AAPG EXPLORER
DECEMBER 2010

Big Land, Big Questions

What's the deal with Alaskan potential?

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AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS AN INTERNATIONAL ORGANIZATION

Vol. 31, No. 12
DECEMBER 2010

AAPG EXPLORER

PRESIDENT'S COLUMN

Commodities Obey Supply and Demand (It's a Law)

By DAVID G. RENSINK

As I have traveled to AAPG conferences during the past year-and-a-half I have been impressed by the number of symposia on shale gas.

I am not struck by the fact that they are held, but rather by the fact that they have all drawn capacity crowds. It is as if 80 percent of our members are working in shale plays or, at the very least, expect to be working in shale plays in the near future.

The most recent of the conferences to feature a session on shale gas was the recent European Region conference in Kiev, Ukraine (see related story, page 39). The interest in shale gas plays is certainly high in Europe, but since the surface owners typically do not own the minerals in Europe, the sight of a drilling rig is much less appealing to the farmers.

As strange as it may seem, I also have been struck by the similarity of the shale gas play to dairy farming. I will stipulate that I personally have not been involved in dairy farming since my youth, but the basic technology and the economics have not changed much in the last 40 years.

Both industries require a substantial capital investment, are labor intensive and are seven-day-a-week operations. The products of both industries are sold at posted prices, and the laws of supply and demand govern the magnitude of the posted price. Therefore, in both markets, there is a penalty for success. The greater your success, the more product you make available to the market – and the lower the price is likely to be.

Both industries are dominated by large corporations, but there is still room in each of them for the small independent.


RENSINK

There is a penalty for success. The greater your success, the more product you make available to the market – and the lower the price is likely to be.

Depletion is a significant factor in both industries. As the means of production age, the volumes decline.

While dairy farmers do not have the luxury of shutting in production until the price improves, they do not face the need to invest additional capital with the inevitable result of increasing supply in order to maintain their acreage position.

There is nothing unique about milk. Any natural resource is subject to the laws of supply and demand. The exception to that rule may be diamonds, where the supply and price seem to be fairly well controlled.

Before you fire up the computer to send me an e-mail noting that prior to 1973 there was a limited natural gas market and the market price of oil was essentially controlled by the Texas Railroad Commission, I will grant that, at the very least, crude oil market forces were substantially constrained prior to 1973. The entire energy industry experienced a major change in 1973. Texas was able to influence crude oil price prior to 1973 because approximately 38 percent of the U.S. oil production from 1935 through 1970 came from Texas.

For those of you outside of Texas who wonder what a Railroad Commission has to do with oil and gas production, the Texas Railroad Commission was established in 1891 to regulate – as the name implies – railroads. However, in 1917 they were given jurisdiction over oil and gas pipelines, and in 1919, they were given jurisdiction over "the conservation of oil and gas, forbidding waste."

In 1920, the production and sale of natural gas in Texas was deemed to be a public utility – and the Railroad Commission was given jurisdiction.

As they say, the rest is history.

Candidate Info Available Online

Video comments by candidates for AAPG office continue to be available online at www.aapg.org.

The comments show the Executive Committee candidates talking about why they accepted the invitation to stand for an AAPG office.

Biographies and individual information for AAPG officer candidates also are available online.

Ballots will be mailed in spring 2011.

The president-elect will serve in that capacity for one year and will be AAPG president in 2012-13. The vice president-Regions and secretary serve two-year terms.

Complete election campaign rules also are available online.

The slate is:

President-Elect

❒ Edward A. "Ted" Beaumont, independent consultant, Tulsa.

❒ John C. Dolson, DSP Geosciences and Associates, Coconut Grove, Fla.

Vice President-Regions

❒ David C. Blanchard, El Paso Egypt Production, Lasilky, Maadi, Egypt,

❒ Stuart D. Harker, Circle Oil Plc, Finchampstead, U.K.

Secretary

❒ Charles A. "Chuck" Caughey, ConocoPhillips, Houston.

❒ Denise M. Cox, Storm Energy, Panama City, Fla.

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REGULAR DEPARTMENTS

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A curious Dall sheep near the eastern end of the Atigun Gorge.

ON THE COVER:

Looking west through Alaska's Atigun Gorge, about 125 miles south of Prudhoe Bay. The Atigun River flows over north-verging, thrust-fault contact between Lower Cretaceous (Neocomian) Okpikruak Formation on left side of river and Lower Cretaceous (Aptian-Albian) Fortress Mountain Formation on right side of river. In the distance, Paleozoic rocks including Lisburne Group carbonates (highest peaks) are thrust over the Okpikruak to form the tectonic front of the Brooks Range. Photos by David Houseknecht.

Vol. 31, No. 12

The AAPG EXPLORER (ISSN 0195-2986) is published monthly for members. Published at AAPG headquarters, 1444 S. Boulder Ave., P.O. Box 979, Tulsa, Okla. 74101, (918) 584-2555. e-mail address: postmaster@aapg.org. Periodicals postage paid at Tulsa, Okla., and at additional mailing offices. Printed in the U.S.A. Note to members: $6 of annual dues pays for one year's subscription to the EXPLORER. Airmail service for members: $55. Subscription rates for non-members: $75 for 12 issues; add $72 for airmail service. Advertising rates: Contact Brenda Merideth, AAPG headquarters. Subscriptions: Contact Veta McCoy, AAPG headquarters. Unsolicited manuscripts, photographs and videos must be accompanied by a stamped, self-addressed envelope to ensure return. The American Association of Petroleum Geologists (AAPG) does not endorse or recommend any products or services that may be cited, used or discussed in AAPG publications or in presentations at events associated with AAPG.
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MARCELLUS PLAY

GPI presence in the Marcellus area

Our ongoing 3D survey covers 2,000 square miles in this active region.

Our 2D program covers more than 1,800 miles across Pennsylvania and West Virginia.

Photos courtesy of David Houseknecht

Permafrost polygons on the northeastern NPR-A coastal plain. Field of view in middle of photo is approximately one-half mile. Location in northeastern NPR-A, about 20 miles west of the Colville River delta.

Pingo on the northeastern NPR-A coastal plain, with subtle permafrost polygons in foreground. The field of view in the middle of the photo is approximately one-quarter mile, located in northeastern NPR-A about 20 miles west of Colville River delta.

Oil resource assessment dramatically lowered

New NPR-A Numbers Slam Expectations

By DAVID BROWN, EXPLORER Correspondent

When the U.S. Geological Survey revised its undiscovered resource assessment for the National Petroleum Reserve-Alaska, it took almost 9.7 billion barrels of oil off the table.

That's a big "Oops" – and the implications extend far beyond the borders of NPR-A.

The 23-million-acre reserve in northern Alaska was designated for petroleum drilling and development, primarily for crude oil exploitation. It was established in 1923 as the Naval Petroleum Reserve No. 4, in hopes of providing future naval fuel supplies.

In its 2002 NPR-A resource assessment, the USGS included a mean undiscovered crude oil estimate of 10.56 billion barrels. In its 2010 revision, released in October, that estimate dropped to 896 million barrels.

The mean undiscovered conventional natural gas estimate for NPR-A also declined, but not so severely – from 61,352 Bcf to 52,839 Bcf.

There was a simple story behind the revision.

Drilling in NPR-A has provided a clearer picture of the region's geology, which turned out to be much less favorable for oil than anticipated.

The ramifications are more complex.

Circum-Arctic Implications

NPR-A lies north of the Arctic Circle and was included in the 2008 USGS Circum-Arctic Resource Appraisal.

That appraisal identified Arctic Alaska as the study area's largest potential oil province, with a fully risked mean undiscovered resource of 29.96 billion barrels out of a total Arctic mean estimate of 89.98 billion barrels.

AAPG member Dave Houseknecht, USGS research geologist in Reston, Va., authored the NPR-A revision.

He said geologists were aware of the poorer prospects for Alaskan oil and drew on that knowledge for the Circum-Arctic study.

"Very much of the difference is our knowing in 2008 when we did the (Circum-Arctic) appraisal about this oil-to-gas falloff in NPR-A," he said.

But the 2008 study makes it clear the Circum-Arctic region is highly gas prone, with a mean estimate of 1,669 Tcf of undiscovered gas resource.

"The high estimates for undiscovered oil in Arctic Alaska that were included in the 2008 Circum-Arctic appraisal, combined with the newly released update of NPR-A, reflect the USGS perspective that a large proportion of the undiscovered oil in the region lies offshore," Houseknecht said.

TAPS Implications

Estimates of the useful life of the Trans-Alaska Pipeline System have extended as far as 25 years into the future. That optimism is largely based on the potential for future crude oil discoveries in north Alaska.

"The other discoveries have not been able to offset the decline at Prudhoe Bay, so there is starting to be real concern about the longevity of the Trans-Alaska Pipeline," Houseknecht noted.

No minimum operating line-fill amount has been established for the TAPS line, but the number currently is thought to be somewhere between 200,000 and 300,000 barrels per day.

Kevin Banks, director of the Division of Oil and Gas of the Alaska Department of Natural Resources, said the day-to-day amount of oil carried in the pipeline is also a key issue. The larger that amount, the less the per-barrel cost of transportation.

"We're concerned about not just longevity, but throughput at any given point," he said.

Alaska Implications

Needless to say, the slashed resource assessment for NPR-A was not favorable for Alaska, nor was it viewed favorably in the state.

"The state has a stake in development (in NPR-A) for a couple of reasons. First, we are going to share in the rents and bids and any other money paid there," Banks said.

"We also collect production taxes from any production activity that occurs there," he added.

Banks compared the state's tax breaks for NPR-A exploration to an investment that pays off as production takes place.

"The state has already paid millions of dollars in tax credits for wells drilled in the past six to eight years," he said. "We've actually put more money into exploration in NPR-A than the federal government has."

About 19,000 wells have been drilled to define prospects in Wyoming, while only a handful has been drilled to date in NPR-A, Banks commented. He wondered how any definitive assessment could be based on such a small data set.

"One of the critiques we have of the revision report is that it mentions only about 30 wells have been drilled, and the USGS doesn't even have access to all the information from those wells," he said.

Houseknecht counters that the USGS reviewed proprietary data from all wells drilled during the past decade except one – a gas prospect that was not updated in the new assessment.

"The public data was corroborated by prorietary data and the assessment results are consistent with all the data," he said, "including the proprietary data."

ANWR Implications

Reduced expectations for significant oil discoveries in NPR-A could renew pressure for opening up the westernmost Arctic National Wildlife Refuge Coastal Plain for evaluation and drilling.

But Banks thinks the recent assessment revision will have the opposite effect.

"My expectation is that this would have a negative impact on exploration in any part of the Alaskan Arctic," he said.

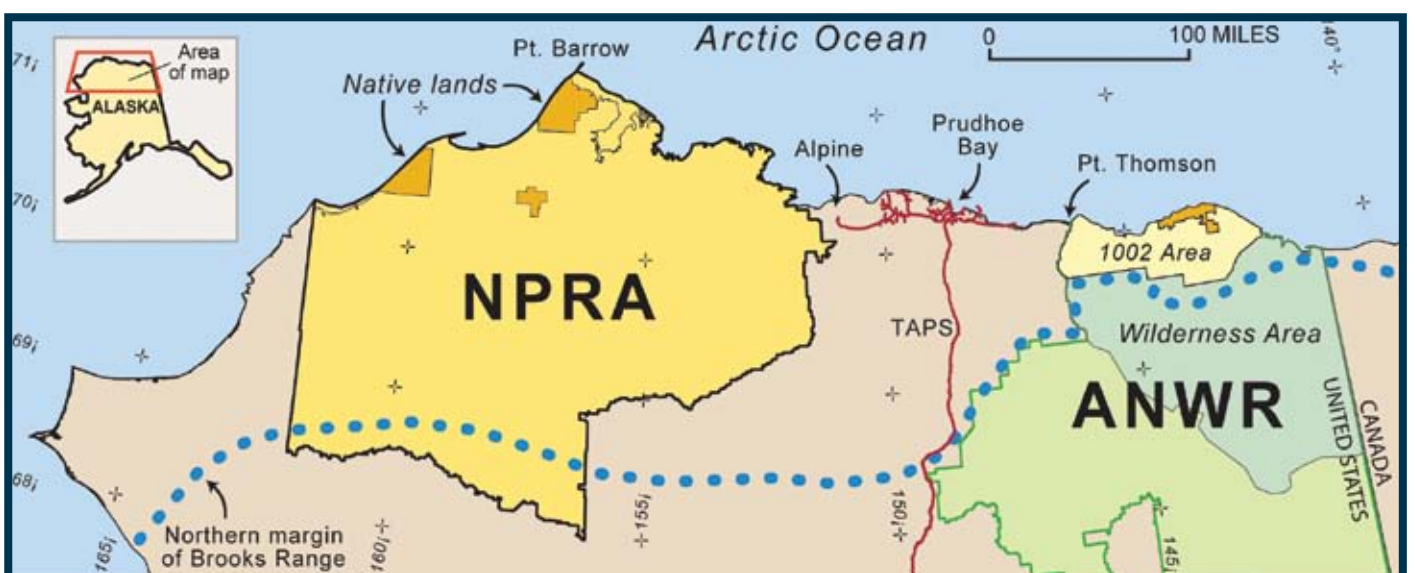
ANWR was established on Dec. 6, 1960. It is managed by the U.S. Fish and Wildlife Service, which is now in the process of updating its Comprehensive Conservation Plan for the refuge.

The review process could lead to the proposal of additional areas for federal wilderness designation and protection, and Banks said he is concerned that the entire 1002 ANWR Coastal Plain area could be designated a wilderness.

(Houseknecht, when asked how the new NPR-A conclusions impact ANWR, always responds, "Not at all.

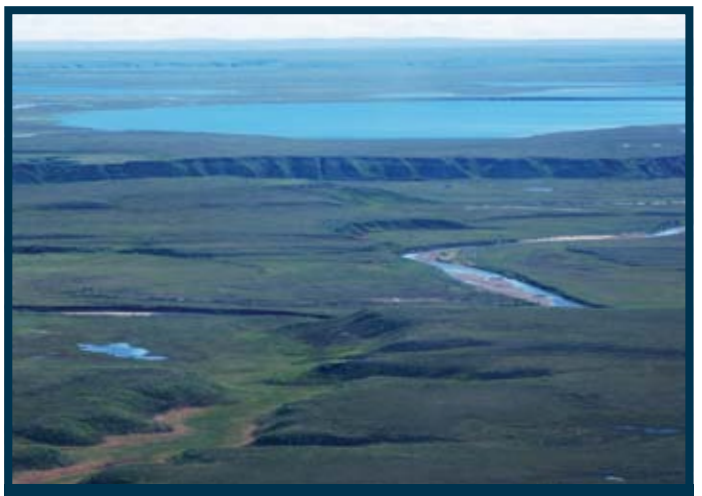
"The region mapping and oil-generating modeling that the USGS has done indicate

See **Alaska**, page 8



The location of the National Petroleum Reserve-Alaska, shown west of Prudhoe Bay and the Arctic National Wildlife Refuge.

Series of bluffs along the Colville River (foreground), about 100 miles southwest of Prudhoe Bay, that defines NPR-A's southeastern corner. Foreground bluff (Umiat Mountain) exposes uppermost strata of the Albian-Cenomanian Nanushuk Formation overlain by the Turonian-Coniacian Seabee and Tuluvak Formations.



Typical view of the northeastern NPR-A coastal plain with relict eolian sand sheet deposits (elevated areas), thermokarst lakes and meandering streams. Field of view in middle of photo is approximately one-half mile. Location in northeastern NPR-A, about 20 miles west of Colville River delta.

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that oil generation did not occur beneath the eastern North Slope – including the ANWR area – until after the northern NPR-A uplift occurred duing the Paleocene," he said. "So there could not have been any influence of the NPR-A uplift on oil resources east of NPR-A.")

Geological Implications

When the USGS prepared the groundwork for its 2002 NPR-A assessment, a major onshore oil discovery had been made west of the Prudhoe Bay production area.

"At that time, what was revolutionizing the exploration picture on the North Slope was the discovery of the Alpine Field. That was the first time this producible oil charge had been found in economic quantities," Houseknecht said.

"In proceeding with our assessment, we assumed that a charge across NPR-A would be similar to the Alpine Field," he added.

Instead, drilling results indicated an abrupt oil-to-gas change just 15-20 miles west of Alpine and poorer reservoir quality than anticipated across the reserve.

Based on sonic logs from exploration wells and other geological evidence, the USGS theorized that Cenozoic uplift and exhumation led to gas expansion, oil degassing and displacement of oil into poorer reservoir rocks.

"What we concluded was that there was a very broad uplift that affected NPR-A during the Cenozoic," Houseknecht said. "There was a large pulse about 60 million years ago and a smaller pulse about 15 million years ago."

It became obvious that NPR-A was looking more gas prone with much less prospectivity for oil in assessed formations, he said.

"Our thinking was that as we moved from east to west (away from the Alpine field), we would not have a gas charge in the northern part of the Upper Jurassic play," Houseknecht explained. "What was really surprising to us as we went through the data was having this gas cap with the condensate in it."

Industry Implications

Houseknecht said it was apparent fairly soon after the 2002 resource assessment that NPR-A would hold less oil than initially believed.

"I was trying to send a message as early as 2005 there was more gas in the NPR-A based on a few years' perspective – and 'Oh, by the way, less oil.' I think people heard 'more gas' but they really didn't hear 'less oil,'" he said.

In part, the assessment revision reflects what hasn't happened in the past decade. Have you heard about the major oil discovery in northeast NPR-A? Neither has anyone else, and the 28 wells drilled in the reserve since 2000 haven't been hugely promising.

Banks thinks the geological re-evaluation of NPR-A calls for more drilling, as a better way to define the hydrocarbon possibilities.

"What this says to me is that more exploration should take place to narrow the uncertainty," he said.

Meanwhile, no exploration activity is slated for NPR-A in this drilling season.

"Industry is not walking away from NPR-A," Houseknecht noted. "They are running away."

Mud volcanoes enter the discussion

Burgess Shale to Add Another Chapter

By BARRY FRIEDMAN, EXPLORER Correspondent

The Burgess Shale is among the most recognizable and studied geological sites in the world – and probably the world's most significant fossil find.

Located high in the Canadian Rocky Mountains – in British Columbia, near Lake Louise and the Alberta border – Burgess contains an amazing record of Cambrian animal fossils, dating 545 to 525 million years ago.

Thousands and thousands of geoscientists have visited its lofty locale. Thousands more of the very best have studied it. Hundreds, maybe more, have written in-depth, comprehensive works on its very existence and profound meaning.

What more is there to tell?

"It's true the Burgess Shale is well known and a UNESCO world heritage area," says researcher and AAPG member Kimberley Johnston.

"Stephen Jay Gould (the late paleontologist and science writer) brought the Burgess Shale fossils to international attention, fueling natural curiosity of animal life and evolution so early in the fossil record," Johnston continued, "but the fossils are only part of the story.

"What really intrigues us as scientists is not what was there, but why they were there."

Why … and how.

Count Kimberley Johnston and her husband and colleague, Paul Johnston of Mount Royal University, also an AAPG member, among those who believe there is more to the story.

The Johnstons, along with AAPG member Stanley Keith, gave a special lecture on the area and its relation to mud volcanism and chemosynthetic communities during the recent AAPG International Conference and Exhibition in Calgary, Canada.

They believe their findings – "The new ideas," Kimberley calls them – "link the sedimentary layers of the Burgess Shale to chemical mud volcanism; the disjunct animal fossil deposits to chemosynthetic communities. We have a hydrocarbon connection, too."

Specifically, they believe that because recent studies show that meter-to-decameter-thick lithosomes, composed of nearly pure clinochlore, are relatively common in the shale – and since the composition of the clinochlore is a Mg-rich product of hydrothermal alteration of mafic minerals, that proves it could not have been deposited by normal basinal sedimentary processes.

It arrived, they believe, at the Cambrian seafloor via mud volcanoes.

Photos courtesy of Jon Dudley, Burgess Shale Geoscience Foundation and Alex Mowat

Geoscientists at work: The Burgess Shale's Walcott Quarry has been called "Mecca for paleontologists" – but the interpretation of its history continues to evolve.

Volcanic Shields

The Burgess Shale has a rich and long history, and no talk about its present can commence without at least a nod to its past.

"There was a 200-meter high submarine escarpment of the Cathedral Formation, with shallow-water animals living on the platform," Kimberley said of the beginning. "Seasonal storms blew them over the edge to a dark watery grave, where they lay on the anoxic seafloor or were stuffed with sediment delivered by the storms or turbidity currents."

Fast forward, if such a thing is possible, a couple of million years later when Burgess Shale layers were laid down.

"After its deposition, the Burgess Shale was exposed to regional green schist metamorphism," she said. "The lead-zinc mines in the type area were supposedly emplaced during the building of the Rocky Mountains."

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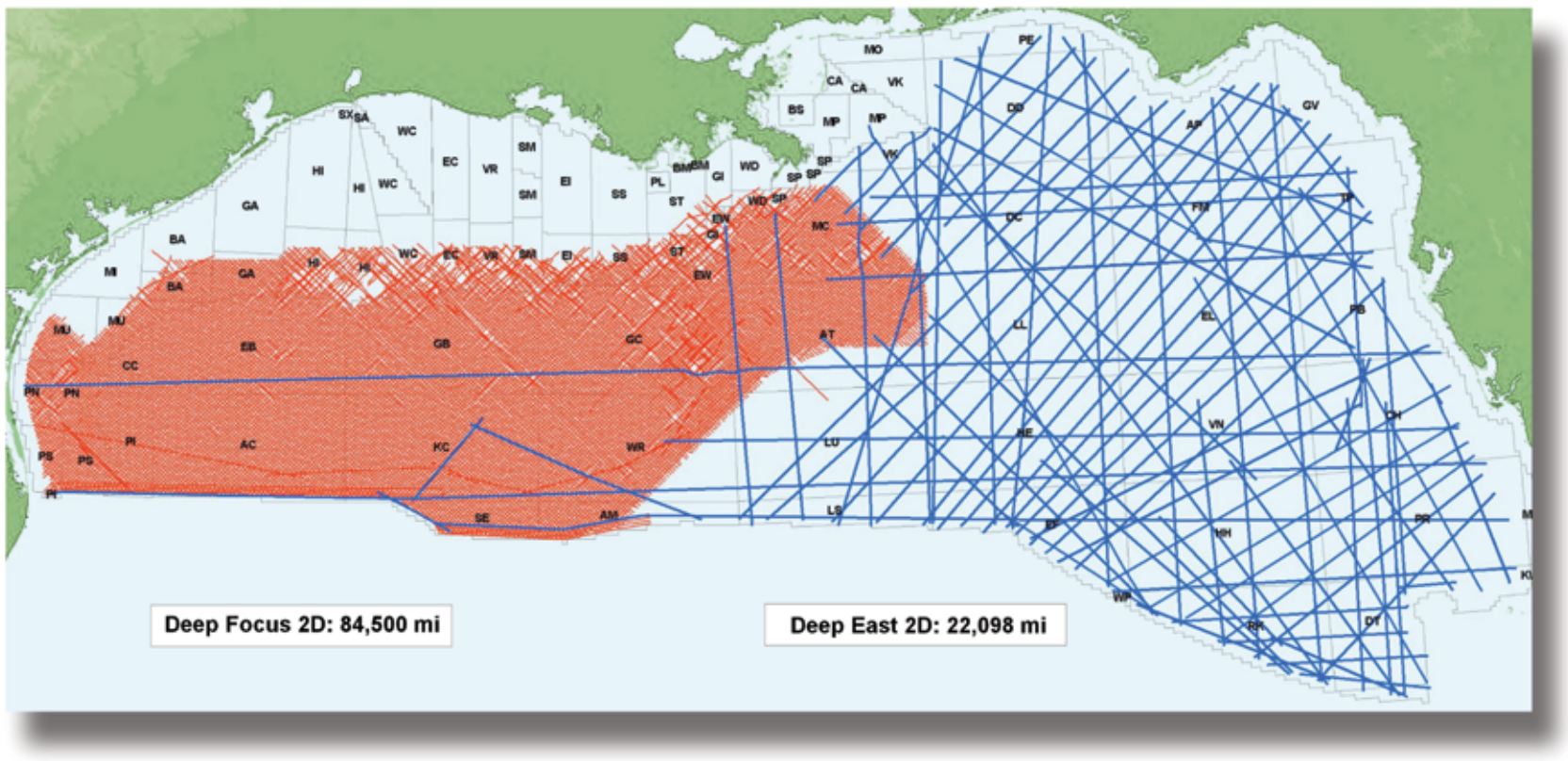
WHEN **QUALITY** COUNTS...



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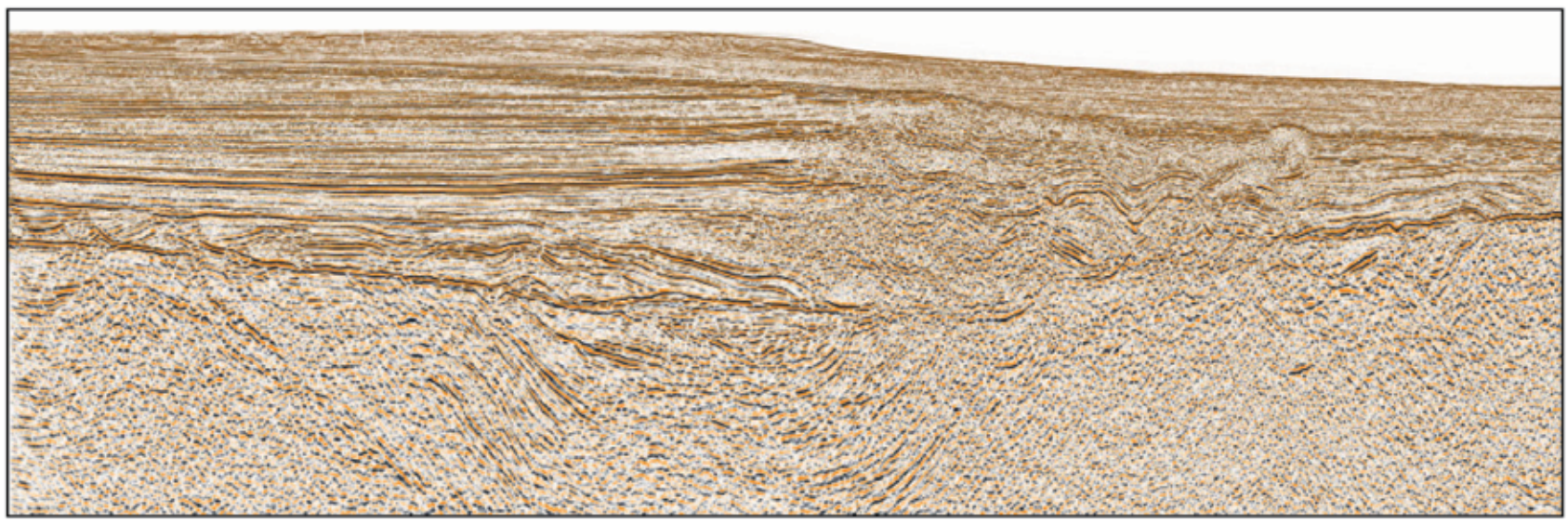

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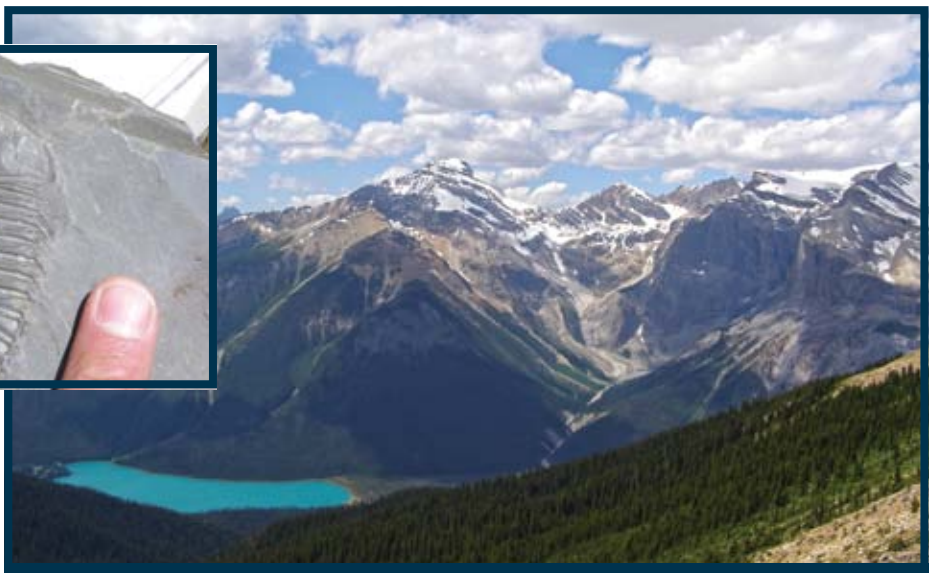
Geoscientists are in fossil paradise when they visit the Burgess Shale; a new theory links its sedimentary layers to chemical mud volcanism and the fossil deposits to chemosynthetic communities.



Fringe benefits: Geoscientists who climb to the Burgess Shale's outdoor laboratory are rewarded with a majestic view overlooking Emerald Lake.

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Supposedly.

"Now we understand that there was not necessarily a tall escarpment at all," she said, "but an active oblique thrust fault related to the movement of North America from the equator."

As for the animals purported to be living during that time, Kimberley says their stories did not end well.

"They were living at the fringes of toxic environments, with these fluids and mud issuing from the fissures that probably built up shield volcanoes, probably very rapidly."

She says their research indicates the fluids probably were responsible for the mass deaths of animals as they were bathed in toxic brines.

She continues, though, on the broader history.

"The regional differences in thicknesses of the Burgess Shale relate to the position of each volcano shield," she said. "The sites of the calderas would have moved through time, according to the plate tectonic stresses. The hydrothermal dolomite, ore minerals and most of the sediment of the Burgess Shale package all are part of a system that generated both hydrocarbons and brines associated with serpentinization very deep in the crust.

"There are several recognizable pulses within the Burgess Shale," she added, "and even into younger Middle Cambrian strata."

The Never Ending Story

Maddeningly, she and her team were initially barred from studying in traditional areas of Burgess – something she believes was fortuitous.

"The blessing was to be forced to look at several Burgess Shale outcrops," Kimberley said.

During that time of "forced" study it became obvious to them that the fossils were not distributed evenly, and that there was another explanation for the paleoenvironment other than deep, anoxic water.

So what happens now? Why, then, the excitement?

"The geochemical data we have are good, but incomplete," she said. "We want to test our hydrocarbon results with more samples from the mud volcano conduits.

"The type area needs to be mapped with consideration for Middle Cambrian faults."

So get ready. Another chapter will be added to the story that everyone knows so well.

Which probably will lead to another, and another, and another … E

Downhole Geology

Next frontiers: micro, log integration

Downhole Tech Made Big Decade Strides

BY DAVID BROWN, EXPLORER Correspondent

It's the end of a decade, and the advances in downhole geology during the past 10 years look more like whole areas of advancement:

- Geosteering, real-time formation and reservoir assessment, improvements in logging while drilling (LWD) and measuring while drilling (MWD), the development of azimuthal tools and other resources.
- Fracture assessment and analysis, fracturability evaluation, fracture systems modeling, microseismic.
- Advanced borehole imaging, new electrical imaging technology, video logging, imaging through mud and fluids.
- Seismic in downhole geology, virtual source seismic, downhole passive seismic, seismic while drilling.
- Developments in neutron tools and spectroscopy, low-field NMR, new ways of detecting and evaluating porosity and permeability levels.

And you could throw in advances in petrophysics, the growing importance of geochemical analysis downhole, plus developments in computing power and software.

It's been an interesting decade.

Not the least because of unconventionals, pushing forward advances in drilling and fracturing. The industry has gone from marveling at the ability to geosteer a short lateral wellbore to not thinking twice about today's 5,000- or 10,000-foot steered laterals.

PITCHER

The industry has gone from marveling at the ability to geosteer a short lateral wellbore to not thinking twice about today's 5,000- or 10,000-foot steered laterals.

Technological Impact

AAPG member Jason Pitcher is global well placement solutions champion for the Sperry Drilling product service line of Halliburton in Houston.

"Ten years ago, if you had asked me what was the limit for staying in a formation and not going out of it, I would have said about 20 to 25 feet," he said.

Today, "we'll put a 10,000-foot (lateral) well in a 15-foot-thick or less section," he noted.

Improvements in downhole tools helped make that possible – and Pitcher said improved density imaging tools developed first.

"We've been able to map the density changes in a 3-D picture around the wellbore, which conventional tools just weren't able to do," he said.

Two types of azimuthal tools also provide important information, Pitcher noted. One is the azimuthal resistivity tool.

"The other kind of tools is the azimuthal deep imaging tools," he continued. "Before the advent of those tools, if I was drilling along in a reservoir and came to changing resistivity, I couldn't have told you if I was at the top of the formation or the bottom."

These new and advanced tools were developed to address specific needs and are less about replacing the traditional triple-combo than capturing additional information.

"In the past 10 years there has been an accelerating focus on LWD tools that are less about replacing wireline data," Pitcher observed.

"The industry has been very focused on tools that add value for the clients by giving them better placement," he said. "We're seeing things now that 10 years ago we had no idea would come along."

In downhole geology assessment, "we're finding new ways to use old tools," Pitcher said. An example is use of a sonic tool to place wells for effective hydraulic fracture stimulation.

"Looking forward," Pitcher predicted, "an area that's going to get a great deal more attention is seismic while drilling.

"I can look to the side very effectively," he added. "What I can't see very well is ahead of the bit. Ahead-of-the-bit technology is really about seismic."

'Incremental Movement'

While shale gas and ultra-deepwater were the dominant exploration stories in the U.S. during the past 10 years, downhole geology saw advances in many areas with few major breakthroughs.

AAPG member Laird Thompson is an adjunct professor at Utah State University and a researcher in Auburn, Calif. He spent 30 years in research at Mobil earlier in his career.

"I don't really see anybody these days doing a huge job of pushing the envelope, like was done from the mid-1970s through the 1980s," Thompson said.

"There's incremental movement and there's radical movement, and I think it's been incremental movement," he noted.

Those incremental moves forward have improved not only the quality of borehole imaging but also the industry's capabilities in obtaining downhole images.

"The most recent advances in borehole imaging in the past 10 years probably

See **Advances**, page 20

Abstracts Sought for 3P Conference

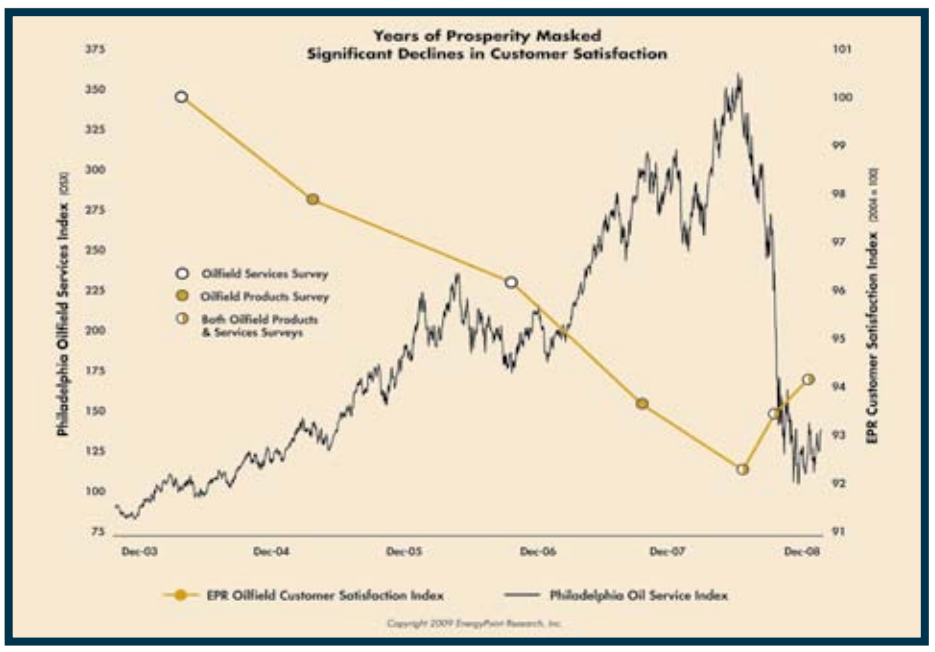
Abstracts are being accepted for AAPG's second Polar Petroleum Potential Conference and Exhibition – or simply, "3P Arctic" – set Aug. 30-Sept. 2 at the World Trade and Convention Centre in Halifx, Nova Scotia, Canada.

The 3P technical program will consist of 15-20 sessions, including 150-160 oral presentations and more than 150 posters, covering all aspects of the geology, petroleum geology and geophysics of the Arctic and Circum-Arctic sedimentary basins.

Proposed topical themes include:

- Appraisal of Arctic Petroleum Resources.
- North Atlantic Conjugate Margins and the Arctic Connection.
- Cenozoic Uplift of Arctic Margins and Implications for Petroleum Potential.
- Evolving Tectonic Interpretations.
- Arctic Petroleum Systems.
- The Ellesmerian Orogeny and Basement Rocks of the Western Arctic.
- Northern Cordilleran-Brooks Range Connection.
- Evolving and Innovative Technologies for Arctic Operations.
- Geophysical Innovations.
- Fundamental Geology and Geologic Maps of the Arctic.
- Impacts of Climate Variability on Arctic Petroleum Potential and Operations.
- Arctic Unconventional Resources.

To submit an abstract, or for more 3P information, go online to www.3parctic.com. The abstract submission deadline is Feb. 15.



Satisfaction Bar Is Set High

During a decade of new tools and new advances in downhole geology, has the oil and gas industry been happy with the numerous downhole services available?

Not so much, said Doug Sheridan, managing director of EnergyPoint Research Inc. in Houston.

EnergyPoint Research surveys the industry to measure satisfaction of, among other things, service companies and their offerings.

He's found an inverse correlation between the prosperity of oilfield service and equipment providers, as reflected by the Philadelphia Oil Service Index (OSX), and general oilfield customer satisfaction (see chart above).

Sheridan proposed some reasons for that disparity.

"Every time you say, 'I have a high-tech gizmo,' you are trying to raise the expectations of customers. Their eyebrows go up," he noted.

"It also sets the bar higher than many high-tech applications can meet," he said.

Also, the industry went through a period of rapidly rising demand because of high oil prices and – for a time – high natural gas prices. Service companies found themselves scrambling to add personnel.

"When you have such a high growth area, it's difficult to have enough well-trained people to do this effectively," Sheridan said.

Maybe because high-tech hype hasn't always lived up to its promises, industry satisfaction has tended to be highest for bread-and-butter downhole services.

"The industry seems to be most satisfied with services that are the most specific, meaning core and fluid analysis, things you can actually take to the lab to look at," Sheridan said.

He's found that operators want results that lead to increased certainty, "as opposed to services that kind of approximate what's going on downhole."

In drilling decisions, Sheridan said, the industry is focused on the integration of downhole equipment, what he called the modeling and simulation of the entire bottomhole assembly.

"What you're trying to do is maximize drilling (efficiency), minimize vibration and drill longer and better than you ever have before," he explained, "because essentially you have already drilled that well on the computer."

– DAVID BROWN

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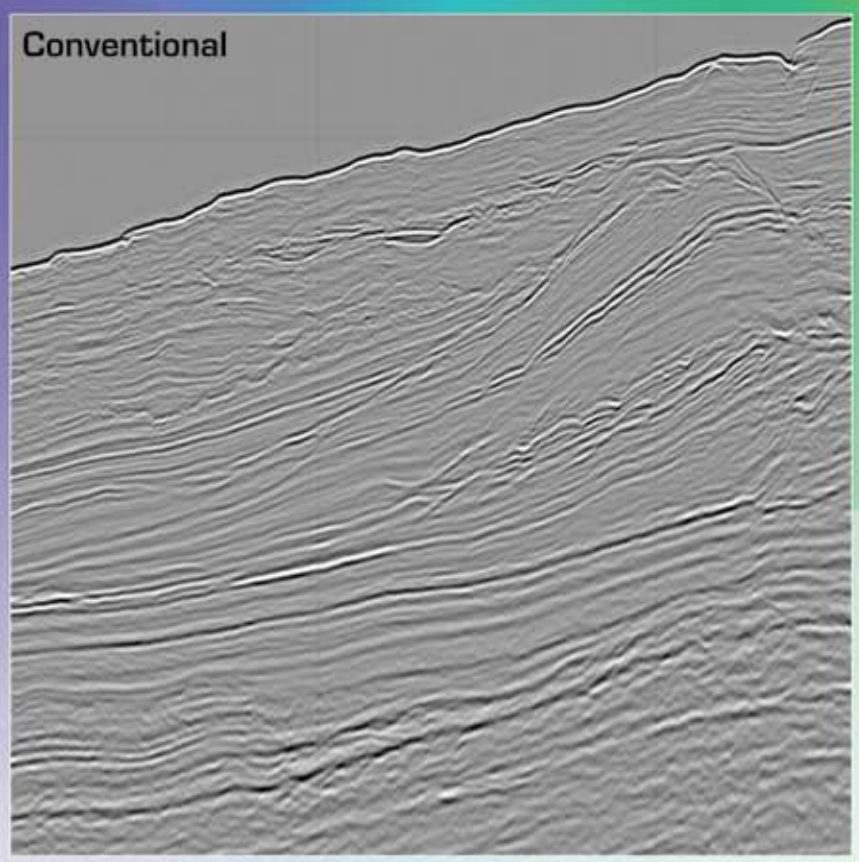

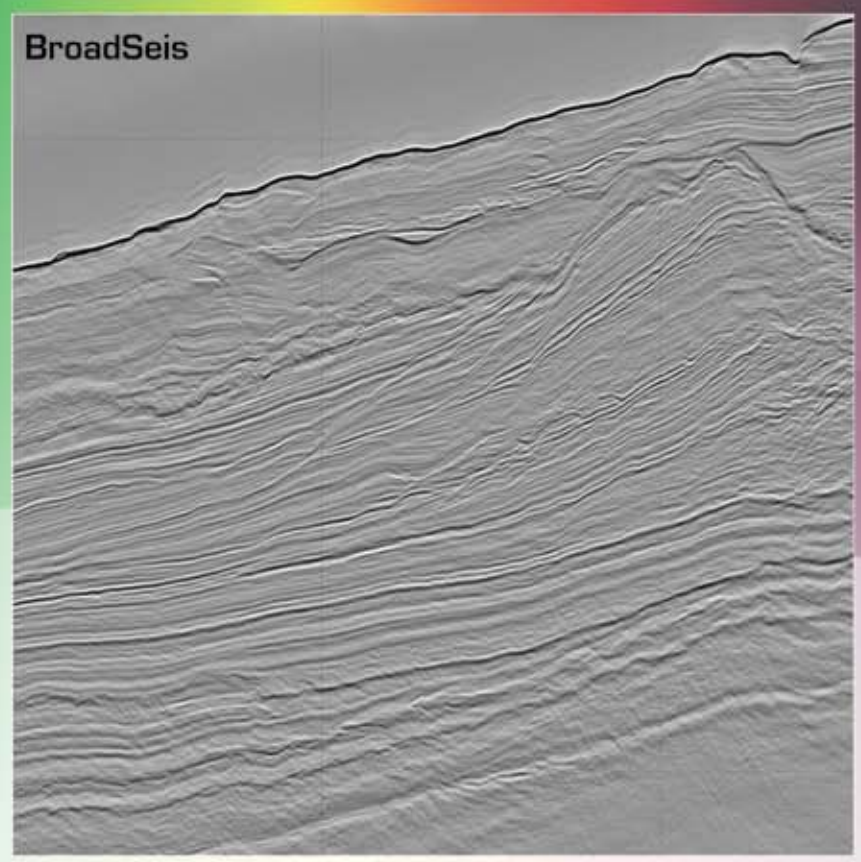

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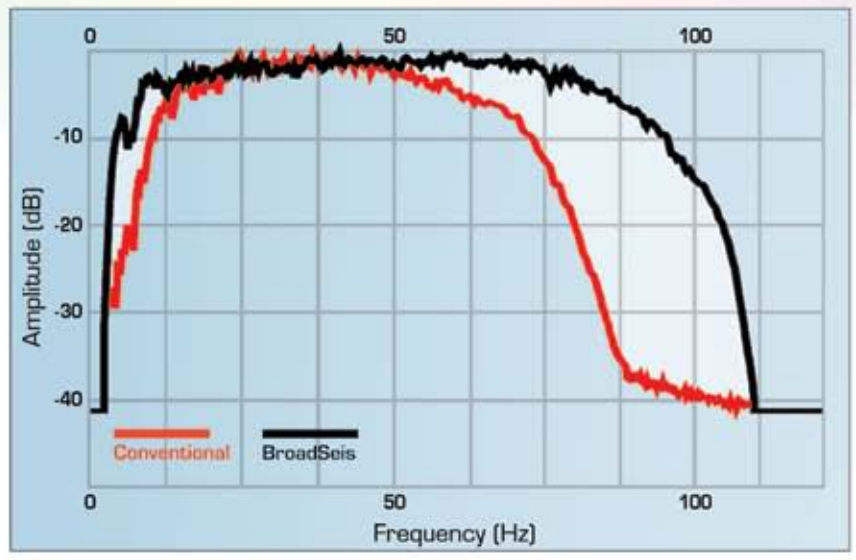

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Getting on the geoscience mechanics bandwagon

Shale Wells Tend to be Custom Jobs

By LOUISE S. DURHAM, EXPLORER Correspondent

The dynamic drilling action in shale gas plays has occurred in large part because operators want to hold onto their leased acreage, in addition to bringing in some early return on their sizeable investment, i.e., bump up the cash flow.

But holding onto leases for the land itself is not the point.

Operators often need time to acquire in-depth scientific knowledge to plan drilling programs to strategically develop their holdings in order to drill the most productive wells.

Given the relatively new big thrust in shale oil action, these plays can benefit from the fact that operators in the earlier gas plays quickly realized there's a steep learning curve for all things shale.

AAPG member Nathan Meehan, senior executive adviser at Baker Hughes in Houston, gets to the heart of the matter.

"Some operators go quickly to what we call the factory approach," Meehan said. "They do a little science, drill a couple of good wells and quickly decide to drill a few hundred more of these based on the assumption this one successful design is good to go on any location.

"Still, we all know that heterogeneity and variability from every location to the next are really high, and the odds you've really optimized things are pretty low," he noted.

"Actually," Meehan quipped, "the only thing about the drainage areas of shale reservoirs that we really don't understand is how far out they go and how vertically tall they are and how long they are.


MEEHAN

Wells in close proximity can be drilled almost identically and yield pretty much identical logs and cores yet demonstrate significant differences in production performance.

"In other words, we don't understand anything about them."

Critical Factors

Indeed, wells in close proximity can be drilled almost identically and yield pretty much identical logs and cores yet demonstrate significant differences in production performance.

"There can be a physical, geological and geomechanical explanation for this," Meehan said. "But in most cases, we don't run enough logs and don't characterize the reservoir enough to be predictive of exactly what locations will be better than others."

Understandably, a broad area with higher TOC and higher silica content than a broad area nearby will perform better overall. Yet there will be significant variations within the "good" area.

"We must do as much science as possible to understand these reservoirs," Meehan emphasized.

Shales in general contain miniscule or no porosity and permeability. In very low permeability reservoirs there's the issue of how large the gas or gas/oil molecules are compared to the size of the pore throats.

"It's not that hydrocarbons can't move through pore spaces that are really small," Meehan said, "it's that they kind of line up and go behind each other, sort of like one or two at a time. With oil, it's a bigger issue, because if you have some of the extremely low permeabilities in some of the gas shales the larger oil molecules might just be trapped there.

"The relative permeability to that oil might be near zero," he continued. "The only way to get it out would be through some microfractures that would give it the ability to move.

"Understanding the microfracturing in shales is probably more important for oil and rich gases rather than dry gas, given that the larger crude oil molecules require better effective permeability to flow from the reservoir in economic volumes," Meehan noted.

"Even if microfracturing is a small part of the total permeability of a particular petroleum system," he said, "it could be extremely important if the rest of the permeability is extremely low."

Geomechanics' True Value

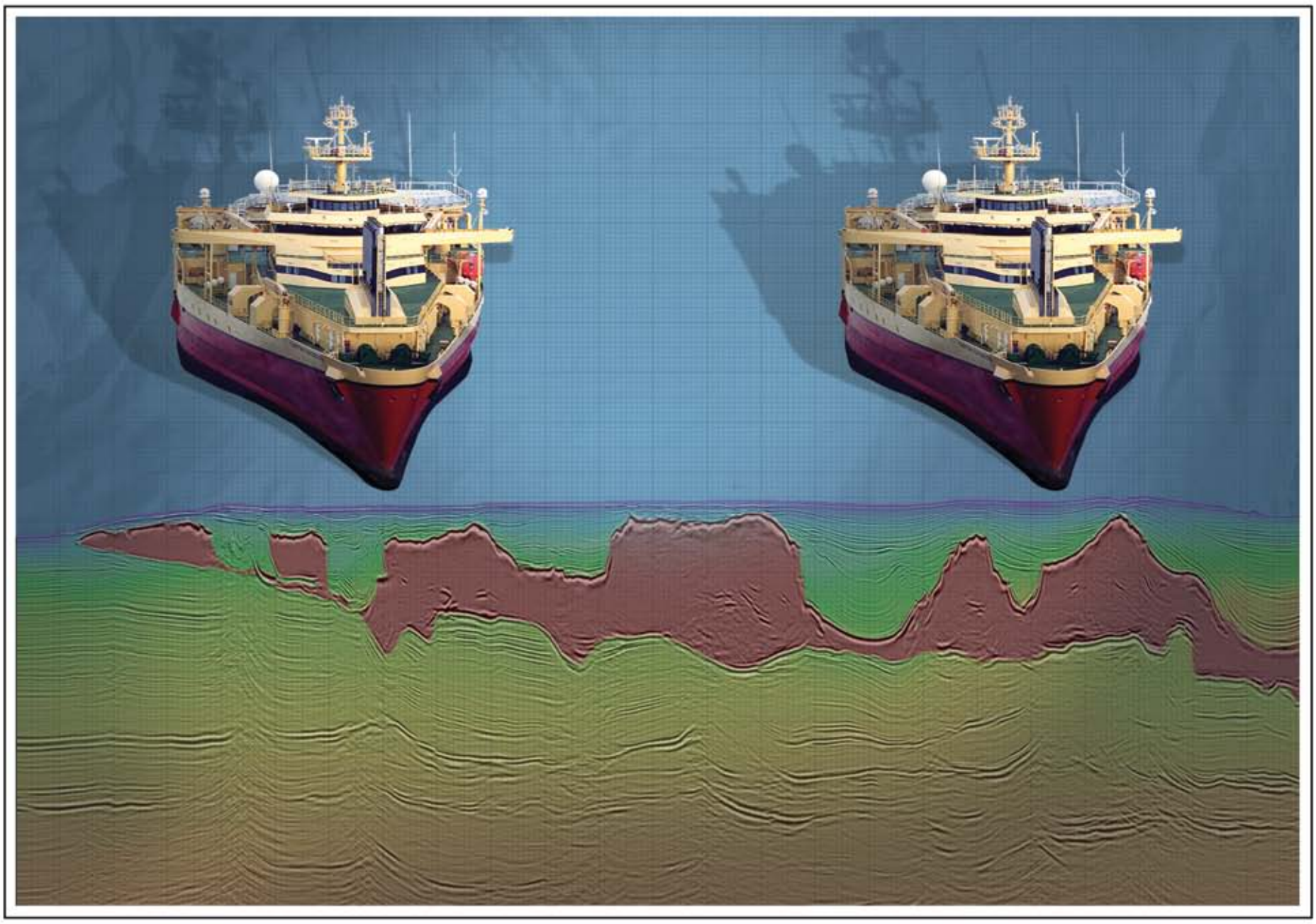
In the Bakken shale oil play, microfractures often are associated with hydrocarbon generation.

"When kerogen cooks out of the Bakken shale, it experiences an intense volumetric increase of about 114 to 170 percent," said AAPG member Scott Stockton, executive vice president of Vector Seismic Data Processing in Denver. "There's great energy stored in that volumetric increase, and it wants to fracture the rock, mainly along the bedding planes."

During the hydraulic fracturing procedure that operators commonly implement in shale plays, the critically stressed fractures – those that are optimally aligned to fail in the present-day stress regime – are the ones that actually fail and shear when they feel the impact of the increased strain caused by the hydraulic frac, according to Meehan.

"A large amount of microseismicity occurs outside of the primary plane of the hydrofracture," he said. "The slippage along all those little fractures enhances the bulk permeability quite a bit, because even a

See **Geomechanics**, page 20



Crystal III, East Breaks

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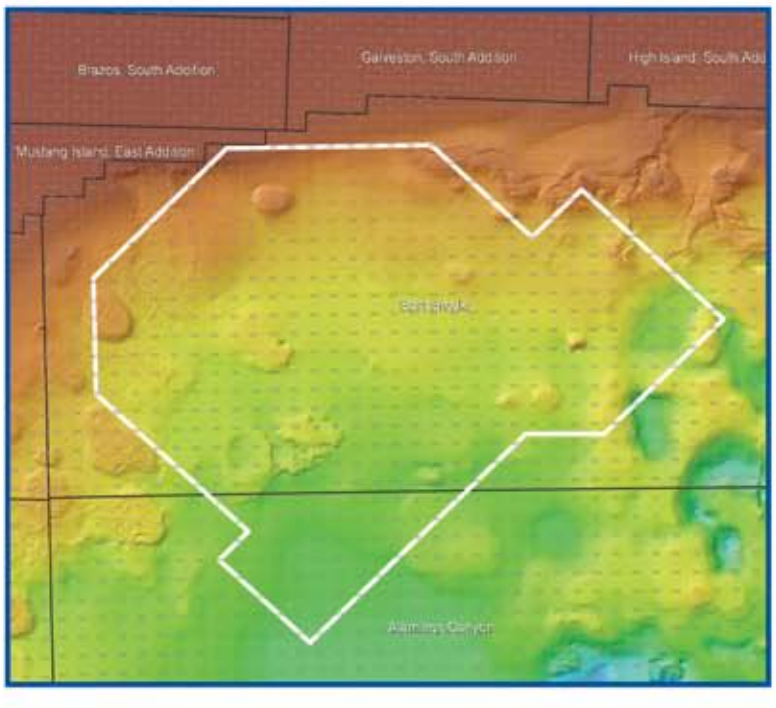

- **Size - 480 OCS blocks**
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- **Technology - TTI Beam and RTM Imaging**
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Advances
from page 14

have been in getting better images for mud-filled holes, because oil-based muds are always a problem for the imaging tools," Thompon said.

In his view, the lack of direct investment of time and money in fundamental research has hurt the industry's ability to develop breakthrough tools.

"It used to be that all the majors had their own research labs. There's almost nobody left in the oil patch that's doing these things. For the service companies, their driver isn't science. It's economics," he observed.

Thompson also believes the industry under-utilizes borehole imaging data, even when companies go out of their way to get downhole imaging.

"I think that image logs are the most under-used data sets in the industry," Thompson observed.

Operators let service companies acquire and interpret the borehole image data, but the results are not mined for additional information or data efficiency, he noted.

"They get the quick answer," he said, "and put $100,000 worth of image data on the shelf."

Let's Get Small

A future area for downhole development is microseismic, Thompson said. It's not technically a downhole application, but microseismic does capture information about what goes on downhole.

Most downhole tools start at the wellbore and just beyond, with an expansion of measurements into the larger formation.

"Microseismic comes at it from the other end, using a surface array or a combination surface-downhole array, where you're going from the large rock picture down to the small," Thompson said.

The difference in measurement and detection scale among the various types of downhole tools makes combining the results a tricky challenge, he noted.

"With all logging tools you have to be aware of the volume of rock you're investigating, so you can do this consistently," he said.

There's also a difference in the relative coarseness or fineness of information detail captured by downhole tools.

"To rectify those things and combine them coherently, that's an area that could stand further investigation," Thompson stated.

Today, many researchers and downhole specialists see the fully integrated combination of seismic data, logging data and other downhole information as the next big challenge in downhole geology.

Thompson said the goal is "a fully holistic, integrated, 3-D model" of the subsurface.

"One of the things we were working on at Mobil was in terms of trying to integrate the different kinds of logging information on the same scale," Thompson recalled.

"I won't say it's the Holy Grail," he said, "but it's an extremely useful exercise."

Geomechanics
from page 18

very small amount results in permeability much higher than before – albeit 'much higher' in this case is relative to a very small number.

"The slippage generates a lot of the ability to drain some incredibly tight rock," Meehan said. "To understand the location and direction of those, you need to do the geomechanical studies of the reservoir."

For some time, geology, petrophysics, geophysics and engineering have contributed to characterizing and understanding subsurface assets. The addition of geomechanics as a practical science to help the evaluation can be invaluable, according to Meehan.


STOCKTON

"The early work was focused on wellbore integrity and forecasting pore pressures," he said, "and a lot of geomechanical issues are not as important in vertical wells as in horizontal and multilaterals – especially those oriented in multiple directions."

The real opportunity for understanding critically stressed fractures came about because more people are building real geomechanical models – particularly with the image logs, i.e., acoustic or microresistivity logs.

"They're able to see both natural fractures and drilling induced fractures in boreholes and then integrate that interpretation along with other data to model stress state in the rocks," he said, "and be able to build predictive models.

"The technology is really important to understand the stress regime, the fractures, be able to get the magnitude and direction of the in situ stress and to understand the normal and shear stresses that act on fault planes," Meehan said. "It's essentially understanding where those fractures are to identify the ones with high conductivity.

"Critically stressed fractures are the ones most conductive to fluid flow," he said. "That's where the flow will be predominant, and you can't get that from running a triple combo in a vertical well.

"A lot of forward thinking operators are increasingly realizing the importance of geomechanics issues and that you don't have to do a geomechanics study on every well to understand a very large

See **Fractures**, page 41

Memoir Offers Borehole Recipes for Success

By LOUISE S. DURHAM, EXPLORER Correspondent

Borehole imaging, experts say, is among the fastest and most accurate methods for collecting high-resolution subsurface data – and that's exceptionally meaningful considering the complex reservoirs that operators face on a routine basis.

So why isn't it a more prominent tool in the geoscientist's arsenal?

Maybe it's all a matter of needing – and having – a recipe for success.

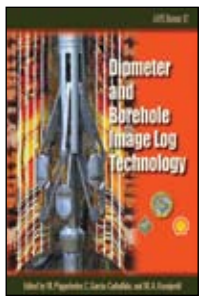
While many geoscientists are willing to incorporate borehole image data into their geological model, they may lack the required expertise to adequately acquire, quality control and process the data into interpretable images, according to AAPG member Michael Pöppelreiter, SRM carbonate team leader at the Qatar Shell Research and Technical Center in Doha.

In other words, there has been no "cookbook" to walk these folks through the important borehole imaging process.

That changed with the recent debut of AAPG Memoir 92: Dipmeter and Borehole Image Log Technology.

The tome, which was three years in the making, was co-edited by Pöppelreiter, AAPG member Carmen García-Carballido (formerly with Shell, now with EnQuest in Aberdeen, Scotland) and Martin Kraaijveld (with Shell Expo Lowestoft, Rijswijk, Netherlands).

"The idea of assembling a borehole image 'cookbook' arose from the members of Shell's borehole imaging team made up of petrophysicists, geologists and data managers," Pöppelreiter noted.



PÖPPELREITERz

"The 'cookbook' was actively used within Shell," he said, "and we thought that an 'upgrade' into an AAPG Memoir would be beneficial for the worldwide community.

"Some of the experts who participated in Memoir 92 represented service companies and universities," he added. "The community of borehole image specialists is small, so we had to rely on a select group of authors to contribute to the memoir."

In all, 19 lead authors contributed, along with co-authors and others.

"The volume provides geoscientists with a practical guide for borehole image log applications along the E&P life cycle, from exploration to field abandonment," he continued. "This includes planning logging runs, data acquisition, quality control, processing and on to interpretation and application in subsurface models.

"The borehole image logs have evolved from standalone niche applications to a key component of subsurface models used for key decision making," he emphasized.

GARCÍA-CARBALLIDO

Reservoir Modeling Boon

Various borehole imaging tools have been developed during the last five years, but the recent revolution in borehole imaging stems from advances in 3-D modeling software. Modern software enables full integration of image log data in the subsurface model.

Associated interpretation workflows offer the advanced details needed to make operational decisions and enhance the predictability of subsurface models.

The single most important application of borehole image logs is reservoir modeling, especially fractured reservoirs – think shales, for instance.

"It's the only device that can deliver three dimensional data on fractures, their distribution and nature," Pöppelreiter noted. "Other applications can detect them, but it is difficult to make a meaningful description of a fractured reservoir without borehole image logs."

Other than 3-D modeling software, another recent key development has been borehole imaging while drilling, using LWD tools. This provides real time information.

Your Own Back Yard

Want in on a secret?

There's no need to spend millions of dollars to acquire the data needed for these invaluable subsurface reservoir models – you likely already have them.

"For the specialist in an oil company, the first place to look for such data might be to go to their own tape archives or their own digital data bases," Pöppelreiter said. "There is so much data in their data bases that can be reprocessed and incorporated into the subsurface models, especially in more mature basins like the U.S. Permian Basin or the UK North Sea, for example.

"Many of these data have been underutilized in the past," he said. "Now we have the software and a big step forward with reservoir modeling, which enables us to use what we already have."

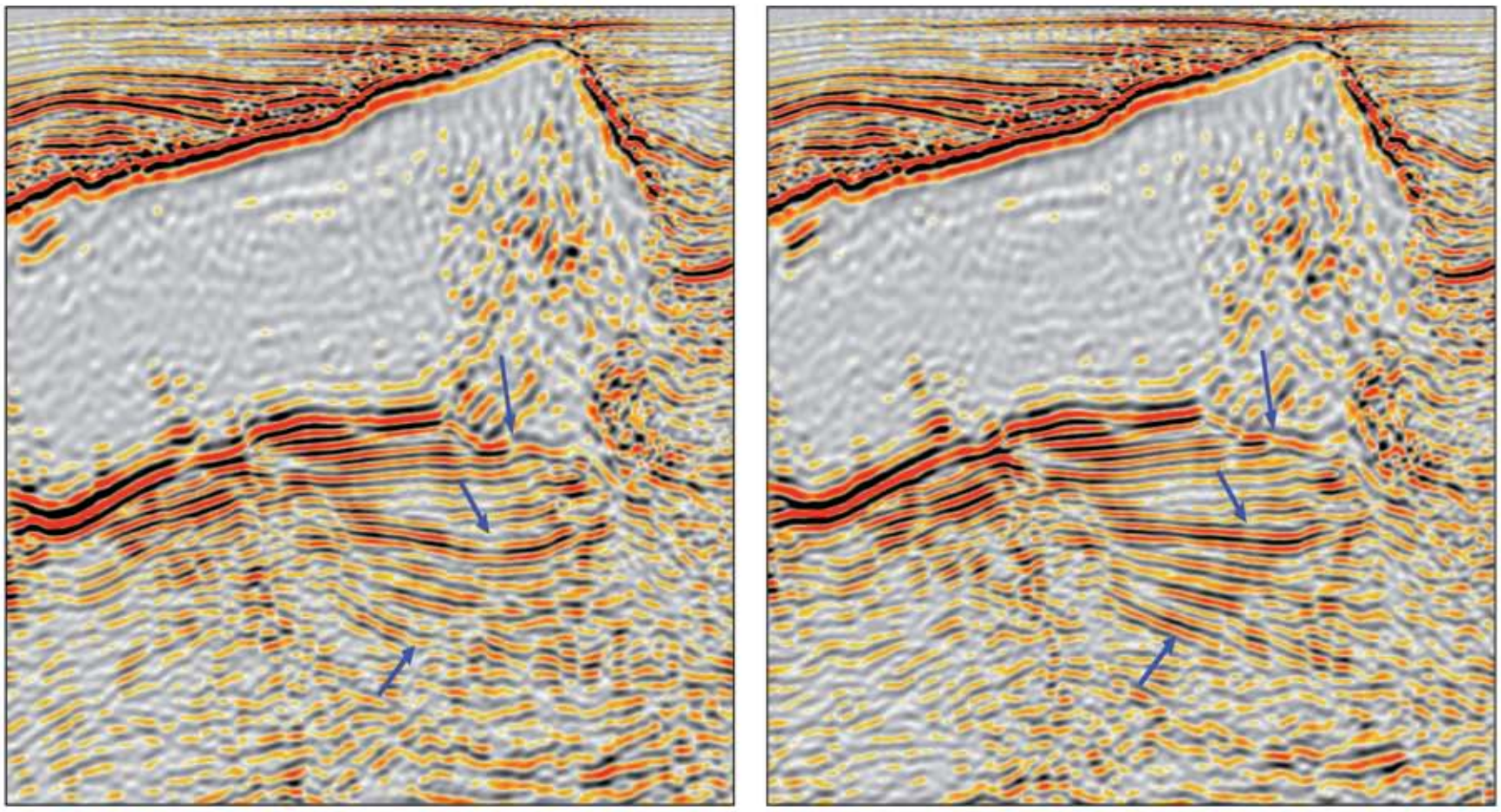
If you're into the unconventional action, pay attention.

"Borehole image data are paramount to unlocking unconventional plays, such as shale gas and coalbed methane," Pöppelreiter remarked.

He emphasized a couple of the salient aspects of Memoir 92:

- It illustrates the value of integrating high resolution dipmeter and borehole image data with seismic, well log and geological knowledge – "in order to construct integrated subsurface models," he said.
- It provides the fundamentals of the technology for novice and specialist geoscientists and petroleum engineers alike.
- It introduces state-of-the-art applications.

Imaging through Dirty Salt



Reverse Time Migration

CGGVeritas continues to pioneer Reverse Time Migration (RTM) technologies for superior imaging in areas of complex structure.

Deriving an accurate salt model is critical to subsalt imaging. The effects of "dirty salt" heterogeneities, such as sediment inclusions, interbedded and layered evaporites, have an appreciable impact on subsalt events. In recent years, our ability to define the external salt boundary has improved significantly due to the availability of wide-azimuth (WAZ) data and advances in RTM. However, dirty salt has historically been ignored during model building stages.

CGGVeritas has designed an iterative reflectivity inversion scheme to derive the velocity structure within the salt. This scheme can be used where picks from intra-salt reflections are too sparse or erratic for picking or for properly constraining tomographic updates. In these RTM depth images from a WAZ dataset, using a constant salt velocity (left) and a dirty salt velocity from reflectivity inversion (right), both the base of salt and the subsalt events are more coherent using the dirty salt velocity.

INNOVATION OF IMAGING TECHNOLOGY REMAINS THE FOCUS OF THE CGGVERITAS R&D AND SEISMIC IMAGING TEAMS.

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TGS has 8,640 km of newly acquired long offset seismic and gravity data in the South Java forearc. For the first time, the new data images a thick package of sediment as shown in the intermediate product above. It has similar characteristics to Mesozoic and Paleozoic NW Shelf Australian sediments. The potential for a working petroleum system is high and yet to be tested.

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Downhole Geology

A controlled process

Shale Hydrofrac Concerns Addressed

By LOUISE S. DURHAM, EXPLORER Correspondent

Hydraulic fracturing is much in the news these days given its widespread use in the ubiquitous shale plays.

It's a long accepted, proven process that dates back to 1903. It was first commercially employed in 1948.

Even so, many people residing in these play areas are increasingly vocal about the technology, questioning and sometimes claiming it's contaminating the subsurface aquifers that source their drinking water, among other complaints.

Perhaps they should abstain from eating ice cream.

That's right. Ice cream.

The popular sweet treat contains guargum, which is used as a thickener in hydraulic fracing fluid.

"Most of the materials we use are pretty benign materials," said Randy LaFollette, manager of shale gas technology at BJ Services in Tomball, Texas. "A lot of the material we get has normal household uses and ingredients."

Whatever the makeup of the fluid, he adds, forget about it migrating into the aquifers.

"There are studies outlining the risk associated with shale gas especially," LaFollette said. "The normal situation is that shale reservoirs have thousands of feet of vertical separation from aquifers or potential underground sources of drinking water.

"It's hard for a frac job to migrate vertically thousands of feet," he said. "There would be some sort of barrier in between – in other words, a rock with geomechanical properties that would act as a barrier to upward migration.

> **"It's hard for a frac job to migrate vertically thousands of feet. There would be some sort of barrier in between – in other words, a rock with geomechanical properties that would act as a barrier to upward migration."**

"In some places what happens as well is you see the overburden becomes the minimum principle stress," he noted. "And so at very shallow depths, the fractures essentially want to turn sideways and not propagate vertically.

"If aquifers are above where that happens, the fracs can't possibly grow in to them."

Addressing concerns over surface spills from hydraulic fracing operations, LaFollette emphasized there is little risk of this happening. Should a spill occur, it can be cleaned before there is any damage to an aquifer.

He noted they are using passive microseismic technology to monitor the subsurface fractures as they are being created.

"Microseismic monitoring is for design calibration and also for shutting down jobs going toward some geohazard you don't want," he noted. "A classic example is the Barnett shale, where karsts and faults lead down into the Ellenberger salt water below the Barnett.

"When we see the fracture microseismic events going in that direction, we shut that stage down and move on to the next stage," LaFollette said.

"We're developing predictive capability," he said. "We don't want to waste frac material and the customers' money to create fractures that aren't beneficial."

Why Frac?

The layperson might be inclined to question whether hydraulic fracturing is really necessary or whether the operators are just too impatient to get the hydrocarbons out of the reservoir naturally.

So why do we fracture these shales, really?

A good example is the Barnett shale in Texas, which kicked off the ongoing shale boom. It's home to sealed natural fracture systems that won't produce economic quantities of gas.

In contrast, the Marcellus shale in the eastern United States is a mix of sealed and open fracture systems.

"You can drill the borehole for maybe 5,000 feet through a sealed natural fracture system with a shale gas well and then evacuate it," LaFollette said, "and you won't get enough gas to run a one-chair barber shop until you complete and frac that rock extensively."

It's all about gas molecule movement in nano-darcy matrix permeability, he explained while providing data points:

- Gas molecule movement in shale of about 10 feet in a well's lifetime, as per Mohan Kelcar with the University of Texas.
- Gas molecule movement of about a meter/year, modeled by Nexen in Calgary.
- Gas molecule movement of a few feet/year, modeled by Chunlou Li at BJ Services shale gas technology group.

"We're all converging on similar numbers," LaFollette said. "The implication is if you don't place a high permeability pathway close to where a gas molecule resides today in the reservoir, it will never find its way to the wellbore – there's no geological time to wait around for these things to migrate out at their own pace.

"Therefore, we frac – it's the only way with current technology to place many high permeability pathways into that volume of

Continued on next page

Continued from previous page

rock we want to drain," he emphasized. "If you can make those fractures close enough together you can effectively drain a large part of the shale.

"The hydraulic fracturing process creates not only tensile fractures, it also shears existing fractures in the target."

Specific Functions

The fluid mix used in hydro fracing has specific functions:

- Transmit energy to the formation to split the rock.
- Transport proppant (through tubulars, completion, near-wellbore fracture).
- It must be compatible with formation minerals and fluids.
- It must be easy to recover.

Slick water fracs, which provided about the same production results as crossed linked gel fracs, became the preferred fracturing fluid in the mid-1990s for shales with which it was compatible. These slick water apps cost about 30 percent less than cross-linked gel treatments, which is quite important given that fracture stimulation costs are a large piece of the AFE for these wells.

"Slick water is one of the simplest fracturing fluids," LaFollette said. "Generically speaking, it's comprised of water and a polyacrylamide friction reducer that makes the fluid more slippery – reducing the friction makes it cost less to pump a job.

"Other additives may be included, such as biocides, surfactants, clay control additives, and breakers, as needed to optimize treatment effectiveness," he noted.

In shale fracs, operators typically recover about 10 to 25 percent of the frac fluid – and what comes back tends to have a high dissolved solids content. What's done with it depends on what it is when it comes back.

"You may start with potable water and it comes back supersaturated," LaFollette noted. "You get into water recovery process issues and reclamation issues.

"Especially where water is hard to come by, you'll see partial reclamation and dilution with other water sources to be pumped down the next well," he said. "We're using as much of recovered load as possible."

Environmental Concerns

Environmentally friendly products are high on must-have lists of both operators and service companies.

For example, the use of ice cream component guargum as a thickener in frac fluid is light years removed from the long-ago days of small frac stimulation treatments using war surplus napalm.

These days, what's green can always be greener.

"We have a project that started last year looking at the environmental aspects of our products," said Andy Jordan, technology support manager at BJ Services. "We looked at the components of the products and came out with a system to verify the relative 'greenness' of the different chemistries we use.

"This mostly helped us to identify the better products in our product line."

When queried about the anxiety on the part of those folks who fear contaminated ground water, Jordan noted they are working to educate the public to show the hydraulic process is controlled, e.g., using microseismic, and the risks are minimal with regard to drinking water.

He noted also that certain states, e.g., Wyoming, Pennsylvania and Colorado, are wanting to establish their own regulations relative to fracing rather than being under the thumb of the federal government's EPA rulings on the matter.

Meanwhile, there appears to be a whole new twist of sorts on the ongoing animosity between environmental groups and energy companies regarding hydraulic fracing. A coalition reportedly is being established among some of these entities with the objective to collaborate on a plan to step up safety and regulation of hydro-fracing.

Southwestern Energy and the Environmental Defense Fund reportedly are said to be the nucleus for this planned new project, which was announced at press time.

AAPG is offering a new online e-symposium titled "Hydraulic Fracturing of Gas Shales," taught by Randy LaFollette of BJ Services in Tomball, Texas.

The on-going, self-paced course consists of a one-hour live e-symposium plus material for one full day of independent study.

The e-symposium can be accessed using a high-speed Internet connection.

Topics include:

- Why Unconventional Gas Reservoirs Need to be Hydraulically Fractured.
- The Importance of Complex Hydraulic Fracture Geometry.
- The Hydraulic Fracturing Process.
- Fracturing Materials.
- What Can We Control
- Why Cause and Effect with Respect to Production Are Not Always Obvious.

For registration and additional information go to www.aapg.org/education/online/details.cfm?ID=195.

Last Thoughts

If you're laying out plans to begin a frac job, LaFollette has some advice: Begin with the end in mind:

- Think about the frac before planning where to land the lateral.
- What frac fluid will be used – and how effectively can it transport proppant above the level of the horizontal in thick pay zones?
- Is there a good lower frac barrier?

An effective set of propped fractures and sheared fractures is actually what you are buying in gas shales. So:

- How much embedment is expected?
- Is the proppant strong enough?
- Will the proppant retain strength over the long term?
- What is the maximum length of lateral that can be placed into the formation and effectively cleaned up after fracturing?

Hedberg conference spawns book

AAPG Memoir Advances Hydrate Research

By COURTNEY CHADNEY, EXPLORER Correspondent

Potential versus viability. Research success versus business realities.

The battle continues for gas hydrates and the role they will play in the world's energy future.

Consider: Even though gas hydrates are considered an extremely challenging research topic, recent small-scale production tests in the Canadian Arctic and North Slope of Alaska have demonstrated that natural gas is producible from hydrate-bearing sands.

These results, combined with other global efforts like the research results from Japan's MH21 Program, have shown the major potential of gas hydrates – potential that is worth oil companies' and governments' time, money and manpower.

And now more data is being entered into the discussion.

AAPG Memoir 89, "Natural Gas Hydrates – Energy Resource Potential and Associated Geologic Hazards," is a new publication that confirms the positive progress that gas hydrate research has made over the past several years.

The book comprises the contribution of over 150 authors and includes research findings, graphic data and 39 of the most current peer reviewed articles from gas hydrate experts worldwide.

The editors include AAPG members Tim Collett and Art Johnson, who have made it their job to help shed light on the mysterious but tantalizing potential energy source – and to spread the word.

COLLETT

Many scientists still see a potential in gas hydrates to provide above and beyond what other resources have.

Collett is a U.S. Geological Survey research geologist in Denver; Johnson is president and chief of exploration for Hydrate Energy International in Kenner, La.

The other editors are AAPG member Ray Boswell, U.S. Department of Energy National Energy Technology Laboratory, Morgantown, W.Va., and Camelia Knapp, assistant professor and director of undergraduate studies, University of South Carolina, Columbia, S.C.

Memoir 89 discusses numerous aspects of the hydrates, including:

- The geologic parameters that control the occurrence and stability of gas hydrates.
- The volume of natural gas stored within gas hydrate accumulations.
- Exploration methods for identifying commercial gas hydrate prospects.
- The technologies needed to economically produce gas from hydrates.
- Possible marine slope stability hazards that can be attributed to the occurrence of gas hydrates.
- The effects of gas hydrate on drilling safety.

Most importantly, the book serves as a publication forum for a number of international gas hydrate research efforts – especially the highly successful gas hydrate research program in Japan, MH21.

Stops and Starts

Memoir 89 was inspired by a 2004 AAPG Hedberg Research Conference on "Natural Gas Hydrates: Energy Resource Potential and Associated Geologic Hazards," which Johnson and Collett co-chaired.

"By 2004, the science of gas hydrate had progressed to the point where bringing together the top experts in the field from throughout the world was needed and appropriate," Johnson said.

This was especially important, he continued, because of the "large amount of erroneous information about gas hydrates circulating in the press and on the Internet."

Now, with the conference in the past and the book in the present, what lies ahead for gas hydrate research?

Boswell said the conference and book have been catalysts for gas hydrate research progression.

"The Hedberg Conference, where the idea of the book originated, clearly marks the point where gas hydrates, at least for me, got real," he said.

Boswell believes that since the conference, "we have transitioned to a stage where geologists and engineers can now openly talk about hydrate prospects, recoverable volumes, reservoir petrophysics and completion strategies – something that was not going on before, when hydrates were some exotic entity unreachable using current approaches."

Collett said the goal of the U.S. national program is to have sufficient information and technology to enable commercial production from Arctic reservoirs by 2015, but the U.S. National Petroleum Council reported in 2003 that mass production from gas hydrates is unlikely before 2025.

Collett believes that despite mixed estimates on when production will play a role in world energy, "that it is certainly possible that hydrates will be able to provide a major supply of gas for the world's future energy needs."

Continued on next page

Continued from previous page

A positive outlook for gas hydrates in the United States was supported by two assessments completed by the Department of Interior in 2008.

- The first, led by Collett and his team at the USGS, was the first to quantify technically recoverable resource volumes from gas hydrate, and reported a mean estimate of 85 Tcf available on the Alaska North Slope with current technologies.
- At roughly the same time, the former Minerals Management Service released the results of a comprehensive assessment of gas hydrate potential in the Gulf of Mexico, reporting that a more than 6,700 Tcf in-place resource likely existed in high-concentration accumulations in sand reservoirs.

This assessment received initial validation by a drilling and coring program conducted by a Chevron-led international consortium in partnership with DOE and the USGS in early 2009, which found high concentrations of gas hydrate-bearing in sand reservoirs in four of seven wells drilled.

Still, plans to further capitalize on these positive findings has recently hit some snags:

- In the United States, the DOE-Chevron Gulf of Mexico Gas Hydrate Joint Industry Project, under Chevron's direction, had scheduled a hydrate-pressure coring expedition, Leg III, for the spring of 2011, but the recent ban on leasing and drilling in the Gulf caused the test to be put on hold until 2012.
- A large-scale production test in the North Slope at Prudhoe Bay, being planned by BPXA, the DOE and the USGS, also originally set for this winter, has been placed on hold. This test would have been the largest gas-hydrate production test so far, and would have taken 18 months to two years to complete.

On the other hand, the ConocoPhillips gas hydrate carbon dioxide-methane displacement production test remains on the schedule for this winter, and hydrate research is forging ahead in Japan, South Korea and India, with a production test scheduled in Japan for 2012.

Digits Add Value to Memoir

AAPG's Memoir 89, "Natural Gas Hydrates – Energy Resource Potential and Associated Geologic Hazards," in addition to offering the latest in natural gas hydrate concepts and science, features a dual digital and print format.

The book, inspired by a 2004 AAPG Hedberg Research Conference, includes 39 papers that are presented as extended abstracts (print) and in their entirety (digital).

The digital portion also is organized into a series of topical sections, offering an overall picture of the subject; a look at projects currently under way in the United States and Japan; and looks at current research and modeling studies.

The co-editors are:

- Tim Collett, research geologist, U.S. Geological Survey, Denver.
- Art Johnson, president and chief of exploration, Hydrate Energy International, Kenner, La.
- Camelia Knapp, assistant professor and director of undergraduate studies, University of South Carolina, Columbia, S.C.
- Ray Boswell, U.S. Department of Energy National Energy Technology Laboratory, Morgantown, W.Va.

When – and Where?

"Fundamentally, it is a matter of economics."

That's what Johnson said when asked to give an estimated time frame for gas hydrates to be produced commercially.

Fortunately, he observed, gas hydrate production will not be needed any time soon in the United States, due to increasing production from shale gas and current low gas prices – but he added that nations with limited domestic energy resources may see gas hydrate development as more important.

"Hydrate progress is primarily driven by governments in many countries that are taking a longer view of energy and laying the groundwork for its development," Johnson said.

"Countries with little domestic energy production usually pay considerably more for their energy needs, because they rely more on imported hydrocarbons, which often come with additional tariffs and transportation expenses," Collett said, citing Japan, South Korea and India, who all have large gas hydrate research programs.

And sometimes, he added, it is all about location, "such as distance to a conventional energy resource," which may lead to "the development of an otherwise non-economic unconventional energy resource."

Collett predicts three scenarios where the first commercial production of gas hydrates might be:

- Northern Alaska or the Canadian Mackenize Delta, where hydrate accumulations already are well documented and production testing already has occurred.
- The Gulf of Mexico – gas hydrates near these marine basins could be drilled and produced from existing facilities as the conventional oil production declines.
- Stand alone gas hydrate production operations, like Japan; these are the most costly and challenging, because these areas have little or no previous oil or gas production to help offset the cost of production facilities.

Since the commercial viability of gas hydrate production remains unproven, is the pace of development will remain uncertain.

"Our understanding of this resource is still evolving," Collett said. "We do not yet know if these accumulations exist in sufficient concentration to make them economically viable, nor do we know whether even concentrated accumulations can be developed economically."

Many scientists, however, still see a potential in gas hydrates to provide above and beyond what other resources have.

And with faster rising populations and stronger desires to improve ecological standards, the need to tap the potential may be more of a factor than now realized.

As Boswell commented:

"(Gas hydrates) has the potential to provide many of the world's most actively growing economies with an increased energy self-sufficiency, which can have numerous positive impacts on everyone."

The Geophysical Corner is a regular column in the EXPLORER, edited by Bob A. Hardage, senior research scientist at the Bureau of Economic Geology, the University of Texas at Austin. This month's column is the fourth in a four-part series on 3-D seismic design.

GEOPHYSICALCORNER

Last Call: The Even-Integer Rule

By BOB HARDAGE

The final guideline that should be used when designing a 3-D survey is the use of the even-integer rule for specifying the exact dimensions of a recording swath. This design principle can be stated as:

A recording swath should span an even number of receiver lines and an even number of source-line spacings (figure 1).


HARDAGE

This rule defines how wide a 3-D recording swath should be in the in-line and cross-line directions so stacking fold is a constant, non-oscillating value across 3-D image space.

This even-integer rule does not replace the previously described concept of using the depth of the primary imaging target to define the size of the recording swath; the rule merely adjusts swath dimensions by small amounts to ensure a uniform stacking fold is achieved.

For example:

If the depth and size of the primary imaging target cause a designer to define the in-line dimension of the recording swath to be 14,000 feet and the receiver station spacing to be 110 feet, the even-integer rule might make a designer adjust the in-line dimension to 13,200 feet (120 receiver stations) or to 14,080 feet (128 receiver stations), depending on how many receiver stations occur between adjacent source lines.

When applied in the cross-line direction, the even-integer rule says the recording swath should span an even number of receiver lines. For example, a recording swath consisting of eight, 10 or 12 receiver lines is better than one consisting of nine, 11, or 13 lines.

Note that the wording of the rule uses the phrase, "should span," not the more restrictive condition, "must span."

* * *

The reason for this even-integer guideline can be seen by referring to the equation for cross-line stacking fold F_{XL} described in last month's article, which is:

F_{XL} = (1/2) (Number of receiver lines in recording swath).

If the number of receiver lines used in that stacking-fold calculation is an even integer – say eight – then the cross-line fold F_{XL} is a whole number: four. In contrast, if the number of receiver lines in the recording swath is an odd number – say nine – then the cross-line stacking fold F_{XL} is a fractional number: 9/2.

Data processors can sum four seismic traces to create four-fold data or five traces to make five-fold data, but they cannot include one-half of a trace in the summation process to create 4.5-fold data. Instead, stacking fold in adjacent bins in the cross-line direction oscillates between four and five so that, in an average sense, the cross-line stacking fold is 4.5.

An oscillating stacking fold is not fundamentally wrong; it simply introduces data-processing challenges that if not properly addressed cause a 3-D image to contain geometry-induced amplitude variations that have nothing to do with geology.

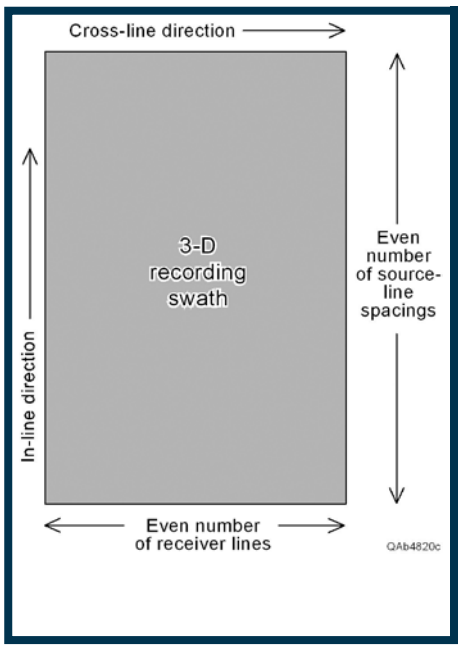

Figure 1 – The even-integer rule for onshore 3-D seismic design. This rule defines what the in-line and cross-line dimensions of a 3-D recording swath should be, so that 3-D stacking fold has a constant integer value across most of a 3-D acquisition grid. The rule specifies that the in-line dimension of a recording swath should span an even number of source-line spacings. This geometrical constraint causes the in-line stacking fold FIL to be a whole number, not a fractional number. A fractional value for FIL causes stacking fold oscillations in the in-line direction; a whole number value creates a constant in-line stacking fold. The even-integer rule further specifies that the cross-line dimension of the recording swath should span an even number of receiver lines. This constraint causes the cross-line stacking fold to be a whole number, not a fractional number, and results in a constant, non-oscillating integer-value stacking fold in the cross-line direction.

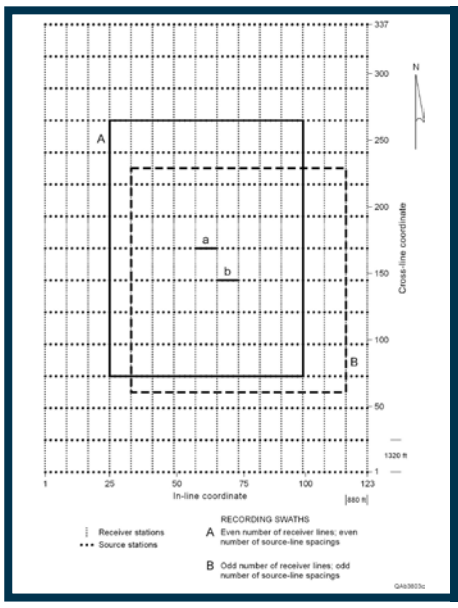

Figure 2 – Comparison of two 3-D recording swaths, A and B. Swath A honors the even-integer rule because it spans 10 receiver lines in the cross-line direction (east-west) and eight source-line spacings in the in-line direction (north-south). Swath B violates the even-integer rule twice because it spans 11 receiver lines in the cross-line direction (violation one) and seven source-line spacings in the in-line direction (violation two). The source-line and receiver-line spacings and the source-station and receiver-station intervals used in this 3-D design are 1,320, 880, 220, and 110 feet, respectively.

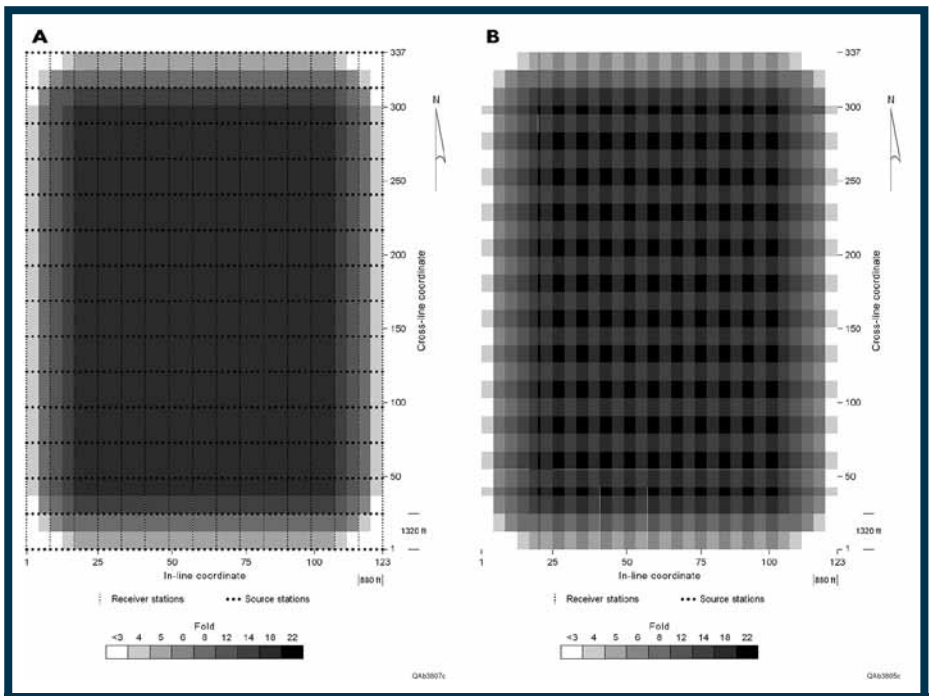

Figure 3 – Comparison of software-generated stacking folds created by swaths A and B. The geometrical parameters for swath A result in a 3-D stacking fold having a value of 20. The 3-D design software achieves that same answer (a). Because swath A honors the even-integer rule, the stacking fold has a constant, non-oscillating behavior over the entire full-fold coverage area (a). The geometrical parameters for swath B cause stacking fold to be a fractional number, 19.25, because swath B violates the even-integer rule. The stacking fold produced by a commercial software design for swath B has a checkerboard pattern consisting of small, abutted areas that have stacking folds ranging from 14 to 22 (b). The spatial distribution and size of each of these distinct stacking-fold areas are such that the average stacking fold over the total full-fold portion of the grid is 19.25. The laterally varying stacking fold produced by swath B makes it difficult to do some data-processing steps (particularly amplitude balancing). The uniform stacking fold created by swath A simplifies data processing and creates confidence in any interpretational process that analyzes variations in reflection amplitudes.

When the even-integer rule is applied in the in-line direction, it requires the receiver lines span an even number of source-line spacings, which means an odd number of source lines should be included in the swath.

For example:

A recording swath should span six, eight or 10 source-line spacings (which would involve seven, nine or 11 source lines, respectively) rather than span five, seven or nine source-line spacings (which would require six, eight or 10 source lines, respectively).

If for any reason – such as permitting constraints or lack of local surface access – a recording swath cannot span an even number of source-line spacings, the even-integer rule can be amended so the design requirement is:

Receiver lines in the recording swath should start and stop exactly on source lines.

The rationale for this rule is that to avoid oscillations in stacking fold in the in-line direction, the stacking fold value F_{IL} must be a whole number, not a fractional number. The only way to ensure F_{IL} will be a whole number is to force the numerator in the F_{IL} equation stated in last month's article to be an even multiple of the denominator.

Consequently, the dimension of a recording swath in the in-line direction should be an even multiple of the source-line spacing.

* * *

An example of the even-integer rule in 3-D design is illustrated as figures 2 and 3. The key geometrical parameters are:

- Source-line spacing = 1,320 feet.
- Receiver-line spacing = 880 feet.
- Source-station spacing = 220 feet.
- Receiver-station spacing = 110 feet.

Consequently, there are 12 receiver stations between adjacent source lines and four source stations between adjacent receiver lines.

Two recording swaths, A and B, are shown overlaying the 3-D grid on figure 2. Swath A honors the even-integer rule; swath B does not.

In the **cross-line direction**, swath A spans 10 receiver lines, which obeys the even-integer requirement. Swath B violates the even-integer rule in the cross-line direction because it spans 11 receiver lines.

In the **in-line direction**, swath A spans 96 receiver stations, but swath B spans 84 receiver stations.

For source stations **a** at the center of swath A, there are 48 receiver stations (that is, four source-line spacings) north and south of the source position, causing swath A to span an even number (eight) of source-line spacings. For source stations **b** at the center of swath B, there are 42 receiver stations. Swath B thus spans an odd number (seven) of source-line spacings and violates the even-integer rule in the in-line direction.

Swath B is further undesirable because it does not start and stop on receiver lines.

Continued on next page

Online ACE Registration Opens This Month

Registration will open in mid-December for the AAPG Annual Convention and Exhibition, set April 10-13 at the George R. Brown Convention Center in Houston.

The meeting theme will be "Making the Next Giant Leap in Geosciences," a topic that will embrace not only domestic but also international activities, research and advances in the geosciences.

The official meeting announcement – which contains both registration information and the complete technical program – will be mailed along with the January EXPLORER.

Also included in the announcement will be detailed information on the luncheon speakers, field trips, short courses, special forums, spouse and entertainment activities, lodging options and general information about Houston and the surrounding area.

The technical program will comprise 11 themes:

- **Molecules to Marketplace: The Business of Energy** – business energy experts from domestic and international companies will discuss active oil and gas trends, price, demand and advice on what might happen in the future.
- **Global Deepwater Reservoirs: Giant Leaps in E&P** – state-of-the-art geoscience investigating deepwater reservoir studies and deepwater depositional environments in fields located offshore of the Gulf of Mexico and Africa.
- **Worldwide E&P: Opportunities in the New Decade** – a look at significant new plays and studies of geological trends, onshore and offshore, from countries of the world including the Americas, Brazil, Middle East and Asia.
- **Challenged Resource Frontiers** – a look at multidisciplinary aspects related to the characterization, assessment and understanding of gas and oil resources from less-than-conventional reservoir systems in both the U.S. and international arena.
- **Mudstones and Shales: Unlocking the Promise** – the multidisciplinary characterization, assessment and realization of gas and oil resources from U.S. and international mudstones and shales.
- **Siliciclastics: Advancing Research to Resource** – a look at all aspects of siliciclastic research and reservoir characterization, including fluvial, shallow marine and deepwater settings, diagenesis and reservoir modeling.
- **Insight into Carbonates and Evaporite** - dealing with carbonate and evaporate characterization (ancient and modern), carbonate reservoirs, diagenesis, reservoir modeling, seismic interpretation and oil and gas studies of carbonates.
- **Breakthroughs: Tectonics, Salt and Basin Analysis** – a focus on basin analysis, petroleum systems and studies of structure and tectonics worldwide, including faulting styles and salt tectonics.
- **Integrating New Technology, Geophysics and Subsurface Data** – an update on geology integrated with geophysics for E&P activities, including surface and subsurface GIS mapping technology.
- **Energy and Environmental Horizons** – featuring EMD-coordinated papers on alternative energy resources and DEG-coordinated papers on environmental geology.
- **The Next Geo-Generation: Who, What and Where** – the trends and dynamics of young professionals (one-10 years) in the energy industry, including a focus on managing career development, attracting and retaining geoscience staffs and forecasting new career pathways.

Complementing those sessions will be a dynamic exhibition hall and a variety of networking opportunities.

The Houston ACE website is www.aapg.org/houston2011/index.cfm.

Continued from previous page

Because of these geometrical constraints, swath A creates whole number values of four and five for stacking fold parameters F_{IL} and F_{XL}, respectively, and a uniform stacking fold of 20 across the 3-D grid. In contrast, swath B creates fractional (non-integer) values for in-line, cross-line and 3-D stacking folds.

Specifically for swath B:

- $F_{IL} = 3.5$.
- $F_{XL} = 5.5$.
- $F = 19.25$.

The 3-D stacking fold patterns produced by swaths A and B are compared on figure 3.

Swath A, which honors the even-integer design rule, creates a uniform stacking fold of 20 across the full-fold central portion of the 3-D grid.

Swath B, which violates the even-integer rule, produces an oscillating stacking fold in both the in-line and cross-line directions, which results in a less-desirable checkerboard pattern of variable fold across the grid.

Because the 3-D stacking fold is 19.25, the checkerboard pattern consists of abutted areas having stacking folds of 14, 18 and 22 that when averaged together give an average stacking fold of 19.25 over the full-fold portion of the image space.

Although seismic data processors can usually adjust reflection amplitudes resulting from this type of irregular stacking fold so that the amplitudes are correctly balanced across the image space, it is prudent to use an acquisition geometry that does not create such data-processing problems.

David Curtiss is the head of AAPG's Geoscience and Energy Office in Washington, D.C., and can be contacted at dcurtiss@aapg.org; or by telephone at 1-202-684-8225.

WASHINGTONWATCH

GEO-DC Office Marks Fifth Year

By DAN SMITH and PETER MacKENZIE

This month marks the fifth anniversary of the Geoscience and Energy Office in Washington, D.C. (GEO-DC), established by the AAPG Executive Committee in June 2005. We are taking this opportunity to review the purpose, past accomplishments and future plans for the office.

GEO-DC is now a well-regarded and respected entity that provides a host of services to AAPG members and policy makers.

The office is critically important to AAPG members. Concern among members about the lack of a coherent, comprehensive U.S. energy policy is very high. Volatile prices for oil and gas, energy security, energy independence, climate change, tax increases to support a myriad of government programs and many other issues have dominated energy policy debates.

Proposals to award tax incentives to alternative energy are widespread, while plans to eliminate tax incentives for fossil energy threaten the livelihood of both domestic and international AAPG members. One of the six purposes of the Association, as stated in our constitution, is "to advance the professional well being of its members" – and that is precisely what GEO-DC is doing.

* * *

There is a disconnect between the oil and gas industry and the American public and the U.S. government.

The narrative in Washington is that Big Oil and its "obscene" profits need to be punished so that the country can move to clean energy as soon as possible. A deliberate move to higher taxes, more regulation, bigger government, redistribution of wealth and suppression of small business is confounding the efforts of geoscientists to explore for new energy sources.


SMITH


MacKENZIE

The petroleum industry supplying the global economy's perceived addiction to oil is under siege on all fronts. The favorite pastime of too many in responsible government positions is to demonize industry and business in general. The evidence suggests that without a change in direction we are headed toward an energy abyss.

What is the solution to this plight?

It is education, education and more education – of science and fact-based information. A grassroots effort is essential, involving every AAPG member. Legislators at all levels of government respond most directly to what they are hearing back home.

AAPG is not a trade association, but rather a scientific and professional association. As such, GEO-DC's purpose is threefold:

- Communicate to policy makers and regulators the scientific knowledge and professional expertise of AAPG's members and inform the policy making process with science.
- Communicate to AAPG members policy issues of importance and professional interest to them.
- Equip and train AAPG members to communicate effectively to policy makers and create opportunities for members to engage in the policy process.

The Governance Board is responsible for providing member oversight of the office and its activities. The Division of Professional Affairs (DPA) provides significant programmatic and financial support through the Governmental Affairs Committee (GAC).

GAC is responsible for the development of AAPG statements, which outline the current views of the Association on a host of policy issues. AAPG statements are the principal touchstone for GEO-DC on policy issues. They are developed by GAC based on suggestions from AAPG members, and then forwarded through the Governance Board and DPA leadership to the AAPG Executive Committee for approval and adoption.

The statements are reviewed and updated periodically to reflect new scientific advancements, policy developments or other changes.

Providing information to policy makers is a primary mission. We do that by responding to information requests as they occur. We also look for opportunities to formally engage Congress and the administration on various issues through written/verbal testimony and responses to requests for public comment. Efforts to directly engage lawmakers and their staff through personal meetings are ongoing.

Developing materials to use in our outreach – such as a primer on oil and natural gas exploration and a whitepaper on R&D needs of the U.S. independent oil and gas producer – are ways that AAPG members have made direct contributions to these efforts.

GEO-DC also routinely works with other organizations in Washington, D.C., always seeking to provide scientific and fact-based information based on our members' knowledge and experience.

GEO-DC hosts Congressional Visits Days twice a year, where geoscientists come to Washington to meet with agencies, congressional committees and individual legislators. We provide speakers and host briefings for Senate and House staff to understand many aspects of energy geology. If any of you (not just DPA members) are interested in contributing your time and effort, please contact us.

* * *

Much has been accomplished, but

See **Washington**, page 37

Download Your NEW December 2010 Bulletin Now!

Article highlights include:

Understanding triangle zones

David Colin Tanner, Christian Brandes, and Bernd Leiss

Analysis of the evolution of triangle zones (widespread structural elements that link fold-and-thrust belts with their foreland basins) can help to better understand the dynamics of these structures. The structural style of triangle zones can strongly influence reservoir properties.

Fracture arrays in the Sichuan Basin

Lianbo Zeng

Microfractures impact the distribution of natural gas and improve storage and permeability. They are especially well developed in the Upper Triassic Xujiahe Formation in the western Sichuan Basin, China. This paper looks at their distribution, characteristics, and origin.

Deeper Neogene depocenters needed

N. Bozhurt Çiftçi, R. Özgür Temel, and Y. Haluk Iztan

The rich source rock in western Anatolian graben basins is oil and gas generative at maturation, but the shallow burial is only locally overcome where additional heat input into the system exists through deep reaching faults, volcanism, or post volcanic hydrothermal circulation.

2010 Annual Report and Index

The 2010 Annual Report includes reports from the president, treasurer, editor, Advisory Council, House of Delegates, Foundation, and AAPG divisions, sections, and committees. The index for 2010 is also included. Papers are listed by title, author, and key word.

The AAPG Bulletin is a technical journal that is recognized in the industry as the leading peer-reviewed publication for information on geoscience and the associated technology of the energy industry.

The link below takes you to the Members Only login page where, with a few key strokes, you can click on a link for the Bulletin Online, the current issue, or for the Bulletin Archives, all issues of the Bulletin to date. Online as searchable html and .pdf files, the current issue is always available by the first of every month.

Members may access the AAPG Bulletin online at:
www.aapg.org/december_bulletin

Also, submit your next paper for consideration via www.aapg.org/bulletin.

Editor's note: Matt Ampleman is an intern for the AGI/AAPG Government Affairs Program.

Strategic minerals long neglected

Rare Earth Elements Face Supply Squeeze

By MATT AMPLEMAN

Rare earth elements (REE) are getting a lot of attention lately.

Amidst a dispute of territorial waters, China has threatened to block export of the crucial mineral products to Japan, according to the *New York Times* Sept. 22 issue. Importantly, no official ban has been announced, but Chinese trade ships have been held in port, and the move has stirred unease in the international community over a virtual Chinese monopoly on REE mining and materials.

China meets about 93 percent of global demand in REE materials. The elements

AMPLEMAN

Demand for REEs is expected to increase 34 percent by 2012. The United States currently has no operable REE mines.

are used in a startling array of goods and technologies including wind turbines, solar panels, rechargeable batteries, night vision goggles and a host of other technologies important to national security.

And with the growing demand for renewable energy, demand for REEs is expected to increase 34 percent by 2012.

That could cause a global squeeze in supply, as the world waits for more mines and processing facilities in the development pipeline.

The United States currently has no operable REE mines.

The issue has drawn attention beyond the mining community – in September, both the Senate and the House held hearings on the issue to discuss two bills that would change the REE landscape in the United States.

In the House, a bill has been fast-tracked through the Science and Technology Committee and passed the full House on Sept. 29. That bill establishes a rare earth materials program under the Department of Energy (DOE), and extends a loan guarantee program already administered under DOE to REE activities – but there are concerns about the efficacy of either measure, because the bill authorizes no additional funds for these activities.

Neither does the Senate bill, which also directs the Secretary of Energy to describe and facilitate the extension of loan guarantee programs to industry stakeholders.

"DOE does not have adequate funds to support the existing pipeline of renewable energy-related projects and proposals, much less an expanded pipeline," said Peter Brehm, vice president of business development for renewable energy company Infinia Corp., in a hearing on that bill.

Both bills are meant to revitalize a long dormant REE industry and supply chain in the United States. The last REE mine in the United States, the Mountain Pass facility in California, closed in 2002.

Jump-Starts

But this isn't the first time that the federal government has intervened to jump-start a lagging REE industry. For decades, U.S. policy on strategic minerals has been marked by cycles of passionate rhetoric followed by unraveling neglect. The first round of interest was stoked by wartime concerns in the post-World War II era, as disruptions in supply prompted the establishment of the National Security Resources Board and a Strategic Minerals Stockpile.

As soon as immediate concerns subsided, however, Congress abolished the board.

Resource concerns flared up again during Ronald Reagan's presidential campaign of 1980, centering on speculated Cold War disruptions of materials and the international agreements in the Law of the Sea. Reagan was backed by the domestic mining industry during the election, but after a re-evaluation of the costs of a minerals program, and the severity of the security threat, the newly elected administration balked. No plan was established for the supply chain – and within its first term, the Reagan Administration began to authorize sales of those same minerals from the national security stockpile.

Now concerns are ripe again, and both sides of the political aisle are interested

See **Rare Elements**, page 36

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WWWUPDATE

S&D Digest Gets Popular Reception

By RON BROADHEAD, Editor, Search and Discovery Digest

"What a good idea! A Search and Discovery newsletter by Internet I wished I'd thought of that."

"Very relevant information for our industry."

"… SD Digest … concentrates information that is timely and broad based…"

– A few of the comments received from AAPG members on the first issue of the Search and Discovery Digest.

The Search and Discovery Digest is a new online newsletter, e-mailed quarterly exclusively to AAPG members.

Each issue of the Digest will have a topical play-based theme that focuses on the geology of a play type around the world. For example, our first issue, which went out at the end of September (early October for Student members), focused on shale gas plays.

Upcoming issues will contain varied topics including unconventional oil and offshore targets.

The primary focus of each issue will be to provide AAPG members with online links to selected Search and Discovery articles, and occasionally to BULLETIN or memoir papers. Other links will point to recent and important play-relevant news, upcoming AAPG meetings and educational events, and play-relevant AAPG position statements.

Also highlighted will be events and activities of interest to Student members.

Links to Search and Discovery documents will remain effective for the long term.

* * *

For those unfamiliar, Search and Discovery is AAPG's online journal, found at www.searchanddiscovery.net.

The site currently hosts over 43,000 documents, mostly articles derived from presentations made at AAPG meetings that are contributed by speakers and poster presenters.

As such, Search and Discovery brings to you the essence of the body of geologic knowledge presented at AAPG meetings throughout the world.

Numerous people are involved in and essential to the production of the Digest. These include:

- Ron Broadhead (New Mexico Bureau of Geology and Mineral Resources, Digest editor).
- Jim Blankenship (AAPG geoscience director).
- Mary Kay Grosvald (AAPG Search and Discovery administrative editor).
- Nancy Mueller (AAPG marketing coordinator).

Rare Elements

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in federal support. But Congress has yet to extend authorizations that will increase and sustain needed R&D for the entire REE supply chain.

Rising prices for REE materials should encourage investments – some have estimated a three-fold increase in the last nine months. Responding to demand, mining corporations in Australia, Canada and the United States will be developing production in the next few years. But should prices drop again, there are concerns that U.S. operations would be out-priced by their ultra-cheap counter parts in China.

Despite the lack of progress on a Senate bill, the Senate hearing this September ended with a stark reminder of the stakes. "This is something that deserves the attention of the U.S. Congress," stated Subcommittee on Energy Ranking Member Jim Risch (R-Idaho).

The previous day, the House had voted 348-78 to give President Obama the authority to impose import tariffs on Chinese goods subsidized by an undervalued currency. Analysts say the president is unlikely to wield such authority, but the vote raises speculation on the likelihood and impacts of a trade war between the two countries.

"If trade conflicts escalate between the Unites States and China … you could see further [REE] restraints on the part of the Chinese," Sen. John McCain (R-Ariz.) concluded.

That's a story line that the United States is not yet ready for.

Registration Available Online For Arctic Meeting

Online registration continues to be available for OTC's inaugural Arctic Technology Conference, which will be held Feb. 7-9 in Houston.

The technical presentations will feature speakers from a dozen countries – Canada, Denmark, Finland, Germany, Japan, Netherlands, Norway, Russian Federation, Singapore, Sweden, United Kingdom and the United States – representing top E&P companies.

ATC is built upon OTC's successful model of multidisciplinary cooperation and contribution, with 14 technical societies and organizations – including AAPG – working together to deliver the world's most comprehensive Arctic Event.

For more information or to register go to ArcticTechnologyConference.org.

Washington

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much more work remains to be done.

To plan for GEO-DC's future, the Governance Board convened a workshop in Washington, D.C., in late 2009. Fifteen projects/issues were considered and prioritized for further development.

The projects include training programs for AAPG members in communicating with policymakers and creating opportunities for members to engage in this activity. We are looking to develop new outreach materials on a variety of topics. And we are constantly looking at ways to provide information and service to AAPG members outside the United States.

Last month the EC approved a proposal from the Governance Board that some of these special projects be funded by members' voluntary contributions (accumulated to date) made on the annual AAPG dues statement. If you are interested in contributing financially to GEO-DC's activities, please mark the appropriate box on your dues notice and show the amount of your voluntary contribution.

(These contributions are not deductible for federal income tax purpose and are limited to U.S. members.)

Thanks to all of you who have already provided financial support.

Special thanks are due to Pat Gratton, Pete Rose, Will Green and Clint Moore for their early vision and leadership in the formation of GEO-DC. Also, special thanks to Deborah Sacrey, who serves as chair of the DPA Governmental Affairs Committee, and her predecessor Carl Smith, for their dedication and commitment to the success of the office.

Extra special thanks to GEO-DC director David Curtiss, who has been critical to the ongoing functioning of the office, and to the office's founding director, Don Juckett.

The stakes are high. The challenge is great. Educating our leaders about what we do has a direct impact on each of us.

We urge you to get involved and join us as we work diligently to bring science to policy.

(Editor's note: Dan Smith is chairman and Peter MacKenzie is vice chair of the Governance Board.)

Editor's note: Regions and Sections is a regular column in the EXPLORER offering news for and about AAPG's six international Regions and six domestic Sections. Jeremy Richardson, director of the AAPG European Region office in London, can be contacted at JRichardson@aapg.org.

REGIONSandSECTIONS

Europe Region Activities Growing

By JEREMY RICHARDSON, Director – AAPG European Region

The London-based AAPG European Region office has had a busy year – we moved to new premises in the heart of London last year and have had an exciting time developing our events and activities while liaising, helping and cultivating our membership and providing a welcome coffee stop for all those AAPG members passing through London.

One of our highlights was participation in the Imperial Barrel Awards.

The European Region competition took place March 26-27 in Prague, Czech Republic, and 13 teams from universities all over Europe took part in the competition, representing diverse cultures, countries and opposite sides of the continent, but all sharing one field of common interest – petroleum geology.

After a hard fought and incredibly busy two days of competition under the watchful eyes of judges from CGG Veritas, ExxonMobil, Nexen, Shell, Statoil and Sterling Resources, the IFP School from Paris, France, emerged victorious.

Two weeks later they attended the IBA finals competition at the AAPG Annual Convention and Exhibition in New Orleans, competing against teams from the United States, Canada, the Middle East, Asia Pacific, Africa and Latin America.

We were again ecstatic when the team from IFP won the overall competition. It was a fantastic effort from the French university, and we offer our congratulations on this outstanding achievement.

* * *

Just prior to the Imperial Barrel Awards competition was APPEX, AAPG's upstream asset fair and conference held in London at the beginning of March. This was a great success that attracted over 550 delegates and 63 exhibitions.

Many exhibitors and delegates considered it the best ever APPEX event. Under the watchful chairmanship of Mike Lakin, a phenomenal number of presentations were packed into three days of networking and deal making.

The 2011 event will run again at the beginning of March, combining with three short courses. Watch this space or go to www.aapg.org for more details.

* * *

The European Region also runs a lot of activities on the educational and networking front, including:

- The monthly Oil Finders Lunch in Aberdeen, Scotland.
- The summer "Education Week" in Scotland.
- A Student Chapter leadership meeting in the Czech Republic.
- An international geoscience student conference in Romania.
- Distinguished Lecture tours, short courses, a joint GTW (with the Middle East office) held in Turkey and a collaboration conference at PETEX in London.
- In the next couple of months we have two more short courses in Paris, on Rift Basin Geology and Basin Modeling; a GTW in London on reserves classification; and a GTW in Copenhagen on the regional geology of West Greenland.

Continued on next page

GTWs Debut in Singapore

The inaugural Geoscience Technology Workshop for the AAPG Asia Pacific Region held in Singapore in late October drew 88 participants and spotlighted 23 presentations on region-focused "Pore Pressure and Related Issues."

For a report on the conference, including photos, see www.aapgasiapacific.org.

A lot of local flavor was offered and enjoyed during the entertainment events at the recent European Region annual conference, held in Kiev, Ukraine.

Kiev Meeting Draws Over 500

By JEREMY RICHARDSON, Director – AAPG European Region

A comprehensive technical program of more than 200 presentations helped attract the highest ever attendance at an AAPG European Region event.

The 2010 ER Annual Conference, with its theme "Exploration in the Black Sea and Caspian Regions," attracted an impressive 502 attendees to the Ukrainian House conference center in Kiev, Ukraine – the first time the ER annual conference has been held in Eastern Europe.

The 502 attendees at the October event represented 212 companies from 28 countries, making the event a standout in the AAPG regional calendar. The event was organized in association with the Ukrainian Association of Geologists.

AAPG President David Rensink attended the event and addressed attendees as part of the opening address.

"The conference in Kiev highlighted the enthusiasm and organizational skills within AAPG's European Region," Rensink said. "It could serve as a model for our other Regions."

Also taking part in the opening ceremony were David Cook, AAPG Europe president; Pavlo Zagorodnyuk of NADRA Group and president of the Ukrainian Geological Society; Ceri Powell, executive VP of Shell; and Kevin Biddle, senior VP of ExxonMobil.

Popular conference streams included a series of sessions on regional geology from across the Caspian and Black Sea basins, unconventional exploration and various aspects of the proven and speculative petroleum systems in the broader region, just to name a few.

"The general theme we have chosen for this conference, 'Historical Past, Promising Future,' refers to the historical and extremely successful exploration in the Caspian basins and, in sharp contrast, to the practically unexplored but very promising deepwater Black Sea basins," said conference general chairman Gabor Tari.

"Our Technical Program Committee worked very hard to put together an exceptionally strong set of sessions organized in four parallel oral sessions and various poster sessions," he said. "We also put an emphasis to have a healthy mix of professionals from both the industry and the academia."

Also offered were two pre-conference field trips, giving attendees the chance to witness some regional geology first-hand; an entertainment program featuring a well-attended Icebreaker reception; and a student reception, where poster prizes were awarded.

More details, abstracts and pictures can be found on the website at www.aapg.org/kiev.

Continued from previous page

Finally, we'll have a very busy month of March, with APPEX, three short courses, a President's lunch, the Imperial Barrel Awards (we're currently fielding a huge number of inquiries about participation in the 2011 competition) and a Student Chapter meeting.

That's enough to keep us all busy.

* * *

Membership seems to be growing steadily in Europe, and we are working hard to encourage the upgrading of memberships to Active status.

We have 25 active Student Chapters in the Region, which are expected to grow under the stewardship of Nick Lagrilliere.

We would not be where we are today with having such an excellent and active European Region Committee. ER President Dave Cook has been exemplary in his role – his enthusiasm, foresight and knowledge of the industry has helped enormously with the task of developing a plan for the year.

The support from incoming European Region president Vlasta Dvorakova, Knut Jakobsson, Bert Clever, Istvan Berczi and Jean Gerard – to name but five members of the committee – also has been instrumental in forging our program.

Last but not least, John Brooks – the Peter Pan of Europe – has been an invaluable and ever-present help to me, never slow to offer advice when needed and with an ability to put many situations and opportunities into perspective.

I personally thank you all.

Editor's note: "Professional News Briefs" includes items about members' career moves and the honors they receive. To be included, please send information in the above format to Professional News Briefs, c/o AAPG EXPLORER, P.O. Box 979, Tulsa, Okla. 74101; or fax, 918-560-2636; or e-mail, smoore@aapg.org; or submit directly from the AAPG Web site, www.aapg.org/explorer/pnb_forms.cfm.

PROFESSIONAL newsBRIEFS

Fadjar M. Budhijanto, to lead geophysicist, Maersk Oil Houston, Houston. Previously reservoir geophysicist coordinator, Eni US Operating, Houston.

Robert Chanpong, to chief geoscientist, Occidental de Colombia, Bogota, Colombia. Previously head of geoscience, Occidental Petroleum of Qatar, Doha, Qatar.

Mike Duhon, to senior staff geologist, Southwestern Energy, Houston. Previously senior geologist, BP America, Houston.

Jerry Durtsche has retired after 37 years in the petroleum industry. Previously explorationist for Davis Petroleum, Houston.

Gretchen M. Gillis, to geological specialist, Aramco Services, Houston. Previously editorial adviser, Schlumberger, Houston.

Frank W. Harrison Jr., former president of AAPG, has been awarded an honorary doctor's degree by Louisiana State University in recognition of a lifetime of "distinguish service to and outstanding achievements in the petroleum industry, philanthropy and unwavering devotion to education and human causes." Harrison resides in Lafayette, La.

William Haws was named 2010 Businessman of the Year by American Solutions for a Winning Future, Washington, D.C. Haws is chief executive officer, Crescent Drilling and Production, New Orleans.

W. Clay Hunter, to technical writer/editor, U.S. Geological Survey Publication Service Center, Denver. Previously hydrologist, USGS Yucca Mountain program branch, Denver.

Tako Koning, to manager-Angola business development, Gaffney, Cline & Associates, Luanda, Angola. Previously adviser-social projects and public relations, Tullow Oil, Luanda, Angola.

Melanie McQuinn, to regional geologist-Asia exploration, BHP Billiton Petroleum, Houston. Previously regional geologist-international new ventures, BHP Billiton Petroleum, Houston.

Ken Nibbelink, to chief geologist, Hyperdynamics Corp., Houston. Previously senior geological adviser, Devon Energy, Houston.

Don Rice, to senior geophysicist, Hyperdynamics Corp., Houston. Previously project geophysical adviser, Anadarko Petroleum, The Woodlands, Texas.

Terry Stanislav, to vice president-exploration and business development, Tauber Exploration and Production, Houston. Previously consultant and BP retiree, Houston.

Daniel C. Steward, to exploration manager-West Africa business unit, Noble Energy, Houston. Previously geological adviser-deepwater business unit, Noble Energy, Houston.

IN MEMORY

James Milton Bibee, 82
Weimar, Texas, Feb. 16, 2010

Arne Dinesen, 79
Birkeroed, Denmark
Jan. 13, 2010

Edward G. Dobrick, 94
Bellevue, Wash., Oct. 11, 2010

Henry Stewart Edgell, 82
Canberra, Australia, April 13, 2010

Frank William Godsey, 81
Walnut Creek, Calif.
Aug. 13, 2010

Arthur Edward Smith Jr., 74
Houston, Nov. 12, 2009

Jon Carl Spradley, 77
Corpus Christi, Texas
Aug. 16, 2010

James Edward Williams, 83
Evansville, Ind., Aug. 15, 2010

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

SPOTLIGHTON

Hedberg Presentation Leads To New Barrier-Smashing Award

Six years ago, Stephen Laubach was a co-convener for an AAPG Hedberg Conference in Austin, Texas, on something called "structural diagenesis."


LAUBACH

In his opening presentation at that 2004 Hedberg, the geologist with the Bureau of Economic Geology at the University of Texas at Austin sounded the clarion for the need for an interdisciplinary look at the links between mechanical and chemical processes in sedimentary basins.

He said decades of petroleum industry focus on shallow parts of sedimentary basins where original depositional fabrics may dominate petrophysical properties could have caused artificial boundaries to arise between the geological, geophysical and engineering disciplines.

His goal – and the goal of the conference – was to break down those barriers. And continuing since that 2004 Hedberg, Laubach has continued to pursue his focus.

Now in 2010, Laubach is Elected Editor of AAPG, and his passion to promote cross-disciplinary thinking has yielded an award that bears his name, established by him and his wife, Ann, which was given at the Geological Society of America meeting held last month.

"The idea of the award," Laubach said, "is to help the academic professoriate think about the needs to students (our future industry employees) in the era of unconventionals. That's the reason for the emphasis on breaking down disciplinary barriers – instead of just proposing cross disciplinary research – and for targeting GSA and offering an award that could be for curriculum development."

A call for proposals will go out each spring for the new award, which carries a $2,500 stipend.

Fractures
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area," Meehan said.

"You have to do more than one, but not a thousand."

Just In Time

Smaller companies are not sitting around enviously watching the larger folks better evaluate their holdings. These small players also are on board the geomechanics science bandwagon, according to Meehan.

He emphasized that the science came about just in time to be used in conjunction with shales.

Besides the overall technical/scientific understanding it affords, it can go far to help determine just how much and what part of that expensive leased area an operator really needs to hang on to.

There's also the potential to drill bigger, more expensive wells where overall cost to drain the reservoir may decrease. Meehan noted there are few multilaterals in unconventional gas reservoirs, but several have been attempted.

In the case of assorted multilaterals each having undergone 30 individual frac jobs, geomechanics can make all the difference in reducing risk.

"We've done it now and had good success," he said. "The question for us is, 'Can we get the reliability and cost such that people will want to do this all the time?'

"Geomechanics has probably changed my opinion more about understanding natural fractures than anything else I've learned in the past decade," Meehan noted.

FOUNDATIONUPDATE

Foundation Goal In Members' Hands

By NATALIE ADAMS, AAPG Foundation Manager

The AAPG Foundation's five-year, $35 million campaign is in the final phase.

The good news is that over $28.8 million has been raised; the challenge is that we still have a $6.2 million gap to close before we reach our goal.

There are two ways you can help – make a significant contribution, and/or involve your company.

Please consider adding a donation to the AAPG Foundation when you send in your dues statement.

To make an online donation, go to www.aapg.org/eDonation/Core/eDonation.aspx.

To see the status of campaign pledges and contributions, and for a list of programs and projects supported, go to foundation.aapg.org.

* * *

New officers were elected by the Foundation Trustee Associates during the group's 33rd annual meeting, which was held recently in Greensboro, Ga.

The newly elected Trustee Associate officers are:

❒ Chairman – **Jerry Namy**, Fort Worth (one-year term).

❒ Vice chairman – **Jay Henthorne**, Wooster, Ohio (one-year term).

They join **Stewart Henry**, of Forth Worth, who will be serving the second year of his two-year term as secretary-treasurer.

During the business meeting, which was chaired by **Ed Heath**:

- **Jack Threet** presented the Chairman's Award to **Scotty Holland**.
- Reports were given by Henry, Vice Chairman **Dick Bishop**, Executive Director **Rick Fritz** and Campaign Co-Chair Jack Threet.
- A special presentation was given by AAPG member **Richard Nehring** titled, "Understanding World Oil Recovery Growth."
- An update on The Bridge documentary project was given by **Scott Tinker**.

The business meetings were interspersed between a variety of other events, including a geological field trip to study the "Geology of the Elberton Granite District," led by Paul Schroeder, professor and associate head of the University of Georgia's Department of Geology.

Elberton is one of the world's largest capitols for production and processing of dimension stone, and during the trip the group toured a blue granite quarry, a granite production and processing operation and a museum.

The AAPG Foundation Trustees was started in 1978 to support the AAPG Foundation, provide counsel and leadership to its Trustees, lend support to its fundraising efforts and guide the Foundation's scientific and educational agenda.

Today there are approximately 274 Trustee Associates members.

More information on the group can be found on the AAPG Foundation website – and if you are interested in becoming a member contact Natalie Adams at nadams@aapg.org.

Next year's Trustee Associate meeting will be held Sept. 7-11, at the Ritz-Carlton Highlands, Lake Tahoe, Calif.

Continued on next page

Recent Contributors

Foundation (General)
Natalie Adams
Stephen James Bedell
David D. Blackwell
Janet Sue Brister
Joseph A. Canales
Douglas Lee Core
Andrew G. Couch
Luis Arturo Crespo
George B. Davis
Henry C. Dean Jr.
Don B. Felio
In memory of George Kronman, Jeffrey A. Boyer, Noel Henry and John Frith
Cory John Godwin
Bruce S. Hart
Adam Barett Himelfarb
Ryan McKenzie Johnson
John R. Kaineg
Rene Paul Kuijper
Richard Edward Lownes
Evangelia Mavridou
James S. McGhay
In honor of John Shelton
Kelsey Shantel Mosley
Edward Gilpin Murphy
Larry Nation
Patrick James O'Connell
Olumuyiwa Anthony Olawoki
Daniel J. Piazzola
Dayna Jean Salter
Orrin Lee Slind
Brian McKenzie Smyth
Hugh Leighton Steward
Paul and Deana Strunk
Kansas State University – Paul and Deana Strunk Geology Scholarship
Naveen K. Verma
Michal M. Zywiecki

Bridge Fund
David C. Blanchard
In memory of those lives lost in the Macondo tragedy
C. Scott Cameron
In memory of Erik Mason

Digital Products Fund
Western Kentucky University
William Frederick Dost Jr.

Grants-in-Aid Fund
George A. Grover Jr.
Alan Orval Swarm

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

Lawrence W. Funkhouser Named Grant
Zane Richards Jobe

Grants-In-Aid Committee Named Grant
Rebecca L. Griffin
Merrill W. Haas Memorial Grant
Paul H. Dudley Jr.

James E. Hooks Memorial Grant
Chevron Humankind
Matching gift for Jayne Sieverding

K-12 Education Fund
Robert James Ardell
In memory of Robert Bybee
Joseph A. Canales
Sandy Meyer
Susie Moore
Susan Smith Nash

Erik Mason Memorial Fund
(Scholarship at Oklahoma State University)
Jeroen M. Peters
Shell Exploration & Production Company

Boone Pickens Digital Geology Fund
John Chance Condron

E.F. Reid Scouting Fund
Terri Duncan
Ronald L. Hart
Bryan Haws

AAPG Going to Milan

Abstracts Sought for ICE

Abstracts are now being accepted online for the next AAPG International Conference and Exhibition, which will be held Oct. 23-26 in Milan, Italy.

The general theme for the meeting, which will be held at the Milano Convention Centre, is "Following Da Vinci's Footsteps to Future Energy Resources: Innovations From Outcrops to Assets."

Seven specific technical themes will be offered:

- Carbonate Reservoirs: From Pores to Production – Aspects covered will include the stratigraphic analysis and sedimentology of carbonate sequences; the role of diagenesis, karst, faulting and the latest developments in the seismic imaging and modeling of carbonate reservoirs and sequences.
- Where Africa Meets Eurasia: Exploration and Production in the Alpine-Himalaya Fold Belt and Foreland Basins – The session's objective is to identify the factors that control prospectivity in different parts of the belt from the Appennines, Alps and Zagros through the mountains of central Asia to the Himalaya, using a variety of technologies, outcrop analogs and case studies.
- Rifts and Deltas – Focus will be on rift to drift tectonics, crustal stretching and heat flow, pre-salt plays, continental and lacustrine reservoirs and delta systems from shelf to basin floor.
- Advances in Integrated Geoscience Applications – A session on all aspects of geoscience and reservoir engineering as applied to conventional and unconventional resource plays.
- Reservoir Management: From Outcrops to Assets – New technologies, work models and world-class reservoirs.
- Dynamic World of "Uncooperative Reservoirs:" The Geoscience of Unconventional Resources – Tight gas, oil shale, shale gas, coal-bed methane and geothermal resources are now viable for providing fuel supply closer to consumers in Europe, India, Asia and the Far East. What makes these reservoirs special?
- Leading-Edge Technologies and the Future of E&P – The challenges of carbon management, new and leading-edge technologies, and future technological developments in the E&P industry.

The deadline for submitting abstracts is Jan. 11. For more information go online to aapg.org/milan2011/CallforAbstracts.cfm.

Continued from previous page

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Two deadlines involving the Foundation's Grants-in-Aid program are approaching.

- First, nominations for L. Austin Weeks Undergraduate Grants must be received at AAPG headquarters by Dec. 15.

The program, funded through an endowment from L. Austin Weeks, is intended to support both undergraduate students and their respective AAPG Student Chapters. Nominees need not be members of AAPG, but they must be members of an AAPG Student Chapter.

The grants are for $1,000 each – half goes to the student and half goes to the Student Chapter in support of educational activities, including equipment, conferences, field trips, etc.

For more details, contact program coordinator Angela Taylor-Shepherd, at ataylor@aapg.org.

For an application and additional information go to students.aapg.org/chaptergrant.cfm.

- Also, the AAPG Foundation is currently receiving applications for its 2011 AAPG Grants-in-Aid Program.

Geoscience graduate students are encouraged to begin the online application process immediately, as it involves multiple steps. A total of $181,000 will be awarded.

The application deadline is Jan. 31.

Students are encouraged to review our restricted named and memorial grants; to see the list of qualifications go to foundation.aapg.org/gia/names.cfm.

For more information, go to foundation.aapg.org/gia/howto.cfm.

MEMBERSHIP&CERTIFICATION

The following **candidates** have submitted applications for membership in the Association and, below, certification by the Division of Professional Affairs. This does not constitute election nor certification, but places the names before the membership at large.

Any information bearing on the qualifications of these candidates should be sent promptly to the Executive Committee, P.O. Box 979, Tulsa, Okla. 74101.

Information included here comes from the AAPG membership department.

(Names of sponsors are placed in parentheses. Reinstatements indicated do not require sponsors.)

Membership applications are available at www.aapg.org, or by contacting headquarters in Tulsa.

For Active Membership

Alaska
Stair, Kelley Nicole, BP, Anchorage (S. Phillips, J.D. Copen Jr., K. Nitzberg)

California
Draucker, Anne C., Chevron, Bakersfield (K.L. Pitts, L.C. Knauer, K.E. Neher)

Colorado
Pech, Gwen, TerraSpark Geosciences, Boulder (G.A. Dorn, W. Bartling, A.R. Brown)

Kansas
Kasten, Leah Ann, CMX Inc., Wichita (reinstate)

Kentucky
Schwabe, Stephanie J., University of Kentucky, Lexington (J.C. Cobb, K.G. Takacs, M. Grammer)

North Dakota
Luther, Mark R., Kadrmas, Lee & Jackson, Bismarck (F.J. Anderson, P.E. Diehl, E.G. Murphy)

Ohio
Lopez, Dina L., Ohio University, Athens (M. Sullivan, E.H. Gierlowski-Kordesch, R.J. Erdlac Jr.)

Oklahoma
Boykin, William Franklin, NuTech Energy Alliance, Oklahoma City (S.M. Roth, J.W. Austin, M.C. Evans)

Pennsylvania
Leberfinger, Jeffrey Lane, ARM Geophysics, Hummelstown (J.A. Harper, A.K. Markowski, L.J. Lentz)

Texas
Bondurant, Charles Hamilton, BP, Houston (D. Steinhoff, J. Jaminski, P. Depret); **Cameron, Nick**, BP, Houston (T.J. Dore, E.T. Lisle, J. Kirkova-Pourciau); **Cody, Rick**, Cody Global Consulting, Georgetown (R.A. Young, R.G. Davis, D. Reinkemeyer); **Hu, Qinhong**, University of Texas at Arlington, Arlington (J.S. Wickham, L.A. Standlee, J.M. Holbrook); **Moss-Russell, Amy Cara**, Chevron, Houston (W.S. Houston, D.M. Cox, C.A. Caughey); **Stackhouse, Stanley Bernard**, El Paso Corp., Houston (W.L. Fisher, C. Kerans, R.J. Steel); **Williams, Gareth**, Lynx Information Systems, Houston (P. Wigley, D.R.D. Boote, P.D. Spencer)

Australia
Brooks, Trevor D., BG-Group, Brisbane (S.A. Barclay, J.L. Titus, C.M. Wickens)

Continued on next page

Certification

The following are **candidates** for certification by the Division of Professional Affairs.

Petroleum Geologist

Colorado
Jane E. Estes-Jackson, McElvain Oil & Gas Properties, Denver (D. Anderson, M. Longman, J. Robinson)

Kansas
Scott Alan Corsair, American Warrior Inc., Garden City (R. Dougherty, D. Hedke, E. Glassman)

Texas
Allan J. Filipov, Fairfield Nodal, Houston (A. Bakes, J. Tubb, M. Cassidy); **Samuel Josh Talbert**, Ecana Oil & Gas (USA) (C. Kightlinger, R. Wilson, T. Matthews)

Australia
Mark J. Moore, BG Group, Brisbane (J. Bates, G. Kemp, B. McConachie)

Petroleum Geophysicist

Colorado
Connie Mongold, Shell E&P, Houston (D. Billman, K. Pitts, B. Ferguson)

CLASSIFIEDADS

POSITION AVAILABLE

Petroleum Exploration Geologist
Newfield Exploration
Tulsa, OK

Seeking Geologist, responsible for conducting detailed prospect analysis and play fairway assessments within the Mid-Continent Region plus the generation and presentation of prospect ideas and leads to management. This position would be located in Tulsa, OK.

The successful applicant will generate and update maps, logs, cross-sections and corporate databases with new tops, correlations, shows and other pertinent geological data. Develop regional, multi-county stratigraphic framework and subsurface correlations.

Minimum qualifications, ten years of experience, knowledge of Mid-Continent upstream oil and gas, experience with conventional and un-conventional plays, experience doing play-fairway analysis assessments. Send resume to klefler@newfield.com.

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POSITION DESCRIPTION: The Department of Geological Sciences at the University of Texas at El Paso (UTEP) is seeking applicants for a tenured/tenure-track open rank faculty position in the broad area of the petroleum geosciences. Fields of specialty could include, but are not limited to, sedimentary geology, geochemistry, geophysics, or reservoir characterization. The ideal candidate has exceptional qualifications in petroleum research, including industry experience, a Ph.D. in the geosciences or closely related disciplines, a strong record of (or potential to secure) extramural funding, experience in mentoring students, and the ability to contribute to the education and training of next-generation geoscientists. The candidate will be expected to teach introductory Earth Science courses, as well as higher-level courses in the candidate's specialty field. Anticipated appointment date is Fall 2011.
THE DEPARTMENT: The UTEP Department of Geological Sciences has a faculty of 15 and enrollment of more than 100 graduate and undergraduate students. The Department is housed in an attractive, 90,000 sq. ft. building that contains faculty and student offices, laboratory and classroom space with analytical facilities that include: Electron Microprobe, MC-ICP-MS, ICP-MS, ICP-OES, INAA gamma detector, UV spectrophotometer, TOC/TN analyzer, class 100 clean room, and geophysical equipment/computing facilities. More information about the activities and facilities in the department can be found at our web site: http://www.geo.utep.edu. The Department also participates in interdisciplinary Ph.D. programs in Materials Science and Engineering, Environmental Science and Engineering, and Computational Science.
APPLICATION PROCEDURE: Review of applications will begin immediately and will continue until the position is filled. Applicants should submit (electronic submission only) a letter of application, detailed curriculum vitae, names of at least three references, and a statement of teaching and research. Should include "Faculty Position Application: YOUR NAME " in the "Subject" block in your e-mail submittal. Please send to:
Dr. Terry Pavlis
Chair, Search Committee
Geological Sciences (Petroleum Geosciences)
Email: tlpavlis@utep.edu
Include "Faculty Position Application: YOUR NAME" in the "Subject" block in your e-mail submittal.
The University of Texas at El Paso is an Equal Opportunity / Affirmative Action Employer. The University does not discriminate on the basis of race, color, national origin, sex, religion, age, disability, veteran status, or sexual orientation in employment or the provision of services. For a current and a more detailed description of our available positions, please log on to our website www.utep.edu/employment.

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DIRECTOR

NEW MEXICO BUREAU OF GEOLOGY & MINERAL RESOURCES

The New Mexico Bureau of Geology and Mineral Resources is seeking a new director and state geologist. The bureau is a research and service division of the New Mexico Institute of Mining and Technology (New Mexico Tech), located in Socorro, New Mexico. With close to 60 employees, the bureau serves as the state geological survey, with a long-standing reputation for excellence in research, service, and outreach. Our mission includes research on the geologic framework of the state, with an emphasis on applied geosciences and the state's geologic resources; and the gathering, preservation, and dissemination of geologic information to the geoscience community, state and federal agencies, and the general public. The director manages the administrative, personnel, and financial affairs of the bureau, including direct supervision of a significant portion of the professional staff, and must be proactive in seeking additional, external funding to support new and ongoing programs. As a division of the university, the bureau works in collaboration with other divisions of the university. The director reports directly to the university president. As state geologist, the director serves on several state advisory commissions. Requirements include a Ph.D. in the geosciences, ten years of professional experience, and five years of administrative experience. Anticipated appointment date: July 1, 2011. Salary: Negotiable. Full details of the position and information regarding application procedures may be found at www.geoinfo.nmt.edu/DirectorSearch and at www.nmt.edu/hr-jobs-at-nmt . For more information about the application process, contact JoAnn Salome in Human Resources at 575-835-5955 (JSalome@admin.nmt.edu). For more information about the position itself, contact L. Greer Price, search committee chair, at 575-835-5752 (gprice@gis.nmt.edu). For full consideration, application materials must be received by March 1, 2011.

See **Classifieds**, page 46

Continued from previous page

Canada
Ahmed, Rehan Uddin, Belloy Petroleum Consulting, Calgary (A.M. Shamsuddin, A.N. Lodhi, A.M.M. Anam); **Bilous, Dean Michael**, Penn West Energy, Calgary (A.S. Millholland, H.A. Wishart, D.J. Carsted); **Lemiski, Ryan Thomas**, Northwest Territories Geoscience Office, YellowKnife (D.A. Dolph, W.S. Houston, S.G. Pemberton) **Longfield, Stephen John**, Penn West Energy, Calgary (D.M. Bilous, S.L. Charbonneau, P.S. Boucher);

Colombia
Gomez, Jaime Ricardo, Schlumberger, Bogota (F.H. Audemard, V.O. Ramirez, B.E. Velasquez)

England
Sengupta, Poulomi, BG Group, Reading (S.K. Roy, S. Roy, S. Dasgupta)

India
Kumar, Asit, BG Exploration & Production India, Mumbai (S. Dasgupta, V.K. Jain, G. Ghosh)

Iraq
Abdulsadah, Riyadh Ashor, South Oil Company ROO, Basrah (C.A. Caughey, T.M. Hassan Al-Mufti, A. Khorshid)

New Zealand
Langdale, Scott, OMV New Zealand, Wellington (T.M.H. Allan, A. Harrison, J.M. Anderson)

Nigeria
Chinye, Joseph Ogomegbunem, Pan Ocean Oil, Nigeria, Lagos (E.O. Olopade, O.W. Ojo, A. Baba-Isa); **Oghomienor, Efe Mena**, Shell Petroleum Development Nigeria, Warri (I.T. Preye, G.O. Giwa, A. Adesida); **Tarka, Alex Nachi**, NNPC, Lagos (M.A. Agbuza, I.T. Sindiku, C.E. Edoziem)

Saudi Arabia
Muhammad, Ashraf, Saudi Aramco, Dhahran (A. Garg, N.A. Mohajir, I. Bhuana)

Spain
Rodriguez Monreal, Felipe, CEPSA, Madrid (R.F. Gomez Ballesteros, R. Baudino, J.N. Comet)

Chevron

Reservoir Quality Specialist

Chevron Energy Technology Company's Reservoir Prediction Team is accepting online applications for the position of Reservoir Quality Specialist, located in Houston, Texas.

Chevron Energy Technology Company delivers leading-edge technology solutions and a full spectrum of services to all of Chevron's global enterprises, as well as research and development of new ideas and tools needed for the future.

The primary job function of the Reservoir Quality Specialist is to collaborate with members of the Reservoir Prediction Team and Explorationists in our operating units to provide pre-drill reservoir quality forecasts to evaluate risk for our worldwide exploration and appraisal program. The successful candidate will be highly skilled in the application of sandstone petrography and diagenetic analysis to new ventures, exploration, and appraisal challenges.

Responsibilities for this position may include but are not limited to:
- Working with members of the Reservoir Prediction Team and explorationists in our operating units to provide pre-drill reservoir quality forecasts (porosity and permeability) using Chevron proprietary data, vendor information and basin modeling output.
- Providing evaluation, promotion, and design of new technical solutions for reservoir quality assessment.
- Acting as a mentor to less experienced analysts.

Required Qualifications:
- A Master's of Science Degree or Ph.D. in siliciclastic diagenesis and/or stratigraphic interpretation with a strong diagenetic and geochemistry foundation.
- Exploration and appraisal experience including log interpretation, seismic interpretation, stratigraphy and facies analysis. Demonstrated problem solving capability.
- Computer skills related to reservoir quality analysis and specialty programs for office productivity.
- Strong written and verbal communication skills.
- The ability to work in a highly collaborative environment involving multiple basin analysis disciplines.
- Ability to work both independently and in a collaborative multi-disciplinary team.

Preferred Qualifications:
- Experience in using reservoir quality modeling software.
- Knowledge of supporting analytical techniques such as fluid inclusions, isotopes, water chemistry, and cold cathodoluminescence technology.
- A minimum of 5 years of petroleum industry or related experience.

To apply or to learn more about this position, please go to http://www.chevron.apply2jobs.com/, Requisition # 032215453. Applications are accepted online only. No phone, fax, or email inquiries, please, from candidates or external recruiters.

EOE M/F/D/V Company URL: **www.chevron.com**

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Indiana University of Pennsylvania: IUP invites applications for one tenure track faculty position in energy resource geology in the Department of Geoscience starting August 2011 at the Assistant Professor level. Ph.D. required at time of appointment. Visit http://www.iup.edu/employment for a complete job description and application procedures. Application deadline January 14, 2011. IUP is an equal opportunity employer M/F/H/V and a member of the PA State System of Higher Education.

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DEPARTMENT OF GEOLOGICAL SCIENCES
UNIVERSITY OF FLORIDA
Thompson Chair of Geological Sciences

The Department of Geological Sciences, University of Florida, invites applications for the Thompson Chair of Geological Sciences, an endowed position at the rank of Associate or Full Professor with tenure. The successful candidate will be expected to teach at the undergraduate and graduate levels, mentor students for M.S. and Ph.D. degrees, and conduct a dynamic, externally funded research program in an area of globally significant earth science that is relevant to geological problems within Florida and the surrounding region. Areas of expertise may include, but are not limited to: basin analysis, regional tectonics, carbonate and/or siliciclastic stratigraphy and sedimentology, biostratigraphy, karst geology, hydrogeology, coastal processes, sea level change, and environmental geophysics. Ph.D. required. Salary will be competitive and commensurate with experience.

For additional information or nominations please contact Dr. Jonathan B. Martin, Thompson Chair Search Committee, Department of Geological Sciences, University of Florida, P.O. Box 112120, Gainesville, FL 32611-2120 (jbmartin@ufl.edu). Review of applications will begin January 14, 2011 and will continue until the position is filled. To ensure full consideration please apply online at http://jobs.ufl.edu (requisition # 0806180). For full consideration, the application should include: (1) cover letter, (2) curriculum vitae, (3) statement of research, teaching, vision, and goals; (4) reprints of no more than three publications, and (5) the names of three colleagues who might be contacted for letters of recommendation. The University of Florida is an Equal Opportunity Institution. If an accommodation due to a disability is needed to apply for this position, please call (352) 392-2477 or the Florida Relay System at (800) 955-8771 (TDD). The selection process will be conducted under the provisions of Florida's "Government in the Sunshine" and Public Records laws.

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MISCELLANEOUS

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DIVISION OF PROFESSIONAL AFFAIRS

ARE YOU DPA CERTIFIED?

The Division of Professional Affairs (DPA) certifies eligible petroleum geologists and geophysicists, as well as coal geologists. The DPA certification is the "Gold Standard" of professionalism.

"Pride in Professionalism" is our motto!

- Formed in 1965, the DPA is a community within the AAPG that focuses on professional practice of energy resource geoscience, upholds the AAPG Code of Ethics, provides continuing education, promotes networking and certifies the credentials of geoscientists. The DPA speaks for you on ethical, professional, technical and legislative matters.

- *Interested in joining???* Please go to the DPA website ***(http://dpa.aapg.org)*** and learn more about the DPA. To see if you are eligible visit the DPA website ***(http://dpa.aapg.org/certification.cfm)*** for an application. If you would like to speak to someone, please call Mark J. Gallagher – Membership Chair at 214-242-7325 or Norma Newby 918-584-2555 (ext 613) at AAPG headquarters.

POST DOC AND PHD RESEARCH ASSISTANTSHIPS
IN STRATIGRAPHY/SEDIMENTOLOGY
CHEVRON CENTER OF RESEARCH EXCELLENCE
DEPARTMENT OF GEOLOGY AND GEOLOGICAL ENGINEERING
COLORADO SCHOOL OF MINES

The Chevron Center of Research Excellence (CoRE), an innovative academic-industry relationship that promotes world-class research and education (http://www.ccore.mines.edu/), invites applications for Post Doc and PhD Research Assistantships to begin in summer 2011. The successful applicants will participate in one of two funded projects: (1) quantitative outcrop characterization of deepwater distributive systems with an emphasis on 3D distribution of high reservoir quality fairways, or (2) quantitative outcrop characterization of a flood-plain dominated fluvial system with emphasis on connectivity and clustering of channel belts. These projects will involve extensive fieldwork in desolate, mountainous regions. Please contact Dr. David Pyles (dpyles@mines.edu) for more information about the research projects.

PhD Research Assistantships:
Applicants for fully funded PhD Research Assistantships must have an M.S. in geology or related field at the time of appointment. Preference will be given to applicants with specialties in outcrop characterization. To apply, follow the on-line application process at http://www.mines.edu/graduate_academic. Please clarify your interest in working with Dr. David Pyles and CoRE in your Statement of Goals. Applications must be completed by January 31.

Post Doc Positions:
Applicants for two-year Post Doc positions must have a Ph.D. in stratigraphy/sedimentology at the time of appointment. Preference will be given to applicants with specialties in outcrop characterization. Experience with petroleum-related research studies and/or petroleum industry experience will be advantageous. The successful candidate must demonstrate strong interpersonal and communications abilities, provide a record of successful collaborative research experiences, have a solid publication record, and have a willingness to travel internationally. Applicants must send a letter of application, résumé, brief statement of professional goals with an emphasis on research objectives, and names and addresses of three professional references to: Ms. Charlie Rourke, Dept of Geology and Geological Engineering, Colorado School of Mines, 1516 Illinois Street, Golden, CO 80401 (crourke@mines.edu). Review of applications will begin no later than February 2011.

CSM is an EO/AA employer and is committed to enhancing the diversity of its campus community. Women, minorities, veterans, and persons with disabilities are encouraged to apply.

DIRECTOR'SCORNER

Meeting Challenges, Assuring Success

By RICK FRITZ, AAPG Executive Director

"Meeting Challenges, Assuring Success."

This is the theme that has led the efforts and planning for the AAPG Foundation's Fundraising Campaign. Each year the Foundation has solid requests and needs that we cannot fund – that is why we set a stretch goal to $35 million by the end of 2011.

I am happy to announce that today we have raised nearly $29 million toward our goal. I also am proud to announce that 85 percent of this money was donated and pledged from the Trustee Associates of the AAPG Foundation. Leaders like Austin and Marta Weeks, Boone Pickens, Larry Funkhouser and Jack Threat have led the way in giving. Their leadership and efforts, along with those of the AAPG Foundation Trustees, have made this campaign successful.

The most common phrase I hear from AAPG members who give is, "I am grateful for my career and the support AAPG has provided. I feel now is the time to give back to my profession."

Please note their testimonials scattered throughout this EXPLORER.

* * *

A $35 million goal is a stretch, but keep in mind the bulk of the monies raised are in the form of endowments for the future of AAPG's student, science and educational programs.

It also allows AAPG to do more with K-12 programs, especially in conjunction with good programs – such as those of AGI. These endowments represent a long-term resource that will be available in perpetuity for our profession and children.


FRITZ

Currently, 10 percent of Active and Associate members give to the AAPG Foundation. We are asking for broader support from you as we complete this campaign.

We also are in the process of asking industry to provide capital to fund immediate resources to launch new programs.

The great humanitarian Albert Schweitzer said, "I don't know what your destiny will be, but one thing I know: the only ones among you who will be really happy are those who have sought and found how to serve."

One of the areas where the Foundation has raised money is in support of public service and awareness. Two years ago, then-AAPG president Scott Tinker approached the Foundation about supporting a film that was to be called "The Bridge," which is designed to tell the public the basic facts about all forms of energy with interviews of world leaders, scientists and energy experts. These interviews are combined with film footage of key energy systems around the world.

The message is in the form of a question: "How do you bridge from our current energy resources to those of the future?"

The film is expected to finish and air in 2011. For those who are interested, there is still a financial need and time for support of the projects. Please contact the AAPG Foundation.

* * *

If you want happiness for an hour, take a nap.

If you want happiness for a day, go fishing (my favorite).

If you want happiness for a year, inherit a fortune.

If you want happiness for a lifetime, help somebody.

The above is one of my favorite Chinese proverbs. I quote it to emphasize our need for *your help* to close out the campaign.

Currently, 10 percent of Active and Associate members give to the AAPG Foundation. We are asking for broader support from you as we complete this campaign.

The Foundation has sent a few brochures with requests for giving – one in the July EXPLORER and one via mail. A donation or a pledge can be made:

- By using one of the donor cards.
- Via our website, at www.aapg.org/eDonation.
- Simply contact Foundation manager Natalie Adams for a personal visit. Her e-mail is nadams@aapg.org, and her phone is 1-918-560-2644 (toll free in the U.S. at 1-888-945-2274 ext. 664).

Winston Churchill was fond of saying: *"You make a living by what you get. You make a life by what you give."*

Please consider giving now for the health and needs of our profession in the near and far future.

AAPG Foundation Trustees

William L. Fisher – Chairman
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William J. Barrett – Trustee
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DIVISIONS'REPORT

'New Era' Provides New Opportunities

By MARY K. HARRIS, President, Division of Environmental Geosciences

Since my last column I have done a bit of traveling in my stead as the DEG president:

- I attended the AAPG Leadership Days in Tulsa, at which time we discussed where AAPG would be in 2025 and held a strategic planning session regarding all the Divisions of AAPG.
- I attended the Eastern Section AAPG meeting in Kalamazoo, Mich.
- I then attended the annual meeting of the Gulf Coast Association of Geological Societies (GCAGS).

On the last day of the GCAGS meeting we learned that the moratorium on drilling in the Gulf of Mexico had finally been lifted. Although this is great news, what does it really mean for the petroleum industry? We know the implementation of new offshore drilling regulations will be forthcoming and will promote safety.

When they are promulgated, it will be an excellent time for AAPG and DEG to step forward to promote the understanding of these new regulations and, more specifically, how they will affect the industry.

Even though the environmental challenges that face us today may seem surreal, now is the time to take action and show the world that we can develop our natural resources in a responsible and environmentally safe manner.

* * *

I attended a talk at GCAGS that addressed "Environmentally Friendly Drilling." Sounds like an oxymoron, right? No, not really. The petroleum industry has been doing environmentally friendly drilling for a long time by recycling fluids, limiting land impacts, minimizing dust, etc. We just haven't done an acceptable job of communicating these practices and experiences to the public. This is certainly true for both onshore and offshore drilling operations.


HARRIS

Think about your impact on our earth. Implementing small changes in our everyday lives can and will make a difference.

The lay public primarily is getting its information regarding drilling and the petroleum industry from the Internet, television and newspapers. Personally, I feel like I am on information overload from all the media hype these days – sometimes it is hard to determine the real truth. This is why I am excited to report that DEG is focusing on targeted environmental topics that affect our industry.

For the 2011 AAPG Annual Convention and Exhibition in Houston, DEG is sponsoring an "Oil Spill" Forum that will be held in the afternoon following our luncheon. We have chosen for our speaker Ed Overton, a well-respected toxicologist at Louisiana State University and expert on the biological aspects of oil spills. He should provide some great insights on what really happened with the oil in the Gulf of Mexico waters.

Other timely topics that will be addressed at the Houston meeting include sessions on carbon sequestration, energy and water issues.

* * *

Previously I talked about expanding our technical focus areas in the *Environmental Geosciences Journal*. Kristin Carter already has begun this work and is collaborating with EMD representatives to prepare a co-sponsored special edition to address environmental issues associated with the Marcellus shale.

I ask that the AAPG community consider contributing technical articles on this topic, and contact Kristin (krcarter@state.pa.us) with any questions about this opportunity.

* * *

Other DEG activities since my last column include the e-mail blast to AAPG student members announcing $0 membership dues, which includes electronic access to Environmental Geosciences. This has been quite successful, and many students have since joined our organization.

Speaking of electronic access, DEG is "going green," and will be phasing out the paper copies of the Journal over the course of the next year. Environmental Geosciences will be published online beginning in mid-2011. While some may question this decision, the DEG Executive Committee believes it is the right thing to do, especially given our position as the environmental arm of the AAPG.

With that I ask you to think about your impact on our earth. Implementing small changes in our everyday lives can and will make a difference.