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Coastal Clues

What you see is what you get – onshore

See page 10

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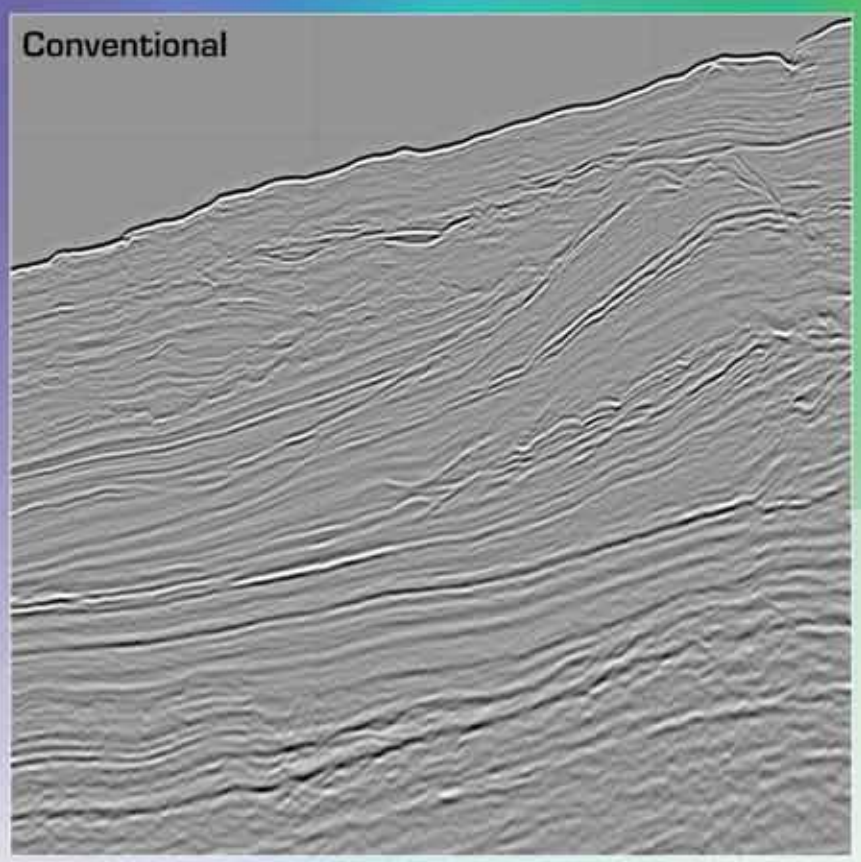

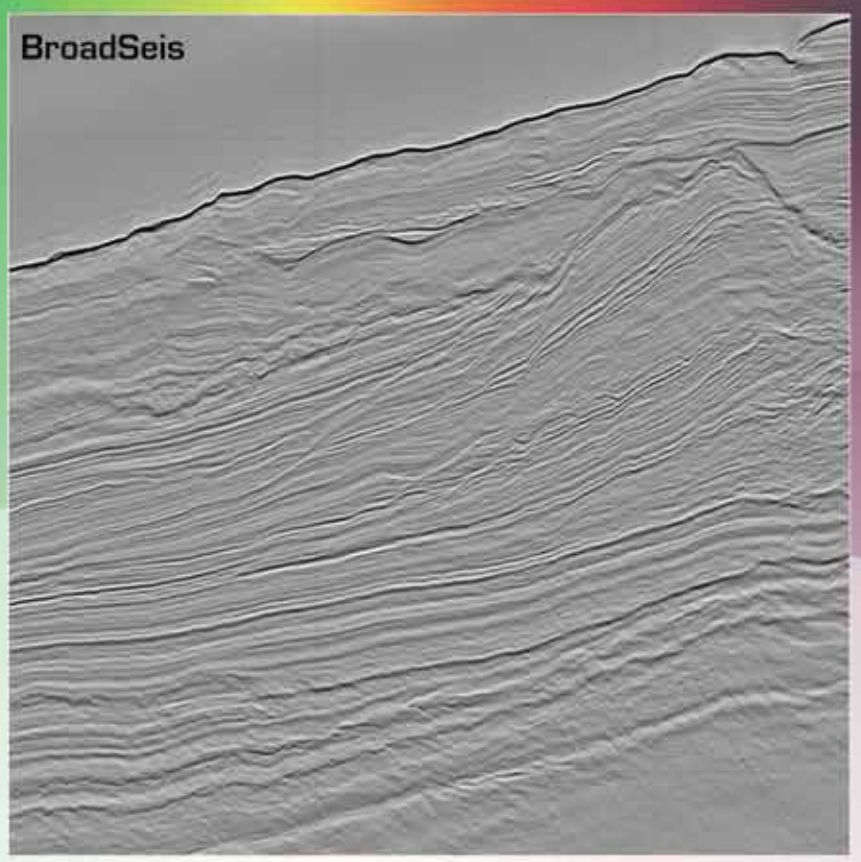

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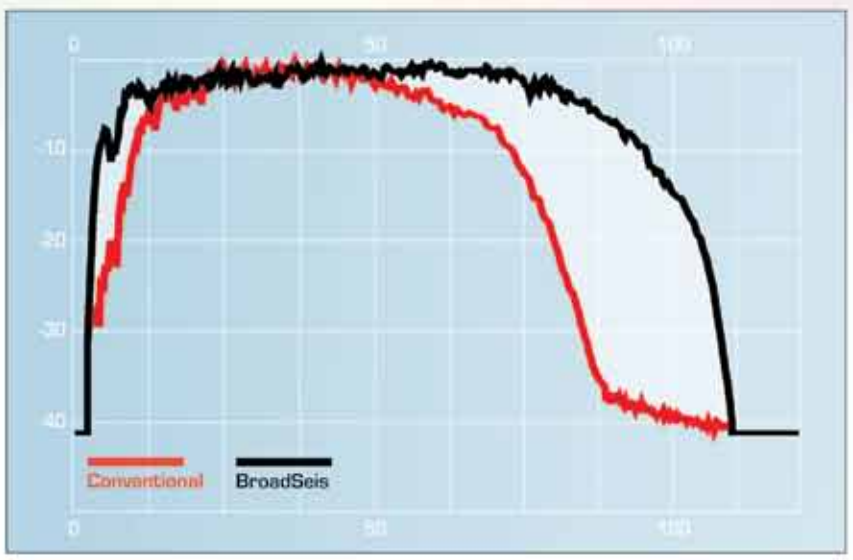

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AAPG EXPLORER

PRESIDENT'S COLUMN

AAPG in 2035?

By DAVID G. RENSINK

One of the goals the Executive Committee has set for this year is to instill a longer range view in AAPG – a 20- to 25-year view. To that end, we have asked the Advisory Council to review the current AAPG Strategic Plan, which was crafted in 2004, to determine whether the plan's assumptions are still valid – and if so, whether the conclusions are still valid. That task is under way. The AC has reviewed the underlying assumptions and has proposed several changes.

We also want to consider what changes AAPG could experience in the next 20-25 years and determine what AAPG needs to do to accommodate the potential changes.

Some of these potential changes are fairly easy to predict. By 2035:

- Over 50 percent of our members will live outside of the United States.
- We will have offices in every Region.
- The average age of our membership will be younger than it is now.
- Our gender ratio will be near 50:50.
- All of our publications will be digital.

Some of the other changes we may experience are a little more difficult to predict with a reasonably high level of confidence.

- As U.S. oil production and, eventually, gas production decline, we will see more mergers and a potential contraction of the U.S. petroleum industry to Houston and Denver. This could prompt two or more U.S. Sections to merge as the demographics change.
- As the Regions grow and establish their own annual meetings, the AAPG International Conference will cease to be relevant. At that point, the AAPG Annual Convention and Exhibition will become a truly international event.
- By 2035, China could be AAPG's seventh Region.

RENSINK

The accompanying graph indicates that if the membership trends of the past five years persist, the Sections and Regions will reach membership parity in 2023 – and by 2035 the current demographics of 62 percent-U.S. members will have flipped to 62 percent non-U.S. members.

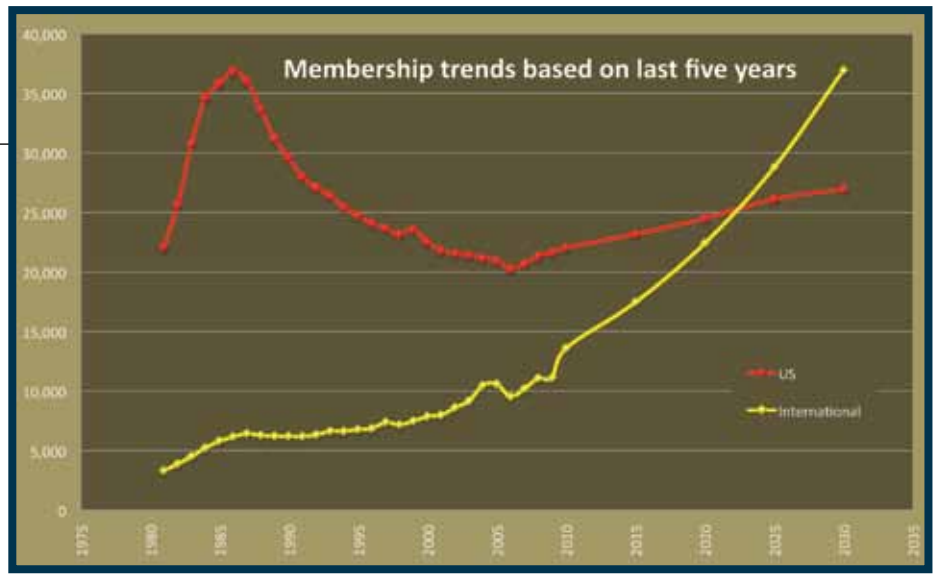
If you believe the graph, our total membership will be approximately 64,000 by 2030. That would be 49 percent higher than our record membership of approximately 43,000 in 1986. This is an attainable goal. The only question is, "Do we have the mechanisms in place to get there?"

At present, approximately 50 percent of our members are over the age of 50. By 2030, the youngest of that group will be 70. A steady influx of young professionals is necessary to merely sustain our membership.

It is not inconceivable that we could merge with another professional society by 2035.

The changes that we foresee for AAPG will mirror the changes we can expect in the petroleum industry:

- There will be a structural shift from West to East.



- The supply crunch may be delayed until after 2020. The international oil companies are stuck in declining, mature markets. Companies will merge to sustain their reserve base, not to grow it.
- The international oil companies will become true joint venture partners of the national oil companies.
- The national oil companies will maintain or increase their two-thirds share of the world's oil reserves.

The need to institutionalize a long-range view within AAPG is driven by the fact that our system of governance does not lend itself to long range planning.

Each AAPG president brings a unique view and vision of what AAPG should be to the Executive Committee. There is certainly nothing inherently wrong with that, but when combined with a turnover of the Executive Committee every two years, AAPG's corporate memory is short. For all practical purposes, our corporate memory resides with the staff, whose jobs are to implement the strategy set by the Executive Committee and the Advisory Council – not create it.

By their very nature, none of the forecasts noted above are certain, but change is inevitable. It is how we plan for it and react to it that will determine our future.

I particularly want to thank President-elect Paul Weimer for his input into the scenarios expressed in this column and for his support for a long-term view for AAPG.

* * *

On another note: We have received a number of positive comments on the new *Search and Discovery Digest*, which is only available digitally.

If you did not receive a copy, it is probably because we do not have your current e-mail address in our records – so please update your information on the AAPG website.

All is not lost; you can still download S&D Digest from the AAPG website.

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24 Kinetics and hieroglyphics and pyrolysis! Oh my! Following the traditional method of determining kerogen kinetics is slow and expensive and yields little kinetic data. The new method of **one-run kinetics** proves to save both time and money while acquiring more data.

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What's this, you ask?

Do you have a smartphone? If so, this image – really, a digital code – could be your instant access to the mobile EXPLORER. See page 49.

ON THE COVER:

Monterey outcrops along the California coast near Santa Barbara/Carpinteria are not only scenic, they're crucial to explorationists who see them as keys to the state's emerging shale play. As one geologist said, "Almost all the oil in California has been sourced by the Monterey" – and today's it's bigger than ever. Story on page 10. Photo courtesy of Michael G. Edwards.

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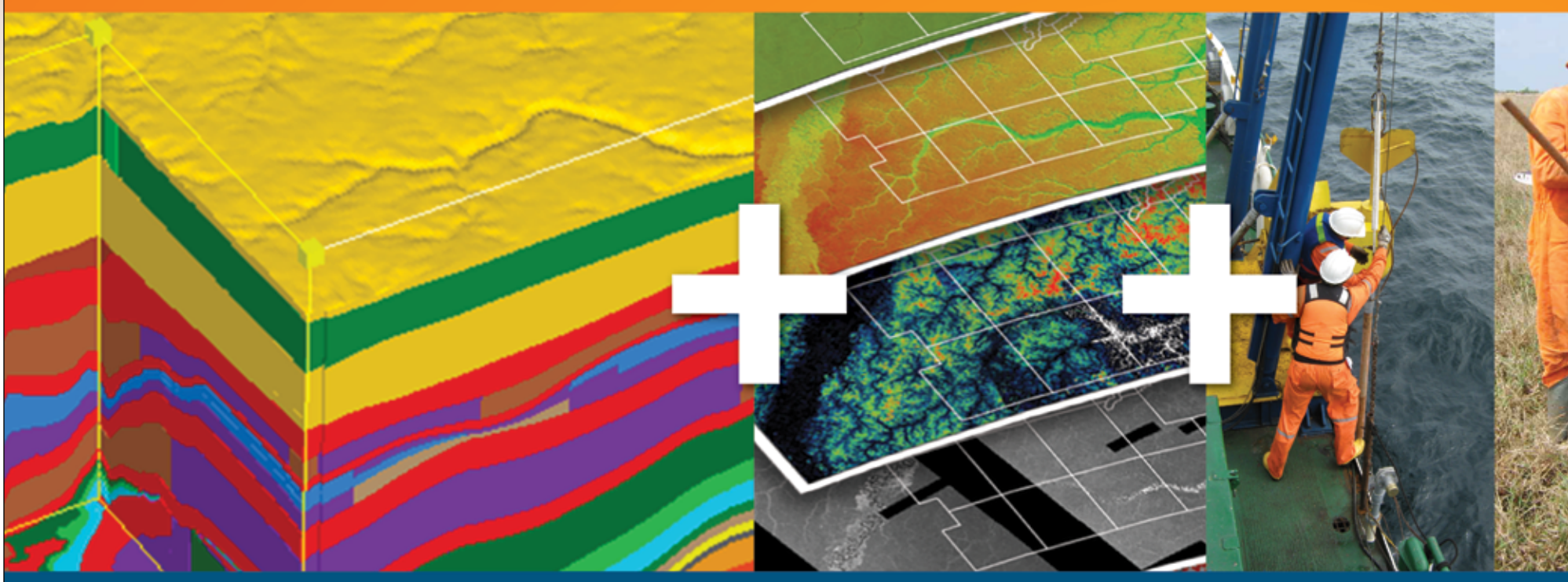

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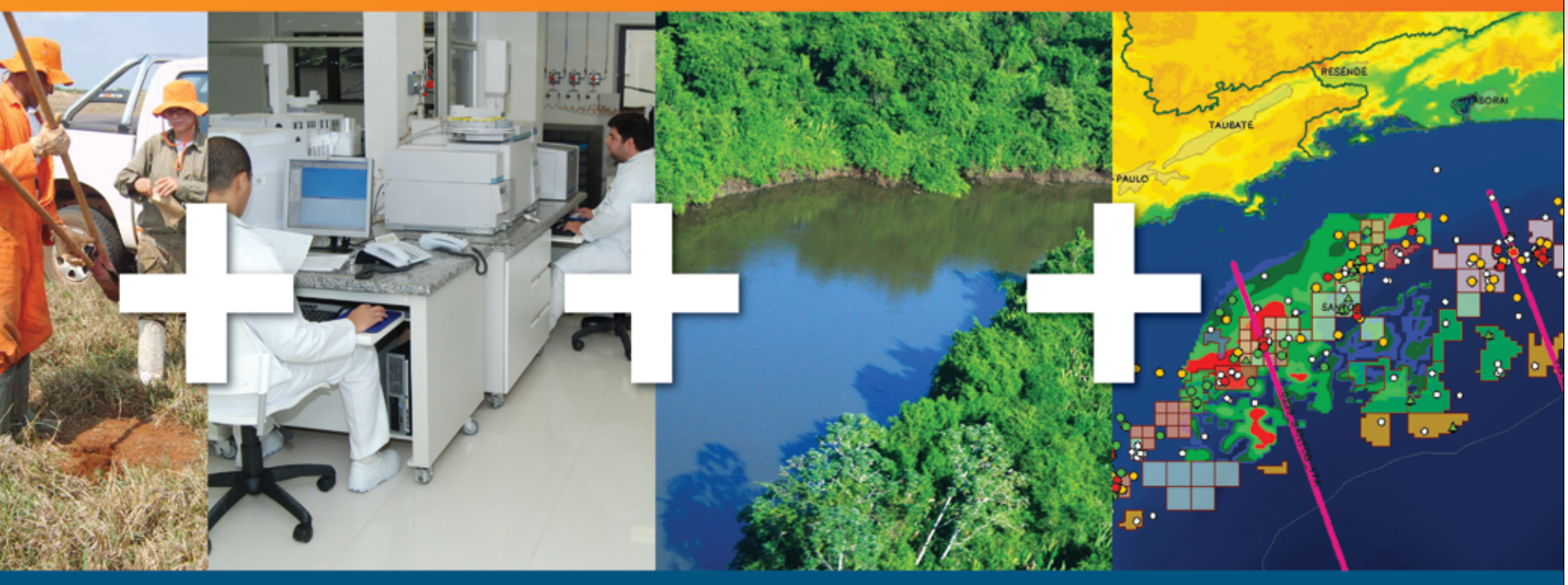

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Brian Lock, a geology professor at the University of Louisiana, presented the paper "The Eagle Ford (Boquillas Formation) of Val Verde County, Texas – A Window on the South Texas Play," at the recent GCAGS annual convention in San Antonio. His co-authors were Lauren Peschier, with Newfield Exploration; and Ashley Fife, with Core Laboratories.

Photos courtesy of Lauren S. Peschier

Outcrop Q, one of three deep road cuts exposing the middle member of the Boquillas Formation in the south Texas Eagle Ford shale. Gray surface is freshly weathered surface (thought to be the productive interval in subsurface, the TST).

Slump fold as it is seen – make that "easily seen" – in the lower member of the Boquillas Formation. Many valuable outcrops in this south Texas play are found right next to roads, in easily accessible areas.

Boquillas appears to have same depositional setting

Outcrops Instructive for Eagle Ford

By LOUISE S. DURHAM, EXPLORER Correspondent

Shale gas plays have elevated land drilling activity to the point that it's a tad off-putting to imagine the state of the onshore industry today had they not materialized only a few years ago.

In fact, these plays have taken on added appeal lately owing to the associated quantities of high-value condensate and natural gas liquids they sometimes contain, not to mention actual shale oil plays.

For example, think Bakken shale oil in the Williston Basin and the shale gas plays with a considerable liquids component, such as the Cretaceous-age Eagle Ford shale in south Texas.

It's no surprise that these type plays have become increasingly alluring as natural gas prices are languishing around $4/Mcf. Meanwhile, oil currently is maintaining a grip around the $80/bbl range.

This has prompted a number of companies – including EOG Resources, Devon Energy, Anadarko and committed natural gas devotee Chesapeake Energy – to pump up their attention on shale plays offering something more than gas.

Reportedly jumping into the Eagle Ford action are industry heavyweights Royal Dutch Shell, ExxonMobil, ConocoPhillips and BP.

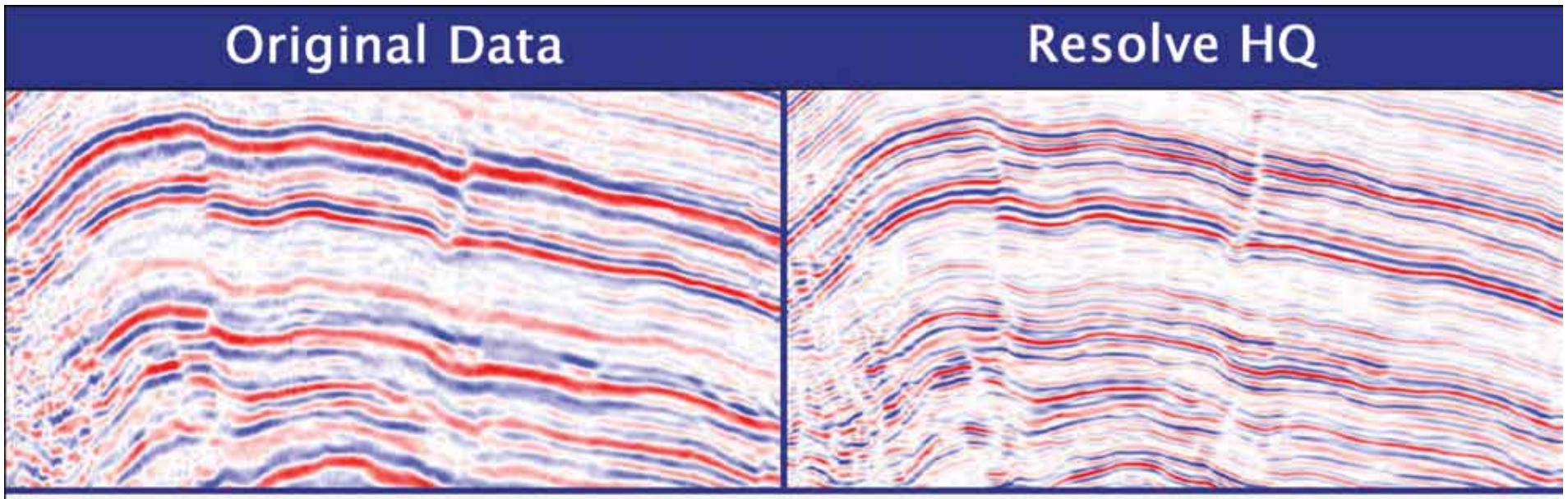
This new twist on shale gas potential has elevated the appeal of the Eagle Ford play in particular. It boasts a confirmed oil and condensate window and extends from near the Mexican border outward to the east/northeast across several counties.

When Petrohawk Energy Corp. went looking for natural gas in the Eagle Ford, it ultimately drilled the discovery well in the now-high-profile play in 2008 in what would be christened the Hawkville Field.

The Hawkville is characterized by a downdip dry gas play in the southwest, a mid-dip gas condensate and an updip oil play, according to AAPG member Dick Stoneburner, executive vice president and COO at Petrohawk.

The Eagle Ford takes on the moniker Boquillas at the eastern county line of Val Verde County slightly northwest of the westernmost part of the main play. This area is significant given that outcrops in Val Verde and Terrell counties appear to be in the same depositional basin setting as the Maverick Basin Eagle Ford wells to the south, enabling improved understanding of the play, according to AAPG member Brian Lock, who is the Robert and Barbara Pettit professor of geology and graduate coordinator at University of Louisiana,

See **Outcrops**, page 8



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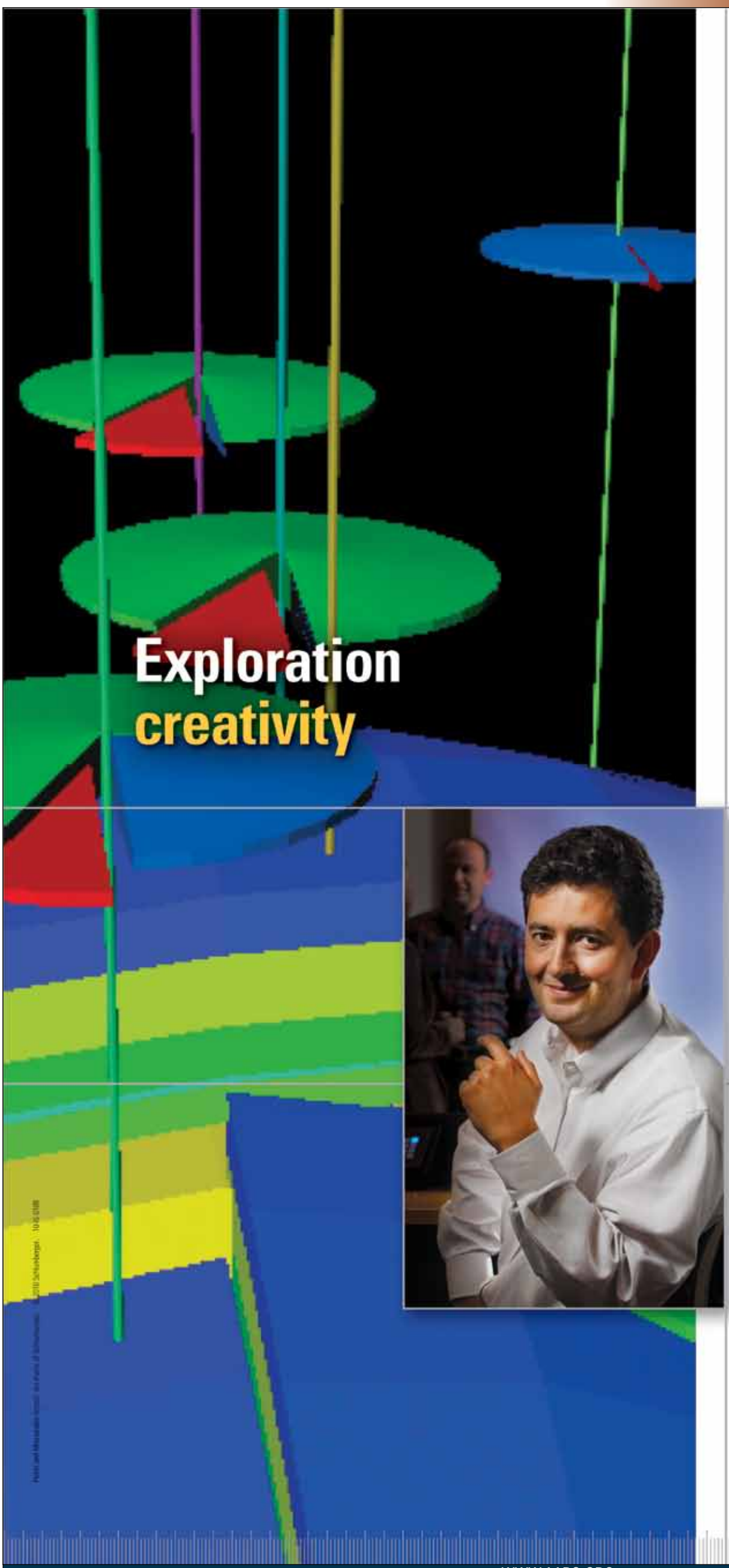

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Fresh marlstone, outcrop Q. The gray surface is a thin weathering skin that has formed since the road cut was excavated in the late 1970s. The black rock beneath the skin exudes a petroleum odor.

Outcrops

from page 6

Lafayette.

"The Boquillas formation, as it outcrops in Val Verde County, is the lateral equivalent of the productive Eagle Ford formation of southwest Texas," said Lauren Peschier, geologist at Newfield Exploration and an AAPG member who penned her master's thesis on this topic working with Lock.

"The outcrops display components of the formation not seen in the subsurface," she added, "enabling a full sequence stratigraphic interpretation."

These outcrops include certain deep road cuts along U.S. Highway 90 in Val Verde County that are particularly instructive for understanding the depositional environment of the Eagle Ford.

Visits to study the exposed geological sequence are very "in" these days.

"A lot of people didn't even know these beautiful road cuts are there," Peschier said. "Now they're all wanting to go on field trips, including the big companies like Shell and ConocoPhillips."

The Three Members

The Boquillas is approximately 200 feet thick in Val Verde County, slightly thicker in the producing counties and over 10 times thicker in northern Mexico, according to Lock. He noted it was deposited during the Cenomanian-Turonian oceanic anoxic event.

The outcropping Boquillas formation can be informally divided into three members, Lock noted:

- The lowest member consists of unstable slope strata, including debris flows, slump folds and breccias, possible turbidites and contourites.
- The upper member is marked by several thicker limestone beds at the base, with chondritid burrows normally associated with low oxygen environments. The main part of this member contains abundant irregular echinoids and is interpreted to represent a return to more normal oxygenated water conditions.
- The middle member is a turn-on, economically speaking, for the industry folks.

"The middle member can be further divided into lower beds comprising limestone-shaly limestone cycles, or parasequences, that form a transgressive parasequence set with an upwards decrease in the number of carbonate beds," Lock said.

"The middle beds in the middle member are composed almost entirely of shaly carbonates," he noted, "while the upper beds include increasing proportions of limestone toward the top and are interpreted as a regressive parasequence set.

"Where it appears in an unweathered state, the middle member is comprised of black organic-rich strata that emit a strong petroleum odor when broken," Lock remarked.

"Fine laminations are undisturbed by bioturbation, and every indication suggests anaerobic sub-seafloor and dysaerobic bottom water conditions during sedimentation," Peschier added. "Planktonic forams and calcispheres are the common microfossils accompanied by small ammonites; the low-oxygen tolerant inoceramids are the only bottom-living fauna."

The Potential

Peschier succinctly summarized some salient points of the middle member of the Boquillas:

- TOC values up to 8.3 percent have been reported from Central Texas and 5.7 percent from some Val Verde County samples.
- High carbonate content equals increased brittleness.
- Porosity: pores within organics, between clay flakes, between larger carbonate grains.

"Although thermally immature in outcrop, the high TOC content of these rocks combined with significant matrix porosity indicate the excellent reservoir potential in areas where maturation has progressed, and sufficient natural and induced fractures become significant," Lock said.

"The Type I kerogen explains the potential for shale oil production."

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SHALE DATA PACKAGES

South Texas Eagle Ford Basin

Partial Map Detail

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API	Operator	Lease	Well	County	Top Depth (ft)	Bottom Depth (ft)
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[illegible]	HAZEL C R ETAL	MAE E COUSER HALEY	1	ATASCOSA	[illegible]	[illegible]
[illegible]	DOUGHERTY, DUDLEY T	HENRY, G W	1	ATASCOSA	[illegible]	[illegible]
[illegible]	PAN AM PETRO CORP	R R BIRDWELL	4	ATASCOSA	[illegible]	[illegible]
[illegible]	SHELLY OIL CO	WINKLER, BERTHA M	1	ATASCOSA	[illegible]	[illegible]
[illegible]	SHELL OIL ET AL	HUMMANN, J W	1	BEE	[illegible]	[illegible]
[illegible]	SHELL OIL	ROESSLER A-5	1	BEE	[illegible]	[illegible]
[illegible]	TEXAS EASTERN TRANS CORP	BARBE GAS UNIT	1	DE WITT	[illegible]	[illegible]
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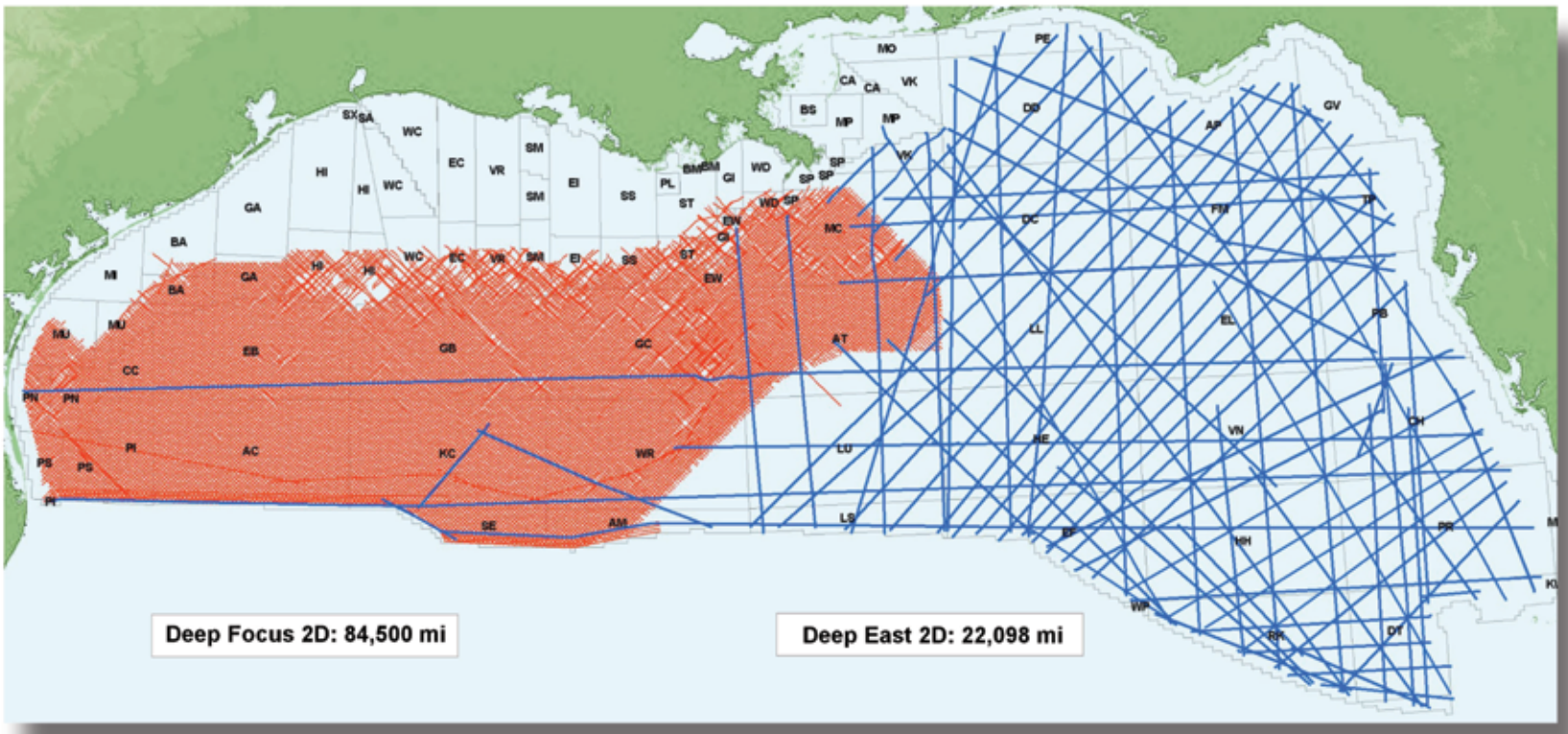

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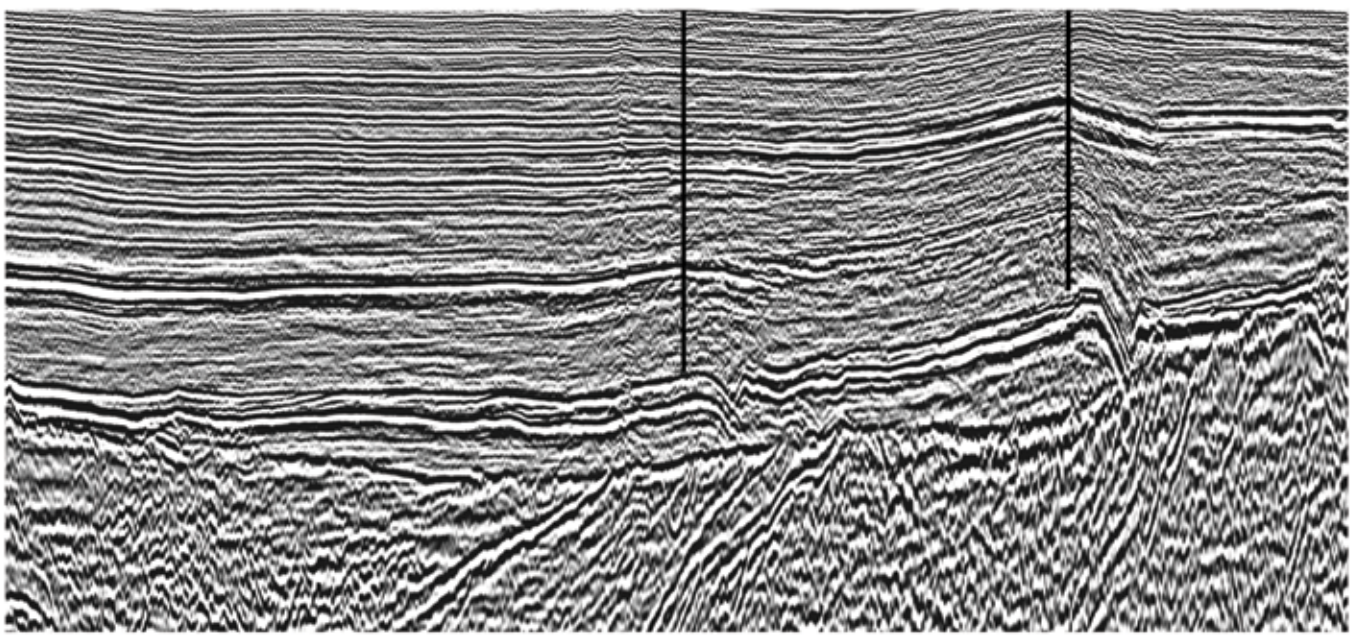

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Monterey Shale Gets New Look

By LOUISE S. DURHAM, EXPLORER Correspondent

Surprise.

Yet another emerging shale play is in the making.

Don't yawn – this one is different.

It's old, but new again – and Big.

We're talking the Miocene-age Monterey shale in southern California that's been produced in one way or another for more than 100 years.

"Almost all the oil in California has been sourced by the Monterey," said AAPG member Marc Kamerling, senior geologist at Denver-based Venoco Inc. "Only a small percentage has come from other source rocks."

To put this in perspective, the Monterey has sourced producing giants such as the Kern River, Elk Hills and Midway-Sunset fields, to name a few.

It's the source rock for about 37 to 38 billion barrels in conventional traps such as sandstones, according to Kamerling. All told, it's estimated to contain more than 500 billion barrels of oil in place.

Along with the copious amounts of Monterey oil being produced from conventional reservoirs, there's also production from the shale itself. In fact, the rock produced in the Santa Maria Basin as far back as 1900.

"Historically, production goes all the way from outcrops mined early on to the very deep," said Mike Edwards, vice president of corporate and investor relations at Venoco. "The Alcatraz Asphalt Company had a couple of open pit mines along the Santa Barbara coast, and a mine shaft they used now sits below the campus of the University of California, Santa Barbara."

The new tools and technologies spawned by the many still-relatively new shale plays across the United States have encouraged companies such as Venoco to look at the Monterey shale in a whole new way, i.e., an unconventional play with enormous production potential.

Kamerling noted that the EUR from fields identified as Monterey producers only is 2.5 billion barrels.

KAMERLING

EDWARDS

Photo courtesy of Michael G. Edwards

Warmed by the sun, Monterey-sourced oil oozes from the overburden of Tar Pits State Park in Carpinteria, Calif.

He is quick to point out some major differences between the Monterey and other shale plays being pursued that are typically associated with 300-million-year-old – or older – structures.

"This is five to 17 million years old," he said. "There are now large areas in the peak oil generation window, so it's generating oil now.

"Some of the larger Monterey fields have only been in geological existence less than one million years," he noted. "The Ventura Avenue anticline is very young and has already produced maybe more than a billion barrels of oil from a Monterey-sourced sandstone reservoir."

Managing the 'Mishmash'

Hydraulic fracturing in shale plays is commonplace these days, but Kamerling said they don't anticipate having to frac the wells they intend to drill, noting there are a lot more structures there than in, say, Mid-Continent shale plays.

Nothing's off the table though.

"Some areas are gently dipping, and we're approaching this with an open mind and not focusing on any one technology we think will solve all our problems," he said. "We think many different things will work and should be tried in different areas.

"Our main completion technique will be to do large acid jobs on these wells drilled horizontally," he added.

The Monterey shale may be practically oozing oil that can range anywhere from 6 degree API gravity up to the 30-plus degree API realm of light crude, but evaluating and understanding this baby can be mentally taxing given the fact that it's at best a mishmash of rock types.

"It's basically a large deposit of diatomaceous material," Kamerling said. "At one state it's diatomite but with low permeability, and it must be stimulated to recover oil – the unaltered diatomite is referred to as the Opal A phase.

"As pressure and temperature increase with depth, it becomes more brittle and more fractured as it alters into cristobalite tridymite, which is known in the industry as the Opal CT phase," he said.

"The Monterey evolves into a quartz phase as lithification progresses," he added.

Kamerling noted the shale produces from all three phases and can vary significantly among different wells.

"In any one spot, you can usually find all of these rock types in different proportions and thicknesses," he said. "The shale also may contain sandstones, depending on where you are."

The play poses the added challenge of dealing with a twisted and broken subsurface created by all the wrenching, folding, compression and other physically disturbing activity in this tectonically active region.

The upside to this movement is that it tends to create varying hydrocarbon traps.

Vertical Monterey Shale bedding exposed in the surf zone on the north flank of the Santa Barbara Channel.

See **Monterey**, page 12

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Monterey
from page 10

Looking for Land

When Venoco embarked on a leasing program in 2006 with its eye on the Monterey as an unconventional resource there was no shortage of available acreage, despite the presence of such a well-recognized and highly productive source/reservoir rock.

Edwards explained that California has long been the domain of the major companies since the start of the 20th century, when they acquired massive fields that are still producing. They've had little incentive to engage in the expense and time needed for wildcatting, leaving large areas in the state unexplored.

This doesn't mean leasing is a slam-dunk.

"There are a lot of small mineral interest owners," Edwards noted, "and there's a lot of land work involved in finding them."

Venoco's work is cut out for it with a goal over the next two years to increase its holdings to 350,000 acres from the current 150,000-plus acres in southern California, which includes about 50,000 acres HBP from the Monterey itself or other zones.

The company has a 10-well Monterey program in the works for this year, including both vertical evaluation wells and development-style horizontal wells targeting zones between 6,000 feet and 14,000 feet. Even though there have been many thousands of penetrations through the Monterey, it most often was not the target zone, so cores weren't cut.

The company also lays claim to the offshore South Ellwood field, which it purchased in 1997. This field discovery in 1969 jump-started the Monterey play in the Santa Barbara channel and led to development of some highly productive fields.

Kamerling noted they are in the midst of a joint 3-D seismic shoot with Oxy. He said the ongoing survey will cover about 320,000 acres and will be the largest 3-D seismic shoot ever in California.

Even though it's known for attempting to move under the radar, Oxy has established a reputation as a go-getter in the California oil patch with some impressive fields under its control – a notable exception to the dominance of the Big Guys.

It's thought that the Monterey producing gross column is hundreds of feet thick at Oxy's Elk Hills field, which the company produces from vertical wells.

Top: Platform Holly, where the offshore Monterey Shale was "discovered" in 1969.
Bottom: Fractured by nature – Monterey Shale outcrop as found on the California coast.

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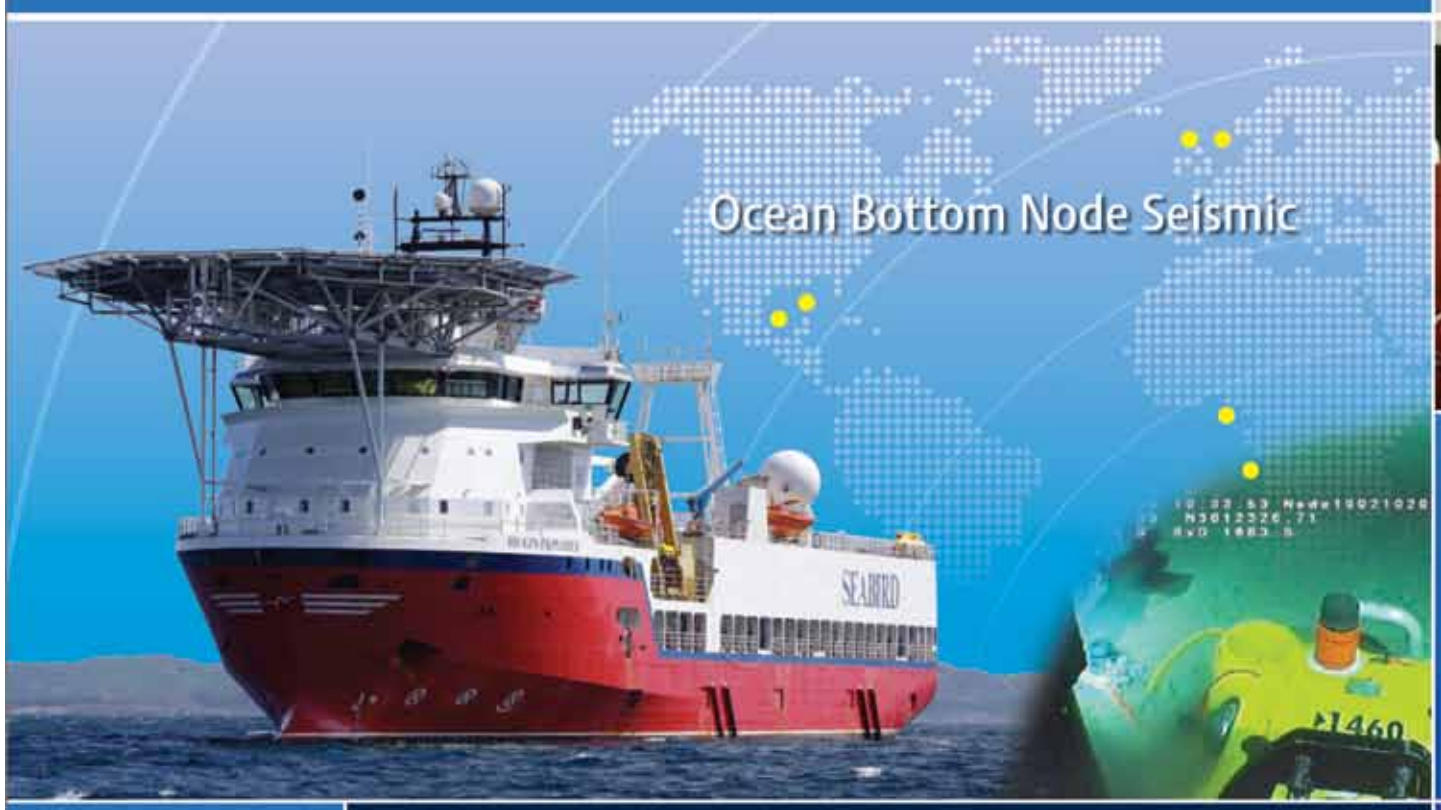

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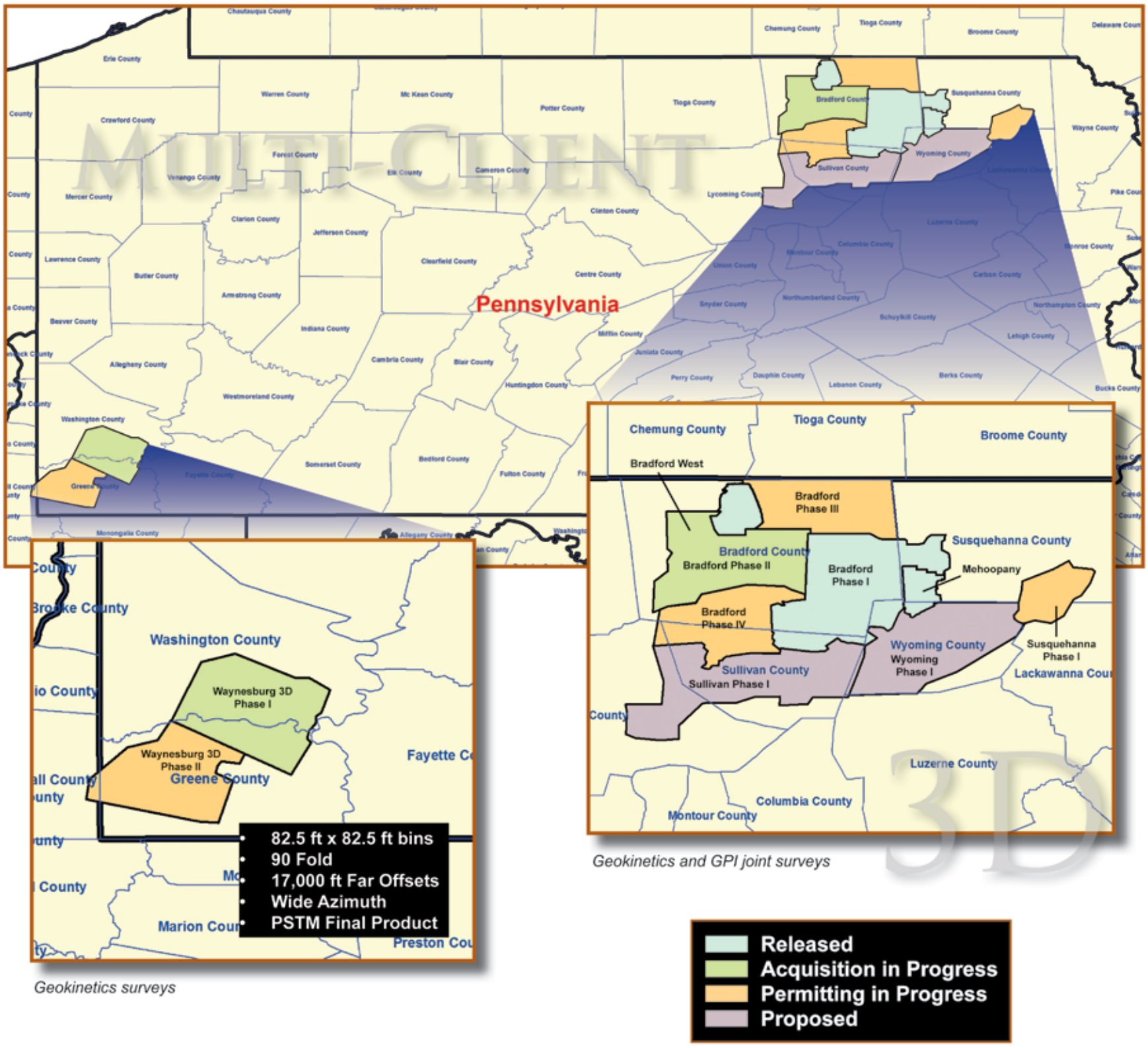

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New information or idea can make a difference

Arctic Frontier Demands Innovation

By DAVID BROWN, EXPLORER Correspondent

The oil and gas industry has seen a period of tremendous innovation, propelling exploration into frontier plays like ultra-deepwater and shale gas.

But that's nothing compared to the innovation needed for future exploration.

As the industry eyes new plays in the Arctic, remote offshore prospects and gas hydrates, creative ideas will be essential.

GAUTIER

The good news:

In dozens of places and disciplines, innovation continues to push exploration and production forward.

A few areas where innovation is making a difference:

- Seep detection, monitoring and analysis.
- Intelligent reservoir modeling.
- Virtual source method techniques.
- Passive seismic monitoring.
- Geokinematics and geodynamic modeling.
- Remote control operations and robotics.
- Seismic while drilling.
- Expandable tubulars and tools.
- Integrated operations and smart fields.

Not to mention new research in geochemistry and nano-everything – including nanotechnology, nanomaterials and even nano-scale visualization.

Photo courtesy of Christine Zenino

An ice shield offshore Greenland: The circum-Arctic region is loaded with energy potential, but exploration there is going to demand an emphasis on technical innovations.

Don Gautier, an AAPG member, is a research geologist with the U.S. Geological Survey in Menlo Park, Calif. He recalled studying shale formations many years ago and realizing they contained a huge amount of natural gas – if anyone could figure out how to produce it.

Gautier compared that challenge to today's problem of developing gas hydrates reserves.

"People say about hydrates, 'Oh, that's so remote it will never happen,'" he noted. "That's surprisingly like the attitude about shale gas a couple of decades ago."

Arctic Proving Grounds

Gautier recently worked on the USGS Circum-Arctic Resource Appraisal that produced estimates of undiscovered oil and gas north of the Arctic Circle.

"The Arctic is one place where innovation is making a world of difference," he said.

When the resource appraisal was completed, "from our point of view, a number of things jumped out at us," Gautier observed.

✓ First, the Chukchi Sea, the Beaufort Sea, offshore the Mackenzie Delta "and maybe part of Greenland" were the most likely oil-prospective parts of the Arctic, he said.

"Shell has spent about a zillion dollars on leases in the Chukchi Sea. And we independently see that as the most interesting part of the Arctic," Gautier noted.

Actually, Shell has committed close to $1.4 billion on leasing blocks offshore northwest Alaska and making drilling plans for the area, in the belief that innovative approaches can lead to oil production there.

✓ Second, the USGS found that most of the Arctic is gas-prone and may contain about 30 percent of the world's remaining conventional natural gas, according to Gautier.

✓ And third, most of the gas is in Russian territory, in places like the south Kara Sea and the Barents Sea.

"The Arctic in general is a place where there's a great deal of uncertainty and all sorts of technical challenges and environmental issues involved. If you look across the Arctic, there's a great spectrum

See **Arctic Frontier**, page 16

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Arctic Frontier

from page 14

of costs," Gautier observed.

Adding to the challenge is the prospect of developing and producing reserves in the subsea Arctic, already attracting exploration activity.

"That's the place where we are seeing quite a bit of interest, especially offshore Greenland and off north Alaska. Offshore northern Alaska could be commercial right away, in my opinion," Gautier said.

He cited offshore northeast Greenland as the kind of exploration province especially attractive to the industry.

"If that was sitting offshore Louisiana, it would have been explored decades ago," he noted.

Finding and developing those subsea Arctic resources, Gautier said, will require innovative thinking in a number of areas:

- Ice management.
- Bringing down transportations costs.
- Creating a serious and effective plan for controlling spills.
- Securing an adequate power supply on the seafloor.

"Just imagine the requirements. An example is this Snoehvit Field – the Snow White Field in the Barents Sea – where they've developed it all with subsea installations," he said.

Creativity in exploration geology also will be required, although Gautier said good, fundamental geology is essential to Arctic projects.

"It's a place where first principles of geology are going to carry the day. A solid geologic model is what's going to succeed there," he said.

A vast region of the world, the Arctic challenges companies to identify and focus on specific places for evaluation and eventual drilling.

"To be able to do that, you've got to have a solid geological judgment about what area you're interested in," Gautier said.

> " ... You have to have some creative ideas. There may be ideas out there nobody has thought about."

'The Only Way'

Broad innovation will be needed to tackle the newest energy opportunities. Ideally, you'd want an innovative individual working on both gas hydrates and the Arctic, using a computer-centered approach, with carbon sequestration thrown in as a bonus.

And that would be Mark White, a research engineer for the U.S. Department of Energy's Pacific Northwest National Laboratory in Richland, Wash.

White is working on a computer simulation of injecting carbon dioxide into gas hydrate deposits to release the methane from its clathrated form.

"The concept for injecting carbon dioxide into a hydrates formation started appearing about 10 years ago," he said.

In recent years, scientists have studied several different ways of producing methane from hydrates. One potential problem is collapse of the hydrates deposit as production takes place.

"There's a possibility of subsidence occurring. But there's a possibility of keeping the formation in place, and you do that by injecting CO_2," White said.

Guest-molecule exchange technology addresses the subsidence possibility by replacing the methane molecule with a more thermodynamic molecule, in this case carbon dioxide, to retain the hydraulic and mechanical stability of the hydrate reservoir.

"Getting that to work is the tricky part," White noted.

A successful process might not only keep the reservoir stable and enable gas production, but also sequester the CO_2.

Previous computer simulation found the approach unworkable because of rapid pore plugging, but White is writing new code to add additional variables. It's an area with little fieldwork for background.

"There really hasn't been enough experimentation going on to validate those tools," White said.

"I do have some experimental data I can work against. I have a Korean colleague coming in and he has some existing data," he added.

White plans to write a paper on the results with collaborator Suntichai Silpngarmlert, a ConocoPhillips researcher, and present it at the inaugural Arctic Technology Conference in Houston Feb. 7-9.

As with so many other areas of current research, innovation is the key.

"The solution to this problem, how to make the exchange happen, you have to have some creative ideas. There may be ideas out there nobody has thought about," White said.

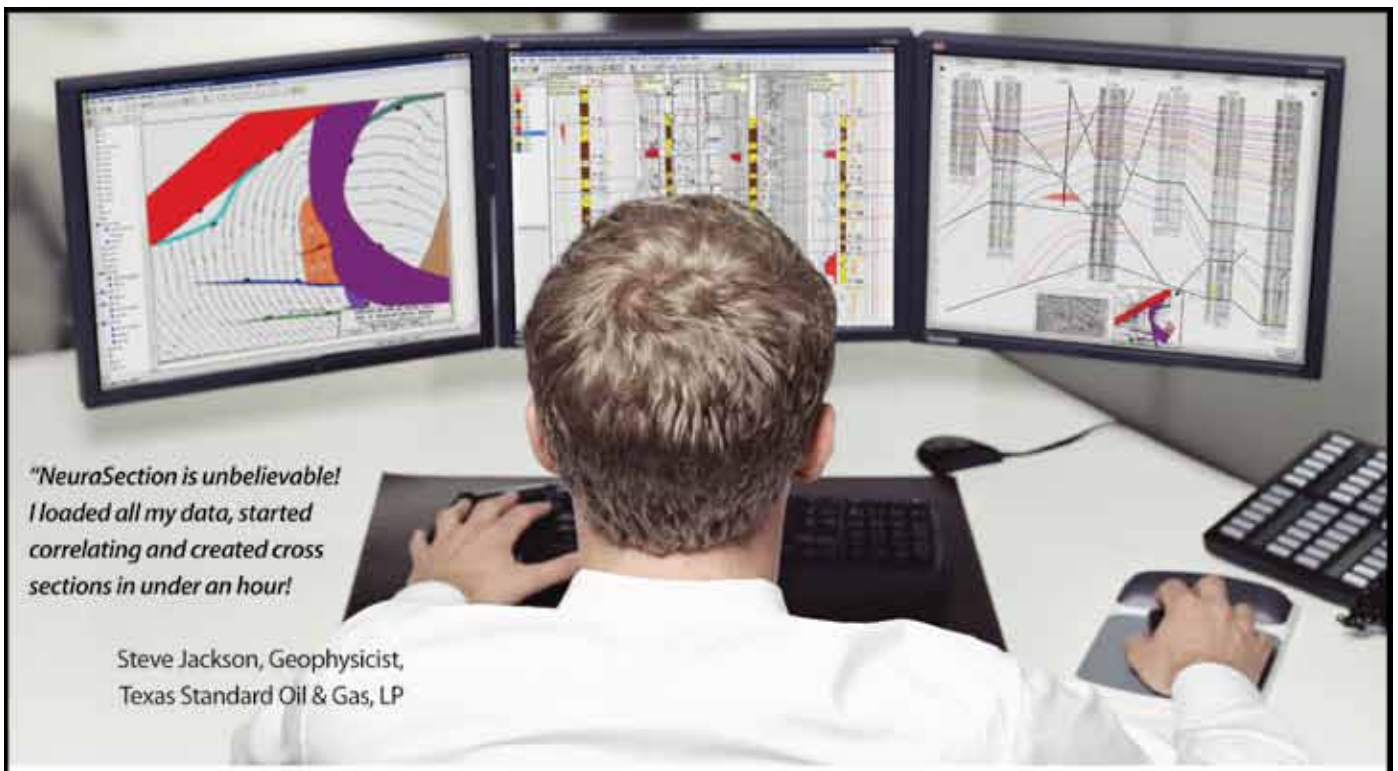
With scientific work going on in multiple frontier research areas, any new contribution or information can make a substantial difference.

"If you're able to drill a well off the northeast part of Greenland, it would be the kind of thing that could completely change the game," Gautier noted.

"Any time you can gather information in the Arctic, it's vastly more important than developing some new information about the (U.S.) onshore, in Oklahoma, for instance," he added.

And innovative thinking is taking exploration into the new frontiers and the years ahead. Said Gautier:

"Innovation is the only way through. It's the only way."



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Unique wells = Unique data

Shales, Acquisitions Create New Data Types

By LOUISE S. DURHAM, EXPLORER Correspondent

Besides the tremendous boost to domestic drilling, shale plays have spawned an array of ancillary business opportunities owing in large part to the complexities inherent to evaluating and producing these dense rocks, which differ considerably from play to play.

Think data, for instance.

Shale plays in general have been dominated by the small to mid-size companies – even though the Big Guys have begun moving in.

Once on the shale fast track, however, many smaller players expanded quickly via acquisitions. Data management needs evolved, principally because of differing types of acquired data compared to other types of plays.

"Working with them as a consultant, I found it was not just how they were handling the data, but there were some unique data types because of the way they were drilling wells," said AAPG member Jess Kozman, owner and lead consultant of Carbon Lifecycle Technology Consulting in Houston.

"They're getting real time geosteering data from long reach horizontal wells," he said, "and it's important to discover the relationships between the stratigraphic position of the lateral and the completion and hydraulic fracturing information."

> **Data management needs evolved principally because of differing types of acquired data compared to other types of plays.**

A Critical Need

Kozman, who presented the paper "Emergence of New Data Types in Unconventional Plays" at the recent AAPG International Conference and Exhibition in Calgary, Canada, partnered with geo-navigation specialist Horizontal Solutions International to devise strategies for centrally managing stratigraphic position data so they could be distributed out to geotechnical professionals.

"In some cases this was also driven by the fact that there are a lot of consortia in the shale plays now, so a company not only needs to distribute information internally, but to determine what data are to be shared between partners in certain operating areas," Kozman said.

"There was a need to work with things like entitlements and shared data bases," he added, "and a lot of these companies didn't have IT staff or data management departments used to working with these kinds of sophisticated delivery systems."

Kozman said new data types they discovered that needed to be managed include True Stratigraphic Position (TSP) of a horizontal wellbore relative to a drilling target. Others have become more critical as specific plays mature, such as the geospatial location of water takeout and disposal locations for hydraulic fracturing.

The TSP log is a new data type that represents positive or negative deviation from the drilling target. It's the relationship between the position of the wellbore and the stratigraphic target – and the analysis of that in real time as the well is being drilled.

"There's not a standard or accepted way to store that information in a lot of geotechnical applications people are using," Kozman said. "We had to calculate that value on the fly.

"The significance for shale operators is the success or failure of a given completion and hydro fracture set for one of these fracs they might run in a horizontal well," he said.

"The success of a particular fracture could be dependent not only on the location relative to the drilling horizon but whether the wellbore is traversing it going updip or downdip in the particular section when they ran that frac," he added.

"That information doesn't lend itself to a lot of current data models."

Merged Information

Horizontal wellbores often run thousands of feet, and the current modus operandi in the shales is to perform multi-stage fracs at intervals along the borehole.

"Operators discovered that to identify better zones to complete they needed to understand not only where the zone was relative to the drilling target but how the wellbore was traversing the zone," Kozman said. "This has an impact on production and decline rates.

"That relationship between TSP and initial production data had been kept in two completely different applications," he noted. "We came up with a way to merge that information in a single map view and wellbore cross-section so the geologists and completion engineers could work together (on) the best way to complete the well."

The solution is a combination of geosteering software and data management tools and strategies to manage the data in real time as they're coming from the well.

"It's a combination of software and services," Kozman noted, "with the solution being 20 percent technology and 80 percent process."

"It's a smaller scale application of all the best practices and lessons learned that have been developed with the larger oil companies over the last decade or so."

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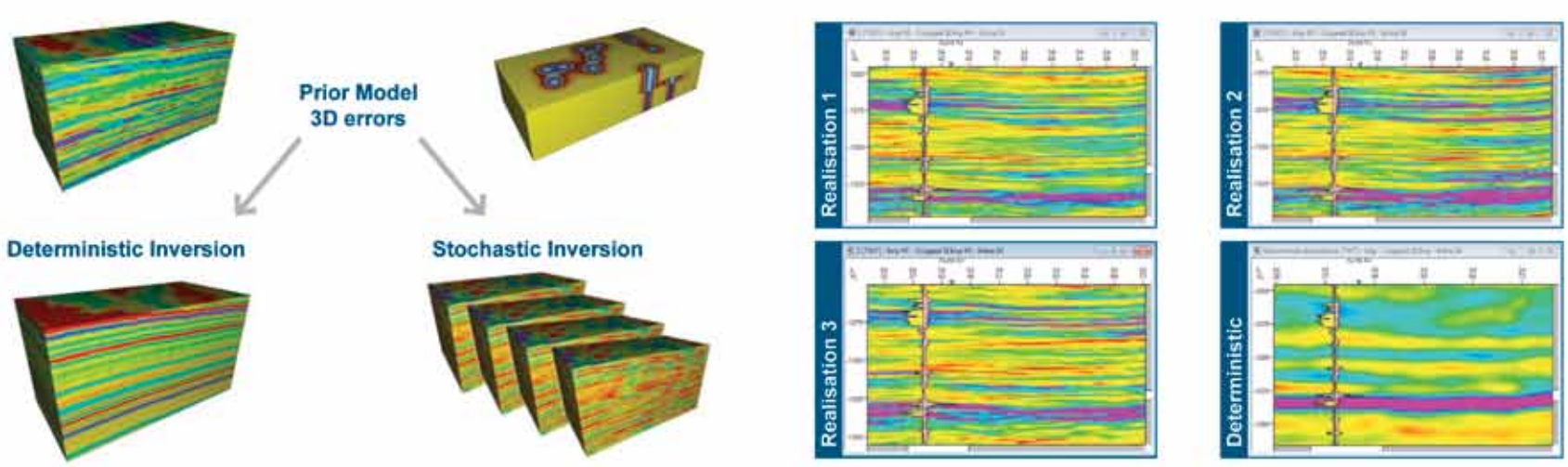

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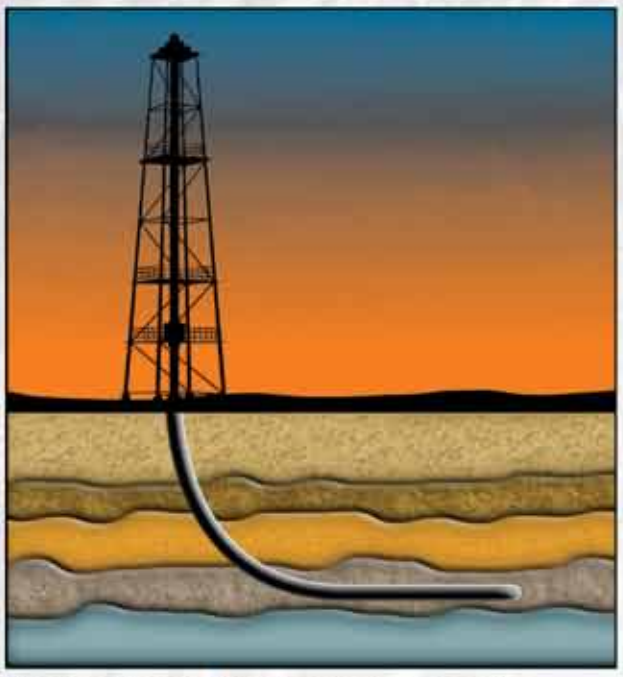

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Consortium eyes 'NeoBakken'

Niobrara Joins the List of Hot Shales

By LOUISE S. DURHAM, EXPLORER Correspondent

As shale plays go, the Niobrara shale is the newest big – and lucrative – thing.

The red hot Niobrara play is even being called the "NeoBakken" in some quarters, suggesting its potential is on par with the prolific Bakken shale oil play.

"The Niobrara is present all over New Mexico, Colorado, Wyoming, Kansas, Montana, North and South Dakota," said Denver-based AAPG member Randy Ray. "It covers a gigantic area, so there's plenty of areas to prospect.

"The Niobrara is part of the Cretaceous seaway that covered the whole middle of the U.S," he added. "We've had cycle after cycle of exploration for Niobrara fractures, mainly oil but some gas where it's deeper."

For the industry folks, lightening struck in 2009 in the form of EOG's #2-01H Jake well in the Denver-Julesburg (DJ) Basin. The strike ignited the Niobrara play.

The well was reported to yield an average of 555 bopd during the first three months of production. A typical new oil well in the DJ basin would tally 100 to 150 bopd.

"When EOG released the information, I think everyone was shocked at the production being so big," Ray said. "We all knew oil was there, but no one pursued it with the new horizontal drilling and staged fracs that were fine-tuned in all the shale gas plays.

"In fact, it's a result of these technologies that you can now make the Niobrara economic," Ray emphasized. "We've always gotten oil shows out of the Niobrara all over the Rockies."

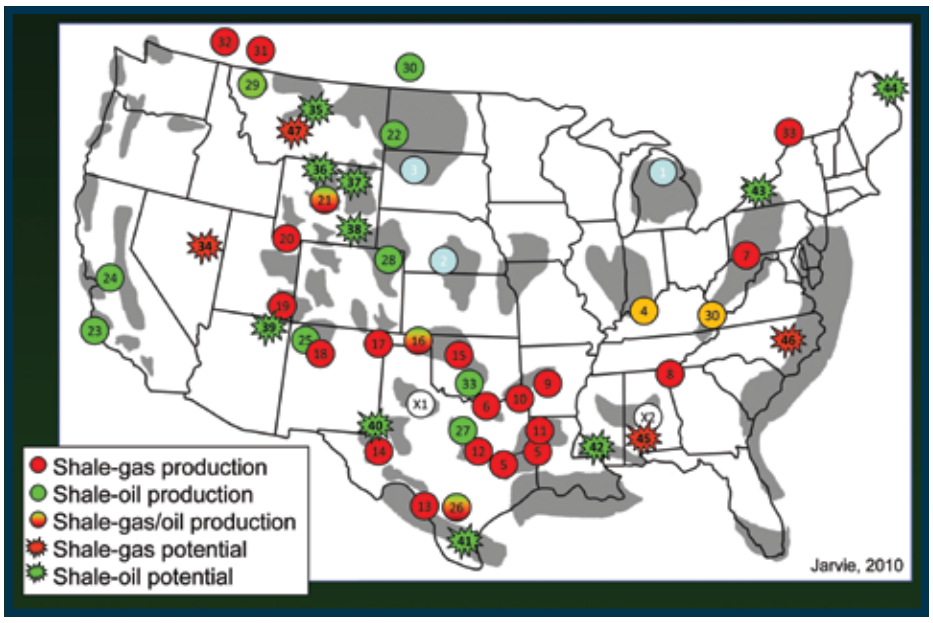
Help Is On the Way

The formation has a unique fault and fracture pattern mainly because it's so brittle, according to Ray. He likened it to a brittle sandwich, with a limestone facies between organically rich shale zones that source the crude.

"There's definitely something different about the fault and fracture pattern in the Niobrara that's not in units above or below," he said. "You see evidence of this unique characteristic in surface outcrop exposures and on seismic lines."

Specifics can depend on location.

"The reservoirs are interbedded with shales, and in the Denver (DJ) Basin there are four main chalk intervals and three main source bed intervals in the Niobrara," said AAPG past president and Honorary Member Steve Sonnenberg, geology professor at Colorado School of Mines. "There's a fourth source bed interval that sits on top of the Niobrara that's part of the lower Pierre shale that's called the Sharon Springs."



Rocky Mountain highs: The top photo shows a rig drilling a wildcat Niobrara well for El Paso in Park County, Colo., southeast of Fairplay in the South Park Basin, an intermontane setting at about 9,000 feet of elevation. The lower photo shows an outcrop of the "A" chalk; one geologist called the Niobrara's unique fault and fracture pattern a "brittle sandwich, with limestone facies between organically rich shale zones that source the crude."

Getting up to speed on the complexities of the self-sourced Niobrara may not be as difficult as you think.

Help is on the way in the form of an industry-sponsored Niobrara consortium being assembled under the leadership of Sonnenberg. He will run the project with assistance from the School of Mines geology professors, Rick Sarg and John Humphrey, along with geology professor Matt Pranter at University of Colorado.

All are AAPG members; Sarg also has been an AAPG Editor (Memoir 81) and past Distinguished Lecturer.

"The Niobrara is an underexploited petroleum system consisting of really rich source rocks with total organic carbon content between 3 and 8 percent in areas, and the reservoir rock primarily being limestone or chalk intervals," Sonnenberg said.

He elaborated further, noting the formation demonstrates facies changes that range from limestone and chalk in its eastern end to calcareous shale in the middle and eventually transitioning to sandstone further west. Depth and thickness are highly variable.

"During the project, we'll address key stratigraphic and structural controls on reservoir distribution, heterogeneity and produceability for this Niobrara interval," Sonnenberg said. "We want to understand the reservoir rocks and also understand the source rocks associated with the Niobrara, the maturity levels, the total organic carbon content in the Niobrara knowing its regional distribution."

The research effort will include a combination of outcrop and subsurface study.

"We'll be developing and looking at the outcrops to look at the reservoirs and also the source rocks and also the types of fractures as they're exposed in the reservoirs and take that work into the subsurface," Sonnenberg said.

Close to the Edge

The consortium will be comprised of perhaps 15 companies, and the program will involve a number of student participants, with several already at work.

"We have confidence in offering support to the program," said Mike O'Shaughnessy, president and CEO of consortium member Lario Oil & Gas in Denver. "It will be a benefit for us and for the participating students – it's a win-win."

When queried about the company's interest in unconventional plays,

See **Niobrara**, page 22

Andaman, Madagascar, Trinidad

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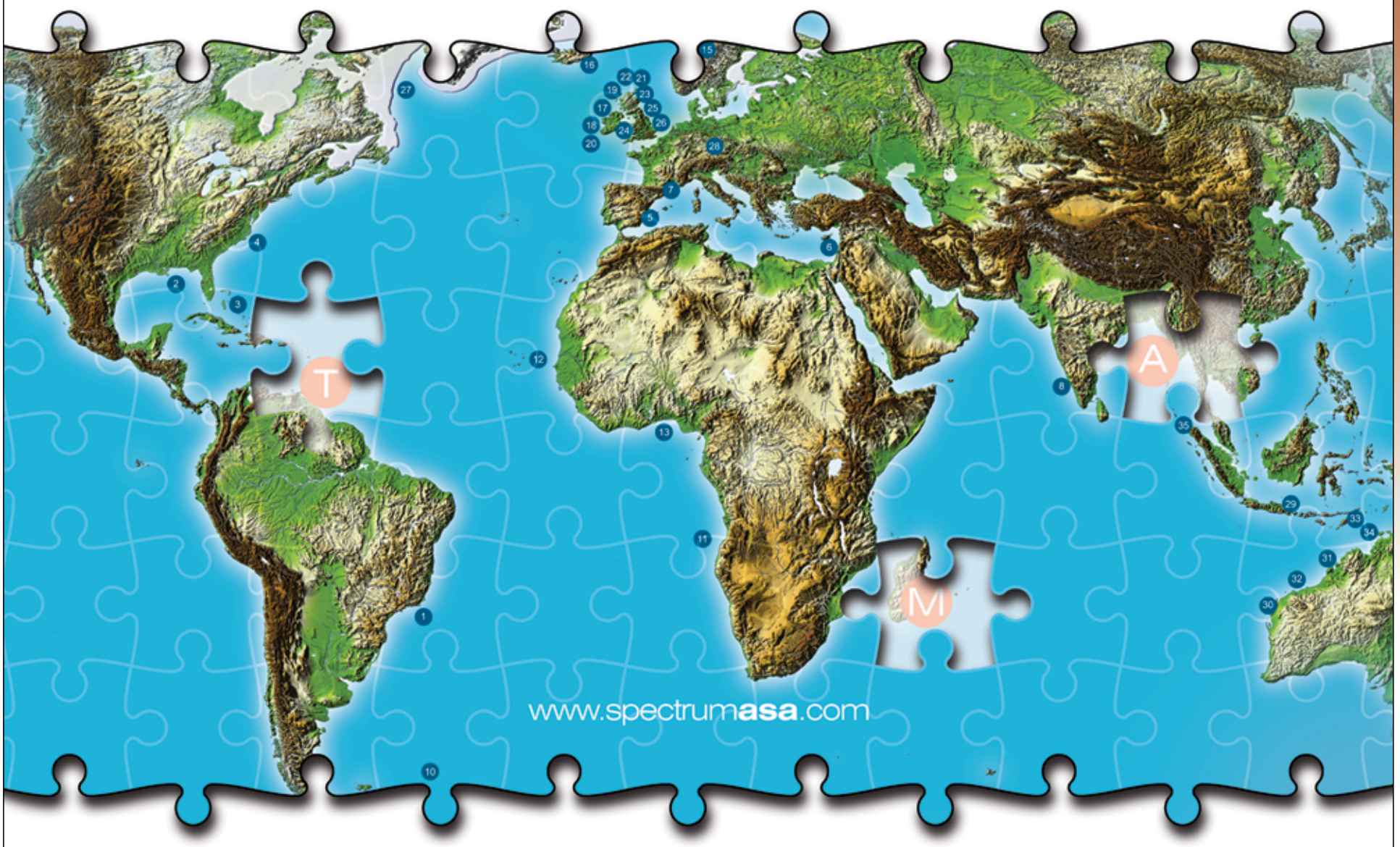

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Trinidad & Tobago:

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The 12,472 km project will be processed with state-of-the-art processing techniques and will be available in mid 2010.

Madagascar:

Spectrum has signed an agreement with OMNIS (Office des Mines Nationales et des Industries Stratégiques), to reprocess various seismic surveys offshore West, South and East coasts of Madagascar.

The surveys have a total length of approximately 6,000 line km and will be available mid 2010.

The Andaman Islands:

Follows the highly successful reprocessing of West Coast India data and forms part of Spectrum's continuing commitment to the promotion of exploration in the Indian sub-continent.

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A Niobrara outcrop about midway between Boulder and Lyons, Colo.; basal dip slope is of the Fort Hays Limestone, and the basal Niobrara "C" chalk makes up the "cliff."

Photo courtesy of Steve Sonnenberg

Taking a "legendary" Niobrara field trip were Rocky Mountain legendary geologists (from left) Robert Weimer, Bob Coats, John Haun and the late Fred Meissner. Weimer, Haun and Meissner are all Sidney Powers medalists.

Niobrara

from page 20

O'Shaughnessy cut to the chase.

"We like the idea of not drilling dry holes," he said.

Oil likely courses through this man's veins considering that his grandfather, I.A. O'Shaughnessy, founded the company in 1916, later incorporating it in 1926 in Wichita, Kan.

Operator and prospect generator Lario is proof positive that smaller companies have the moxie and the know-how to go after the big plays. The company has honed considerable skills in the Barnett and Woodford shales and particularly in the Bakken play where it has more than 300 wells.

AAPG member and Lario development geologist Jeff Ware summarized the types of companies who have jumped into the Niobrara action:

- Those in other resource plays like the Bakken and applying what they learned there.
- Companies who missed the Bakken are heavily gas-weighted and need to get oilier and see the Niobrara as the perfect place.
- Companies who are there by good fortune, such as Noble and Anadarko, who have hundreds of thousands of HBP acres that happen to be in a good place where the Niobrara is developing right under their feet.

Lario has latched onto 24,000 acres net in a solid block on the southeast part of the Wattenberg Field in the DJ Basin where the Niobrara is about 8,000 feet deep.

"We haven't drilled wells there yet," O'Shaughnessy said. "We anticipate drilling a science well, which will be a vertical well that will cut core and log and maybe be used on a microseismic monitor in 2011 and be positioned so it will be a standalone vertical with offsetting horizontal wells.

"We'll use the vertical wellbore to monitor the fractures using microseismic," he noted.

Many Bakken wells have been drilled without the benefit of 3-D seismic, but the Niobrara is a different game.

"We think 3-D will be key to the economic success in the Niobrara," Ware said, "because the rock is so much more broken up, more faulted and fractured in the reservoir itself.

"We're doing more things there that aren't necessary in the Bakken, such as signing contracts for aeromagnetics and getting bids on specific designs for 3-D," Ware noted.

He said they think the edges of the Niobrara will be the best parts of the play just as in the Bakken.

"If you can catch an updip edge where the thermal maturity has stopped, we think those will be the sweet spots," Ware said. "We went after an updip edge, as are others, that we believe is the end of thermal maturity."

Leasing action in the play has slowed from the earlier frenzy, but leasing overall is a good indicator of just how hot a play is or will become.

"In terms of how important a play has become, we tend to always monitor plays in terms of acreage cost or how much excitement there is," Sonnenberg said. "Two years ago you could lease at probably $50 an acre, and now a lot of it is a thousand dollars an acre in prospective areas." E

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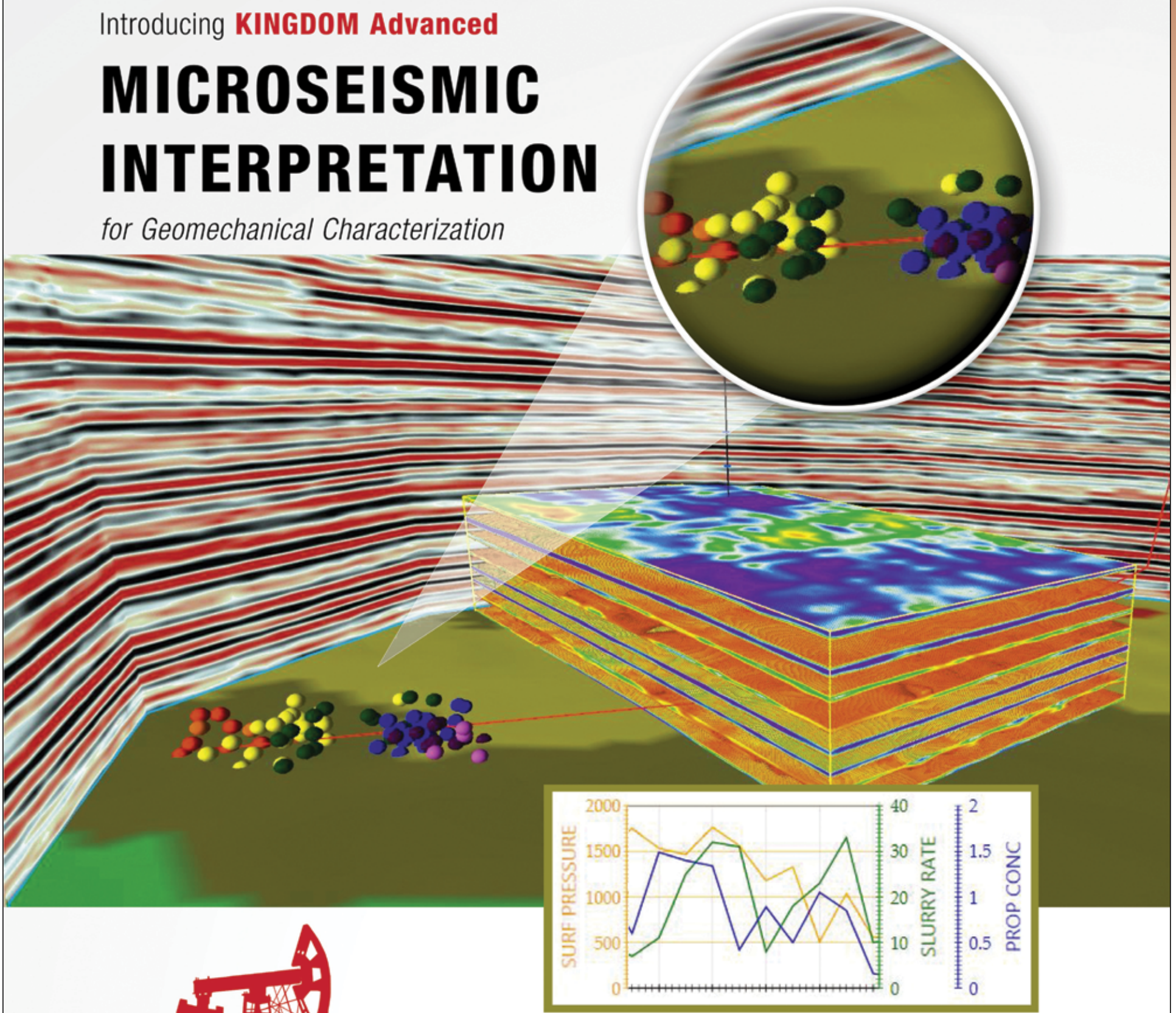

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Reading the hieroglyphics of maturation

One-Run Kinetics Give a 'Quick History'

By DAVID BROWN, EXPLORER Correspondent

Under the right circumstances, single-run kinetics can be a home-run method of understanding source-rock maturity.

The technique was developed by AAPG member Doug Waples, consultant in Evergreen, Colo.

Kinetics analysis gives the exploration geologist a view of the maturation history of source rocks in a basin. It's done by pyrolysis, a technique that involves heating rock samples to determine their maturity and the type of kerogen they contain.

If several pyrolysis runs are carried out on a single source-rock sample at different heating rates, kinetic parameters can be determined for the sample.

> "A database fell into our hands ... The caution is, not every database is as carefully preserved as this one was."

But this traditional method of determining kerogen kinetics is slow and expensive, and thus only small amounts of kinetic data are normally acquired.

Waples devised a method of conducting kinetic analysis using one Rock-Eval pyrolysis run per sample – a lower-cost method that can either enable one to measure kinetics even on a limited budget, or on a normal budget to acquire much more data.

At the recent AAPG International Conference and Exhibition in Calgary, Waples presented a paper in which he described an extension of one-run kinetics concept to extract kinetic parameters from existing pyrolysis data without performing new laboratory analyses.

In addition to providing even greater cost savings, the new approach has obvious logistic advantages, since it doesn't require access to rock samples.

Call it a super-efficient way to develop kinetics information.

Waples said he became interested in geochemistry after studying chemical kinetics at Stanford University. He was working at Chevron's laboratory in La Habra, Calif., when he began applying kinetics to geochemical processes.

The key to one-run kinetics, according to Waples, is to use a fixed A frequency factor. Not only does that simplify the analysis, it also eliminates values that are "thermodynamically impossible," he said.

"By defining the activation energy, you accomplish two important things. You can do the kinetic analysis in one run and you don't have an A value that can hurt you," Waples said.

"One danger of traditional kinetics is that the A values are chosen mathematically, with no regard for the laws of chemistry and physics, and are thus sometimes quite wrong," he added.

Applied to an area of the Mexican Gulf of Mexico, one-run kinetics allowed Waples and his Pemex colleagues Alfredo Vera and Jorge Pacheco to challenge the prevailing geological interpretation.

"Everybody had concluded there was only one organofacies but two lithofacies with an inner ramp and an outer ramp. What we discovered was there actually were two organofacies," he said.

With a set of existing pyrolysis runs from the Bakken Shale in the Williston Basin of North Dakota, Waples had the opportunity to extend one-run kinetics to archived data.

"A database fell into our hands and we were wondering what to do with it," he said. "The caution is, not every database is as carefully preserved as this one was."

Working the Bakken

That dataset of several thousand pyrolysis analyse was given to Platte River Associates in early 2000 by the U.S. Geological Survey. Platte River's intention was to utilize these data in both software testing and better Bakken understanding for modeling.

AAPG member Robert Coskey, president of Rose Exploration Inc. in Denver, described the Bakken kinetics work during AAPG's Calgary meeting, in a talk titled "Spatial and Temporal Maturity Variations of the Bakken Shale Using True Kinetic Parameters," prepared by AAPG members Jay Leonard and Mohamed Said along with himself and Waples.

See **Kinetics**, page 26

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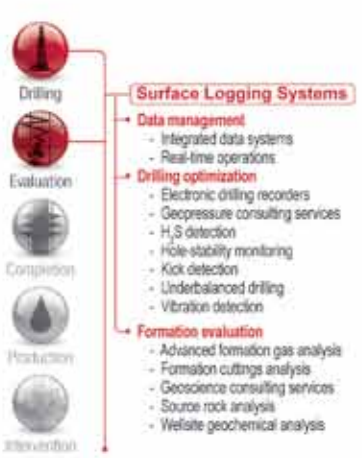

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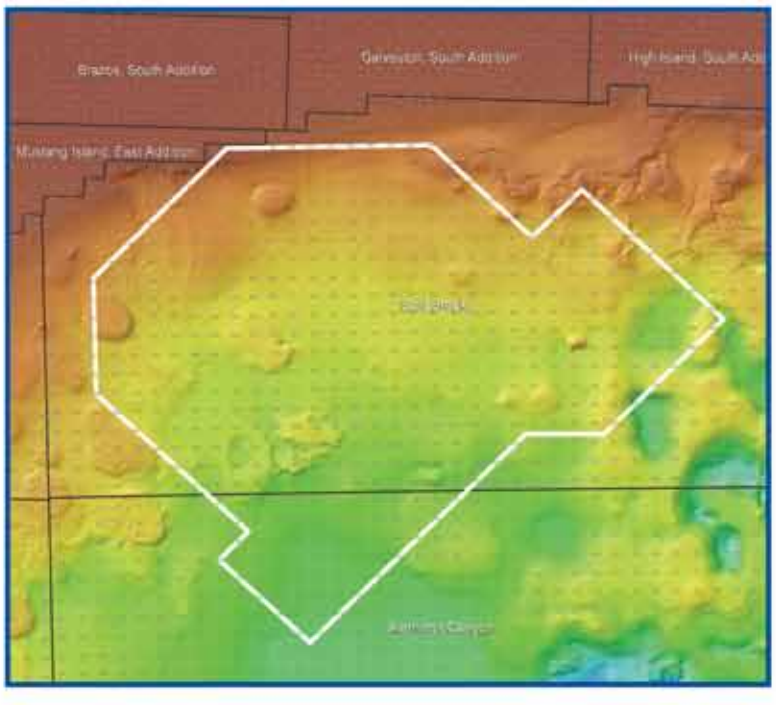

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Kinetics

from page 24

Coskey, in describing the exploration potential of the Bakken kinetics, said the existing data set included about 200 pyrogram records, out of which about 180 were used in the kinetics analysis.

"Platt River Associates was just very fortunate to salvage that data set from work that Leigh Price at the USGS was doing at the time," he said.

Using Waples' one-run kinetics analysis, the authors were able to identify and characterize the more thermally mature and less mature areas of the shale play.

"You could see how the activation energies increased as you moved from the less mature parts of the basin to the more mature part," Coskey noted.

> "To me, the new kinetics Doug came up with show that the Bakken matured earlier than we thought, and more rapidly."

"Observations of this rate through both space and time provides valuable insights to identification of future Bakken sweet spots," Leonard commented. "We believed that the kinetics information would highlight the subtle differences of generation."

Rock-Eval pyrolysis is used to determine several properties of source rock, including:

- S1, the amount of free hydrocarbons in a rock sample.
- S2, the amount of hydrocarbons generated through thermal cracking of kerogen (nonvolatile organics) in the sample.
- S3, the amount of carbon dioxide produced during pyrolysis of the kerogen.
- Tmax, the temperature of maximum S2 production, or the temperature at which the maximum release of hydrocarbons from cracking of kerogen occurs.
- The Hydrogen Index or HI, a derived measurement of the hydrogen richness of the rock, used for distinguishing kerogen type.

With Waples' method, "you could under the right circumstances get a double bang for your buck. You get the geochemical data, the S1-S2-S3 data, and by running the program you get a look at the kinetics," Coskey said.

In this case, Coskey described the most mature Bakken Shale as having a HI of less than 100, Tmax of greater than 445 and total organic carbon (TOC) of less than 8 to 10 percent.

Some findings were surprising. In thermal evaluation, the Tmax range of the mature oil zone is usually greater than 435 degrees to 450 degrees Celsius.

"What we found out – and the ground truth seems to prove this out – is that even at a Tmax of 430 you're generating substantial amounts of oil" in the Bakken, Coskey said.

Geologists generally see high TOC as a favorable sign in shale plays. But lower TOCs can be expected in the mature areas of a play, as found in the Bakken example.

"Some of the TOCs I've seen are well over 30 percent by weight, which is 50 percent by volume. By the time you get to the mature part of the basin, it's 8 to 10 percent," Coskey said.

Since kinetics involves not only the effects of temperature but also time, Coskey was able to develop a better understanding of the basin's burial history.

"It appears that the cooking pot is wider than we originally thought," Coskey said.

"We never had any real Bakken kinetics before," he added. "To me, the new kinetics Doug came up with show that the Bakken matured earlier than we thought, and more rapidly."

Leonard points out that the PRA geologic burial history modeling shows that the additional exposure to heat during rapid burial, coupled with the thermal blanketing effect of the Pierre Shale, override the lower activation energy prediction of the new kinetic model. The net results were that the timing of oil generation did not change significantly between the new single run kinetics and the older Lawrence Livermore Type II kinetics.

However, with a different, slower rate of burial the effect could be quite different, Leonard said – and the generation time issue may result in a structure being charged, or not, depending on the timing of structures and oil generation.

A Valuable Tool

Waples developed the idea of one-run kinetics 10 years ago and introduced the concept in a paper published in 2001-02. The industry response was ...

Underwhelming.

"No one other than me has used archived data, to my knowledge. And few people have done one-run kinetics," he said.

"It's kind of leading edge," Coskey acknowledged.

"What he's doing differently is processing that S2 curve to come up with a mean activation energy for each of those samples," he said.

As of now, Waples said, the only lab with a history of conducting his one-run kinetics evaluation is StratoChem Services in Cairo (the one in Egypt, not Illinois).

And there are some caveats involved in the approach.

One-run kinetics makes the biggest contribution "if you've got something where there's a significant variation in maturity across your area," according to Waples.

When using existing data, the records

See **One-Run**, page 49

Gorontalo Basin

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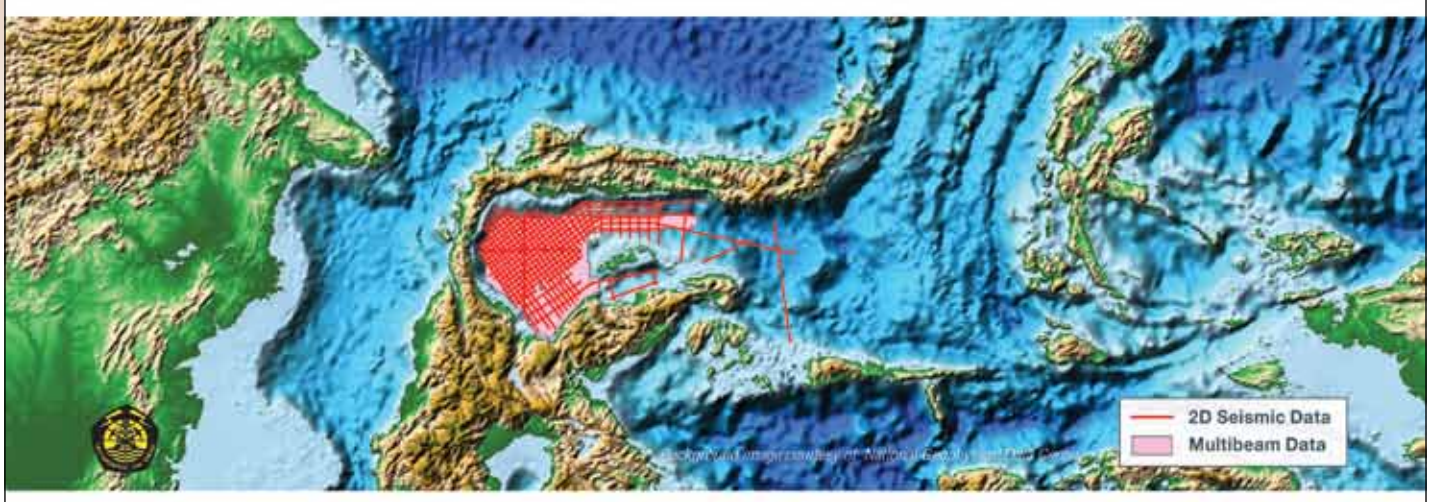

Located in the northern part of the Indonesian island of Sulawesi, The Gorontalo Data Package is a joint project between Searcher, Fugro and TGS. The Data Package has extensive geoscientific data coverage to aid in assessing this frontier area.

The Gorontalo Basin is a large, unexplored basin with evidence that an active petroleum system is in place:

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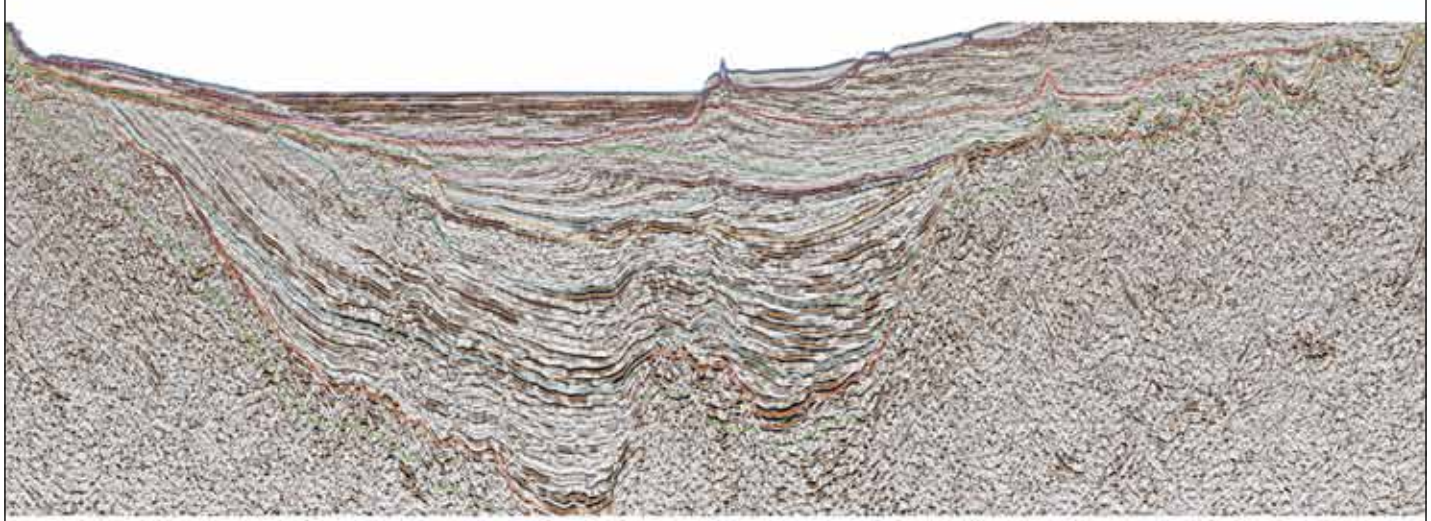

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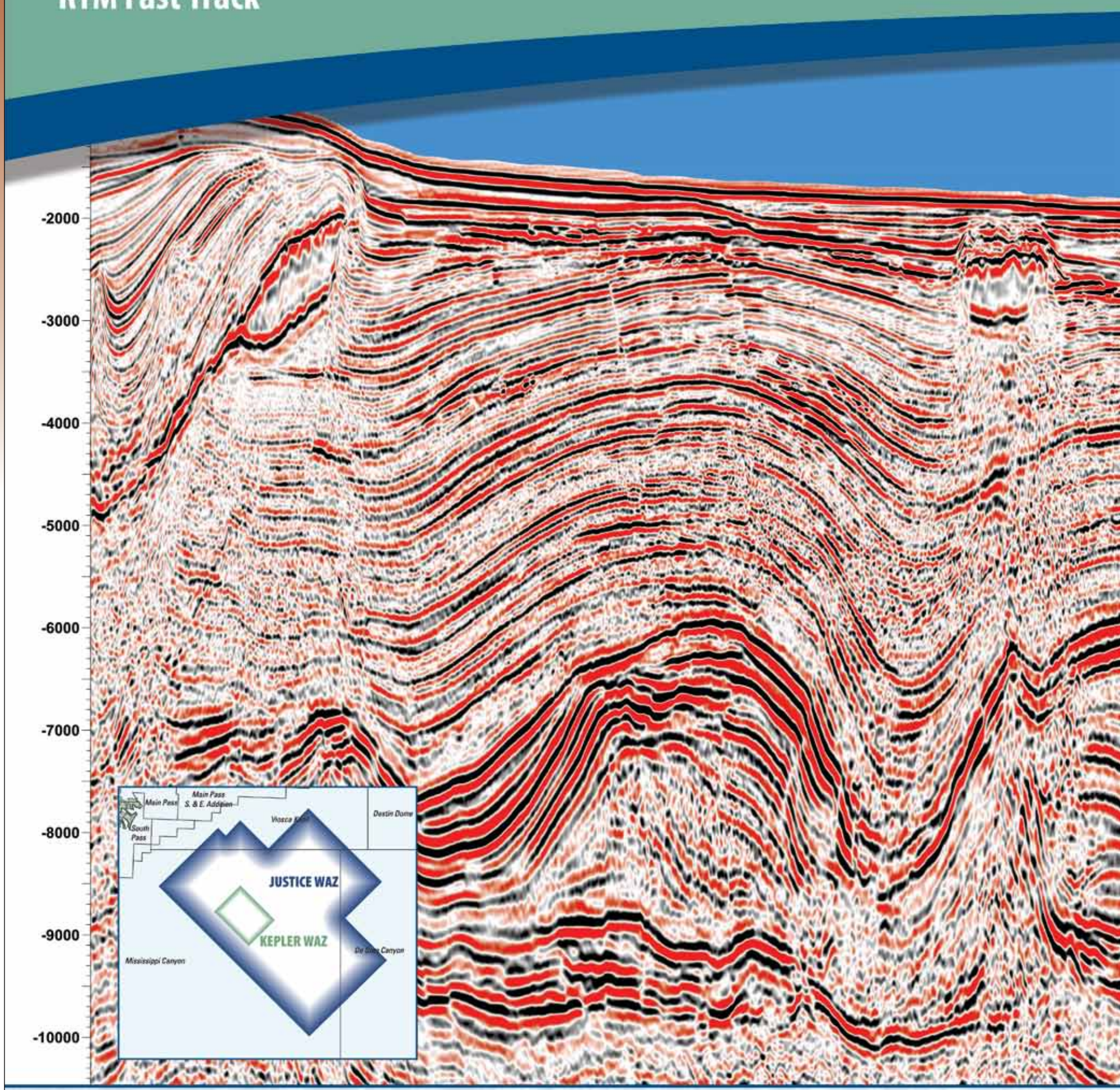

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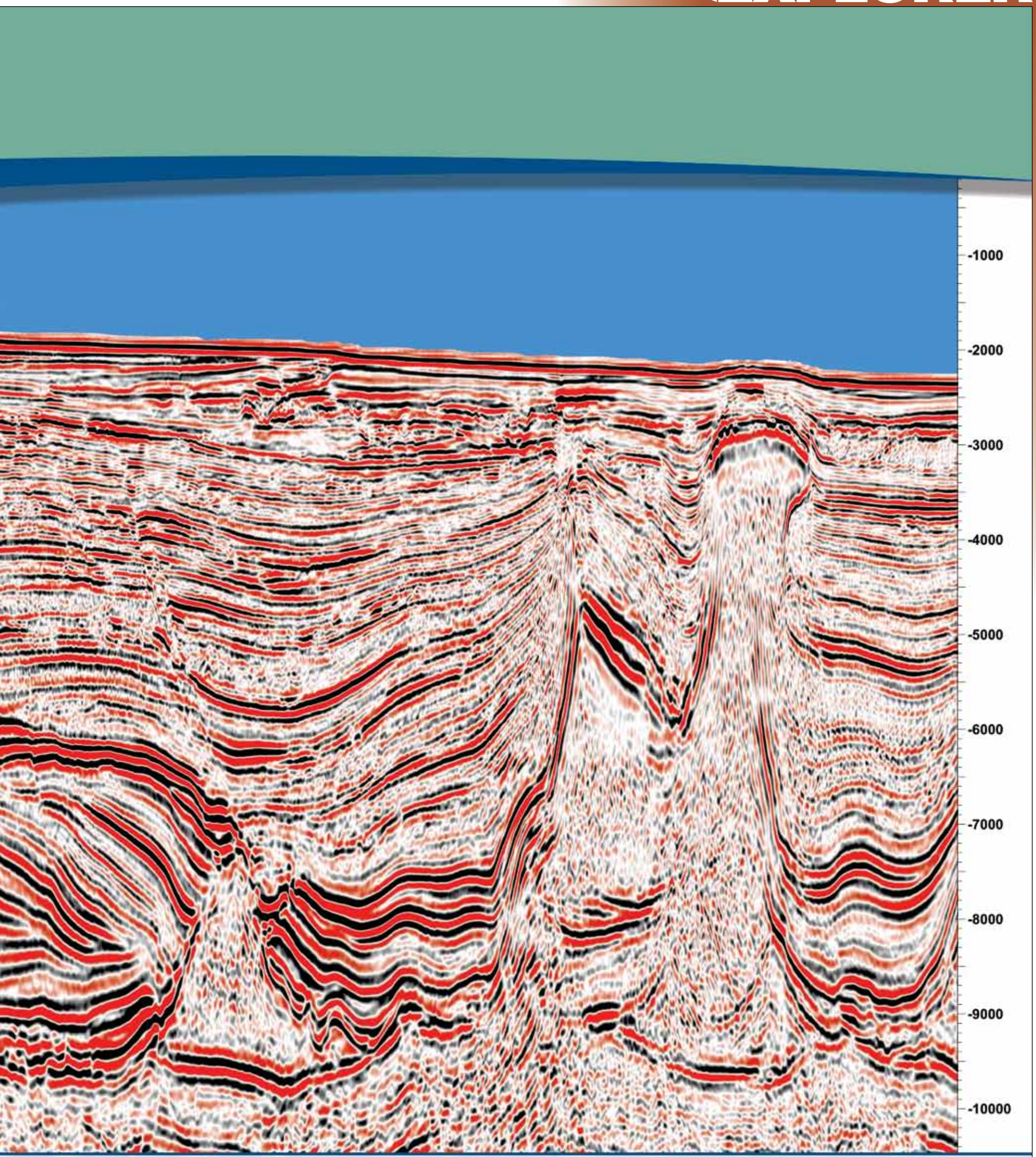

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GeoFORCE a 'Hands-On' Inspiration

By BARRY FRIEDMAN, EXPLORER Correspondent

Some people talk about how important it is to introduce young students to the wonders of geology.

Some people actually walk the talk.

GeoFORCE, an AAPG Foundation-supported program that began in southwest Texas but already shows a potential for global impact, is a pre-college program that provides a welcome mat to the world of science for middle and high school students.

Its goal is to encourage underserved yet talented and committed students a chance to pursue education – and, perhaps in a perfect world, careers in science.

And maybe it aspires to something even higher.

To Doug Ratcliff, the program's director of outreach, GeoFORCE contributes not only to the advocacy of science but the transformation of lives.

"The strength of GeoFORCE," Ratcliff said, "is its ability to give students a powerful and memorable experience that has a lasting impact on their lives."

This is done, he says, by the GeoFORCE experience, which he describes as intensive.

"The ongoing nature of the program – every summer for four years throughout high school – is critical," he said, "with spectacular field trips to emphasize science learning and exciting travel to new environments."

GeoFORCE is run by the Jackson School of Geosciences at the University of Texas at Austin. Its intent is to increase the number and diversity of students pursuing degrees in math and science, especially the earth sciences.

A whole new world: tenth grade GeoFORCE students – comprising honor students from predominantly minority regions of southwest Texas – experience the Grand Canyon.

Specifically, GeoFORCE takes high school honor students from predominantly minority regions of southwest Texas and the Houston area on geological field trips across the country to educate and excite them about science.

Each summer for four years, students travel to different sites – some as close as Austin, Uvalde and Port Aransas, and some as far away as Florida, Washington, D.C., and Oregon.

AAPG Foundation Help

Before a program can motivate students, and before it can show them the wonders of science, it first needs to find those students whose DNA is conducive to such a relationship.

"GeoFORCE identifies high achievers in math and science at the eighth grade level and then provides the students with a four-year series of work-and-reward activities that motivates them to excel in school and builds their awareness of opportunities in math and science," Ratcliff said.

Why this is important is both obvious and worth repeating – both on an individual and societal level.

"The U.S. economy is dominated by technology," he said, "with roughly half of economic growth over the last 50 years attributed to scientific innovation."

The problem, as he and others have pointed out, is America is losing its edge in global innovation. The future is not bright. According to Ratcliff, math rankings of U.S. 15-year-olds compared to other developed countries now place us at position number 28.

GeoFORCE, he believes, is part of the answer.

"The program is designed to improve this situation by providing spectacular, multi-year, science learning experiences," he said.

With everything from notebooks to airfare, chaperones to tuna sandwiches, cameras to field guides, a program that takes students to the Grand Canyon can get expensive.

The AAPG Foundation, which places a priority on geoscience education, has contributed $10,000 annually for the past three years (to the program).

Moreover, Ratcliff says that having

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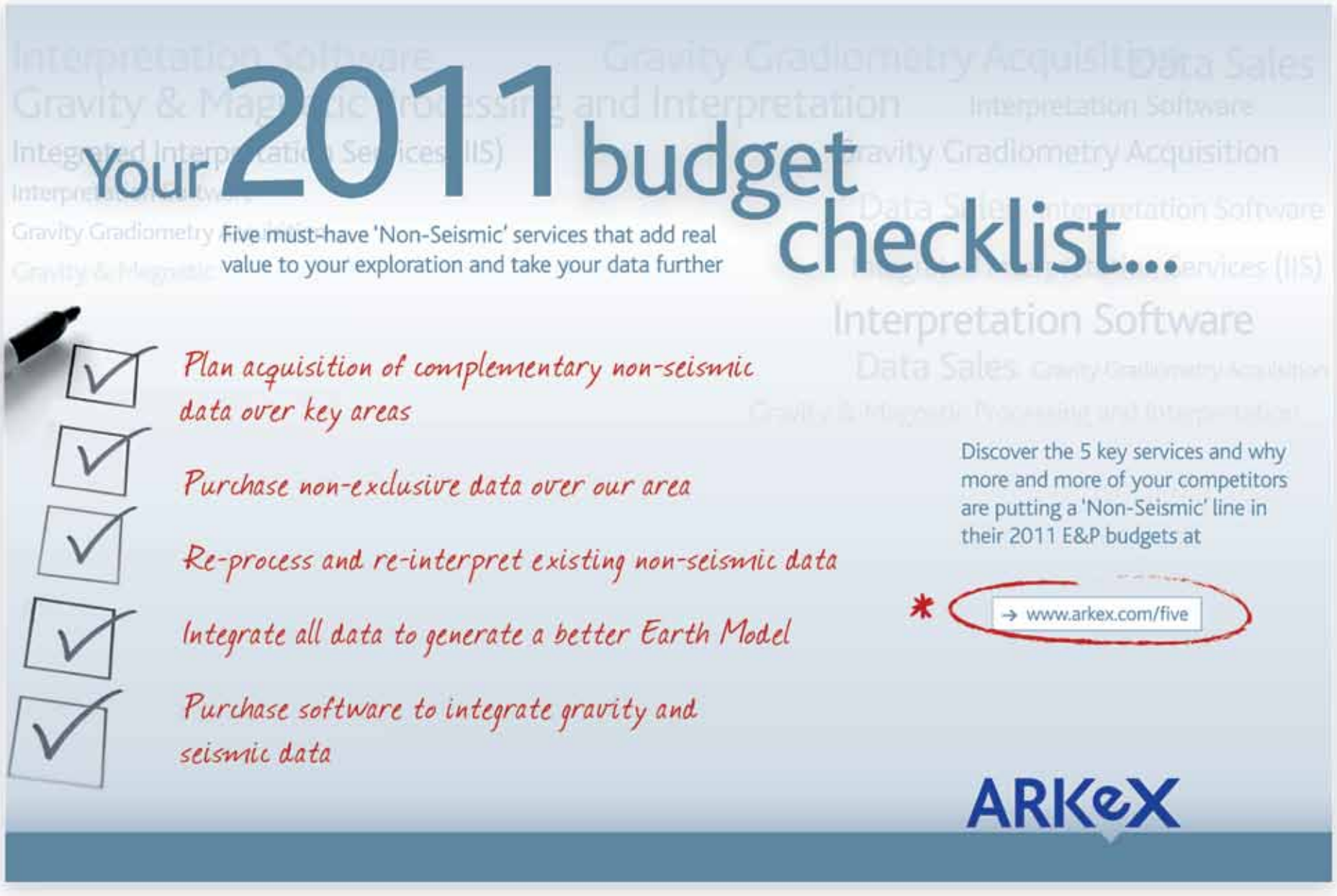

Continued from previous page

the AAPG Foundation onboard acts as a catalyst for attracting industry support for the program.

In fact, 17 energy companies as well as state and federal agencies have provided additional contributions as well over the program's six-year life.

Ratcliff wants to emphasize the key to the success of GeoFORCE is that it is a hands-on experience – and not based solely in the classroom.

"We have learned that one effective way to excite and engage young people is to immerse them in geologic experiences that spark their imagination, inspire their academic development, and broaden their perception of the world."

Adventures in (Geologic) Wonderlands

Students in the program participate in summer field sessions, or "academies," which occur every year throughout their high-school education, with each academy building upon the previous year.

The academies include two-day to week-long study at the University of Texas, as well as discovery experiences and field trips to places such as Mount St. Helens, the Florida Keys, the Guadalupe Mountains and the Grand Canyon.

It is these summer programs, Ratcliff said, which define the program.

"The heart of the GeoFORCE program is the summer field trip experience," he said, "with each year progressing from the simple to the more complex."

The program includes:

- Year One: Ninth grade – Trips start in Florida, where students see a variety of sedimentary processes in action, and visit the Gulf Coast and the Florida Keys.
- Year Two: 10th grade – Students are taken to the Grand Canyon to see sedimentary rocks and to discuss geologic time.
- Year Three: 11th grade – A trip to Oregon, focusing on volcanoes and plate tectonics; students also visit the Pacific Ocean.
- Year Four: 12th grade – The year takes place in the Appalachians, where the students encounter deformation processes like folding and faulting. They conclude in Washington, D.C., with visits to the Smithsonian and the U.S. Geological Survey.

"By the end of the program students have a strong grounding in Earth sciences," Ratcliff said.

Young geoscientists also take similar, though shorter trips. In general, each trip has 40 students, a professor, an educational coach, a geologist from a sponsoring company, a coordinator, a trail driver and six counselors.

Mining the Urban Canyons

The program, which now boasts 700 students, expanded recently to the inner city Houston area, which presented a new set of challenges.

"Houston demographics are not the same as the Southwest region," Ratcliff said. "The public school population of southwest Texas is rural and 85 percent Hispanic, with very few African Americans. The Houston public school population is urban, 53 percent Hispanic, 28 percent African American and 8 percent white – with a sizable Asian population and some Native Americans. More than a third of the Houston participants are African American."

And while outreach was and is the goal, standards stay high. Students must maintain a B average in all GeoFORCE work to continue in the program.

And they are.

One hundred percent of students in the GeoFORCE program achieved college readiness test scores, as opposed to 29 percent for non-GeoFORCE students in the region.

According to program statistics, 90 percent of the inaugural group of 80 GeoFORCE students were accepted into junior colleges, colleges and universities, with 63 percent majoring in science, engineering or math – and not only did 23 of them become students at the University of Texas, but five of them are pursuing majors in the Jackson School of Geosciences.

Clearly, the circle was unbroken.

"Of course, having these students attend UT (is) a bonus to our program," Ratcliff added.

U.S. Geological Survey geologists give ninth grade GeoFORCE students a lesson on the geology at Harpers Ferry, West Virginia.

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Geokinetics

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 third in a four-part series on 3-D seismic design.

Next Step: Is Stacking Fold Acceptable?

By BOB HARDAGE

This article is the third of a four-article series – the topic this month considers Part 3 and Part 4 labeled on the figure 1 flow chart of 3-D seismic design methodology.

Stacking Fold

Stacking fold is the number of field traces that are summed during data processing to create a single image trace positioned at the center of each bin.

HARDAGE

At any stacking bin coordinate, the stacking fold inside the bin varies with depth. Referring to figure 2, when a stacking bin is centered about a deep reflection point B, the stacking fold is a maximum at depth B because the largest number of source and receiver pairs can be utilized to produce individual reflection field traces inside the bin.

The number of source-receiver pairs that can contribute to the image at B is typically confined to those source and receiver stations that are offset horizontally from B a distance that is no larger than depth Z_2 to reflection point B.

Thus, distances CE and EG shown on figure 2 are each equal to Z_2.

Using this offset criterion to determine the number of source-receiver pairs that contribute to a seismic image at any subsurface point, the stacking fold at depth Z_2 would be N_2 – because N_2 unique source-receiver pairs can be found that produce distinct field traces reflecting from point B.

When the stacking bin moves to a shallower depth Z_1, the stacking fold decreases to a smaller number N_1 – because only N_1 source-receiver pairs generate field traces that reflect from A and still satisfy the geometrical constraint that the source-receiver pairs are offset a distance DE (or EF) or less that does not exceed depth Z_1.

In a 3-D context, stacking fold is the product of in-line stacking fold (the fold in the direction that receiver cables are deployed) and cross-line stacking fold (the fold perpendicular to the direction that receiver cables are positioned).

Defining F as 3-D stacking fold, F_{IL} as in-line fold and F_{XL} as cross-line fold, this principle leads to the design equation:

$$(1)\ F = F_{IL} \times F_{XL}.$$

To build a high-quality 3-D image, it is critical to not only create a proper stacking fold across the image space but also to ensure the traces involved in that fold have a wide range of offset distances and azimuths.

Equation 1 provides no information about the distribution of source-to-receiver offset distances or azimuths that are involved in a stacking fold. If it is critical to know the magnitudes and azimuth orientations of source-receiver offsets, then commercial 3-D design software must be used.

Offset analysis is a topic that goes beyond the scope of this discussion, which is structured to provide simple explanations of the basic principles of 3-D seismic design. All discussions of 3-D stacking fold will be based totally on equation 1.

It is the simplicity of this equation that makes it appealing to use to explain to non-geophysicists how stacking fold and 3-D recording geometry link together.

* * *

In 2-D and 3-D acquisition geometry, in-line stacking fold F_{IL} is a function of two geometrical properties:

- The number of active receiver channels.
- The ratio of the source-station interval and the receiver-station interval.

Specifically, in-line stacking fold is given by the equation:

$$(2)\ F_{IL} = (1/2)\ (\text{Number of receiver channels}) \times [(\text{receiver-station interval})/(\text{source-station interval})].$$

In 2-D seismic profiling, the source-station interval is usually the same as the receiver-station interval, making the ratio term in the square brackets equal to unity. However, in 3-D profiling, the source-station spacing along a receiver line is the same as the source-line spacing, which is several times larger than the receiver-station spacing.

For example, if the receiver-station spacing is 110 feet, and the interval between the source lines is 1,320 feet, then there is a source station every 1,320 feet along each receiver line – and the square bracket term in equation 2 has a value of (1/12).

The in-line fold for 3-D data acquisition is thus considerably less than it is for 2-D recording geometries. In this hypothetical example, it is 12 times less.

Cross-line stacking fold F_{XL} – created by a 3-D acquisition geometry – is controlled by the number of receiver lines that are incorporated into the 3-D recording swath and is given by:

$$(3)\ F_{XL} = (1/2)\ (\text{Number of receiver lines in recording swath}).$$

* * *

The last step in the 3-D design procedure (Part 4 of figure 1) is to compare the designed stacking fold with the predefined stacking fold that is desired.

A key question at this stage is, "How do you preselect a stacking fold that is appropriate for comparison?"

There are several ways to answer this question.

The ideal situation is to have access to 3-D seismic data previously recorded near the prospect area. If those data have good signal-to-noise character, then one should simply define the stacking fold that was used in recording these older 3-D data as being the stacking-fold objective for the new 3-D data acquisition program.

If the signal-to-noise character of these pre-existing 3-D data is not acceptable, a higher stacking fold should be considered.

If only 2-D seismic data are available in the area of interest – and these 2-D data adequately image the subsurface geology – a popular design guideline is:

$$(4)\ \text{3D stacking fold} = (1/2)\ (\text{2D stacking fold})$$

This is a statement of a commonly observed condition that 3-D stacking fold often needs to be only one-half the value of 2-D stacking fold to cause 3-D data to have equivalent signal quality.

If neither 2-D nor 3-D data are available, the only recourses are to ask advice of people who have recorded data in the area – or to guess.

If the calculated stacking fold is significantly different from the intended value of stacking fold, then the design procedure must be repeated. In this second iteration, one or more of the critical geometrical parameters (source/receiver-station spacings, source/receiver-line spacings or recording swath size) must be adjusted to cause the stacking fold to converge toward the desired value.

Because of the simplicity of the method described in this article series, designs can be iterated easily and quickly.

Next month: The use of the even-integer rule for specifying the exact dimensions of a recording swath.

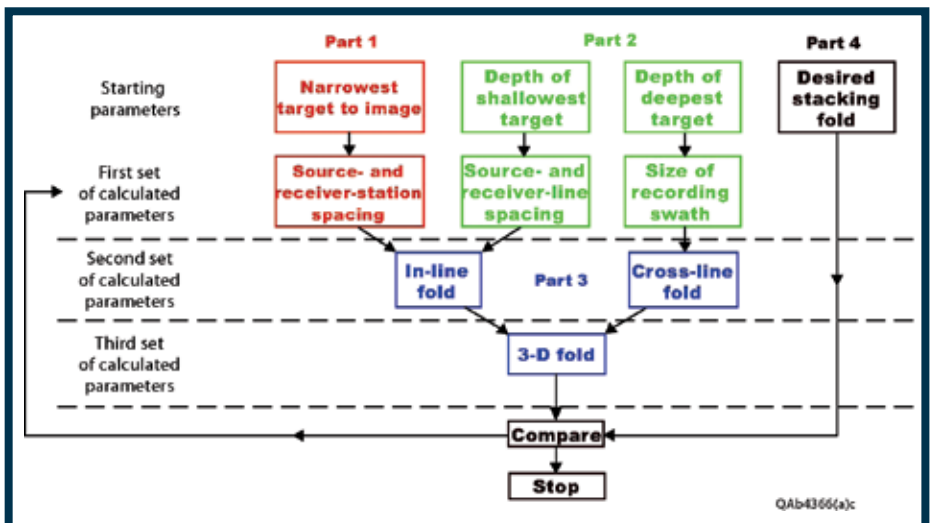


Figure 1 – Planning steps that can be followed to design a 3-D seismic acquisition geometry. This article discusses the topics identified by the areas labeled Part 3 and Part 4.

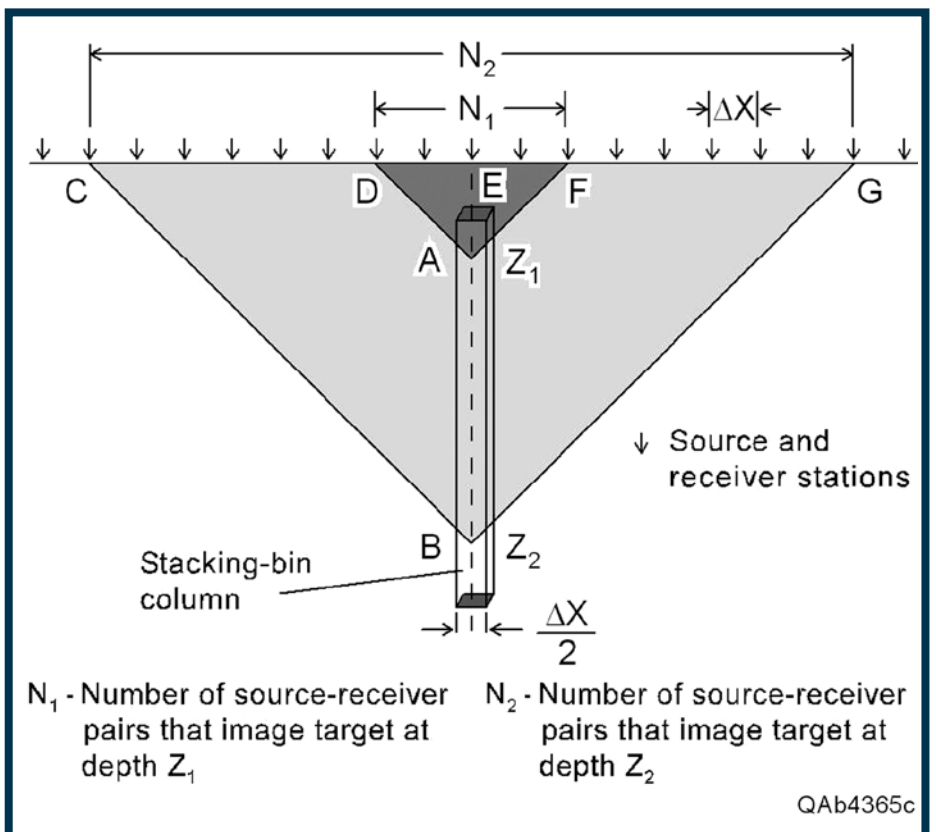
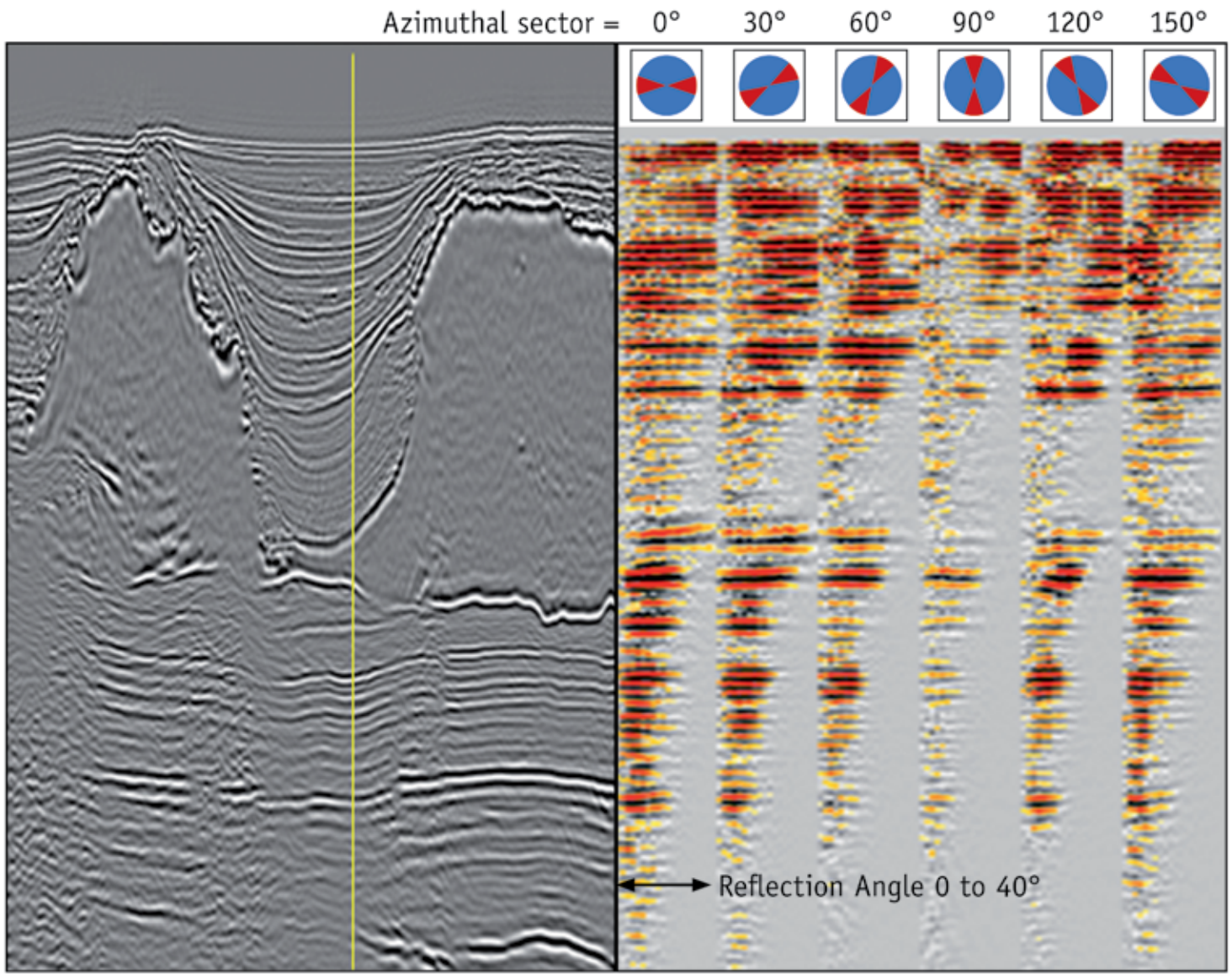


Figure 2 – Vertical variation in stacking fold. The source-station and receiver-station spacings along this profile have the same value Δx, which results in a stacking bin width of Δx/2. The vertical column shows the coordinate position of one particular stacking bin. For a deep target at depth Z_2, the stacking fold in this bin is a high number because there is a large number (N_2) of source-receiver pairs that produce a raypath that reflects from subsurface point B. Only one of these raypaths, CBG, is shown. For a shallow target at depth Z_1, the stacking fold is low because there is only a small number (N_1) of source-receiver pairs that produce individual raypaths that reflect from point A. One of these shallow raypaths, DAF, is shown. When a 3-D seismic data volume is described as a 20-fold or 30-fold volume, people are usually referring to the maximum stacking fold that is created by the 3-D geometry, which is the stacking fold at the deepest target.

Superior Imaging in Complex Structures



Stack data (left) with yellow line annotating the location of an RTM 3D gather (right), displayed in six azimuthal sectors.

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Velocity Model Building with RTM

RTM CIGs, such as this example from a CGGVeritas WAZ survey in the Garden Banks area, are free of the migration artefacts typically seen when using ray-based algorithms. Such artefacts are due to multipathing issues in these methods, particularly in the vicinity of complex geologic structures. Using RTM for the entire model building process results in a more accurate velocity model and hence a better final image.

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'10 ICE the second largest

59 Countries Represented at Calgary

By VERN STEFANIC, EXPLORER Managing Editor

A technical program bolstered by a heavy emphasis on unconventional reserves and shale gas potential provided the setting for the second highest-attended International Conference and Exhibition in AAPG history.

The 2010 AAPG ICE, held in September at the Telus Convention Centre in downtown Calgary, Canada, had a total attendance of 2,281, putting it behind only the 2006 ICE meeting (2,626) in Perth, Australia, in terms of attendance.

Calgary had hosted three annual AAPG meetings, but this was the first time an ICE was held in Canada.

Convention officials agreed that it proved to be a winning locale.

"The program went very well," said meeting general chair and AAPG Honorary member John Hogg. "We had a great technical program that brought people from around the world to Calgary, and we showcased Canadian and international resources and plays – a first for the ICE."

Confirming the meeting's international flavor was the fact that participants came from 59 countries, the top five being:

- Canada – 1,230 attendees.
- United States – 569.
- United Kingdom – 73.
- Brazil – 24.
- Norway – 22.

"I think the biggest surprise about the meeting was how well everything went," Hogg said. "Other than overcrowding in a couple of rooms the conference went without a hitch."

The "overcrowding" problems were perhaps due to, paradoxically, the meeting's successful and compelling technical program. Several talks – especially those dealing with unconventionals and shale plays – had overflow crowds as attendees tried to jam into rooms to hear the latest on the industry's hottest topics.

Closed-circuit monitors were set up outside those rooms to accommodate the crowds – and those areas were often crowded, too.

"I think people will remember the Calgary meeting as a good time with a strong technical program, a wealth of field trips, short courses and, of course, the (post-meeting) core conference," he said.

The meeting officially started with an opening session that featured a provocative talk by AAPG President Dave Rensink, who asked attendees to try to imagine what the Association would be like in 2030.

Rensink's thoughts on AAPG's "possible reality" included:

- Over 50 percent of the membership will be non-U.S.
- AAPG publications will be digital.
- The average age will be lower than it is now.
- As Regions develop their own annual conferences, the need for ICE will disappear, as the Annual Convention and Exhibition will become international events.
- China will be AAPG's seventh Region.

(More of Rensink's thoughts on this – much of which was part of his Calgary speech – can be found in this month's President's Column on page 3.)

Other highlights included:

- Capacity crowds for the special luncheons, including past AAPG president Scott Tinker's talk at the Featured Speaker Luncheon on how technological advances will help fuel the future of unconventional gas resources.
- Special lectures on the Burgess Shale and bitumen development in northeast Alberta.
- A full-day emphasis on unconventionals, which attracted huge crowds to sessions, discussions and luncheons throughout the day.

The next ICE will be held Oct. 23-26 in Milan – AAPG's first international meeting held in Italy.

Calgary Presentations Cited

Winners for the best oral and poster presentations at the recent AAPG International Conference and Exhibition in Calgary, Canada, have been announced.

The winners include the first-ever Student member to be the sole author of the best international poster award.

The best presentations were:

Gabriel Dengo Memorial Award
(best paper)

- Petroleum Systems of the Northern Red Sea, presented by AAPG member **Jennifer Scott**, Hess Corp., London, England.

Co-authors were AAPG members Benn Hansen, Niall McCormack and Laura Lawton, all with Hess Corp. in London, England, and members John Guthrie, Steve Crews, Andy Pepper and Caroline Burke, all with Hess Corp. in Houston.

Other co-authors were Graeme Gordon, Dean Griffin, Rod Graham and Tim Grow.

Ziad Beydoun Memorial Award
(best poster)

- Forebulge Influence on Deposition of the Cretaceous Castlegate Sandstone, Book Cliffs, Utah, USA, by AAPG Student member **Kathryn Hoffmeister**, of the University of Kansas, Lawrence, Kan.

Scott and Hoffmeister will receive their awards at the AAPG Annual Convention and Exhibition, set April 10-13 in Houston.

AAPG International Conference & Exhibition

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Created so finances won't deter membership

Dues Structure Considers Income

By VICKI BEIGHLE, AAPG Membership Manager

Apparently, AAPG has a message that's worth repeating.

In a recent survey of members being dropped for non-payment, over 50 percent of the respondents said – despite several articles and e-mailed messages to explain the program – they were unaware of AAPG's graduated dues structure.

So, for the record: AAPG has a graduated dues structure – and has since 2008.

Unlike other organizations that tie annual dues to World Bank categories, AAPG dues are based on the individual member's ability to pay, i.e. their Personal Gross Income in USD (PGI).

There are three levels of dues, based on a member's PGI:

- Level 1 – $90 annually. This applies to all members earning greater than $50,000.
- Level 2 – $45 annually (50 percent savings). This applies to all members earning between $25,000-$50,000.
- Level 3 – $22.50 (75 percent savings). This applies to all members earning less than $25,000

Levels 1 and 2 who have mailing addresses outside of North America must also pay a mandatory $20 mail surcharge.

AAPG's purpose in creationing this dues program was so that no geoscientist would be denied participation because of a financial situation.

The graduated dues structure is of particular importance to graduating students, whose dues previously were increased to the full rate(s) $90/$110 for the next fiscal year billing after graduation, regardless of their employment situation or financial difficulties.

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		Bulletin			Explorer	
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	$100.00		✓		✓	✓
	$145.00	✓	✓	✓	✓	✓
Level 2 $25,000 to $50,000	$ 45.00	✓		✓	✓	✓
	$ 85.00		✓		✓	✓
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Level 3 <$25,000	$ 22.50	✓				✓
	$ 42.50	✓			✓	✓
	$ 62.50		✓			✓
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	$127.50	✓	✓	✓	✓	✓

With the graduated dues program, those who are seeking employment have the opportunity to maintain their membership with a maximum discount up to 75 percent!

* * *

As a cost savings measure to the organization, publication options are reflective for the level of dues paid.

- All members receive the EXPLORER and BULLETIN as part of their monthly benefits – however, the default delivery method for the BULLETIN is online, with two semi-annual CDs.
- **Level 1 members** with mailing addresses *outside North America* have the option to choose PRINT delivery of the BULLETIN at no additional charge (they are already paying the mail surcharge); those with mailing addresses *in North America* may also choose print delivery of the BULLETIN, but they must pay an additional $10 mail surcharge.
- **Level 2 members** receive online access to the BULLETIN; they can opt to receive a PRINT version by paying the additional print copy fee ($30). Mail surcharge(s) as indicated above still apply.

See **Dues Structure**, page 38

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7 - 11	Applied Subsurface Geological Mapping	Perth, Australia
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	$110.00		✓		✓	✓
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	$140.00	✓	✓	✓	✓	✓
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Dues Structure

from page 36

▸ **Level 3 members** receive online access to both the EXPLORER and BULLETIN (no CDs).

▸ Members receiving PRINT copies of the BULLETIN do not receive the CDs. However, they have the option to pay an additional fee of $45 to receive online access, print copy and semi-annual CD's (plus applicable mail surcharge(s).

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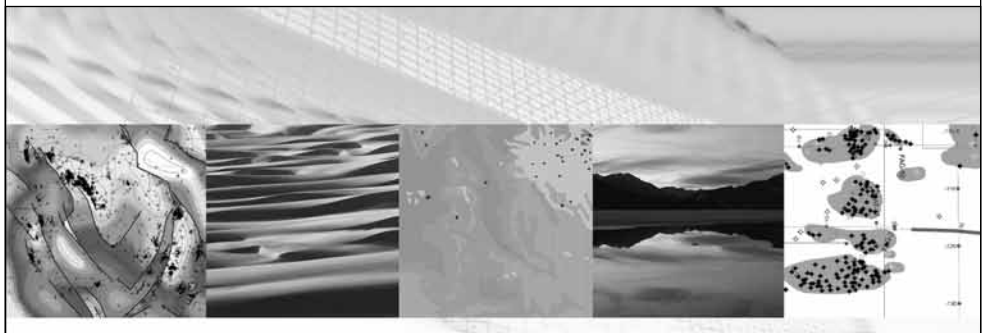
Our staff is available to assist with any questions you may have; contact Member Services at (800) 364-2274, or (918) 584-2555.



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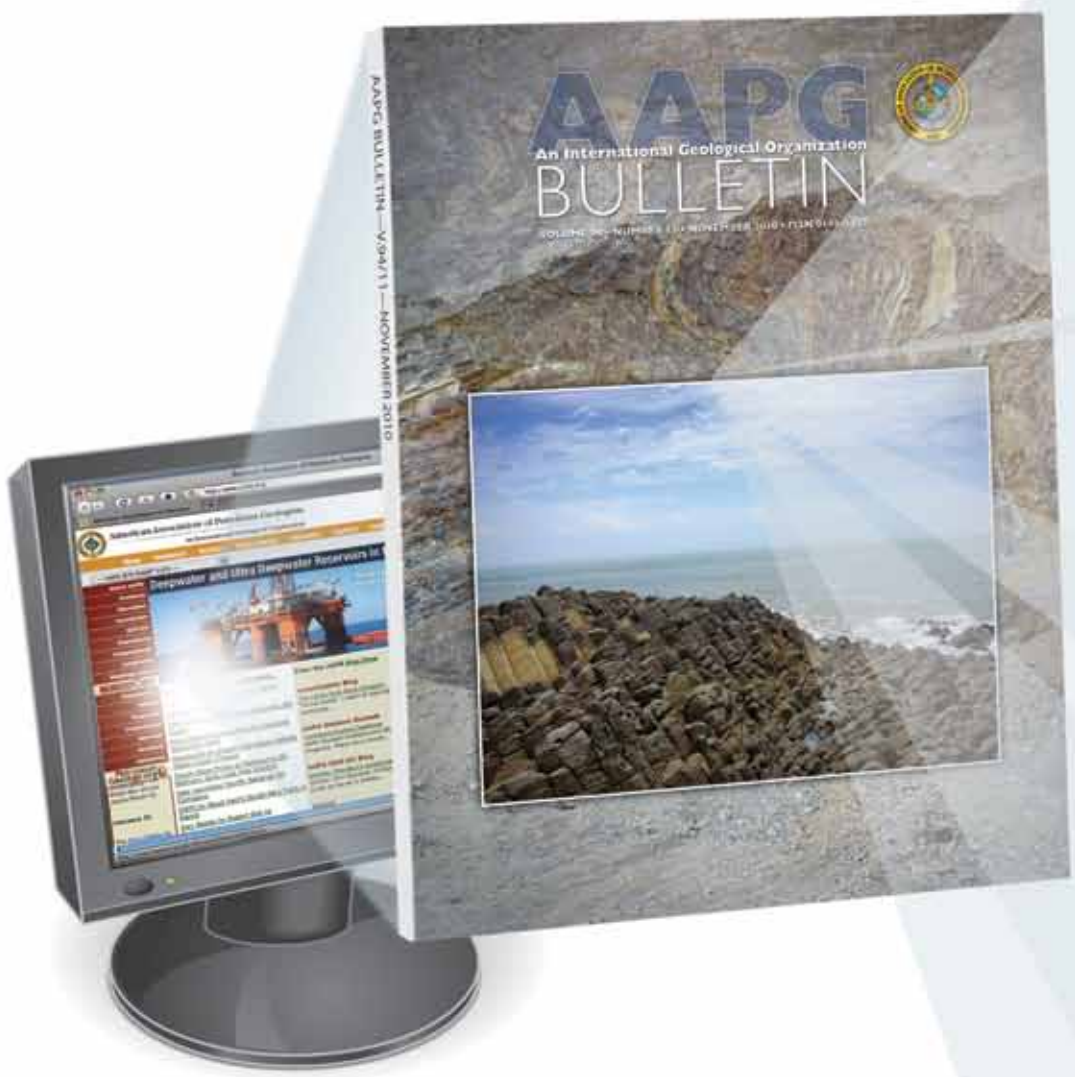

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Article highlights include:

Tightening up an important term

Harry Doust

The play concept is valuable and should be central to exploration decision making, but its loose definition can lead to misunderstandings. Even though its flexibility makes it useful, the term should be based on the petroleum charge system, the reservoir/seal formation pair or lithofacies, and the trap type.

Predicting porosity is promising

O. C. Ogiesoba

Seismic attributes and neural networks were utilized to predict porosity distribution in the Trenton-Black River carbonate succession of southern Ontario. Three-dimensional visualization was employed to examine the relationships between porosity and basement-involved faults.

3D complements poor well data

Darrin Burton and Lesli J. Wood

Since conventional interpretation methods do not produce images of adequate quality for seismic geomorphologic analysis in the West Natuna basin, Indonesia, high-quality 3D seismic and well data are utilized to illuminate reservoir, seal, and source characteristics of hydrocarbon-bearing features.

Exploring for shale gas

Dariusz Strąpoć, Maria Mastalerz, Arndt Schimmelmann, Agnieszka Drobniak, and Nancy R. Hasenmueller

This study of the New Albany Shale, eastern Illinois basin, was conducted to provide new data on the depositional paleoenvironment, to determine the geochemical origin and geologic controls on the gas, and to evaluate implications for future exploration and production.

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

WASHINGTONWATCH

Will Lame Ducks Set Stage for Energy Debate?

By DAVID CURTISS, GEO-DC Director

President Barack Obama came to office during a tumultuous period, and with a long list of policy priorities: stimulating the economy, withdrawing combat troops from Iraq, reforming the health care and financial services sectors, and so on.

Most of these issues required Congressional action, and the 111th Congress responded with a remarkable record of legislative accomplishments. With Democrats in charge of both the Senate and the House of Representatives, it systematically assembled, debated and passed legislation right down the president's list.

CURTISS

Any legislation that does not pass before the 111th Congress adjourns is scrapped, and the 112th Congress begins with a fresh slate in January.

Yet on one significant presidential priority – energy and climate change legislation – progress has been elusive.

The House of Representatives passed climate legislation in summer 2009 and an offshore energy bill this past summer.

The Senate Energy and Natural Resources Committee passed a bipartisan energy bill in summer 2009 and its own offshore energy bill this year – but neither bill has been considered by the full Senate, and attempts at climate legislation have foundered. Prospects for passage of any of these bills in a post election lame-duck session are bleak.

In an interview in the October issue of *Rolling Stone* magazine, President Obama admitted as much, saying one of his "top priorities *next year* is to have an energy policy that begins to address all facets of our overreliance on fossil fuels [emphasis added]."

Nevertheless, efforts continued in September in the Senate to prepare for possible legislative action in the lame duck session.

Sen. Jeff Bingaman (D-New Mexico), chair of the Senate Energy and Natural Resources committee, led the effort by joining forces with Sen. Sam Brownback (R-Kansas) to introduce legislation mandating a federal renewable electricity standard (RES) of 15 percent by 2021.

A comparable RES had been the cornerstone of the Senate Energy and Natural Resources Committee's 2009 legislation. And lobbying by the environmental community for passage of a federal RES increased in recent weeks as it became apparent the Senate was unable to move climate legislation.

Together with Sen. Olympia Snowe (R-Maine), Bingaman introduced a clean energy tax measure before the Senate left town to campaign. According to a press release issued by Bingaman's staff, the bill "focuses broadly on building and industrial energy efficiency; domestic manufacturing; emerging clean energy technologies; and carbon mitigation."

Senate Majority Whip Dick Durbin (D-Illinois) – the second highest ranking Senate Democrat – agrees with Obama that passage of energy legislation this year is a "long shot." The Senate already has ratification of the START nuclear arms treaty, extension of the Bush tax cuts and annual appropriations to tackle when it returns after the election.

* * *

If that is so, then why is anyone bothering to introduce these bills?

Because, first, there is a small chance a bill could pass.

Second, because Senate Majority Leader Harry Reid (D-Nevada) has said that Senate energy legislation will be cobbled together from provisions with the 60 votes necessary to suspend debate and vote on the measure. These individual measures simplify that process.

Finally, these legislative initiatives could lay groundwork for the next Congress.

I agree with conventional wisdom that energy legislation is unlikely in 2010. But I am greatly concerned about measures I see moving in the appropriations process.

Sen. Dianne Feinstein (D-California) chairs the Interior, Environment and Related Agencies appropriations subcommittee, and has indicated that her bill would impose a Congressional moratorium on the Pacific outer continental shelf (OCS) along the coasts of California, Oregon and Washington. Similarly, senior House Democrat appropriators have

Continued on next page

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AAPG's geoCVD 2010 "team": first row, from left, Michael Fogarty, Michael Campbell, Jennifer Burton and Rosemary Juckett; second row, Dan Smith, Deborah Sacrey, Cheryl Desforges and Ross Clark; third row, Dan Tearpock and Jim Hill; top row, Don Juckett and Bryant Fulk.

geoCVD 2010: Mission Accomplished

By DEBORAH SACREY, CVD Chair

AAPG members once again returned to Washington, D.C., in September for Geosciences Congressional Visits Day 2010 (geoCVD 2010).

Congress was in town for several weeks before heading back on the campaign trail, so we took the opportunity to talk about energy issues important to our members. We also had a chance to meet with the Environmental Protection Agency, the National Research Council and the Congressional Research Service.

We talked about the fundamental interrelationships of the economy, environment and energy production – particularly oil and natural gas. We also discussed the role of federal research and development in creating jobs and training and equipping the next generation oil and gas work force.

My sincere thanks to all of our participants: Jennifer Burton, EMD President Michael Campbell, Ross Clark, Cheryl Desforges, Michael Fogarty, Bryant Fulk, Jim Hill, AAPG past president Dan Smith and DPA President Dan Tearpock. Thank you for joining with us to bring science to policymakers.

Preparations already are under way for our next CVD in spring 2011, and we'll publish dates as soon as available. This will be a particularly important CVD, because it will be the first of a brand new Congress.

I hope you'll attend.

Candidate Videos 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.

Continued from previous page

indicated desire to impose a Congressional moratorium on both the Pacific and Atlantic OCS.

These proposed moratoria are redundant, because the administration has no plans to lease the Pacific OCS and cancelled the Virginia lease sale planned for 2011 in the aftermath of the Gulf oil spill. But the spill is providing political cover for legislators to reinstate a policy that for 25 years prevented exploration and production of much of the nation's OCS.

This would be a huge step backward for U.S. energy policy.

Election results will dictate whether energy legislation or appropriations move in the lame-duck session of Congress. Any legislation that does not pass before the 111th Congress adjourns is scrapped, and the 112th Congress begins with a fresh slate in January.

* * *

It's a fresh slate for GEO-DC, too. No matter who wins in November, there will be new faces on Capitol Hill, new staff and no lack of people who need science and fact-based information to make better energy and environmental policy decisions.

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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. Abeer Al Zubaidi is the AAPG Middle East Director of Operations, based in Dubai, UAE.

ME Region Focuses on Needs, Growth

By HUSSAIN AL OTAIBI, Middle East Region President

Although historically focused on its birthplace in North America, AAPG is growing rapidly in several international locations, including one that is in the heart of the oil industry – the Middle East.

OTAIBI

AAPG'S Middle East Region (MER) currently is home to approximately 719 members; while this represents only about 2 percent of the current total global AAPG membership, the MER Council is aggressively moving forward to develop a number of initiatives in the Region to both support the growth of AAPG as well as to support the needs of the growing number of geoscientists in this economically important region.

These initiatives include the biannual **Middle East Geosciences Conference and Exhibition** (GEO), held this past March in Manama, Bahrain, which attracted 1,036 geoscientists, as well as a number of activities that are designed to serve the needs of the area's growing young professional and student population.

Those activities include:

- A "Young Professional and Student Conference and Exhibition," which would be first of its kind in the area.
- A series of targeted visits to various universities in the Region.
- Support and encouragement to prospective university teams to participate in the Imperial Barrel Award (IBA).

The team from King Fahad University (with then-AAPG President John Lorenz, fifth from left) won the first Middle East IBA competition – and then took third place at the international competition in New Orleans.

This last initiative deserves a special note in its own right; the first ever Middle East IBA competition was held this past March (in association with GEO 2010), and featured participation of three strong teams from universities in the area.

The winner of this inaugural ME IBA competition was a team from King Fahad University of Petroleum and Minerals, which then went on to win third place honors in the international IBA competition at the AAPG Annual Convention in New Orleans.

* * *

The MER section also has conducted a number of successful Geosciences Technology Workshops (GTWs) in the area, the most recent of which, **Basin and Petroleum System Modeling in the Middle East: Applications and Case Studies**, was held in October in Dubai, UAE, and attracted 40 participants.

Other GTWs this year have been:

- **Assessment of Unconventional Gas Resources**, held in May in Istanbul, Turkey, which drew 78 registrants.
- **The Role of Fracture and Geomechanical Characterization in the Hydrocarbon Industry: Middle Eastern Perspective**, held in June in Rome, Italy, which had 71 registrants.

More GTWs are planned, including:

- **The Geosciences of Exploring and Developing Tight Gas in the Middle East**, planned for Jan. 24-26 in Beirut, Lebanon.
- **Mixed Carbonate/Evaporite Successions**, tentatively scheduled for February 2011.

Information on these and all Middle East GTWs can be found on the Region's GTW website at www.aapg.org/gtw.

* * *

With such an active program, AAPG is positioning itself to be able to service the growing needs of the geosciences community in this ancient region.

Stay tuned – the future is bright in the Middle East Region!

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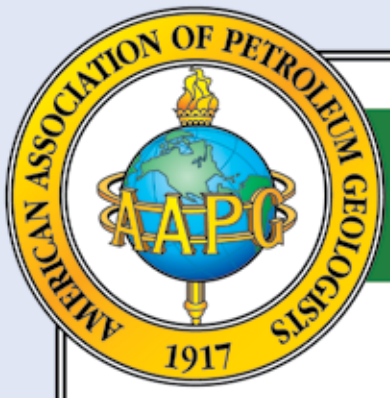

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GeoFORCE Gets Foundation Grant

By NATALIE ADAMS, AAPG Foundation Manager

The AAPG Foundation Trustees have approved granting $45,000 to the Texas GeoFORCE program, to be given over the next three years.

The Foundation began funding the GeoFORCE program three years ago, which continues to meet its objective of increasing interest in the geosciences among high school students with emphasis on minorities.

Currently, there are nearly 700 students in the GeoFORCE program, which identifies eighth-graders who are high achievers in math and science and then provides them with a four-year series of work-and-reward activities that motivates them to excel. Field trips to places like Washington, D.C., and the Grand Canyon are included (see "Making a Difference," page 30).

Funding also was approved for the AAPG Student Focus Booth at the Geological Society of America Annual Meeting, held in Denver in late October and early November. The booth promoted and facilitated AAPG new member recruitment, primarily targeting students and academic faculty.

The Foundation has provided funding for this event since 2006.

The Foundation continues to support programs all over the world that educate, train and enhance the careers of those in the geosciences – your contributions are hard at work and making a difference.

For a list of programs and projects supported, or to submit a proposal for funding, go to foundation.aapg.org.

GeoFORCE eleventh graders at Mt. Saint Helens; the AAPG Foundation provides funding for the program, which seeks to increase interest in the geosciences among high school students.

* * *

Many thanks to **William Dost Jr.** for making a contribution to establish a University Subscription for Western Kentucky University.

Through a one-time endowment gift of $12,500 to the AAPG Foundation Digital Products Fund-University Subscription, students and faculty at your alma mater receive uninterrupted access to the entire AAPG Digital Library – over 850,000 pages of international, national and regional libraries of petroleum and geology and geophysics information.

* * *

Several opportunities currently exist to have your contribution to the AAPG Foundation matched, including:

- The Tulsa Geological Society will match donations made toward a university subscription to two universities – the University of Tulsa and the University of Arkansas.
- Gifts given to the Erik Mason Memorial fund will be designated to support the scholarship established in his name at Oklahoma State University and matched two-to-one through OSU and made available by AAPG member T. Boone Pickens if they are received by Feb. 11, or 1:5 to 1 if they are pledged over the next five years.
- All are encouraged to inquire at your company about matches that may exist there.

Every gift made to the AAPG Foundation will count toward the "Meeting Challenges … Assuring Success" campaign. The current status of campaign pledges and contributions is available online at the Foundation website.

* * *

Two new members have been added to the Foundation Trustee Associates. They are:

❒ **Marvin Brittenham**, AAPG's current vice president-Sections, of Parker, Colo.

❒ **Don Clarke**, of Lakewood, Calif.

See **Foundation**, page 47

HOUSTON GEOLOGICAL SOCIETY
Explore Our Connections
Applied Geoscience Conference (AGC)
2011 AGC OF US GULF REGION MUDROCKS AS UNCONVENTIONAL SHALE GAS/OIL RESERVOIRS

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CHUCK VORCE, DEVON ENERGY
MIKE MOLDOWAN, STANFORD UNIVERSITY
YONGCHUN TANG, PEER INSTITUTE (CALTECH)
TIM RUBLE, WEATHERFORD
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2011 AGC OF US GULF REGION MUDROCKS AS UNCONVENTIONAL SHALE GAS/OIL RESERVOIRS
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THIS APPLIED GEOSCIENCE CONFERENCE (AGC) HAS FOUR HALF DAY SESSIONS:
AS APPLIED TO US GULF REGION MUDROCK SYSTEMS
Monday, February 7
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PM Session: GEOCHEMICAL ADVANCES IN MUDROCK RESERVOIR CHARACTERIZATION
Tuesday, February 8
AM Session: GEOPHYSICAL ADVANCES IN MUDROCK RESERVOIR CHARACTERIZATION
PM Session: COMPLETION ADVANCES IN MUDROCK RESERVOIR COMPLETIONS
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For a list of programs, go to http://foundation.aapg.org/programs.cfm

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- *By phone, 1-888-945-2274, ext. 644*
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All donor names will appear in an upcoming issue of the Explorer.

To discuss the area of greatest impact of your gift, call Natalie Adams, Foundation Manager, 1-888-945-2274, ext. 644.

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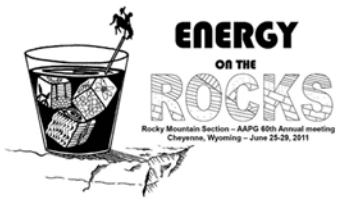
ASSURING SUCCESS

AAPG FOUNDATION

"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.

Rocky Mountain Section – AAPG
2011 Annual Conference
June 25-29
Little America, Cheyenne, Wyoming



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- Sedimentology and Stratigraphy of Rocky Mountain Basins
- Student Papers

CONTACT INFORMATION
Andy Finley – andy@goolsbyfinley.com

Go to www.rms-aapg.org/2011_meeting/
for complete meeting information

PROFESSIONALnewsBRIEFS

Nathan S. Bennett, to manager-Marcellus Shale Program, Pennsylvania Department of Conservation and Natural Resource, Bureau of Forestry, Harrisburg, Pa. Previously senior geologic scientist, Pennsylvania Department of Conservation and Natural Resource, Harrisburg, Pa.

Mike Daly, to executive vice president of exploration, British Petroleum, reporting directly to the BP chief executive officer, Oxford, England. Previously head of exploration and access, BP, Oxford, England.

Greg Hatch, to senior geophysicist, Repsol Energy North America, The Woodlands, Texas. Previously geological adviser, Spectrum GEO, Houston.

John C. Hoffman, to senior exploration geophysicist-West of Shetlands, Chevron Upstream Europe, Aberdeen, Scotland. Previously consulting operations geophysicist, Chevron North America Exploration and Production, Houston.

Jeff Lelek has retired as manager of geologic technology and research, BP, Houston. He now resides in Steamboat Springs, Colo.

Daniel B. Linger, to senior geologist/team lead, Petrohawk Energy, Houston. Previously senior explorationist, Crimson Exploration, Houston.

Alex McNair is taking a temporary sabbatical, Erath County, Texas. Previously exploration geophysicist, Houston Energy, Houston.

Mark D. Milliken, to geologist, Link Energy Operations, Casper, Wyo. Previously geologist, Elk Petroleum, Casper, Wyo.

Frederico Ribeiro, to exploration manager, Enap Sipetrol-Egypt, Cairo, Egypt. Previously exploration manager, Chariot Oil and Gas, Windhoek, Namibia.

Frank Sheppard, to senior geophysical adviser, Noble Energy, Houston. Previously independent consultant, Houston.

Kevin J. Sullivan, to manager of geology and business development, Atlas Gas & Oil, Traverse City, Mich. Previously senior geologist, Atlas Gas & Oil, Traverse City, Mich.

John Troschinetz has retired as division geological specialist with EOG Resources in Midland, Texas. Troschinetz resides in Midland, Texas.

Wan Yang, to associate professor-Department of Geological Sciences and Engineering, Missouri University of Science and Technology, Rolla, Mo. Previously associate professor, Wichita State University, Wichita, Kan.

Online AAPG Meeting Updates

Abstracts are now being accepted online for two AAPG meetings:

▸ The 2011 **AAPG International Conference and Exhibition**, which will be held Oct. 23-26 in Milan, Italy.

This will be AAPG's first ICE in Italy. The theme is "Following DaVinci's Footsteps to Future Energy Resources: Innovations from Outcrops to Assets."

▸ The second **Polar Petroleum Potential Conference and Exhibition** – or simply, "3P" – which will be held Aug. 30-Sept. 2 in Halifax, Nova Scotia, Canada.

Also, registration is open online for the inaugural **Arctic Technology Conference**, set Feb. 7-9 in Houston.

Go to www.aapg.org.

AAPG GEOSCIENCES TECHNOLOGY WORKSHOPS

Focused Workshops to

The Geoscience of Exploring and Developing Tight Gas in the Middle East

24-26 January 2011 • Beirut, Lebanon

Volumes of gas in place in tight sand reservoirs are estimated to several hundred trillion cubic meters distributed globally. The Middle East contains a large percentage of these volumes with known accumulations found in the Ordovician/Silurian carboniferous sandstones and low permeability Jurassic carbonates. However, exploration results of the last 25-30 years suggest that successful appraisal and development of tight gas reservoirs requires a careful synthesis of many factors, both geologic and economic.

Tight gas reservoirs represent a challenge in terms of drilling, development and stimulation. This is due to the unconventional nature of these reservoirs in terms of their low permeability, high temperatures and high pressures. Consequently, improving recovery factors from the current percentage and driving down operating costs represent the major strategic challenges for R&D geoscientists and engineering teams in the industry. The development of low permeability gas reservoirs will give a substantial boost to the world's gas demand and reserves in the coming decades.

Tight gas is a prospect which to date, remains largely underexploited. Current conventional appraisal, testing, development and production techniques are not fully adapted for cost effective development and most of these accumulations remain untapped. Attend this GTW as we explore what the future holds.

Middle Eastern Mixed Carbonate/Evaporite Successions and Analogues

28 February-2 March 2011 • Abu Dhabi, UAE

Mixed carbonate/evaporite successions (such as the Khuff and Aab Formation) are the host of the world's largest hydrocarbon accumulations. In addition, mixed carbonate/evaporite basins have a high potential for source rock generation. Because of significant economic importance, there remains the need for further studies on the processes of formation of mixed carbonate/evaporite succession as a depositional system.

While carbonate deposition is linked to relative sea-level changes, biogenic production and paleogeographic changes, evaporite deposition is primarily controlled by net evaporation of seawater in a basin and reflux process. Formation of evaporites may be decoupled from relative sea-level changes and evaporites might occur during rise as well as fall of relative sea-level. In addition, later replacement and neomorphism of evaporites make an interpretation of the original depositional environments more difficult. Further, modern evaporite depositional environments, such as the coastal sabkhas of Abu Dhabi, might be limited analogues to the extensive evaporite systems of the past.

It is crucial to understand the interplay between carbonate/evaporite deposition in a modern sequence stratigraphic and diagenetic famework in order to understand changes in reservoir quality and build meaningful reservoir models.

Join us to revisit some known concepts such as sequence stratigraphy, sedimentology, diagenesis and reservoir modeling of carbonate/evaporite successions with eyes on unconventional thinking.

Register online at www.aapg.org/gtw

Foundation
from page 44

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GEOSCIENCES TECHNOLOGY WORKSHOPS GTW AAPG

New Ways to Look at Old Data: New Pay Zones, Increased Production, Expanded Regional Plays

8-9 November 2010 • Houston, TX

Increase Profitability in Shales and Unconventionals, Mature Fields, Completions, EOR, Bypassed Pay

Combining old and new data can give you a powerful new approach that can result in immediate positive results. The key to improved production and better exploration results could be right at your fingertips it's just a matter of finding out how to bring together old and new well logs, seismic, geology, cores, production, and more. People who have tried the approach and have had success will share their stories.

Sessions include using existing data for effective hydraulic fracturing for horizontal wells, ways to look at old well log data to find new fields and new productive zones, integrating core information and old seismic with new technologies for better imaging of reservoirs, combining old and new data for enhanced oil recovery, and bringing together old and new data to better understand shale reservoirs.

Deepwater Reservoirs in the Gulf of Mexico

18-19 January 2011 • Houston, TX

This workshop is targeted at geoscientists and reservoir engineers who are actively involved in deepwater exploration, development, and technical studies. The goals of the Deepwater GTW include providing a forum that showcases integrated studies of deepwater reservoirs, affording ample opportunity for dialog and lively group discussions, and facilitating interdisciplinary innovation in these challenging environments. Each session will include an IPOD discussion (in-depth discussion on issues, problems, opportunities, and directions).

We are planning a full day of talks and discussions focused on pre-Tertiary (Paleogene) exploration and development, as well as a full day on the Miocene and Pliocene. Most presenters hail from either the asset teams or research teams of some of the most innovative deepwater operators. Academia and top service providers will also be well represented.

We are very privileged for 2011 to have the Society of Petroleum Engineers (SPE) as a co-sponsor of the Deepwater GTW!

Success in the Marcellus and Utica Shales: Case Studies and New Developments

23-25 May 2011 • Baltimore, Maryland

This workshop will take an interdisciplinary approach to analyzing case studies of Marcellus and Utica shales. Presenters will come from asset teams and research teams of current operators. The presentations and discussions will include basin geology, shale mineralogy, organic-matter type, gas geochemistry, structural style, along with discussions of emerging plays in southern Canada. Biogenic vs. thermogenic gas will be discussed, as well as an analysis of natural fractures and their role both in exploration and in completion / production. will discuss keys to "sweet spots." Each session will include an IPOD discussion (in-depth discussion on issues, problems, opportunities, and directions).

INFORM – DISCUSS – LEARN – SHARE • THE AAPG GTW EXPERIENCE

For information on these AAPG GTWs, please log on to our website at http://www.aapg.org/gtw.

The recent fall AAPG-SEG Student Expo gave attendees a chance to showcase their talents and network with friends and potential employers.

28 companies participate

Student Expo Draws Record Crowd

By SHANNON LeBLANC, Expo Committee Member

The largest AAPG-SEG Student Expo to date attracted 385 attendees and representatives from 28 companies to the George R. Brown Convention Center in Houston.

These students came from all over the country, eagerly seeking career opportunities in the oil and gas industry and taking advantage of the many short courses, field trips, industry interviews and, most importantly, the chance to learn/practice their networking skills.

The annual fall Expo, held in late September, was "an excellent gateway into the oil and gas industry for graduate students," said AAPG Student member Kimberly Mead, a recent Vanderbilt University graduate who is now attending the University of Houston for her masters in geology.

"I signed up to present a poster, and submitted my resumé, not really knowing what to expect," she said. "The week prior to the Expo my voicemail was flooded with interview requests – I had six interviews throughout the day, with companies ranging in size.

"I left as a more experienced interviewee, but also a more confident applicant," Mead said. "I cannot imagine any other venue offering as much opportunity into the oil and gas industry as the AAPG Student Expo.

"My main piece of advice is to give a poster, even if it is not oil related," she added. "Most of my interviews were based on my abstract, and my ability to talk through my research when standing by my poster."

This year's program included:

- A Recruiter Panel Discussion, in which recruiters from several companies answered questions about what an interviewee might want to know before their interview session.

  Some of the questions asked were "What job opportunities do I have with just a bachelors degree?" and "Is it still possible for me to get a job as an international student?"

  The panel also presented students with a clearer idea of what most companies are seeking in their new hires.

- Several field trips, to an Anadarko drilling rig, the nearby Gulf Coast and to Core Laboratories.

- Several short courses, including a Schlumberger/WesternGeco Technology Day, plus courses from Shell and ExxonMobil.

- Industry exhibits and interviews, plus the Kelly Scientific Resources Resumé Review, providing some tips on offering more effective resumés.

- This year's Student Expo poster session, which were academically "mind blowing!"

The winning posters were presented by:

✓ First place ($750 prize) – AAPG Student member **Jaydeep Ghosh**, University of Alabama, Tuscaloosa, Ala.

✓ Second place ($500) – AAPG Student member **Jacob Siegel**, Rice University, Houston.

✓ Third place ($300) – AAPG Student member **Matthew Gatewood**, University of Alabama, Tuscaloosa, Ala.

Keep watching for upcoming stories about some of the other Expo events including the Eastern Section Job Quest, the AAPG/SEG West Coast Student Expo and the Rocky Mountain Rendezvous.

Details and dates for future Expos – including the AAPG/SEG Spring Break Expo in Norman, Okla., in March, can be found at www.studentexpo.info.

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WWWUPDATE

EXPLORER Goes Mobile

By JANET BRISTER, AAPG Website Editor

Yes, you are seeing spots before your eyes, but the spots have a purpose.

That funny pattern shown here and on page three of the EXPLORER is called a "QR Code," and it's designed to help provide easy access to the Web EXPLORER in the blink of an eye – or, at least, a click of your mobile phone.

For some – "QR Code" may be a new term – and concept. I had to do some research to understand this old technology. Yes, it is old technology – 16 years old.

This "quick response" code was developed in Japan in 1994 by Denso-Wave, a subsidiary of Toyota. It allows content to be decoded at a high speed, and was used to track parts in vehicle manufacturing.

Its use has evolved over the years into a standard format that works with mobile phones. All you need on your mobile phone is a camera and a QR scanning App.

There are many free QR scanners available, but if you would like a list visit the AAPG wwwUpdate blog post titled "It's a mobile, mobile, mobile world!" written by Bogdan Michka, AAPG web producer.

Launch the scanning App and point your camera at the code and instantly your phone will tell you what the code says.

The code we've included with this issue is a web address that links you to the mobile version of the current issue of the EXPLORER.

Hold On a Minute

Now, before you get too excited, check your phone.

Is it a smartphone? Or a feature phone?

The AAPG mobile design is for smartphones only. A feature phone is readily confused with a smartphone because it seems pretty smart. And it is.

The difference is a smartphone runs third-party software. This includes operating systems and applications.

So, there are many feature phones capable of browsing websites, receiving e-mails, capturing video, interpreting QR codes – all very nice features. However, if the cell phone is incapable of running an operating system such as Windows Mobile, Symbian, Android or Apple's iOS it remains a feature phone.

Smartphone Users Proceed

So, if your cell phone is a smartphone, then I encourage you to download a QR scanner App. Launch it and point-and-click the QR Code featured in this issue.

The scan of the printed QR Code will connect instantly to the mobile version of the current web EXPLORER. In other words, the date on the printed EXPLORER pages won't determine the website you'll view; the scan always will take you to the current issue.

Good browsing!

Scanning the QR Code on page 3 of this issue with your smartphone will launch the mobile version of the EXPLORER website.

One-Run

from page 26

have to be well-preserved with accurate pyrolysis temperature readings and pyrolysis yields as a function of time.

And kinetics gives the geologist a basis for forming a concept of maturity, not an exact duplication of a basin's thermal history.

"We do these Rock-Evals fast, in 15-20 minutes. These are only an approximation of what goes on in the Earth – but we don't have a couple of million years to run the tests," Coskey said.

Still, Waples sees one-run kinetics as highly valuable for maturity indication, organofacies analysis and large databases of kinetics and even avoiding an adjustment problem in the standard attrition-model approach to kinetics. The application of one-run kinetics to the Bakken even revealed a possible weakness in the analysis.

"It's like you were given a library of hieroglyphics and suddenly you can read them," Waples said.

"It's a tool, and you're silly if you've got a problem and you don't consider all your tools," he added.

For Leonard et al., the ability to use kinetics information in the Bakken Shale was more than worthwhile.

"As for exploration geologists," Coskey said, "it gives you a far better understanding of the thermal and generative history of the basin."

Industry professionals and students are invited to submit abstracts to the AAPG 2011 International Conference & Exhibition. The technical program committee encourages abstracts that relate to any of the topics listed below. Final sessions and formats (oral or poster) are determined by actual submittals.

Proposed conference themes — Deadline to submit your abstract is 20 January 2011.

Theme I (main theme): 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 fracturing in carbonate reservoir performance and the latest developments in the seismic imaging and modeling of carbonate reservoirs and sequences.

Theme II: Where Africa Meets Eurasia — Exploration & Production in the Alpine-Himalaya Fold Belt and Foreland Basins
The Alpine-Himalayan fold-and-thrust belt and its associated foreland basins is one of the world's most prolific, and most complex, hydrocarbon provinces. It contains a wide variety of mature, emerging and still frontier plays in both clastic and carbonate regimes.

This theme will examine the tectonic evolution of the Alpine-Himalayan chain, its influence on sedimentation, diagenesis and reservoir and source development at a basin to prospect scale. The 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 analogues and case studies.

Theme III: Rifts and Deltas
This theme seeks to address all aspects of rifted margin dynamics and related deltaic processes. 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.

Theme IV: Advances in Integrated Geoscience Applications
This theme will cover all aspects of geoscience and reservoir engineering as applied to conventional and unconventional resource plays with emphasis on the value of integration of disciplines. Topics will range from global and basin scale assessment to petroleum system and play analysis to prospect generation and evaluation, reservoir modeling and management.

Theme V: Reservoir Management — From Outcrops to Assets
Sustaining production rates to meet the growing demand globally requires detailed reservoir characterization and effective management of the discovered resources over the long term. Understanding reservoirs starts with fundamental field-based outcrop studies and subsurface analysis. New technologies and work models will be discussed along with world-class reservoirs in this theme.

Theme VI: Dynamic World of "Uncooperative Reservoirs" — The Geoscience of Unconventional Resources
New technologies have made viable tight gas, oil shale, shale gas, coal-bed methane and geothermal resources providing fuel supply closer to consumers in Europe, India, Asia and the Far East. These resources have induced dramatic strategic moves by a variety of companies to get into unconventional plays in new areas. What makes these reservoirs special is what will be addressed in this theme.

Theme VII: Leading-Edge Technologies and the Future of E&P
This theme includes the challenges of carbon management, new and leading-edge technologies in geoscience and reservoir engineering and future technological developments in the E&P industry.

Submit abstracts online at **www.aapg.org/milan2011**

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

Colorado

Dirst, Gordon E., Mudlogging Systems, Grand Junction (reinstate); **Hillix, David Michael**, El Paso Exploration & Production, Denver (D.M. Wheeler, R.H. Goldstein, J.H. Cox Jr.)

Kansas

Womble, Ruth-Ann D., McCoy Petroleum Corp., Wichita (J.R. McCoy, D.M. Cox, D.M. Rawlins)

Michigan

Rising, Patricia Spiess, West Bay Exploration, Hanover (M.M. Matson, M.A. Johnston, R. Budros)

Oklahoma

Mayes, Kevin M., Apache Corp., Tulsa (P. Schenewerk, K.A. March, M.D. Kuykendall); **Tarkington, Jarred Zane**, Tier Hydrocarbon Exploration, Oklahoma City (R.K. Downing, D.T. Boyd, F.M. Black)

Pennsylvania

Haecker, Adam C., Cabot Oil and Gas, Pittsburgh (A.S. Wylie Jr., T.D. Taylor, P.E. Towey)

Texas

Flannery, Jack Russell, self-employed, Houston (G.J. Gail, J.R.J. Studlick, M.P. Dolan); **Flores, Trino Ali**, ConocoPhillips, Katy (D.M. Flores, R. Hernandez, S.R. Schwegal); **Gentry, David Keith**, Marathon Oil, Houston (V.M. Moore, W.M. Blount, R.W. Rothengass); **Hall, Kevin B.**, Halliburton, Sugar Land (J.L. Gevirtz, K.E. Williams, M.J. Croy); **Hess, Janet Lindley**, ConocoPhillips, Houston (reinstate); **Hung, Enrique J.**, Chevron, Houston (A.W. Bally, D.H. Roeder, M.A. Lorente); **McNichol, Kevin Charles**, BMO Capital Markets, Houston (P.C. Cunningham, G. Hite, J.R. Gips); **Mendez, Milton M.**, Chevron, Houston (M.D. Johnson, G.M. Brown, J.S. Moros Leon); **Strunk, Dana Derickson**, Chevron, Houston (J.R. Frank, M.D. De Brock, Y.K. Altobi)

Canada

Freeman, Annelise, Rodina Oil Corp., Calgary (P.J. Bennett, P.A. Philipchuk, J. Cox); **Lofgren, Per**, ARC Resources, Calgary (D.A.C. Gardner, M.S. Chalmers, J.S. Lee); **Spooner, Samuel A.**, Torquay Oil Corp., Calgary (A.W.S. Denton, J.B. McKercher, A. St. Onge)

Egypt

Afife, Mohamed Moustafa, Benha University, Benha (R. Littke, R.I. Ramadan, M.A. Al Amawy); **Ouda, Ibrahim Awaad**, Arabian Oil Co., Maadi (T.F. El Azhary, M.M.H. Said, N.M. Tewfik)

England

Hirst, Clare Louise, Hess, London (P.S. Whitehouse, M.A. Rosen, D.E. Lawton); **Jameson, Matt P.**, Neftex Petroleum Consultants, Abingdon (M.D. Simmons, P.R. Sharland, D.M. Casey); **Sarney, Alexandra**, Badley Ashton & Associates, Horncastle (M. Bertouche, B. Kostic, G. Paintal)

Germany

Abalmasova, Aleksandra, W.L. Gore & Associates, Putzbrunn (D. Hellwig, P.A. Harrington, P. Hirsch)

Hungary

Bada, Gábor, TXM Oil and Gas, Budapest (F. Horváth, R.J. Wallis, B.E. Law)

India

Saikia, Kausik, Cairn India, Dwarka, New Delhi (S. Bhardwaj, S. Sanyal, S. Sarkar)

Indonesia

Guldbech, Christina, Hess Corp; Jakarta (D.L. Sturrock, M. Kloska, O.V. Vejbaek)

Libya S.P.L.A.J.

Nemmwi, Nadia Ali, Occidental Oil, Tripoli (R.M. Aburawi, R.J. Bottinga, C.C. Valerio)

Malaysia

Anis, Ahmad, PTTEP, Kuala Lumpur (W.S. Houston, C.K. Morley, R.C. Shoup); **Everts, Arnout J.W.**, LEAP Energy Partners Asia, Kuala Lumpur (D.F. Kluesner, J.J.G. Reijmer, P. Panwar); **Jo, Gyuhwan**, JX Nippon Oil & Gas

Continued on next page

Certification

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

Petroleum Geologist

Alaska

William Allan Hunter, Chevron, Anchorage (B. Voorhees, D. Strum, K. Pitts)

Oklahoma

Markus Dale Thomerson, Devon Energy, Oklahoma City (S. Hulke, H. Martin, G. Asquith)

Texas

Igor M. Effimoff, E&P Consulting, Houston (T. Klekamp, O. Nye, W. Bement)

Petroleum Geophysicist

Colorado

Tanya Lynn Inks, IS Interpretation Services Inc. Denver (D. Anderson, M. Kozimko, B. Colleary)

Colorado

Timothy Bryan Berge, Pangean Resources, Denver (L. Sternach, S. Sonnenberg, D. Tearpock)

Award Winners Correction

Information was incorrect in the October EXPLORER regarding the achievements of two AAPG award winners.

The correct information is:

Special Award

Presented to individuals and organizations whose area of work may not qualify for one of the existing awards, but is worthy of Association recognition.

❒ **Anthony Doré**, Statoil, Houston, honored for his published contributions and analysis on the tectonic history, geology and petroleum systems of the northeast Atlantic margin; for his "influential" leadership in working to bridge industry and academia; and for being "an enlightened" senior manager who has influenced his company to embrace new geological play concepts and technology.

Public Service Award

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

❒ **Mark J. Doelger**, Barlow and Haun, Casper, Wyo., for his efforts since the late 1960s to "accurately communicate" the story of oil and gas exploration to the general public. He has been played an on-gong role in speaking to state and federal regulators, government agencies, environmental and industry trade groups and various commerce and civic associations. He also has played a prominent role in helping with Wyoming legislation regarding the role of the Wyoming Pipeline Authority.

Doré and Doelger will be receiving their awards along with the other AAPG honor and award winners at the opening session of the AAPG Annual Convention and Exhibition, set April 10-13 in Houston.

2011 Open Enrollment Course Schedule

Rose & Associates

Risk Analysis, Prospect Evaluation & Expl. Economics

Houston, Texas	January 24 – 28
Calgary, Alberta	April 4 – 8
Houston, Texas	May 9 – 13
Calgary, Alberta	September 26 – 30

Risk and Uncertainty Analysis for Unconventional Resource Plays

Denver, Colorado	February 22 – 23
Houston, Texas	May 2 – 3

Play Based Exploration: Mapping, Volumetric and Risk Analysis

Houston, Texas	March 21 – 23
Houston, Texas	September 26 – 28

Register at: www.roseassoc.com/instruction Questions: allisondunn@roseassoc.com Ph: 713/528-8422

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Continued from previous page

Exploration, Miri (K. Nakayama, K. Umezu, J.T. Jong)

Netherlands

Van Der Molen, Allard S., Shell, The Hague (H. Darman, J.F. Boels, M.J. De Ruig)

Nigeria

Imbasi, Eudorah Numoebiye, Shell Petroleum Development Nigeria, Port Harcourt (I.T. Preye, G.O. Giwa, O.O. Falade)

Peru

Camani, Estrella, CEPSA Peru S.A. Sucursal Del Peru, Lima (reinstate); **Jumpa, Hayme**, CEPSA Peru S.A. Sucursal Del Peru, Lima (J.A. Botillo Perez, A.A. Chalco, J.N. Comet); **Minaya, Isaac Basilio**, CEPSA Peru S.A. Sucursal Del Peru, Lima (J.A. Botillo Perez, A.A. Chalco, J.N. Comet); **Pena, Fernando Daniel**, Savia Peru S.A., Lima (M. Chavez-Cerna, A. Lopez-Chavez, J.C. Quinto)

Thailand

Charoentitirat, Thasinee, Chulalongkorn University, Thailand, Bangkok (J.J. Lambiase, J.K. Warren, T.W. Dignes)

IN MEMORY

Eric Atkinson, 86
Calgary, Canada, Sept. 11, 2009

Robert W. Bybee, 90
Dallas, Sept. 19, 2010

Matthew Will Daura, 84
Bellaire, Texas, Feb. 6, 2010

James Paul Elliott, 57
Houston, April 14, 2010

Claude David Fiddler, 77
Bakersfield, Calif., Dec. 30, 2009

James Thomas Hanifan, 61
Marble Falls, Texas, July 22, 2010

George Elliot Kronman, 55
Houston, Sept. 15, 2010

W.N. McKinney Jr., 76
Spring, Texas, Aug. 18, 2010

Louis Walcott Minturn, 95
Houston, Nov. 25, 2009

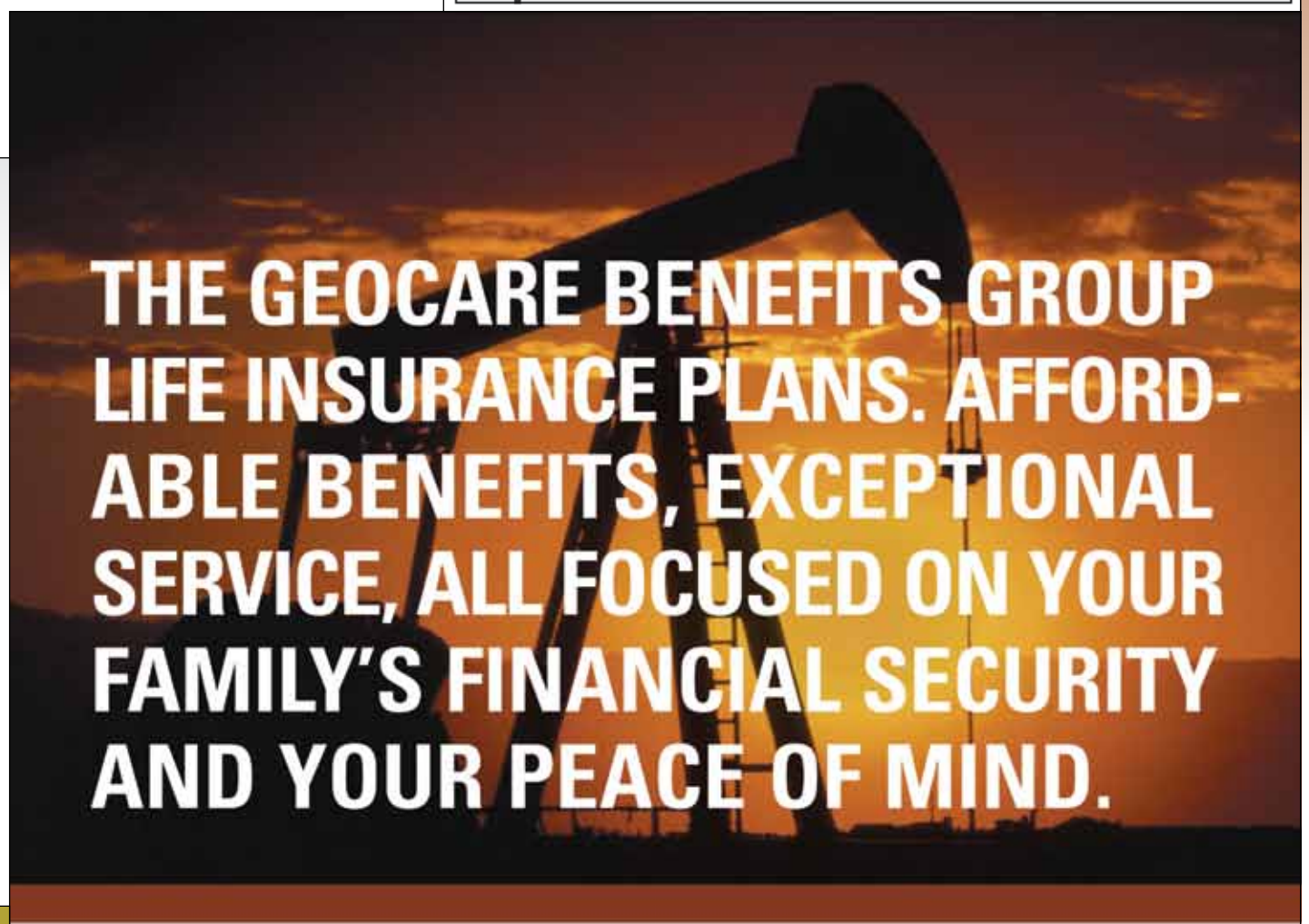
Frank A. Reilly, 83
Houston, April 1, 2010

David Michael Rolling, 62
Dallas, Jan. 4, 2010

Benjamin John Sorrell, 90
Austin, Texas, Sept. 10, 2010

Donald A. Zimmerman, 87
Richardson, Texas, Aug. 8, 2010

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



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GeoCare Benefits Life Insurance Plans, P.O. Box 189, Santa Barbara, CA 93102-0189, Email: geocarebenefits@agia.com. The Group Plans—Term Life, 10-Year Level Term Life, and First-to-Die Term Life Insurance Plans are underwritten by New York Life Insurance Company, 51 Madison Ave., New York, NY 10010 under Group Policy GMR/G29067/G29195/FACE. All coverage is subject to approval by New York Life Insurance Company.

GEOCARE Benefits

EMD
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operations by producing power from 240-plus F produced water in the 50-100 kilowatt range of output. They have one or more wells in the 4,000 to 5,000 barrels/day range that could help offset operating expense in the field.

Presently, Hilcorp is focusing on developing geothermal energy that is in conjunction with oil and gas production.

▶ Another company, Universal GeoPower, has focused on Texas as a region for establishing geothermal production, making use of the orphan well list available through the Texas Railroad Commission and, along with a DOE grant, pursuing possible sites in the Liberty County area.

They have created a flow model for reservoir analysis and have been developing the software by iteration, making predictions on past wells and comparing those with their actual production records and then making forward model predictions on new wells regarding fluid flow. As a result they have altered some of their strategy.

Universal is looking at sands of Eocene age where porosity can be 28-32 percent and permeability in the Darcy range.

* * *

Not every company is focusing on co-produced geothermal power in the oil patch.

▶ Pioneer Natural Resources is investigating the potential for developing geothermal power in the Raton Basin of Colorado.

This project, still in the early exploratory phase, is seen by Pioneer as an attractive alternative – or even a supplement – to existing fossil-fuel production due to geothermal energy's potential as a long-term, clean and 24/7 base-load energy resource. This makes geothermal more attractive than other alternatives like solar and wind that have neither the 24/7 capability nor the issues surrounding operation and maintenance.

Pioneer has been working with the Colorado Geological Survey as this area is being investigated for its geothermal opportunity by other companies as well.

▶ Louisiana Geothermal, the sister company of Louisiana Tank, Jordan Oil and Central Crude of Lake Charles (La.), received DOE funding to conduct a geopressured geothermal project just east of the Sweet Lake area of Cameron Parish, keying off past DOE work in the Louisiana and Texas Gulf Coast.

The company anticipates this project to produce enough power in the next two years to provide much of the power needs of Cameron Parish.

The well will be drilled specifically for geopressured-geothermal power production to a depth on the order of 16,000 feet, with a calculated net potential of around 5.6 megawatts of power. Flow is anticipated at 30,000 barrels/day, with a capacity factor of 90-plus percent.

If all continues as planned, production could start as early as 2012.

* * *

This past July the DOE hosted a meeting of select professionals at the National Renewable Energy Laboratory in Golden, Colo., to discuss the low temperature (<400 degrees F) geothermal program for furthering its deployment nationwide.

Among the various suggestions made for developing this resource was the strong opinion that the expansion of low-temperature geothermal requires the inclusion of the oil and gas industry as a critical component. The oil and gas industry brings a large pool of talented geoscience and engineering professionals – and their respective companies – plus an understanding of subsurface energy production that would allow geothermal development in sedimentary basins, an unconventional arena for geothermal production and a bigger worldwide expansion of geothermal development.

Schlumberger's recent acquisition of GeothermEx, a comprehensive geothermal consulting and services firm active in over 50 countries, suggests an increasing interest in geothermal energy as a future area of operations expansion – a potential now under consideration by oil and gas exploration and production companies in many favorable areas of the world.

Geothermal energy is once again poised for expansion worldwide. Because of its high 90-plus percent capacity factor, it has high continuous availability and is thus not susceptible to the volatility of oil and gas pricing.

Generation of electricity from geothermal energy would provide a steady, dependable cash flow that would support an O&G company to define the equivalent of a 'baseload' profit stream, just as the utility industry must always maintain a 'baseload' flow of electrical power that is available on demand.

Geothermal energy is the original renewable energy resource.

(Editor's note: Erdlac, principal geologist with Erdlac Energy Consulting, Midland, Texas, is acting chair and vice chair-Industry of the EMD Geothermal Energy Committee.)

Geothermal: An Organized Approach

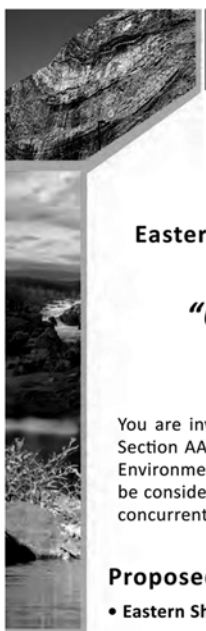
By RICHARD J. ERDLAC

AAPG recognizes the importance of geothermal energy for the oil and gas industry, and is working through the EMD to encourage the production of geothermal energy as an important part of the industry's future.

The EMD Geothermal Committee presently comprises Richard Erdlac as the acting chair and the Industry vice chair; David Blackwell (SMU) as the University vice chair; and Tom Anderson (RMOTC) filling the Government vice chair position. Joel Renner, the previous chair, is a special consultant to the committee.

Four other EMD representatives have been appointed to the Active Committee. They are Paul Morgan (Colorado Geological Survey), Michael D. Campbell (I2M Associates LLC), Steven Tischer (Arcadis) and Cenk Yardimcilar (Ankara, Turkey). Paul Britt (DPA) and Michael Jacobs (DEG) serve as vice chairs to the EMD Geothermal Committee.

Finally, an Observing Committee of some 27 AAPG-EMD members represents individuals who have expressed an interest in geothermal energy and will be monitoring the committee's activities (see the Members' Only website of the Geothermal Energy Committee).



AAPG Eastern Section Meeting
2011 Washington, DC
A NEW ENERGY FRONTIER

CALL FOR PAPERS

Abstract Deadline: April 4, 2011

Eastern Section - American Association of Petroleum Geologists
2011 Annual Meeting

"On the Edge of A New Energy Frontier"

September 24 – 28, 2011 - Washington, D.C.

You are invited to submit an abstract for oral or poster presentation at the 2011 Eastern Section AAPG Annual Meeting. All papers of interest to the Eastern Section, the Division of Environmental Geosciences, Energy Minerals Division, and Division of Professional Affairs will be considered for presentation. The technical program is expected to comprise two or three concurrent oral sessions and one poster session each day.

Proposed Theme Sessions

- **Eastern Shale Gas** - *Marcellus, Utica, Huron, Ohio, Horton Bluff, Frederick Brook, and others*
- **Conjugate Margins** - *Basin development during early rifting; North America - Europe analogs; North Atlantic - Arctic relationships, etc.*
- **Energy and Policy Issues in the Eastern U.S.** - *Societal and environmental impacts of shale-gas development, Federal and State land availability, Data accessibility from States, etc.*
- **Carbonate Sedimentology, Stratigraphy, and Diagenesis** - *In honor of Fred Read upon his retirement from Virginia Tech*
- **Coal and Coalbed Gas** - *Developments in resource characterization and environmental issues*
- **E^3– Energy, Economy, and Environment** - *Historical trends and forecasts for the eastern region and the nation; Emerging concepts and methods*
- **Carbon Sequestration** - *Case studies; Methods for assessing EOR and storage potential; Offshore storage potential; Reservoir and seal systems;*
- **Decision Support Systems for Energy Resource Managers and Policy Makers** - *Methods and case studies*
- **Thermal History of Eastern Basins** - *Thermal and maturation histories; Hydrocarbon generation, migration, and retention; Uplift, exhumation, and gas expansion*
- **Atlantic OCS and State Waters** - *Geology and resource potential; CO_2 sequestration potential*
- **New Ideas in Old Rocks** - *Emerging concepts in stratigraphy, structure, and geochemistry in eastern basins; New developments in unconventional gas reservoirs; Innovation enabling rejuvenation or extention of old fields*

Technical Program Co-chairs: Dave Houseknecht (dhouse@usgs.gov) & Jim Coleman (jlcoleman@usgs.gov)

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.

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CLASSIFIEDADS

POSITION AVAILABLE

TWO ENDOWED FULL PROFESSOR POSITIONS OSU BOONE PICKENS SCHOOL OF GEOLOGY

The Boone Pickens School of Geology at Oklahoma State University (OSU) seeks applications for two endowed chairs: the Chesapeake Energy Corporation Chair of Petroleum Geoscience and the Devon Energy Corporation Chair of Basin Research. We are particularly interested in candidates with interests in one or more of the following: unconventional energy resources, petrophysics, reservoir characterization/modeling, tectonics of sedimentary basins, depositional and diagenetic systems, and basinal fluids. These chairs will be filled at the level of Professor, will carry tenure in the School of Geology, and will be effective August 2011. Applicants must have a Ph.D. degree in geology or related field and have an outstanding record of research. The applicant must be committed to excellence in teaching both undergraduate and graduate students, will be expected to supervise M.S. and Ph.D. level graduate students and develop courses in her or his specialty.

The successful candidates will join a faculty of eleven geoscientists and will take leadership roles in a department that has close ties to the petroleum industry. The School's teaching and research facilities include state of the art geophysical field and laboratory equipment and software, the Devon Visualization Laboratory, and a wide range of petrographic and geochemical instrumentation. The School also has a recently renovated field camp facility near Canon City, Colorado.

Candidates should submit a letter of application, including a discussion of research interests and approach to teaching, along with a curriculum vitae and contact information for three references to: Endowed Chair Search, Boone Pickens School of Geology, 105 Noble Research Center, Oklahoma State University, Stillwater, Oklahoma 74078-3031. Screening of candidates will begin on November 8, 2010 and continue until the position is filled. More information about the Boone Pickens School of Geology can be found on the web http://geology.okstate.edu along with additional information about these opportunities. Inquiries may be directed to Dr. Todd Halihan (todd.halihan at okstate.edu) or Dr. Jay Gregg (jay.gregg at okstate.edu). Committed to health and safety Oklahoma State University maintains a tobacco free work environment. Oklahoma State University is an Affirmative Action/Equal Opportunity/E-Verify employer committed to diversity.

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Idaho National Laboratory

Research Leader and Manager
Carbon Resource Management Department

The Idaho National Laboratory is seeking a highly qualified individual to lead its Carbon Resource Management Department. As Department Manager, you will be expected to lead manage and grow a currently small department in the Idaho National Laboratory Energy and Environmental Science and Technology Directorate, with a focus on unconventional fossil energy while you are actively engaged in research aligned with Department goals. Development of regional, national and international research partnerships will be an important responsibility. The minimum qualifications for this position are a PhD in physical science or engineering plus 8 years post-PhD experience, a strong record of research productivity and demonstrated leadership. Fossil energy research accomplishments and previous management experience would be important assets. United States citizenship is desirable but not essential. Applications, including a full resume and the email addresses of 6 individuals who have agreed to act as references should be sent to Paul.Meakin@inl.gov. Evaluation of applications will begin on December 1, 2010, and the position will remain open until filled. Idaho National Laboratory is located on the Snake River Plain near spectacular mountain ranges and national parks (Yellowstone and Grand Teton). You would be working on the Idaho Falls campus.

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ASSISTANT PROFESSOR – UINTAH BASIN

The Department of Geology at Utah State University-Regional and Distance Education Campus is accepting applications for a nine-month, tenure track position located at the USU Uintah Basin Regional Campus in Vernal, Utah. Responsibilities include teaching (graduate & undergraduate courses), research, and service duties. PhD in geology or a closely associated field is required. See http://jobs.usu.edu (req. ID 052291) for more information and to apply online.

See **Classified**, page 54

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We are looking for a Senior Geoscientist to support the company's E&P of unconventional resource assets. This will be the first dedicated 'unconventionals' role in the business and as such, candidates must already possess relevant expertise, especially in basin shale gas exploration and development.

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Any applications sent directly to SPI/Sasol will be forwarded to Simpson Crowden. The appointment of candidates is subject to the verification of credentials. Sasol is committed to establishing a diverse workforce and we thank all applicants for their interest

Tenure Track Position in Sedimentary Geology
(Position #20121TLF005)

TEXAS TECH UNIVERSITY
College of Arts & Sciences
Department of Geosciences

The Department of Geosciences at Texas Tech University invites applications for a tenure track position in sedimentary geology to begin Fall semester, 2011. Depending on experience and qualifications, the successful candidate may be appointed at the Assistant or Associate Professor level; a Ph.D. in geological sciences is required at the time of appointment. We seek a candidate with interests in carbonate/clastic sedimentary processes and petrology, depositional systems, basin analysis, sedimentary tectonics, sequence stratigraphy, or sedimentary geochemistry and diagenesis. The candidate will be expected to teach undergraduate and graduate courses in their specialty, establish an innovative, externally funded research program, and direct M.S. and Ph.D. student research.

The Department of Geosciences is one of the fastest growing units at Texas Tech University, with nearly 30 faculty members in solid earth geosciences, geography, atmospheric science, and climate change. We work closely with the National Weather Service and the U.S. Geological Survey Texas Water Science Center which has a field office in our department. The Department maintains analytical facilities for light stable isotope mass spectrometry, laser ablation and solution ICP mass spectrometry and elemental analysis, low-temperature aqueous geochemistry, and x-ray diffraction, as well as rock- and thin-section preparation and mineral separation facilities. The Imaging Center of Texas Tech houses several TEM and SEM instruments with EDS, EBSD and CL detectors. All instrumentation and facilities are supervised by full time technical support. Geologic and geophysical interpretational/modeling/mapping software packages such as Geographix Discovery, ProMAX, GeoProbe, and PetroMod, as well as the full suite of ESRI GIS software are available. Additional information about the Department of Geosciences may be found at http://www.depts.ttu.edu/gesc/. Opportunities exist for participation in on-going multidisciplinary programs in Petroleum Engineering and Civil Engineering (hydrology).

Review of applicants will begin on January 1, 2011 and continue until the position is filled. Applicants must visit the TTU employment website (http://jobs.texastech.edu), search for requisition #82382, and provide the required information. Afterwards, applicants should submit a letter of application, a description of research & teaching objectives, curriculum vitae, and names and contact information, including e-mail addresses, of at least three references. These documents may be uploaded to the employment website or mailed to: Dr. Hua-wei Zhou, Geosciences Search Committee Chair (806-742-1308; h.zhou@ttu.edu), Department of Geosciences, MS 1053, Texas Tech University, Lubbock, TX 79409-1053. Representatives of the Department will be present at GSA, SEG, and AGU meetings during the Fall of 2010.

Texas Tech University is an equal opportunity/affirmative action institution; women, minorities, veterans and persons with disabilities are encouraged to apply.

Institute of Petroleum Engineering

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Informal enquiries are welcome to Prof. Simon Stewart, Institute of Petroleum Engineering, simon.stewart@pet.hw.ac.uk (0131 451 3120).

Download an application pack from our website www.hw.ac.uk/jobs or contact the Human Resources Office, Heriot-Watt University, Edinburgh EH14 4AS tel 0131 451 3475 (24 hours); email hr@hw.ac.uk quoting ref 170/10/AAPG.

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The Petroleum Geology of Iraq

by A. A. M. Aqrawi, J. C. Goff, A. D. Horbury and F. N. Sadooni

This book presents a comprehensive, up-to-date appraisal of the reservoir rocks, source rocks, seals and traps that control Iraq's petroleum resources. Early chapters review the history of the oil industry in Iraq and outline Iraq's tectonic setting and evolution. A five-chapter section on stratigraphic elements, arranged by megasequence, is followed by an assessment of Iraq's petroleum systems. The book provides an invaluable source of information for petroleum geologists and other researchers.

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Classified

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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.

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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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SEDIMENTARY GEOLOGY
UNIVERSITY OF WYOMING

The Department of Geology and Geophysics (http://geology.uwyo.edu) invites applications for a tenure-track, Assistant Professor position in sedimentation/stratigraphy. Ph. D. is required at the time of appointment. We seek an individual who shows the potential to develop an internationally recognized, externally funded research program, will be involved in the undergraduate and graduate teaching mission of the department, and will complement departmental strengths. Specialty is open and may include such diverse fields as petroleum geology, quantitative basin analysis, seismic stratigraphy, carbonate sedimentation, paleoclimate reconstruction, and physical sedimentology. Relevant instrumentation in the Department includes: fission-track laboratory, multi-sensor core logger, micro-analytical facility, high-abundance sensitivity TIMS, LA-ICPMS, a next generation multi-collector ICPMS and a modern reflection seismology lab. The University includes the School of Energy Research (http://www.uwyo.edu/ser/) and a centralized Stable Isotope Facility (http://uwacadweb.uwyo.edu/SIF/).

Applications should include a statement of research and teaching interests and accomplishments, curriculum vita, and the names and contact information of three references. Review of completed applications will begin November 15, 2010. Send a compiled electronic copy (PDF version preferred) of your application to the search committee (sedsearch@uwyo.edu). If you have additional application materials to send, please direct them to Sedimentary Search Committee, Dept. 3006, Geology & Geophysics, University of Wyoming, 1000 E. University Ave., Laramie, WY 82071.

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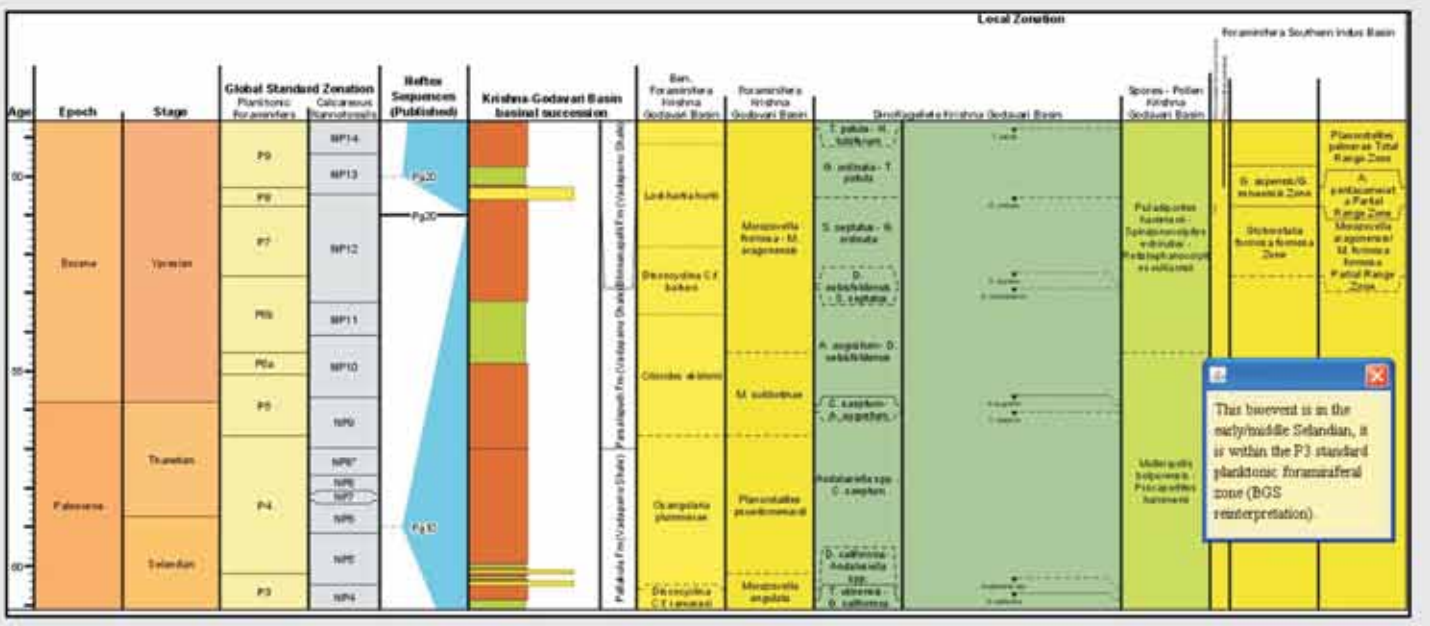

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DIRECTOR'S CORNER

PTTC Relationship Under Study

By RICK FRITZ, AAPG Executive Director

It is "State Fair" season again in the United States – a time to eat bad fried food and ride wild carnival rides (and hope they were properly inspected).

As in previous years, I always look for the newest "health" food on a stick. Last year they introduced deep fried garlic mashed potatoes on a stick.

This year they finally reached for the ultimate – deep fried butter on a stick! I thought, "Why not just inject grease directly into my arteries?"

This year I decided to reflect on my health and did not try this latest culinary delight.

* * *

There are certain times in life and in business to stop and reflect on the current reality and contemplate the future. AAPG is in this process with President Rensink's request for the Association leadership to consider what AAPG will look like well in to the future – even to 2035.

As part of this evaluation we are examining the effectiveness of all of AAPG's major programs. Recently, the Executive Committee, Advisory Council and the AAPG directors were asked to force rank AAPG's top 25 programs. In addition, we made an independent audit of several programs to better understand the needs and demands of the membership.

One program we are evaluating is AAPG's relationship with the Petroleum Technology Transfer Council, or PTTC. In 2006, PTTC needed to renew its

FRITZ

We are at the end of the three-year trial period and it is time for AAPG to evaluate its long-term relationship with PTTC.

Department of Energy (DOE) funding, and AAPG was approached for a potential relationship to stabilize PTTC and help its board find new funding.

Since 501c(3) not-for-profit corporations cannot be purchased, AAPG agreed to become the sole member of PTTC. This initial agreement was for a three-year trial period.

The mission of PTTC is to provide education and training to small producers, independents and consultants. This is primarily accomplished by providing base funding to Regional Lead Organizations (RLOs). RLOs typically are universities or state government agencies.

The first phase of the business plan for reconstructing PTTC was to re-establish DOE funding. In the event of a budget shortfall AAPG agreed to support PTTC up to $300,000 the first year or until DOE funding could be established.

The second phase of the business plan was to secure funding from industry and private sources. This was critical to ensure PTTC was not totally dependent on government funding. Another key item was to secure support from another not-for-profit society.

The first phase went very well with DOE. AAPG and the PTTC leaderships were able to secure two major contracts from DOE for a total of $5 million over five years. However, there was one critical change from previous funding, in that DOE required a very specific scope of work related to DOE activities, which limits PTTC's flexibility in the workshops and other programs that it offers.

When the DOE PTTC program was started in the early 1990s the plan was for industry to take over funding after five years; however, industry funding was never enough to support the program. For the past three years several attempts were made to secure industry and private funding. Although there have been several very generous donations from individuals, general industry support has been limited.

For society support, the Society of Petroleum Engineers was asked to join AAPG in a joint partnership. SPE declined the offer.

The reality is PTTC is essentially a program primarily funded by the government with limited funding from industry and individuals.

Now we are at the end of the three-year trial period and it is time for AAPG to evaluate its long-term relationship with PTTC. The key metrics will be the overall benefit to AAPG members and the potential liability if DOE funding is cut, stopped entirely or if the scope of work is changed considerably.

As a result, on Oct. 9 at the GCAGS meeting in San Antonio, the AAPG Executive Committee formed an ad hoc committee to make a recommendation concerning AAPG's future involvement with PTTC.

There are three likely outcomes:

- Continue the current relationship.
- Separate but work together through a joint venture agreement.
- Divest and provide general support.

We will let you know before the end of the year the recommendation of the ad hoc committee. Also, we will be looking for response from the membership so please send us your opinion at rfritz@aapg.org.

* * *

Before I left the state fair this year my 10-year-old daughter, Zoe, tried a chocolate pickle on a stick. She loved it; I thought it was gross.

I think I will stick to corn dogs.

Rick

DIVISIONS' REPORT

Tapping Into Geothermal a Hot Idea

By RICHARD J. ERDLAC

The last 10 years has witnessed an expansion by the oil and gas industry in the type of energy resources that are being developed. Coalbed methane, gas shales, oil sand, oil shale and tight gas sands all have seen growth in numerous places worldwide as companies look for dwindling reserves to maintain operations and societal demand for greater amounts of energy production.

There is, however, another resource hidden within the depths along with oil and gas that has yet to be produced by the oil and gas industry: geothermal energy.

When geothermal energy is mentioned, the first location that many people think of is volcanoes, hot springs, fumaroles, etc., which are valid considering the nature of a volcano and the associated hot water with their formation at depth.

Most people in the O&G industry, however, know of stories where a drilled well encountered such high temperatures that "the tool melted in the hole." These anecdotes have made for interesting stories, but they also represent the realization the industry quite often reaches temperatures in excess of 200 degrees Fahrenheit in its drilling for oil and gas.

Since heat is energy, the industry needs to realize it has left an untapped energy resource in the ground that has been considered a nuisance and a problem in the search for hydrocarbons, an energy resource that renews itself.

The question then arises: Would this energy be economic to develop?

* * *

Several companies already have begun to recognize this "stranded" heat energy resource and are beginning to harness this energy for electrical power generation in operations use.

For example:

- Continental Resources was approached by the University of North

ERDLAC

Dakota and Berrendo Wind/Geothermal with the idea of generating electrical power from several of their water wells.

Continental produces between 40,000 to 50,000 barrels of 190-200 F water per day from six water supply wells. As the water must be cooled prior to its use, Continental saw this as an opportunity to extract energy for electrical power generation and use within the Cedar Creek field, as reported in a 2009 talk at Southern Methodist University.

According to Berrendo, the organizations are working through the contracts with the U.S. Department of Energy (DOE), which is providing project funding, the university and Continental Resources.

- Denbury Resources is working in conjunction with Gulf Coast Green Energy, which acquired DOE funding, and Southern Methodist University to establish a co-production project at the Summerland Field in Mississippi. Produced water of nearly 200 F at 4,000 barrels per day will be used to offset electrical operating expense at this field, with the production of about 50 kilowatts of electricity. This is a test project to determine how effective co-production may be for offsetting these electrical expenses.

If successful, however, this may open the door for additional co-produced opportunities in geothermal energy development.

- Houston-based Hilcorp Energy is looking to supplement south Louisiana field

See EMD, page 52

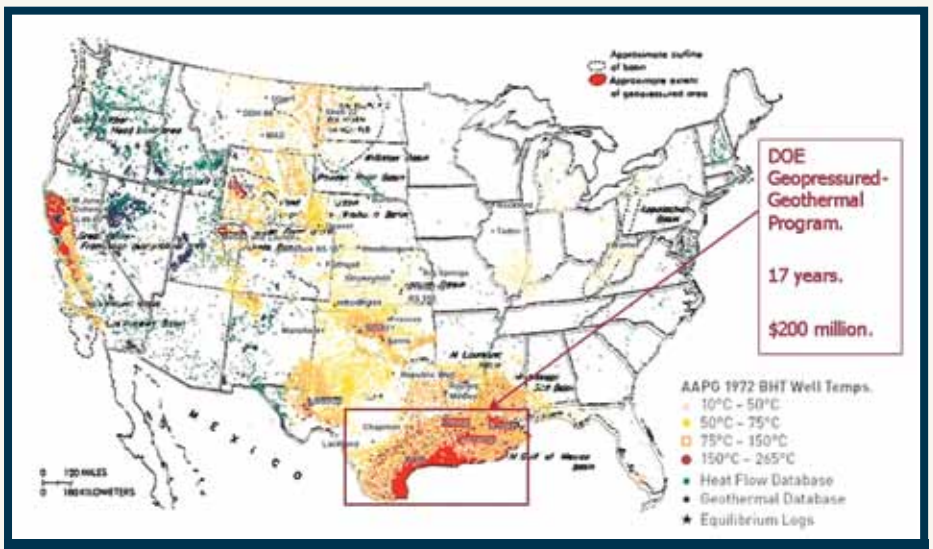
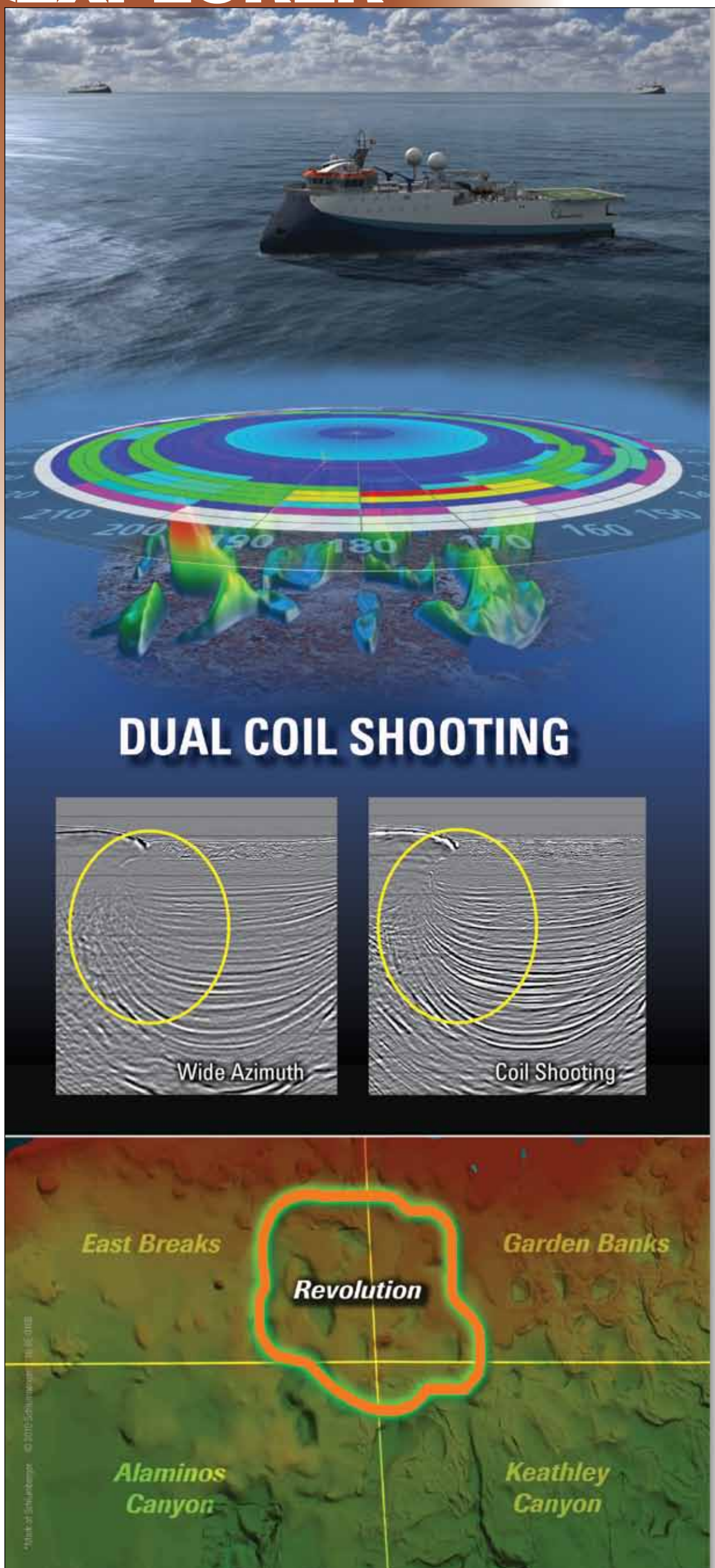


Image of the AAPG 1972 geothermal database from O&G wells superimposed on a map of geopressured regions (in red) identified in basins within the United States. The geopressured map is from Wallace, 1982 and the AAPG map is recreated by Blackwell and Richards, 2004.



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