year. People stay on it for years," Pearson said.

Although the conference tries to focus on the Rockies, it also has brought in speakers to discuss technologies being utilized in Texas, the Midcontinent and elsewhere. It has even included a few non-U.S. speakers, Pearson said.

Attendees come from throughout Colorado as well as Wyoming, Utah, Texas and other states.

"About 25 percent of the attendees are from outside Colorado," Ray said.

Student participation is also a key part of the conference.

"We always host about 50 students from the region's universities to come. Now these students are becoming speakers and even serving on the committee," Ray said.

Best yet, the symposium also helps to financially support the two professional societies that sponsor it.

"The financial success," Pearson said, "has contributed a lot to the local societies."

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SPOTLIGHTON ...

PROWESS Shines Light On Women 'Pioneers'

By COURTNEY CHADNEY, EXPLORER Correspondent

With AAPG's 100-year anniversary now just three years away, the AAPG's PROWESS Committee (Professional Women in Earth Sciences) is creating a way to recognize and honor pioneer women who were vitally important to AAPG, the profession and the industry.

According to committee co-chair Jessica Moore, PROWESS has been hard at work researching and preparing 100 biographical sketches of AAPG Pioneering Women in Geosciences for the upcoming anniversary.


MOORE

The idea was the brainchild of past AAPG president and Honorary member Robbie Gries, who wrote an email to the committee in March 2012.

"The first 100 women in AAPG … for the 100 year anniversary … might be interesting and fun", Gries said.

Since then, PROWESS enthusiastically embraced the project and is making great progress developing 100 sketches of women who could serve as an inspiration to all.

"There was a strong desire for us to understand, as well as to recognize, the huge contribution of those women who paved the way for us geoscientists today," Moore said.

Nine PROWESS members comprise the research team – and according to Moore, the team's skills as explorationists have come in handy. While the research has been quite challenging for the group and has made them feel at times more like detectives, Moore described the research process as "a wonderfully inspiring journey.

"We have learned to scour ancestry sites, obituaries, church records, university alumni records, government censuses and much more," Moore said, proudly.

In the early days, AAPG membership records took the form of 3-by-5-inch cards, with new member applicants' contact information, education and employment details often hand-written or manually typed by the applicants themself.

These carefully preserved records revealed the first 100 women members were born between the years of 1882 and 1921. Midway in this age range was AAPG pioneer Ruth Schmidt, born 1916, who was with colleagues measuring the depth of glacial Portage Lake in Alaska when the great 1964 earthquake hit that endangered their lives.

(A story on Schmidt and her career is set for the April EXPLORER.)

Moore described sketches that will be part of the final collection – biographies that portray amazing women from all walks of life, from housewives who taught piano lessons in their spare time to fund their oil discoveries to professional geoscientists interrupting their studies and careers to serve in World War I and World War II combat and aviation units.

"It has been a wonderfully inspiring journey to search out the histories on women we have come across in pursuing this immense research effort," Moore said.

"I really cannot pick a favorite biography," she added. "They are each stories of tremendous passion, hard work, stamina and ingenuity, from which we can all take lessons."

Looking for Mentors

AAPG established PROWESS eight years ago, in an initiative to help retain women in the industry. At that time only 40 percent of the undergraduates of geology were women, and women made up less than 10 percent of AAPG members.

> **"They are each stories of tremendous passion, hard work, stamina and ingenuity."**

Since its inception, the PROWESS committee has grown from 20 members in 2006 to 55 members from six countries at the start of 2014. PROWESS also has helped to increase female AAPG membership to 18 percent in the short time that it has been around.

The increase in female AAPG members is attributed in part to the leadership and career – focused short courses for women and men offered at the AAPG annual conventions each year since 2012, organized and co-hosted by PROWESS and the Association for Women Geoscientists (AWG).

This year at the Houston ACE, in addition to a pre-convention short course, a mentoring and networking reception is offered on Saturday evening, co-hosted by PROWESS, AWG and the Society for Exploration Geophysicists (SEG) Women's Network Committee.

PROWESS also has been working tirelessly to help address concerns and take an active approach in improving the climate for women in the industry.

Moore believes a common theme that unites women in the geosciences today is their desire for role models and mentors – another reason she's so passionate about the 100 Pioneer Women project.

And although Moore feels that in most cases she has had the same benefits and treatments as her male peers, "time and again this is being proven to not quite be the case for everyone," she said.

Women in the industry desire to see "women with technical, business and informal work-life balance competence and lessons learned to share," that can help them with the challenges they encounter, she said.

"Personally, I have found great benefit to the networking I've gained across the industry and globe as well as the skills I've gained," Moore said, "and will continue to gain through the short courses on leadership skills and business acumen."

The 100 Pioneer Women project, she hopes, will be another part of that effort – with long-lasting benefits.

"These sketches are just one way that the committee plans to help women find these role models," she said, "and continue making positive differences in the professional career of women in the geoscience industry."

AAPG Education UPCOMING EDUCATION SCHEDULE

Last Chance

NEW - Virtual Field Trip: Geology of the Grand Canyon, Bryce Canyon, and Zion National Parks -- An AAPG E-Symposium	March 5, 2014
NEW - Technical Writing Triage -- an AAPG E-Symposium	March 13, 2014
Field Safety Course for Field Trip Leaders Houston, TX	March 26-27, 2014
Basinal to Local Scale Stratigraphy and Facies Architecture of the Jackfork Group Turbidites, Arkansas Little Rock, AR	April 3-5, 2014
Getting Started in Fluvial Stratigraphy Houston (with AAPG Annual Convention)	April 5, 2014
Applied Concepts in Naturally Fractured Reservoirs Houston (with AAPG Annual Convention)	April 5-6, 2014
Concepts, Models and Case Studies of Dolomitization Houston (with AAPG Annual Convention)	April 5-6, 2014
Deepwater Siliciclastic Reservoirs Field Seminar California	April 11-16, 2014

Short Courses

Basic Well Log Analysis Austin, TX	April 28-May 2, 2014
Petrophysical Analysis and Integrated Approaches to the Study of Carbonate Reservoirs Austin, TX	April 29-May 1, 2014
Summer Education Conference Denver, CO	June 16-20, 2014

Field Seminars

Clastic Reservoir Facies and Sequence Stratigraphic Analysis of Alluvial-Plain, Shoreface, Deltaic, and Shelf Depositional Systems Utah	May 3-9, 2014
Geology of Grand Canyon, Bryce Canyon and Zion National Park Nevada	May 31-June 6, 2014
Play Concepts and Controls on Porosity in Carbonate Reservoir Analogs Spain	June 1-6, 2014
Northern Appalachian Basin Faults, Fractures and Tectonics and Their Effects on the Utica, Geneseo and Marcellus Black Shales New York	June 23-27, 2014

Online Courses

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Editors Gather to Consider AAPG Publishing

By PAULA SILLMAN, AAPG Technical Publications Supervisor

The second annual Charles H. Taylor Fellowship meeting, held in late January under the leadership of elected editor Michael L. Sweet, once again threw a bright spotlight on AAPG technical publication efforts.

Specifically, those attending focused on the process of selecting papers for the publications awards and discussing publication strategy for the various journals published under AAPG.


SWEET

The meeting is a chance for associate editors, the elected editor and AAPG publications staff to discuss ways to work together effectively.

"I think the meeting is a good idea, giving associate editors, the elected editor and AAPG publications staff a forum for discussing how we do our work," said attendee Julia Gale. "We certainly accomplished the business of recommending award winners, and I thought the idea of spreading the nominations through the year was a good one that will allow more input in the future."

"I was very impressed by the dedication and experience of both the AAPG staff and volunteering editors on hand for this event," said attendee Kristen Carter. "We had a great list of candidate papers, books and special publications for award consideration this year, too.

"It quickly became clear to me that AAPG's publications are top-notch," she said, "due not only to the content of the submissions but also to the commitment of the volunteers and staff who review, revise and ultimately publish the research."

Items of discussion included:

▸ AAPG Publications Awards.

In selecting the next set of Sproule, Dott and Pratt award winners, the group's focus was on what constitutes a "best paper." It was determined that the main judging points would be:

✓ Clear presentation of ideas (illustration, organization, writing style).
✓ Scientific validity.
✓ Global impact.
✓ Innovative ideas or application.
✓ Utility of application to petroleum geology.

▸ BULLETIN.

In 2012, the Senior Associate Editors Board of the AAPG BULLETIN was formed – a group of specialized editors with the duty to assist the elected editor in selecting reviewers and drafting a decision for specific manuscripts assigned to them.

▸ DEG's Geosciences Journal.

Geosciences, published since 1994, went exclusively digital in July 2011. The editorial board includes the editor-in-chief, managing editor, special issues editor and 30 associate editors, representing countries and continents around the globe.

▸ Search & Discovery.

Launched in 1997, searchanddiscovery.com is an online publication for E&P geoscientists. Most contributions come from presenters at AAPG ACE, ICE, Section and Region meetings, GTWs, Hedberg conferences, meetings of AAPG-affiliated societies and approved unsolicited manuscripts.

Papers in Search and Discovery are not peer-reviewed, but they are available for free to members and to the general public.

▸ Interpretation Journal.

Launched in October 2012, Interpretation is co-published quarterly by SEG and AAPG. The first issue was published in August 2013, and the journal is off to an excellent start, having published 46 papers in its first two issues.

The editorial board consists of an editor (currently selected by SEG) and deputy editor (currently selected by AAPG), as well as a current group of general editors selected by both organizations.

The evening ended with a talk on Early Diagenesis in Fine-grained Sediments: Cement Precipitation as a Modifier of Fabrics and Porosity Systems in Fine-Grained Rocks by AAPG member Joe Macquaker, ExxonMobil URC, who was the winner (with co-author Andy Aplin) of last year's Wallace E. Pratt Memorial Award for best BULLETIN article.

AAPG | Imperial Barrel Award 2014

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Workshop explores the possibilities

Seismic Sets Sights on Sweet Spots in Shale

By KEN MILAM, EXPLORER Correspondent

Shale plays may be changing the face of the petroleum industry, but they are a relatively new phenomenon as a viable resource – and their unique nature presents challenges to exploration and production.

Identifying "sweet spots" requires a number of measurements, and seismic data is a particularly valuable asset, according to AAPG member Joanne Wang of Paradigm.

WANG

> "To transform the seismic data into the much needed reservoir quality information requires a support of a number of technologies and workflows."

In a presentation at a recent AAPG workshop, "Revisiting Reservoir Quality Issues in Unconventional and Conventional Resources: Techniques, Technologies and Case Studies," Wang discussed her company's experience in the Eagle Ford and Barnett shales.

Wang said experience shows that properly processed, imaged, analyzed and interpreted seismic data can be vital for success in shale plays.

"Seismic data provides valuable information for all stages of shale play exploration and production since it carries signatures related to lithology, fluid and in-situ stress. To transform the seismic data into the much needed reservoir quality information requires a support of a number of technologies and workflows," she said.

Three major determining factors for identifying sweet spots are total organic carbon, shale brittle/ductile quality and in-situ stress, she said.

In-situ stress.

In-situ stress is one of the key factors that determine a successful drilling program. The challenge is how to accurately estimate the stress intensity and its orientation using surface recorded seismic data. Seismic data responds to stress. This can be observed as the azimuthal dependent behavior of the seismic amplitude and the seismic velocity, Wang said.

The AVAZ approach measures the changes in amplitude variation with reflection angle and azimuth affected by the anisotropic media.

Horizontal transverse isotropic media is assumed for the Eagle Ford shale given that the structural change is mild, the layer is relatively flat, and the shale is preferentially stressed in the studied area. Typical AVAZ attributes inverted by the HTI AVAZ inversion includes anisotropic gradient, stress intensity and azimuth of symmetry axis. Interpretation and visualization techniques are critical to extract and map the stress intensity and its orientation, she said.

Brittle/ductile quality.

Shale brittle/ductile quality can be estimated using the mechanical attributes such as Poisson's ratio and Young's modulus. Relatively, low Poisson's ratio and high Young's modulus correlate to brittle shale zones and high Poisson's ratio and low Young's modulus correlate with ductile shale zones. Seismic inversion procedures are used to invert seismic data amplitudes sampled by reflection angle to secure attributes sensitive to lithology and fluid changes. P and S impedances are layer properties directly related to rock properties such as bulk modulus, shear modulus, Young's modulus and Poisson's ratio, for example from which shale brittleness can be estimated.

Total organic carbon.

Presence and volume of TOC in the shale formation affect acoustic properties such as p wave velocity, density and AVO behavior. As such AVO attributes together with P impedance can be used to identify the zones with relative high TOC.

Winding up.

"The key point is to identify sweet spots in shale formation where the production rate and recovery rate are at the highest," Wang said.

"We have been working on different shale plays in the U.S., such as Barnett shale and Eagle Ford shale," she said. "We'll need the future drilling to confirm our observations in these particular cases."

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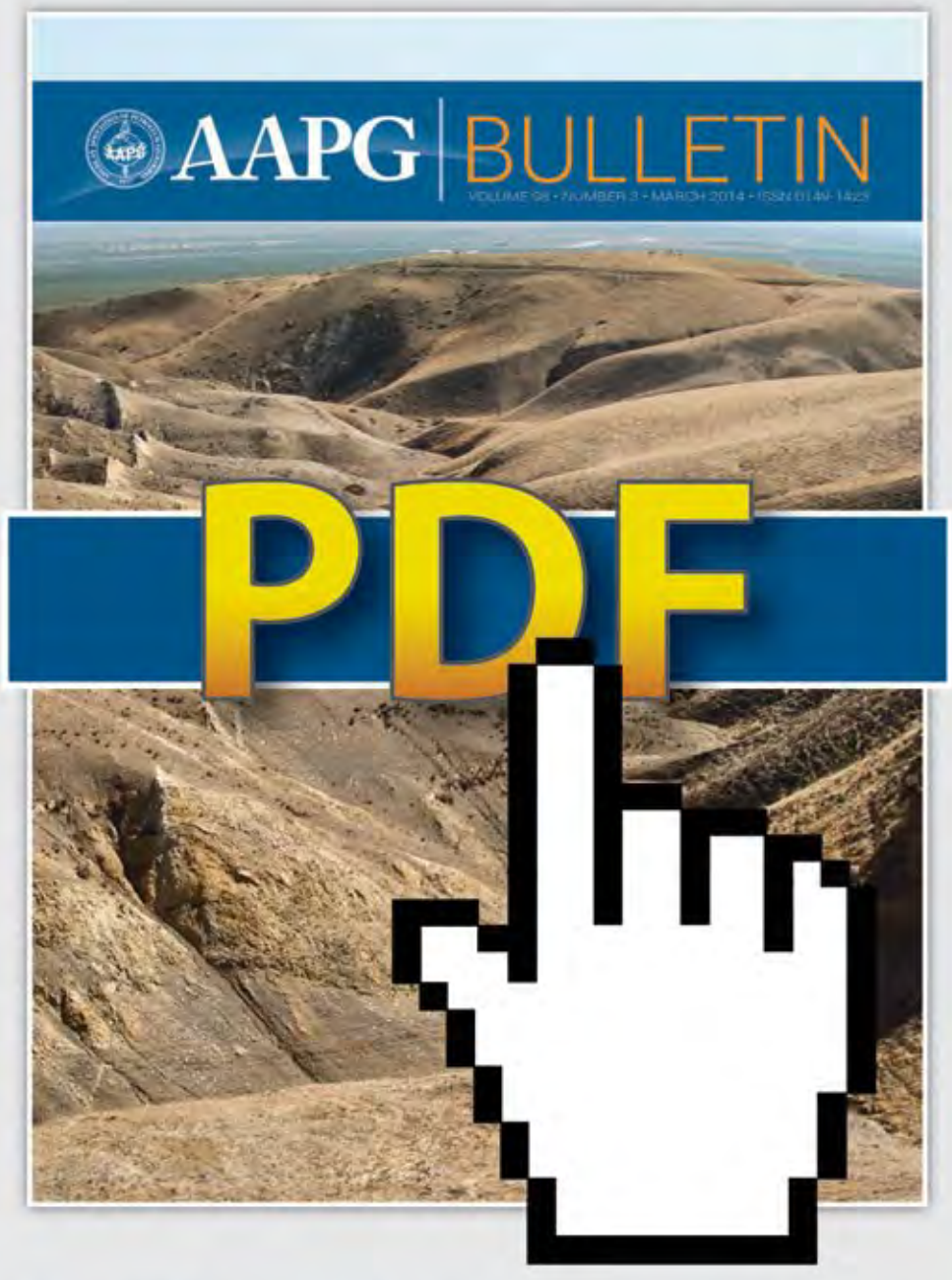


BITUMEN RESERVOIRS OF ALBERTA E&P Note

Richard S. J. Tozer, Albert P. Choi, Jeffrey T. Pietras, and Donald J. Tanasichuk

The objective of this study is to model the original trap of the Athabasca oil sands, Alberta, in order to understand the trap geometry and charge timing. The original extent of the trap is preserved despite flexural loading because the petroleum charge was rapidly biodegraded to immobile bitumen.

OFFSHORE SEQUENCES OF VOLCANICLASTIC ROCKS

Tim J. Watton, Kirstie A. Wright, Dougal A. Jerram, and Richard J. Brown

THyaloclastite results from the rapid quenching of molten basalt lava on contact with water. Data from a core taken by the Hawaiian Scientific Drilling Project are important in helping to calibrate well log responses through similar intervals in other areas of active petroleum exploration.

ORGANIC CARBON-RICH SHALES

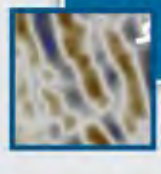
Daniel Kohl, Rudy Slingerland, Mike Arthur, Reed Bracht, and Terry Engelder

This paper describes the lithofacies, associated depositional processes, and systems tracts of the lower portion of the Marcellus and associated formations. A sequence stratigraphic framework for predicting the lateral and vertical variability of the economically significant lithofacies in this interval in presented.

DIFFERENTIATING PARENT BEDS

Andrew Morton, Sean McFadyen, Andrew Hurst, Jeff Pyle, and Philip Rose

Heavy mineral provenance studies are an effective method of tracing the origin of injected sandstones. Such studies from the Eocene of the UK Central North Sea show that the sandstones of the Brimmond and Forties fields have different origins.



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

Updated Seismic Data Needed For OCS

By EDITH ALLISON, GEO-DC Director

The first seismic surveys of the Atlantic Outer Continental Shelf (OCS) since 1988 could happen in the next two years – if the Bureau of Ocean Energy Management (BOEM) finalizes the required environmental impact statement (EIS) in the next few months.

The next step would be for BOEM to issue permits for the seismic surveys and other geological and geophysical activities in support of oil and gas exploration and development, renewable energy and marine minerals in the Mid- and South-Atlantic planning areas.

This process started with nine applications for geophysical surveys submitted from 2005 to 2009, and BOEM's 2009 announcement of its intent to prepare an EIS.

This is an important step for the future of Atlantic offshore oil and gas production. Unfortunately, the EIS, which was started in 2009, has been sufficiently delayed that seismic data will not be available in 2014, as BOEM starts development of its next five-year OCS leasing plan.

The next five-year plan can consider opening Atlantic offshore tracks to leasing without the seismic data, but seismic surveys and geologic assessments must be completed before there are any lease sales.

The seismic surveys, however, do not assure that the South-, Mid- or North Atlantic OCS areas will be included in the 2017-22 five-year OCS leasing plan or that leasing will occur.


ALLISON

Seismic surveys and geologic assessments must be completed before there are any lease sales.

The U.S. Atlantic OCS was under a variety of congressional or executive branch moratoria between 1982 and 2008, which prohibited any geological or geophysical studies. (There also was a six-month moratorium on deepwater drilling instituted in response to the Macondo well blowout.)

Existing Seismic Data

Seismic surveys were conducted in the Atlantic from 1966 to 1988, before the development of 3-D seismic. The publically available Atlantic OCS seismic data includes 11 surveys made up of 1,132 track lines that cover 56,493 kilometers, which are available from the U.S. Geological Survey.

The past moratoria have struck some as illogical when Canada has a thriving Atlantic oil and gas industry. Looking specifically at seismic surveys, Shell completed a large 3-D survey this past summer and fall in deep water about 200 miles off the coast of Nova Scotia.

Recently, a representative of the Canadian Association of Petroleum Producers reported on Canadian offshore activity to a House Natural Resources Committee, Subcommittee on Energy and Mineral Resources hearing.

Seismic surveys have been conducted offshore Canada for decades, and, as in the United States, Canadian seismic surveys are required to avoid marine mammals and sea turtles and to mitigate impacts to marine organisms and fishing vessels.

Potential Resource Volumes

BOEM released its "Assessment of Undiscovered Technically Recoverable Oil and Gas Resources of the Nation's Outer Continental Shelf" in 2011. The assessment estimates that 3.3 billion barrels of oil (Bbo) and 31.28 trillion cubic feet (tcf) of gas are in the Atlantic OCS, excluding Florida.

By area, the estimated technically recoverable resources are:

- North Atlantic – 1.35 Bbo and 9.87 tcf of gas.
- Mid-Atlantic – 1.42 Bbo and 19.36 tcf of gas.
- South Atlantic – 0.53 Bbo and 2.04 tcf of gas.

Geophysicists point out that these volumes, based on outdated geophysical and sparse well data, are bound to be exceptionally low.

(The potential for greater resources is suggested by the fact that the Gulf of Mexico resource estimate grew five-fold from 1987 to 2011 assessments, based on improved seismic and drilling.)

Regulators and policy makers, as well as energy developers and consumers, expect to benefit from improved understanding of the resource base.

Environmental Concerns

Many environmental organizations are opposed to allowing seismic surveys in the Atlantic because of potential harm to marine organisms, especially endangered whales and sea turtles.

Others oppose the seismic surveys because they may facilitate future oil and gas drilling and fossil energy consumption.

BOEM reports that it has spent $40 million on research into the impact of seismic surveys on marine life, and has consulted with other regulatory agencies such as the National Marine Fisheries Service to assure the planned surveys

Continued on next page

Consortium's database

'A Great Way to Learn'

By LOUISE S. DURHAM, EXPLORER Correspondent

Imagine the insight to be gained from showing every aspect of an already-drilled prospect, whether good or bad, to an audience of your peers for scrutiny.

We're talking peers from a company other than your own.

There's an industry forum that exists for this purpose.

It's the DHI Interpretation and Risk Analysis Consortium.

The Consortium was formed in 2001 by Rose & Associates in Houston. The leadership team was comprised of R&A consultants (and AAPG members) Mike Forrest and Rocky Roden, with software support by Roger Holeywell.

FORREST

RODEN

"The three of us have been doing this now for almost 13 years," Forrest said. "When (AAPG Honorary member) Pete Rose called me and asked me to manage this new group, none of us envisioned that it would last this long."

Forrest provided a quick-look overview of the heart of the effort:

"The Consortium has built a seismic amplitude anomaly interpretation and risk analysis application referred to as SAAM (Seismic Amplitude Analysis Module)," he said. "The SAAM software is used to risk seismic amplitude anomalies from all AVO classes; it helps organizations better characterize the four AVO Class Gas Sand amplitude anomalies, often called DHIs.

"Over 230 prospects are currently in the software database for analysis," he added, "and to help calibrate the weighting factors of the data quality and anomaly characteristics."

He elaborated further on DHIs, emphasizing that seismic amplitude anomalies play a vital role in the prospect evaluation process.

"When these anomalies occur at a potential reservoir level, they are frequently called DHIs, or direct hydrocarbon indicators," Forrest said. "They are changes in reflection response that may be related to oil and/or gas accumulations."

He noted that DHIs include bright spots, flat spots, dim spots, character/phase change at a projected oil or gas/water contact, and an amplitude variation with offset.

A caveat: Seismic amplitude anomalies can be caused by factors other than commercial hydrocarbons, leading to incorrect interpretations. For example, a low porosity gas sand might be interpreted as a high porosity oil sand.

Some Good, Some Bad

Roden is an award-winning geologist, having won the 2011 Ziad Beydoun Memorial Award as co-author (with Stan Abele) of the best poster presented at the AAPG International Conference and Exhibition in Milan, Italy.

He delved into some of the consortium specifics.

> **The 230 wells in the database are about evenly split between good and bad.**

"About a year or two into the consortium, we started a procedure where the different oil companies would show prospects, including everything they would if showing them to management or a potential partner," he said. "This included well logs, seismic, technical analysis, everything.

"The prospects had been drilled," Roden emphasized, "but they would get perspective from people who didn't know the outcome, whether the well was good or bad."

He noted the 230 wells now in the Consortium database are about evenly split between good and bad.

"There are all kinds of interesting trends and statistical things coming out of this," he said. "All of the Consortium members have access to the database, which contains only the answers to questions we ask in our software."

In other words, there's no hard data, such as seismic lines, log interpretations and such.

See **Consortium**, page 53

Continued from previous page

comply with the Marine Mammal Protection Act.

The mitigation measures proposed by BOEM would exclude the use of air guns in right whale migration areas from mid-November through mid-April, and in waters near sea turtle nesting areas in Florida during nesting season.

Visual monitoring for marine mammals near the survey vessels would also be required.

Congressional Interest

At the House hearing, a member of the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling stated that opening the Atlantic should be delayed until Congress takes the actions recommended by the Commission to improve offshore safety. An example would be modifying the Outer Continental Shelf Lands Act to increase liability amounts and provide whistleblower protections.

Congress, however, has no plans to consider legislation on offshore safety regulations.

Members of Congress have introduced several bills that would require BOEM to permit seismic testing in the Atlantic OCS as part of other changes to open the Atlantic OCS to drilling. None of these bills is expected to become law.

The Geophysical Corner is a regular column in the EXPLORER, edited by Satinder Chopra, chief geophysicist for Arcis Seismic Solutions, Calgary, Canada, and a past AAPG-SEG Joint Distinguished Lecturer. This month's column deals with comparative performance of some spectral decomposition methods.

So Many Challenges – But So Many Choices

By SATINDER CHOPRA and KURT J. MARFURT

The previous three Geophysical Corner articles have focused on the spectral decomposition of seismic data, describing some of the methods and their applications.

This month we add another one on the same topic, showing the comparative performance of some of the methods commonly available in the interactive interpretation software packages.

Each of these methods has its own applicability and limitations, and the choice of a particular method also could depend on the end objective.

* * *

The most basic and perhaps the simplest method is the traditional Fourier transform method, also known as the short-window discrete Fourier transform (SWDFT) method.

As the name implies, when using a fixed time window the seismic data is transformed into the frequency domain, and the output spectral amplitudes and phase volumes are visualized at different frequencies.

The choice of the time window has a bearing on the frequency, temporal and spatial resolution of the output data. A shorter time window could result in a reduced frequency resolution on the output and vice-versa.

Figure 1a shows a comparison of stratal slices from the input seismic data volume from western Canada and the equivalent slices at 55 Hz from the SWDFT spectral decomposition method using a time window of 30 ms (figure 1b) and 60 ms (figure 1c). The stratal slices were chosen 24 ms below a marker seismic reflector close to 960 ms on seismic data processed with 5-D interpolation used to regularize offsets and azimuths.

The shape of time window also is important. Careful tapering (rounding the edges) avoids artifacts called the Gibbs phenomenon. The "smoothest" taper would be to use a truncated Gaussian window; this particular implementation of the SWDFT is named the Gabor transform, after its originator.

A common pitfall for the SWDFT is to use an analysis window that is smaller than the period of interest, such that Gibbs artifacts dominate the result. A fixed window will include more cycles of a higher frequency than of a lower frequency sinusoid, suggesting that one could design the window length to be proportional to the period.

This construct gives rise to the continuous wavelet transform (CWT).

* * *

In figure 1d we show a 55 Hz spectral magnitude display, using CWT equivalent to the previous stratal slices – and notice the superior definition of the channel morphology. If in turn, the window is a Gaussian whose standard deviation is the period being analyzed, we obtain (omitting a few key mathematical details) the S-transform. This choice avoids picking a window that is too small.

One can implement these transforms

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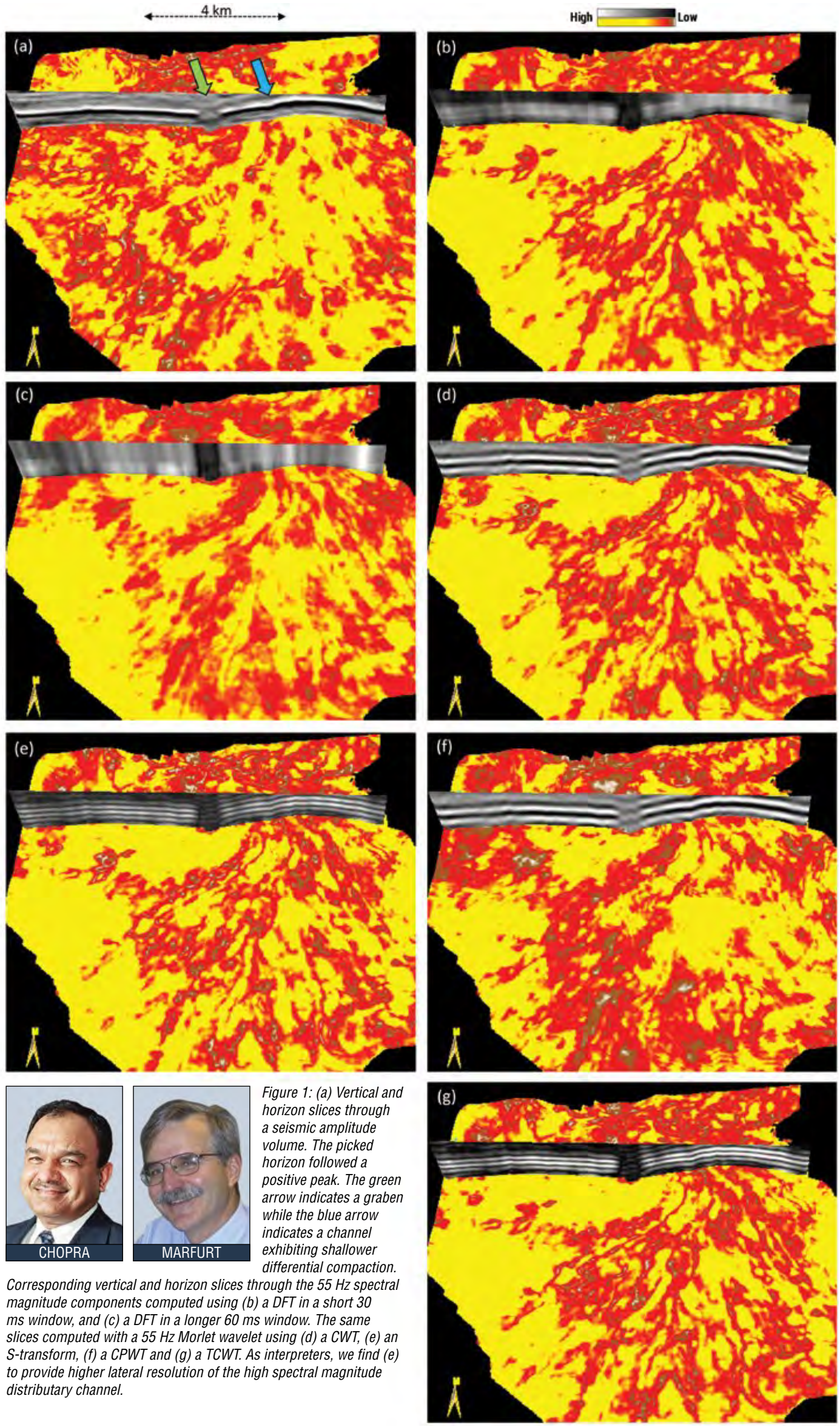

CHOPRA

MARFURT

Figure 1: (a) Vertical and horizon slices through a seismic amplitude volume. The picked horizon followed a positive peak. The green arrow indicates a graben while the blue arrow indicates a channel exhibiting shallower differential compaction. Corresponding vertical and horizon slices through the 55 Hz spectral magnitude components computed using (b) a DFT in a short 30 ms window, and (c) a DFT in a longer 60 ms window. The same slices computed with a 55 Hz Morlet wavelet using (d) a CWT, (e) an S-transform, (f) a CPWT and (g) a TCWT. As interpreters, we find (e) to provide higher lateral resolution of the high spectral magnitude distributary channel.

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

Continued from previous page

in two ways:

- By simply cross correlating the seismic trace with a suite of complex band-limited wavelets.
- By applying a suite of band pass filters to the data and then computing the square root of the energy under a sliding window.

In general, the S-transform yields better temporal resolution than the SWDWT, especially at higher frequencies (figure 1e).

By construction, the CWT and S-transforms produce lower temporal resolution at lower frequencies. The continuous wavelet packet-like transform (CWPT) method overcomes this limitation by dividing the window into sub-windows but keeping the same central frequency. This makes it somewhat flexible and in the process displays higher resolution.

This can be seen in figure 1f, where it resolves the channel morphology better than the SWDFT and the CWT displays in figures 1b, 1c and 1d.

In the CWT spectral decomposition method when the spectral magnitude display is sought at a given frequency – at, say, 55 Hz – it usually produces the averaged spectral amplitude response from the neighboring frequencies 50 Hz to 60 Hz. Time frequency continuous wavelet transform (TFCWT) spectral decomposition method overcomes this averaging by producing the desired spectral magnitude at the desired central frequency within the given time window.

In doing so, it results in producing a higher time-frequency resolution than the SWDFT or the CWT methods – notice this on the display in figure 1g. It is computationally intensive, and so takes longer to run.

* * *

The wide choice of algorithms can be quite confusing. As is often the case, no algorithm is always best.

If the objective is to measure the number of geologic cycles per unit time, we suggest stratal (i.e. proportional) slicing the seismic data between two picked horizons, and then applying the SWDFT with a window equal to the number of slices. In this case the cyclicity would be a geologic cyclicity, say of progradation and retrogradation along a shelf margin vs. a much quieter and lower "frequency" basinal area.

The algorithm that shows the most "geology" is not necessarily the best. Longer window algorithms like the SWDFT will often cause more vertical mixing of stratigraphy, providing images with "more channels" than a shorter window S transform.

While these channels exist in the data, they may be more properly associated with shallower or deeper horizons than the one being examined.

Conclusions

Different spectral decomposition methods provide an effective way of examining the seismic response of stratigraphic geologic features in terms of spectral components and so help in the interpretation. Each of the methods described above have their own advantages and limitations.

The user is expected to understand these characteristics of the methods before making their application.

We hope this article helps provide some insight into this aspect.

Consortium
from page 51

Going Global

A European section kicked off a few years ago after a number of international companies asked to join the group. There are regular meetings in Houston and Europe, and all members of one group also are members of the other.

Certain off-the-beaten-path venues can take on some added allure.

A recent meeting convened in Cape Town, South Africa, where Tullow Oil has a sizeable office. Tullow organized a field trip to the Karoo Basin in South Africa, which has world-class turbidite exposures.

"We had a full house," Roden remarked.

Through the years, these get-togethers have yielded a raft of knowledge, triggering new ways to look at a wide variety of prospect ingredients in many instances.

"We recently found out that in prospects where the AVO interpretation is a large percent of the risk, you're more apt to have a dry hole than if it's not," Roden said.

"What it relates to is, if all I have is an AVO interpretation and not anything else, and the AVO shows something hydrocarbon related, then I have a higher chance of a dry hole than a good one," he noted. "This makes good sense in that if all you have is AVO response and nothing to calibrate to it, it quite usually is a wet sand.

"Next to a wet sand, low saturation gas is the second highest reason for failure," Roden noted. "The third is no reservoir at all, and the fourth is a tight reservoir with low permeability and porosity.

"Half of the dry holes (in the database) that were wet sands are very thick wet sands," Roden said. "They gave a seismic response misinterpreted to be a hydrocarbon response."

The Consortium's prospect presentation format is highly valued by the member companies.

"There's not another forum in the industry where they can show prospects and get feedback from a bunch of peer companies who have different experiences, knowledge, approaches," Roden emphasized.

"Internal feedback is good, but it's not the only way to do something," he noted. "People really like this.

"In fact, some companies send some of their new recruits," he said. "This is a great way to learn."

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

Evolution, Adaptation Continues for BULLETIN

By JOHN LORENZ

"The publications of the American Association of Petroleum Geologists (AAPG) constitute the essential part of [the basic library of the petroleum geologist] … No other professional organization in any science so totally dominates its field on a worldwide basis … The scope of the material published by the Association is both truly international and genuinely all-embracing within the field" (North, 1985, Petroleum Geology, p. 5).


LORENZ

The AAPG BULLETIN, the standard-bearer of AAPG publications, is still the benchmark for peer-reviewed scientific publications in the field of hydrocarbon-related geology, even though competition exists today from other societies and for-profit publishers.

That the BULLETIN fulfilled a need is shown by the fact that it doubled in size from 1917 to 1919, growing from 13 to 25 papers during its first three years of existence. It became a monthly journal by 1925, and by 1930 the year's total was 69 papers.

Today the BULLETIN publishes 80-100 papers a year, and AAPG membership surveys continue to give it consistently high satisfaction ratings.

* * *

One of the facets that distinguishes the BULLETIN from those of many other geologic publications is that concepts presented in BULLETIN papers can be used in solving the problems of finding and extracting hydrocarbons, without which we still would be traveling by horse and huddling around wood fires at night.

The utility of BULLETIN papers can be measured both by the number of times a paper is cited by other authors and – since many BULLETIN readers use the papers to find oil rather than to write other papers – by the number of times a paper is downloaded from the Internet.

(A list of BULLETIN papers that have most commonly been downloaded during the last decade can be found at http://bulletin.aapg.org/notable-papers.)

Since early 2001, AAPG members have been provided with free online access to back issues of the BULLETIN, and people take advantage of this membership service on average 6,400 times a day – or 2.3 million times a year.

* * *

The inaugural 1917 issue of the BULLETIN contained a significant number of international papers, and Morley's 1966 review of the first 50 years of AAPG history mentioned complaints to the effect that there weren't enough papers on topics and regions pertinent to the interests of specific AAPG members.

Such perceptions still echo today and derive from the immediacy of oilfield problems – which would benefit from direct-fit tools if they existed.

Hydrocarbon geology, however, is typically a science of inference and analogy. Don't look in the BULLETIN for the 13 mm wrench needed to turn a 13 mm bolt; rather look for concepts on how to recognize a 13 mm bolt as well as how much and in which direction to turn it.

Also recognize that if you don't have a 13 mm bolt that needs turning today, you might find one tomorrow: BULLETIN papers have relevance and application over the long haul – they are not newspaper-type articles that are useful only today.

* * *

The BULLETIN has experimented with providing readers with more directly applicable geologic tools, such as local field studies in the E&P Notes series.

Continued on next page

John Lorenz is with FractureStudies LLC in Edgewood, N.M. He was AAPG's elected editor in 2001-04. He also was AAPG president in 2009-10, and has won the A.I. Levorsen Award (twice), AAPG Distinguished Service Award and the Jules Braunstein Memorial Award.

Margins
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new hydrocarbon discoveries and presenting newly recorded multi-client seismic data. Students are strongly encouraged to participate, and the call for papers is April 1, 2014 (www.conjugatemarginsnl.ca).

Science *and* G&G

Conference co-chair Ian Atkinson is chief geophysicist and research and development manager of Nalcor Energy's oil and gas operations.

Created in 2007, Nalcor, the province of Newfoundland and Labrador's nascent crown energy corporation, has the right to obtain a 10 percent equity position in offshore oil and gas projects requiring Development Plan Approvals by the federal and provincial governments. Nalcor recently acquired an interest in 47,000 kilometers of high-quality 2-D multi-client seismic data designed to attract new E&P players to the offshore.

"This conference focuses on both the science and the G&G data, which is unique," Atkinson said. "We have industry explorers who are the drivers of new ideas and researchers who are the developers of new knowledge.

"When you put these two groups together, you've got a real chance of moving the industry forward and of benefitting the Atlantic conjugate margins," he added.

Atkinson believes the conference's format and collegial environment (there are no concurrent presentations) provide a great opportunity for geoscience students and young professionals to network.

"The benefit to the students is huge," Atkinson said. "It's a big thing (for them) to present to academics, government and industry – and, it's a great forum for the petroleum industry to see these bright minds and up-and-coming earth science graduates."

Continued from previous page

This series was popular with geologists in the trenches, but it turned out to be nearly impossible to find authors for the series, since those geologists with the field data didn't have time or couldn't always get permission to publish the data.

Ultimately, contract writers were paid to write most of the pieces – but that ran counter to the philosophy of the BULLETIN as a peer-reviewed scientific journal. For better or worse, that practice was discontinued, although the series continues to receive occasional submissions from volunteer authors.

In fact, with the exception of the few dedicated and essential AAPG publications staffers at headquarters, the BULLETIN has always been supported and run by volunteers: the elected editor and all the associate editors as well as reviewers and authors are unpaid, donating their time and expertise. Some have permission to work on BULLETIN issues on company time, others spend evenings at the kitchen table over manuscripts lit by a guttering candle.

The AAPG elected editor, who is a member of the AAPG Executive Committee, was originally appointed – it was an "elected" position, but with a single candidate.

Since 2000, however, there have been two candidates who stand for the position, even when it's difficult to find a minimum of two qualified individuals willing to be considered for the position. Qualifications include not only some knowledge of publication, but also someone with significant available time and a willingness to undertake the job.

A thick skin is useful, too.

Successive editors have had different approaches to the position, but there is no escaping the operational nuts and bolts of obtaining reviews, synthesizing reviews, making acceptance decisions and working with the AAPG headquarters publications team in turning around 150-200 manuscripts per year – as well as with the AAPG Executive Committee in directing high-level Association strategies. In fact, the position involves surprisingly little editorial word-smithing.

* * *

The monthly BULLETIN was first offered in electronic format in about 2004, which provided a significant savings in postage costs to AAPG and improved the rate of successful and on-time monthly deliveries worldwide. For these reasons, student membership only comes with an electronic version of the BULLETIN.

Other members, however, have found that they do not make time to at least peruse the BULLETIN if it isn't a physical presence on the desk, and about 10 percent of the AAPG membership still choses paper/hardcopy delivery of the BULLETIN each month.

The rate of manuscript submissions to the BULLETIN ebbs and flows. At present there is a backlog of accepted papers in the queue awaiting publication, but at other times there has been a shortage of papers.

Manuscripts are submitted to the BULLETIN by authors who have a geologic story to tell and who feel that the BULLETIN is the place to share it with folks who might benefit from it. High professional visibility to the right audience is an important part of why authors submit papers to the BULLETIN.

But, it is circular – the BULLETIN must remain an attractive venue for authors if it is to attract quality papers, and quality papers make it an attractive place to publish.

The AAPG BULLETIN is many things:

- It is a prestigious forum to publish scientific papers focused on hydrocarbon geology.
- It is a repository for a wealth of information.
- It is one of the most visible reminders of the benefits of belonging to AAPG.

The BULLETIN has a 96-year publication history that has evolved and adapted with changes in technology, and it will continue to change in order to meet the needs of the AAPG membership and the community of oil-finding/oil-producing geologists.

(Author's note: References were to Morley, H.T., 1966, A History of the American Association of Petroleum Geologists: First Fifty Years; AAPG BULLETIN, v. 50, and to North, F.K., 1985, Petroleum Geology, Allen and Unwin, Boston.

Also, special thanks to Karen Gail Piqune of the AAPG Foundation Energy Library; to Beverly Molyneux and Paula Sillman of the AAPG publications team; and Jim Blankenship, Scott Cooper, Gretchen Gillis and current AAPG elected editor Mike Sweet.)

Editor's note: Nick Lagrillière is the Young Professionals Committee chair; Meredith Faber is the Young Professionals Committee vice chair; Richard Ball is AAPG's elected secretary; and Cat Campbell is the Rocky Mountain Section secretary-treasurer elect.

Young Professionals Eager to See Simplification

By NICK LAGRILLIERE, MEREDITH FABER, RICHARD BALL and CAT CAMPBELL

A crucial part of the AAPG Young Professionals Committee's mission statement includes "building an understanding of the value of a lasting relationship between AAPG and young professional members."

Therefore, we felt it important to voice our views on the proposal to eliminate the sponsorship requirement to become a full member of AAPG.

To the point: The committee is strongly in favor of dropping the sponsorship requirement, for a number of reasons.

▸ The current sponsorship requirement drains our already limited pool of volunteers in two ways: first by limiting our membership intake, and then by drawing delegates away from other priorities.

For aspiring members, obtaining all the necessary sponsorship materials can be a daunting task. Many may not know any AAPG members to approach. Still more may feel uncomfortable asking a member for sponsorship.

This is especially true for some international applicants for whom such a request may be demeaning or outright taboo. According to AAPG Secretary Richard Ball and House of Delegates Chair Larry Wickstrom, fully 41 percent of the current membership – over 15,000 individuals – are international. However, of that number, only 4,000 are full members.


LAGRILLIERE


FABER


BALL


CAMPBELL

To truly become an international organization, we must address this problem. Removing the sponsorship requirement is one admirable step toward that goal.

Moreover, the present system requires delegates to spend a considerable amount of time reviewing applications, contacting the sponsors and performing other tasks. This time would be much better spent recruiting members or volunteering for the Association.

▸ If we truly want all geoscientists who qualify for AAPG Member status to move into that category, we need to focus on increasing and advertising the differentiation between the value of full membership relative to that of associate membership. Without a substantial incentive to pursue full membership, it's unlikely that an Associate will ever advance to Member, regardless of any sponsorship requirements.

Lowering the administrative barriers and emphasizing the benefits of full membership will play an important role in making the process of transitioning from Associate to Member less of a hurdle.

As Ball said:

"Many have expressed their concerns that this change will cheapen our membership process, or make the AAPG less exclusive. I respect these opinions, especially since they come from people I hold in high esteem. However, I believe we are hindering ourselves – and the future of the Association – by making the application process difficult for a number of passionate Associate members.

"I have received enough feedback to understand there are people who feel that the sponsorship requirement is keeping good people out of our organization while simultaneously doing very little to keep nefarious people from getting in. If the sponsorship requirement is removed, the checks completed by the AAPG headquarters staff will continue to be part of the application process and all members will still be bound by the AAPG Code of Ethics, the tenets of which will remain unchanged."

▸ Although possibly more applicable to the Young Professional members, we think it is also worth pointing out that we live in a time of instant gratification. People now access most services with the click of a button – or even the swipe of a finger. In an ever-faster moving society where equal access for all is becoming the norm, we are not doing ourselves any favors by adhering to requirements and restrictions.

We are not saying that the organization needs to cater to today's cultural norms, but acknowledging the manner in which modern society communicates and exchanges information is essential to the organization's longevity.

As a demographic, YPs want to feel like equal partners in the Association. Investing in that attitude by making full membership available to all qualified geoscientists will help make AAPG sustainable in the future and more accessible globally.

We respect that the sponsorship requirement served an important purpose in the early days of the Association, but we also believe that the membership process must evolve to remain relevant.

Continued on next page

3-D Course
from page 36

more things change, the more they stay the same.

"No matter how much science and technology have changed, there are still things people need to learn, still basic concepts of understanding the geology and what you can and can't do," Hart emphasized. "The importance of understanding geology when you're trying to do interpretation is just as important now as earlier.

"The industry is getting value from 3-D today, but it would be getting more value if (they) were more focused on using it for unconventionals, which are so big now," Hart added.

He stands ready to help.

"To do more unconventionals in my course, I need to update my digital textbook, which won't take all that long at this point," he said. "I'd really like to do it – if I can find the time."

Meanwhile, you can take advantage of his current enlightening 3-D course to get a good grasp on:

- Fundamental controls on seismic resolution/imaging.
- How data acquisition and processing parameters affect data interpretability.
- Differences between 2-D and 3-D seismic data.
- How and why different seismic visualization techniques are used during an interpretation.
- Basic concepts of seismic structural interpretation.
- Basic concepts of seismic stratigraphic interpretation.
- The utility of different types of advanced seismic analyses (AVO, attributes, inversion, etc.).
- A generalized seismic interpretation workflow, emphasizing the need to integrate seismic interpretation with geologic and engineering analyses.

Continued from previous page

- There also is an element of competiveness. When compared to our sister societies around the world, we have by far the most complicated membership application process. It certainly does not help make the Association feel more welcoming.

- At the grassroots level, every minute we spend talking about our different membership categories and sponsorship requirements is a minute not spent talking about the benefits that membership offers and the services that AAPG provides.

In the end, surely that cannot be how we prefer to allocate our time.

The Young Professionals Committee, therefore, sincerely hopes that the House of Delegates will vote in favor of eliminating the sponsorship requirement for membership at its meeting during the upcoming Annual Convention and Exhibition in Houston.

INMEMORIAM

International consulting geologist and AAPG Honorary member Daniel J. Tearpock died Feb. 9 at his home in Houston. He was 65.

A native of Nanticoke, Pa., Tearpock received a bachelor's degree in earth sciences from Bloomsburg University and a master's degree in geology from Temple University. By 1985 he was a senior geologic engineer with Tenneco Oil Co., and in 1988 he formed Subsurface Consultants and Associates in Houston, which grew into an international consulting and training firm with multiple branch offices.

Tearpock was active in DPA affairs, and served on the DPA Executive Committee as treasurer, vice president and, in 2010-11, as the Dzivision's president.

He was a recipient of the DPA Heritage Award, and in 2013 received AAPG Honorary membership.

* * *

John J. "Jack" Gallagher Jr., a former science director for AAPG, died Feb. 24 in San Antonio. He was 74.

Gallagher received his bachelor's degree from Boston College, a master's degree in geology from the University of Missouri and a doctorate in tectonophysics from Texas A&M University.

His career included various stints as a petroleum geologist and business manager in several companies, and he was the AAPG science director from 1997 to 1999. He left AAPG to be a co-founder of Career Partnering LLC in Tulsa.


TEARPOCK


GALLAGHER

* * *

John Joseph "Jack" Gallagher Jr., 74
San Antonio, Feb. 24, 2014
Peter Lawrence Gordy, 84
Qualicum Beach, Canada
Jan. 15, 2014
John Melvin Henton Jr., 88
Carencro, La., Oct. 16, 2013
Eleanor M. Hoover, 88
Conroe, Texas, Jan. 7, 2014
Carlton Leith, 94
Salinas, Calif., Oct. 24, 2013
Tom S. Loutit, 61
Deakin West, Australia
Oct. 10, 2013
Gordon Prather, 81
Amarillo, Texas, Dec. 16, 2013
Clement R. Rondeau, 84
Ironwood, Mich., June 15, 2013
Norris E. Saunders, 87
Stockton, Calif., Jan. 10, 2014
Taras P. Storey, 93
Calgary, Canada, Dec. 27, 2013
* **Daniel J. Tearpock**, 65
Houston, Feb. 9, 2014
Lowell Brent Watson, 77
Weatherford, Texas, Nov. 17, 2013
Charles B. Wheeler, 82
Miami, Fla., Dec. 22, 2013

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

Foundation Announces Undergrad Grant Recipients

By NATALIE ADAMS, AAPG Foundation Administrative Manager

The AAPG Foundation recently awarded 69 undergraduate grants to deserving students and their university geoscience departments, clubs or student chapters through its L. Austin Weeks Undergraduate Grant program awards.

Each of the awards was for $1,000 that would be split evenly between the student and his or her geoscience department, club or student chapter.

Students can use their portion of the grant to purchase equipment required for hands-on exploration (e.g., rock hammers and camping equipment). Alternatively, they may apply their funds toward tuition fees.

University departments, their clubs or student chapters are free to use their portion of the grant to support student geoscience activities through the purchase of necessary equipment and/or the funding of conferences and field trips).

More than 100 students competed this year for the limited number of grants.

To support the undergraduate activities that make education come alive and increase the number of awards available, give to this program today.

Include the name of the university of your choice, and the Foundation staff will encourage them to apply for this award.

* * *

Speaking of Foundation-backed programs:

If you are attending AAPG's Annual Convention and Exhibition this April 6-9 in Houston and are interested in learning more about the programs the AAPG Foundation supports, you are welcome to stop by the Foundation booth in the AAPG Center, located in the exhibition hall of the George R. Brown Convention Center.

* * *

John P. "Jay" Moffitt, with Gateway Exploration in Houston, has joined the AAPG Foundation Trustee Associates.

Moffitt has 36 years of Gulf Coast experience. Prior to forming Gateway Exploration he was an owner in Union Gas, where he was responsible for all phases of geology and geophysics – the company drilled more than 200 wells in the Wilcox, Frio and Yegua trends south and southeast Texas. Discoveries included Brushy Creek, SW Mission Valley, Marshall, Dreyer and Vickers, where combined EUR of 450 billion cubic feet of gas and 8-10 million barrels of oil and gas liquids have been proved.

Before joining Union Gas, he worked as a generating geologist for Yuma Petroleum, Williams Exploration, Citation Oil & Gas, Santa Fe Energy and Phillips Petroleum.

He has a bachelor's degree in geology from Ohio State University and a master's in geology from San Jose State, for whom he has endowed a university subscription.

Continued on next page

Foundation Contributions for January 2014

General Fund
Jerry L. Brown
In memory of Kirby Cockerham
John Arthur Carver
Paul H. Dudley Jr.
In memory of Robert "Bob" Ottman
James M. Funk
Ursula Hammes
William Herbert Hunt
Joseph Walter Kulik
Robert Kenneth Steer
In memory of C.B. "Chuck" Wheeler
Robert Graham Stewart
Bruce Henry Wiley
Barry Lynn Zinz

Awards Fund
Teacher of the Year Award
Phillip Salvador

Distinguished Lecture Fund
Walter Charles Riese

Education Fund
Don Wendell Beauchamp
Encana Cares (USA) Foundation
Matching gift/Julie Hill
Shell Oil Company Foundation
Matching gift/Rita Monahan

Grants-in-Aid Fund
George and Martha Grover
Phillip Salvador

Harry and Joy Jamison Named Grant
Leslie A. Jamison
In honor of Harry Jamison
Leslie A. Jamison
In memory of Joy Jamison
Sara L Jamison and David L. Phillips
In honor of Harry Jamison

James E. Hooks Memorial Grant
Chevron Humankind
Matching gift/John Gilbert

John E. Kilkenny Memorial Grant
Pacific Section AAPG Foundation

Robert K. Goldhammer Memorial Grant
Encana Cares (USA) Foundation
Matching gift/Mark Gallagher
Ursula Hammes

Imperial Barrel Award Fund
Chesapeake Operating Inc.

Military Veterans Scholarship Fund
Chevron Humankind
Matching gift/Charles Rubins
Robert D. Cowdery
M.A. Custer
Paul H. Dudley Jr.
In memory of Tony Gibbon
Stephen Michael Fremgen
David Crile Kisling
Janet A. Lawrence
Shell Oil Company Foundation
Matching gift/C. Scott Cameron

John F. Bookout Jr. Military Veterans Scholarship Fund
Marlan Wayne Downey
In memory of Woody Nestvold

Publication Pipeline Fund
Martin Macdermott Cassidy

Search and Discovery Fund
Ronald F. Broadhead
In memory of Richard O. Donley Jr.

L. Austin Weeks Undergraduate Grant Fund
Shell Oil Company Foundation
Matching gift/C. Scott Cameron

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

REGIONSandSECTIONS

Canadian pride

Turner Celebrations Begin

By FRANCOIS MARECHAL, AAPG Canada President

This is a very significant year in Alberta and throughout the Canada Region, as it represents the 100-year anniversary of the Turner Valley gas field.

The Turner Valley Field currently is undergoing a true renaissance thanks to the effort of young and old geoscientists implicated in the unconventional resources sector of the North American oil industry.

As such, it seems appropriate for me to reach out to all of our readers and invite them to share any personal family history that may in some way be connected to the creation *of the Canadian (and North American, for that matter) oil and gas sector.*

* * *

Just as oil and gas pioneers ventured west across Canada, a considerable number also came north from the United States. And as president of the AAPG Canada Region, I hope to bring more awareness and recognition to that reality.

*For instance, earlier this week a journa*list from southern Alberta shared some of her family*'s early history with me – she indicated that:*

"… In 1900, at the age of 18, her grandfather-in-law, Jim Morrison, left Nebraska and travelled by train to Ponoka, Alberta. There, he took a job working at a local sawmill. Shortly thereafter his own father followed suit, selling his contracting business in Nebraska and moving first to Ponoka and later to Okotoks, where he bought the Alb*erta Hotel …"*

The family was now firmly established in Alberta.

"… In Okotoks, Jim Morrison obtained employment as a clerk at the Paterson Trading Company store, and it was during the time that he worked there that he became fluent in the Sarcee language. Many years later, he took great joy in talking to First Nations people in their native tongue, as there were very few white people who knew the language …"

One hundred and one years ago in 1913:

"… Jim Morrison went to work for the Canadian Western Natural Gas, Heat, Light and Power Company Ltd., hired by the founder Eugene Coste. Until 1918 he was their agent in Okotoks. Later moving to Viking, Alberta, he became the drilling superintendent and drilled a number of gas wells to develop the Viking-Kinsella Field. Natural gas from this field was piped into Edmonton in 1924.

*"In 1921 he was transferred to Calgary where he was in charge of building a gas pipeline from Turner Valley to Calg*ary. From 1922 to 1923 he was in charge of drilling a number of gas wells at Barnwell, and in 1924 went to Foremost, Alberta, where he was in charge of building the 10-inch pipeline to link the Foremost and Burdett gas fields

"In 1925 he went to Burdett where he was in charge of the gas company's operations in that part of the province. In 1936, he was transferred to Lethbridge as district superintendent, where he remained until he retired in 1946 …"

* * *

By sharing the above passage with you I hope to kindle your interest in recognizing the true pioneer spirit of previous generations of individuals implicated in the creation of our oil and gas industry, both north and south of the 49th parallel.

I would like to express my utmost appreciation to Christy Morrison for providing me with the historical background, which I quoted in this letter to the best of my abilities.

We are at a point where a new tranche of young professionals and students alike will seek guidance from some of us. Let's do the best that we can to share history's leanings with them.

Continued from previous page

* * *

The Foundation just boxed up three sets of new publications bound for Oberlin College, Stanford University and The College of Wooster, thanks to **Larry and Jean Funkhouser**, who generously support AAPG Foundation's Newly Released Publications Program.

The program annually supplements university geology libraries with new geoscience publications.

Longtime AAPG Foundation supporters, the Funkhousers began supporting the Newly Released Publications Program in 2011 and have sent a dozen books to each school, providing their family's alma maters with cutting edge resources to educate future leaders of the geosciences.

You also could support the university of your choice by setting up a special fund to provide a set of newly released publications to the university geology library. Each publication you send will feature a bookplate attached on the front inside flap recognizing your contribution.

Join the Funkhousers and the AAPG Foundation by gifting this opportunity for future generations of geology students to have the best resources available.

* * *

Do you find you have no time to search for geologic publications?

Let the AAPG Foundation Energy Library help.

Karen Piqune, our geoscience librarian, worked in the oil and gas industry before coming to AAPG some 28 years ago – and she has every resource at her fingertips, so she can save you time and resources in your search for literature, statistical references, affiliated societies' publications and other research materials and maps.

Contact Karen Monday-Thursday, 12:30-5 p.m., and 12:30-4:30 p.m. on Fridays. Visit http://foundation.aapg.org/library; or call 1-800-364-2274 or 1-918-560-2620; or email Karen at library@aapg.org.

Editor's note: The commentary here has been edited due to space limitations; the entire article can be found online in the March 2014 EXPLORER.

Commentary

Sponsors: 'No Real Barrier'

By CLINT MOORE, PAT GRATTON, WILL GREEN, DAN SMITH, STEVE SONNENBERG, TOBY CARLETON and RICK FRITZ


MOORE


GRATTON


GREEN


SMITH


SONNENBERG


CARLETON


FRITZ

The issue of sponsorship for the full "Member" membership class has been considered by the House of Delegates (HOD) many times in recent decades, as well as past Advisory Councils and Executive Committees. To date, the only HOD consensus two-thirds majority vote to alter the time-honored process was a change just four years ago, to allow one non-member reference as the third sponsor for a full Member membership. Now, it's coming back again.

For decades, a large majority of past and present AAPG leaders and Members have affirmed the value of sponsorship, and intentionally created the "Associate" class of membership specifically to allow professionals "associated with geological science" to join AAPG in a non-peer reviewed process, as well as rename the Junior members that did not desire to upgrade to Active. In fact, any potential member who does not wish to pursue sponsorship can go to the AAPG website and instantly become an "Associate" member. Thus, there is no real barrier to membership in AAPG.

This class of membership was specifically created to provide an alternative for both geoscientists and geoscience-related professionals who do not wish to be peer-sponsored Members. Membership is virtually instantaneous, and the only standing they do not have in AAPG are:

- To vote in elections.
- To serve in the HOD, EC or AC.
- To join DPA.

All can be members of committees.

Becoming an AAPG Associate member is as easy as signing up for a magazine subscription. Should we now throw out sponsorship and make full Member membership as easy as signing up for a magazine subscription? Many past leaders and members do not believe so.

Why? Because sponsorship is a key base foundation of our Code of Ethics, as codified in our Constitution – Article IV, Section 4, where it states in paragraph a) "Members of the Association shall aid in preventing the election to membership of those who are unqualified or do not meet the standards set forth in the Code of Ethics." Since AAPG's inception, sponsorship always has been the first and foremost method of ethical review of a potential member.

Over the years, many advocates of eliminating the sponsorship requirement have repeatedly expressed their belief that if we did so, thousands of international members would join. Supposedly, these thousands refuse to join instantly as Associates, but insist on not joining unless they can become full Members, so we should eliminate sponsorship for all of them. Does that make much sense? Is that a real, widespread problem, or just a theory from a few anecdotal statements, or wishful thinking? Interestingly enough, an examination of the membership statistics of our current Associate class of members, dispels that assumption.

Recently, the AAPG membership department analyzed the current Associate class to see how many were degree-qualified for full Member class, if they were granted amnesty to that level. There were actually 3,675 degree-qualified U.S. members, and only 1,931 international degree-qualified Associates, for a total of 5,606. Additionally, Students and YPs are about equal data. So is eliminating sponsorship going to unlock a great international membership opportunity? Not likely. Remember too, the promise of graduated dues from similar proponents was thousands of new members.

Today, there are only about 750 international members paying graduated dues, and a nearly similar 650 U.S. members paying them. Even worse, roughly two-thirds of the 1,400 graduated dues members appear to have been existing members that converted, resulting in lost revenue to AAPG. What happened to that theory of significant international membership growth? Changing our focus from constantly tweaking bylaws, to improving and creating new products and services, would be more attractive to potential members. In short, if we build more value they are more likely to come than ever from eliminating sponsorship.

Clearly, many longtime members involved in sponsoring members or reviewing applications have experienced reviews where ethical concerns were a factor in whether a person became a member or not. Peer review is the tool we use to recommend someone as not only "ethical" but also "professional" – that they have something to add to the society either through their scientific knowledge or their understanding of our industry. Please review the testaments in support of sponsorship from four unique past AAPG presidents below – unique because they also were chairs of the House of Delegates:

Continued on next page

CLASSIFIEDADS

POSITION AVAILABLE

Petroleum Geologist

Illinois State Geological Survey
Prairie Research Institute
University of Illinois at Urbana-Champaign

The Illinois State Geological Survey (ISGS) is a premier state geological survey serving the needs of Illinois with earth science information relevant to the state's environmental quality, economic vitality, and public safety. The ISGS, which is part of the Prairie Research Institute at the University of Illinois at Urbana-Champaign, is located in the Natural Resources Building on the University's 700-acre campus.

We are seeking an experienced petroleum geoscientist to join the research team in reservoir characterization tasks for enhanced recovery of petroleum in mature oil fields within the Illinois Basin. Requirements include a minimum of a master's degree in geology, geological engineering, or related discipline. Ph.D. is preferred. Twelve (12) years petroleum geology or related industry or research experience post bachelor's degree. Knowledge of petroleum geology with an emphasis on subsurface reservoir characterization techniques such as interpreting well records and geophysical logs, including picking formation contacts and rock properties, identifying and interpreting facies, and depositional environments from subsurface geological data, cores, and outcrops, and a basic understanding of enhanced recovery techniques, reservoir diagenesis, and of petroleum systems.

Applications must be received by April 30, 2014. To apply, qualified candidates must submit an online profile through https://jobs.illinois.edu/academic-job-board by the closing date. Additionally, candidates must upload a 1) cover letter, 2) résumé/CV, 3) the names and contact information (including e-mail addresses) of three professional references. All requested information must be submitted for applications to be considered. Incomplete applications will not be reviewed.

For further information please contact Lori Walston-Vonderharr, Human Resources, Illinois State Geological Survey, at lwalston@illinois.edu or 217-244-2401.

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MISCELLANEOUS

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Continued from previous page

✓ Dan Smith: "…We should not eliminate entirely the sponsor provision from membership qualifications … I fully understand the reasons for complete elimination, but it's part of a big objective to radically change the Association. The sponsor screening process works to identify bad applicants. It should be noted that nearly all professional societies worldwide require a sponsor … a time honored method of keeping a society 'professional.'"

✓ Pat Gratton: "… I believe retention of at least one sponsor as a requirement is important. If an applicant is really interested in joining the Association, obtaining one sponsor should not be a burden and in fact would demonstrate motivation. If any candidate is not that motivated, Associate category is available. I found three sponsors fairly easily and I have sponsored many applicants over the years. Also, there have been a few applicants I declined to sponsor due to direct experience with them connected with ethics questions."

✓ Will Green: "I think it is important to retain the system and have at least one member sponsor an applicant, so at least one person would have an idea that the applicant's ethics are OK. We are a scientific organization and need to maintain a standard of professionalism."

✓ Steve Sonnenberg: "I do not support the proposed bylaw amendment to do away with sponsorship for AAPG members. I think a reduction in the number of sponsors is OK. Reasons: 1) It is not hard to find a sponsor – I do not buy the argument that this is holding up membership; 2) By removing this aspect of membership requirement, we become just another scientific society. AAPG is both a professional society and a scientific society; 3) This is not the magic bullet to increase membership – this may actually drive some of our existing members away; and 4) This is not costly to AAPG to maintain this requirement. We have been doing this since 1917."

Let's move on to what really matters in becoming indispensable to geoscientists worldwide. Sponsorship is not a hindrance to our growth, and definitely places a good emphasis on our Code of Ethics. It makes us more professional, and being a professional association emphasizing ethical standards has always been attractive to geoscientists worldwide. Sponsorship for potential members is where it all starts. Let's not throw away one of the fundamental foundations of our emphasis on ethics and professionalism.

(Editor's note: Pat Gratton, Will Green, Dan Smith, Steve Sonnenberg and Toby Carleton are all past AAPG presidents and former chairs of the House of Delegates; Rick Fritz is a former AAPG executive director; and Clint Moore is a former AAPG treasurer and chair of the HOD Constitution and Bylaws Committee.)

ADD NOTE SEE MORE ONLINE

Editor's note: In last month's column it was reported that Saudi Aramco's Sheyba field produces 750 million barrels of oil per day. The correct figure is 750 thousand barrels of oil per day.

DIRECTOR'SCORNER

Innovation, Collaboration Create New Value For AAPG

By DAVID CURTISS

How can AAPG create and deliver value to its members, volunteers, customers, the oil and gas industry, and to society? After all, that's why we exist as an organization.

But what is value, anyway?

Ultimately, it is a subjective assessment of "the regard that something is held to deserve; the importance, worth or usefulness of something."

The perception of value is going to vary from person to person, but our job as an association seeking to be indispensable to the petroleum geologist is to innovate and try new things, looking for those areas where the interest and response from our members, customers and other stakeholders demonstrate that we're delivering value to a significant number of them.

Ultimately, the marketplace tells us whether we're delivering value.

Evaluating AAPG's activities in terms of value, then, yields a useful metric to determine where to place emphasis and efforts. The Association should allocate its resources – both financial and human – to deliver maximum value and impact to achieve its mission.

* * *

One emphasis that AAPG has had in recent years is multi-disciplinary integration.

As geologists we do this naturally, integrating disciplines such as tectonics and structure, sedimentology and stratigraphy, geophysics, geochemistry and engineering – the list goes on and on – in our search for oil and natural gas. But as discipline-specific silos have broken down within exploration and production companies, the need to cross-train "interpreters" provides AAPG with a significant opportunity to deliver value to oil and gas professionals.


CURTISS

The Association should allocate its resources – both financial and human – to deliver maximum value and impact to achieve its mission.

AAPG has been intentional in pursuing these collaborations across several disciplines. The Geophysical Integration committee is one example. The new Petroleum Structure and Geomechanics Division is another.

And several years ago AAPG and the Society of Exploration Geophysicists (SEG) established an ad hoc cooperation committee, chaired by past SEG president Bill Barkhouse and past AAPG president Lee Billingsley, to identify specific opportunities for two of the largest professional geoscience organizations to work together to create value.

That was the focus of the third AAPG-SEG leadership summit, held last month in Houston. This annual event gives a group of SEG Board members and AAPG Executive Committee members an opportunity to sit together and discuss ways to bridge the disciplines of geology and geophysics.

As our leaders engaged in these talks, they were building upon a successful foundation:

- In late 2011, SEG joined AAPG and SPE in the creation of the Unconventional Resources Technology Conference, successfully launched in August 2013, and designed specifically as a new multi-disciplinary research conference.

- Since 2012 the AAPG and SEG Middle East offices in Dubai are co-located, enabling better coordination of our activities in the region.

- Last year, SEG and AAPG jointly launched INTERPRETATION, a new quarterly peer-reviewed journal focusing on subsurface interpretation. The third edition was delivered to subscribers last month, and is available both in electronic format and in print. Visit the AAPG website and search "Interpretation" for more information.

* * *

At the second leadership summit, held in February 2013, AAPG and SEG leaders signed a Memorandum of Understanding pledging cooperation.

This year's discussion expanded on that theme, with the group discussing the opportunities to collaborate on joint meetings with the goals of:

- Integrating multidisciplinary geoscience content.

- Reinforcing the relevance of geosciences in exploration and production.

- Delivering value to our members, customers and other stakeholders.

Getting two independent organizations with unique and established cultures to successfully work together, both at the leadership and staff levels, requires trust and coordination. So, it was gratifying that the week following the third leadership summit, both AAPG President Lee Krystinik and SEG President Don Steeples met again in Tulsa with the respective staff leaders to continue the conversation and demonstrate their engagement with this collaboration.

The current issue of EXPLORER focuses on seismic advances. As you read the articles you may have been inspired to seek more information about a particular geophysical topic, or realized that there's a big question out there that remains unanswered.

Those are the kind of ideas we're looking for, so please share them. It may be a perfect opportunity for AAPG and SEG to work together to deliver more value to you in your quest to find oil and gas.

Value. It's the measurement of how well we're serving you.

DIVISIONSREPORT: DEG

Our Environmental Role in Global Natural Gas

By DOUG WYATT, DEG President

Just before Christmas I was preparing for a presentation to be given to a group of university administrators and corporate and government liaisons on the future of global energy.

I really enjoy the opportunity to discuss broad global topics because, as a geologist, I get to arm-wave a lot!

However, as I review global energy data, it constantly and increasingly impresses on me the long-term future of fossil energy and most importantly, the role of "unconventional" natural gas.

We could discuss the definition of the term "unconventional" and what it really means, but that is best left for another time. What's more important now is to discuss the role of our environmental efforts to best support the global gas phenomenon.

I believe there are three main environmental issues that we must consider in the utilization of natural gas as a primary fuel source for the next several decades.

- The first is the use of water in natural gas production. This includes not only stimulation water but also produced waters, water needed for well site reclamation, water for power production and impacts to human consumption, industrial and agricultural needs.


WYATT

We can help by reminding people that most energy companies practice responsible environmental programs with publically available environmental policies.

For clean and efficient natural gas production, we must consider the entire hydrogeologic cycle as well as water surpluses and deficits for the minimum overall environmental impact.

We even can use our geoscience skills to make many current water conditions better, more geologically natural and all within the natural gas production cycle.

- Secondly, and many might now argue as most importantly, is the impact of natural gas as it is released into the atmosphere.

Studies provide various values of methane (as well as ethane, propane, and butane, for example) released as free gas from hydraulic fracturing and well site operations and cite the implications. As geologists supporting the clean utilization of natural gas, we must also be aware of these issues and address them from our perspective.

How we address them might be circumstance-dependent – but we have to be knowledgeable and conversant, as well as aware of the best practices to minimize releases.

- Finally, we must be aware of the direct day-to-day impact and perspective of natural gas production on the human quality of life – pipelines everywhere, big muddy drill pads, pastoral settings disturbed, viewscapes obliterated, ugly "big oil" taking over the family farm. We all have heard these objections.

Although there has been a certain amount of historical truth supporting these perceptions, we can help by reminding people that most energy companies practice responsible environmental programs with publically available environmental policies.

Maybe the best way to help the public understand is by showing them what we do as environmentally aware geoscientists, that we also expect and demand responsible environmental programs associated with natural gas production and utilization, and that we too appreciate clean fields, hiking trails and natural viewscapes. It is who we are!

I recently reviewed data that strongly suggested:

✓ Our estimates of gas in place are grossly underestimated.

✓ The volume of potential source rocks is also considerably underestimated.

Wow!

The future of natural gas is strong, and so is our AAPG-DEG need to ensure that these resources are utilized in a safe, clean, efficient and effective environmental way.

(BTW, I have recently changed jobs. If you wish to communicate please email me at douglas.wyatt@halliburton.com.)

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